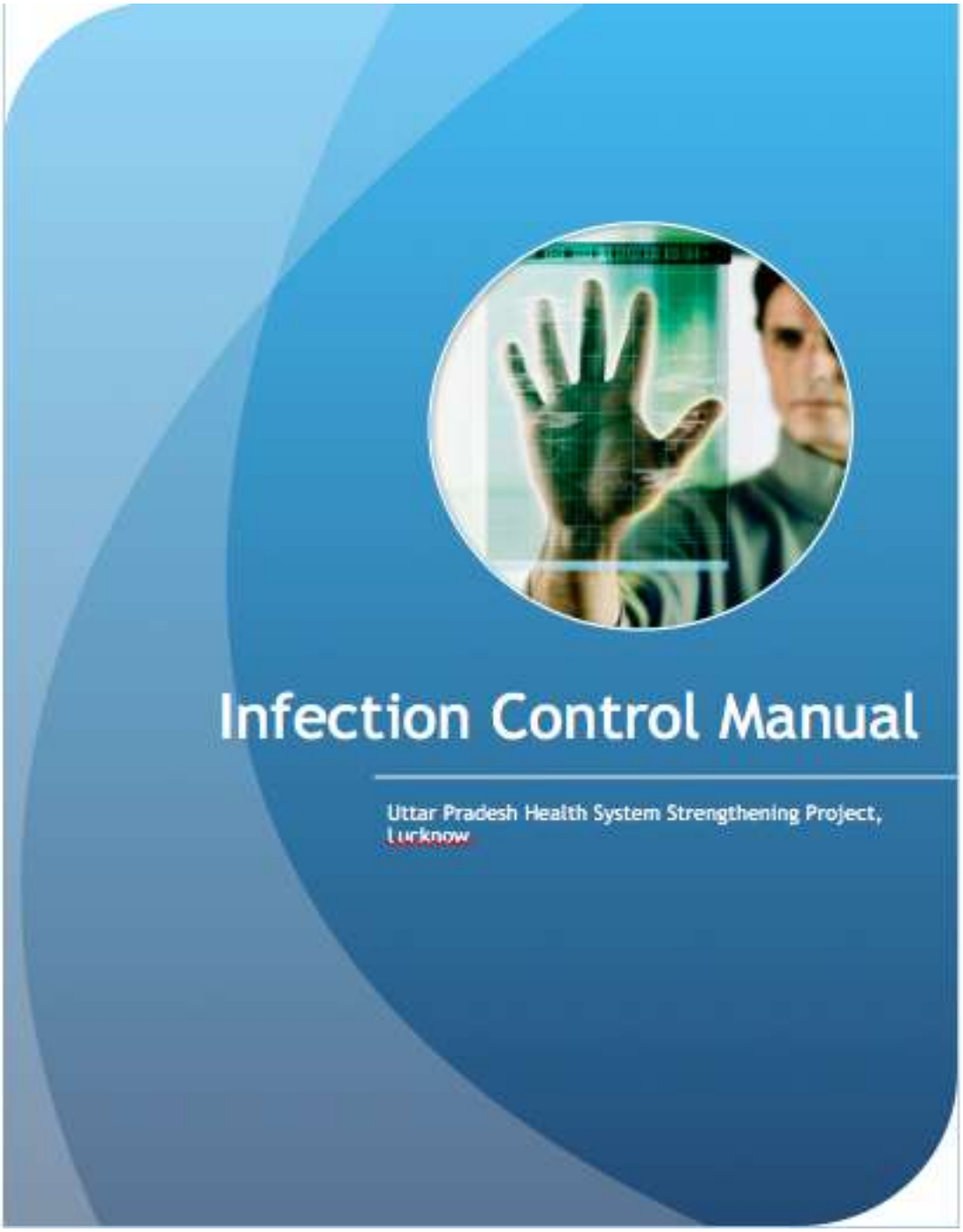
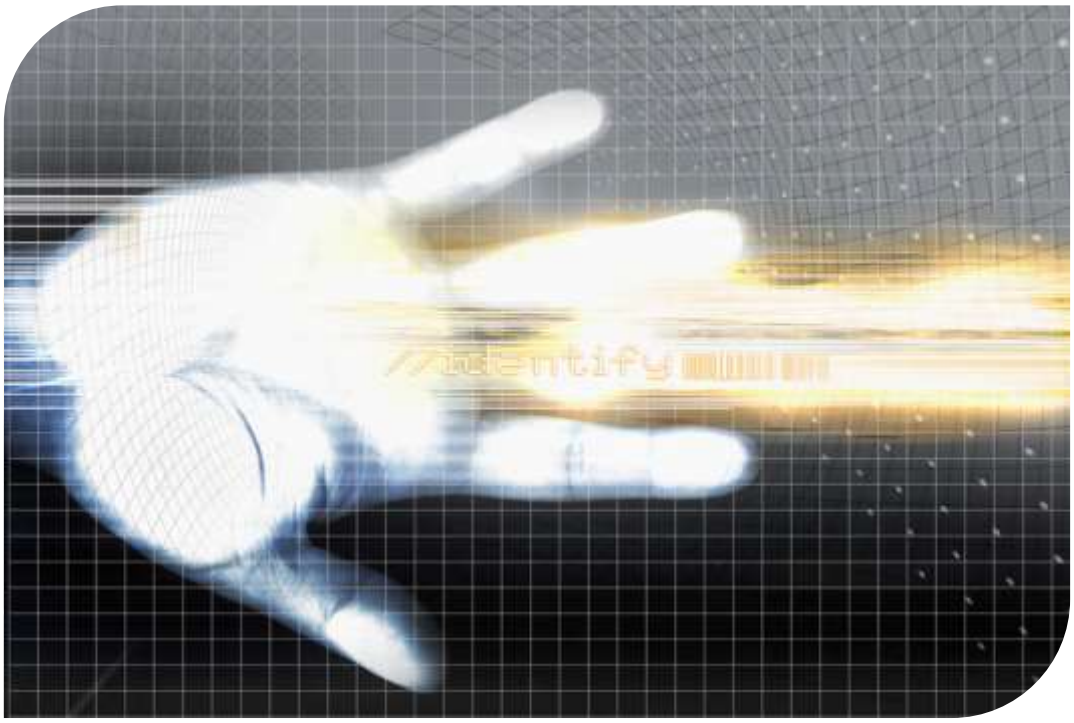


Training Block 2,
SIHFW Campus C-Block, Indira Nagar,
Lucknow-226016 Uttar Pradesh



Index

Sidharth Nath Singh
Cabinet Minister, Medical and Health

Ministry of Medical and Health
Government of Uttar Pradesh

MESSAGE

'Swastha ho har ghar parivaar' has been taken as the guiding priority in the *Lok Kalyan Sankalp Patra* of the present Government. As the guarantor of the health of the citizens of Uttar Pradesh, Department of Medical Health & Family Welfare has taken an endeavour for revamping of the healthcare facilities across the state.

"*Prevention is better than cure*" has always been relevant in public health. Hospital acquired infections are big challenge to this and need immediate attention. Our mission is to make our public health facilities infection free by implementation of standard procedures and destroy infection at its root.

I am glad to present Hospital Infection Control Manual for our public health facilities. I believe that this will be followed at each and every level of healthcare service delivery and perfection against infection will be achieved.

Safe Care saves life.

(Sidharth Nath Singh)

Prashant Trivedi
Principal Secretary
Health and Family Welfare

Department of Health and Family Welfare
Government of Uttar Pradesh

PREFACE

The Government of Uttar Pradesh is committed to provide free quality healthcare services across all public healthcare facilities across State. The District level Hospitals are under certain accreditation programme and we achieved to have fair number of certified facilities.

Department of Health and Family Welfare, GoUP is pragmatically facilitating quality assurance programme for sustainable revamping of the facilities which can meet the ever increasing need of Public Health system in the state. We are making efforts to create inbuilt and sustainable quality improvement in Public Health Facilities which delivers good quality treatment and also ensures patient safety.

Infection control is one of the main concerns in all public health care facilities across State. Therefore development of strong mechanism for implementation and surveillance is of utmost importance. These guidelines, jointly prepared by the technical committee formed under U.P.Health System Strengthening Project will certainly help hospitals to strengthen their infection control practices. This would help to prevent further spread of infection and to deal effectively with new infectious diseases as well.

The guidelines address all aspects of an infection control programme accompanying compendium of check-lists are intended to support the efforts of state in ensuring a infection free environment at Public Health Facilities. I do hope that both patients and healthcare providers would be benefited from this.

-SD-
(Prashant Trivedi)

V. Hekali Zhimomi
Secretary Medical Health

Department of Health and Family Welfare
Government of Uttar Pradesh

FOREWORD

Government of U.P has taken various initiatives for improvement of public healthcare facilities. The success in these interventions is evident by the number of the certified facilities by National Accreditation Board for Hospital and healthcare providers (NABH), National quality Assurance Standards (NQAS) and Kaya Kalp etc.

Quality assurance in healthcare can be made sustainable if there is an inbuilt mechanism within the facility along with the ownership by the healthcare providers. Quality is not a onetime affair rather it is a culture which needs continuous monitoring against pre-defined standards and objective elements. Govt. of U.P is progressing towards hospital revamping and accreditation which would result in sustainable development of the public health facilities. UPHSSP believes in sustainable strengthening of the health system of Uttar Pradesh which will ultimately help the common man in having access to quality health services at no cost.

Hospital infections pose a serious threat for the patients and healthcare providers financially and socially as well. Infection prevention and control is an indispensable part of quality assurance program of a health care organization. It reduces the occurrence of various hospital acquired infections and reduction in overall patient stay in the hospital, making the facilities safer in terms of cross infection for already suffering patients. Apart from patients it also reduces the chances of infection to healthcare providers who are always at risk of being infected. Thus efficient infection control mechanism has direct impact on the financial and social implications caused by hospital acquired infections.

The infection prevention guideline will serve as a tool to ensure safer hospitals for all patients and healthcare providers. Infection prevention guidelines will also direct the healthcare providers to follow correct infection prevention and control practices. The guidelines have been prepared with this perspective defining relevant quality standards.

(V. Hekali Zhimomi)

Dr. Harsh Sharma
Addl. Project Director
U.P. Health System Strengthening Project

Department of Health and Family Welfare
Government of Uttar Pradesh

ACKNOWLEDGEMENT

The Hospital Infection Control Guidelines have been developed by the department of Health and Family welfare GoUP, under the guidelines and support of V. Hekali Zhimomi, Secretary Health & Medical Care GoUP. The contribution and valuable inputs given by Dr. Hem Chandra, Prof. & Head Department of Hospital Administration and Medical Superintendent Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow (SGPGIMS) helped in firming up the guidelines within a set time period.

I must appreciate the technical contribution and initiatives of Dr. T.N. Dhole, Head Department of Microbiology SGPGIMS, Dr Prashant Gupta Associate Prof. Dept. of Microbiology King George Medical University who have coordinated the process of developing these Hospital Infection Guidelines besides making substantial technical contributions in it.

The efforts and initiatives taken by Dr. Dheeraj Tiwari, Assistant Director EM cell (UPHSSP), Dr. B.K. Verma, Assistant Director QA Cell (UPHSSP), Dr Santosh Kumar Sr. Consultant QA and Dr. Sachendra Raj Consultant QA and other UPHSSP team members contributions and collating all available information.

I hope these Hospital Infection Control Guidelines and accompanying compendium of check-lists facilitate to build a sound and credible infection control system at Public Health facilities across the state.

(Dr. Harsh Sharma)

Acronyms

AERB : Atomic Energy Radiation Board
AIDS : Acquired immune deficiency syndrome
AIIR : Air-borne Infection Isolation Room
AMC : Annual Maintenance Contract
BMW : Bio-medical Waste
BSI : Blood stream infections
CAUTI : Catheter Associated Urinary Tract Infection
CBWTF : Combined Bio-medical Waste Treatment Facility
CHG : Chlorhexidine gluconate
CLABSI : Catheter Associated Blood Stream Infections
CMC : Comprehensive Maintenance Contract
CSSD : Central Sterile and Supply Department
ETO : Ethylene Oxide
GI : Gastro-intestinal
HCP : Healthcare Providers/ Healthcare Personnel
HICC : Hospital Infection Control Committee
HAI : Hospital Acquired Infection
IC : Infection Control
ICCU : Intensive Cardiac Care Unit
IPD : In-patient Department
LRTI : Lower respiratory tract infections
NACO : National AIDS Control Organisation
NOC : No Objection Certificate
MDR : Multi-drug Resistant
MRSA : Methicillin Resistant Staphylococcus Aureus
MRSF : Methicillin Resistant Staphylococcus Epidermidis
MoU : Memorandum of Understanding
OPD : Out-patient Department
OT : Operation Theatre
PICU : Paediatric Intensive Care Unit
PEP : Post exposure Prophylaxis
PPM : Potentially Pathogenic Microorganisms

PPE : Personal Protective Equipment

SSI : Surgical Site infections (SSI)

URTI : Upper Lower respiratory tract infections

UTI : Urinary tract infections

VRSA : Vancomycin Resistant Staph Aureus

VRE : Vancomycin Resistant Enterococci

VAP : Ventilator-associated pneumonia

WHO : World Health Organisation

List of Figures

List of Tables

1 • Infection

This unit will cover:

- Basics of Infection control.
- Infection Control Programme; Infection Control Team.

1.1 • Infection; basic definitions [1, 2, 3, 4, 9,12, 25, 27]

Key terms used in this document are given below:

1.1.1 Infection

Infection is the invasion of an organism's body tissues by disease-causing agents, their multiplication, and the reaction of host tissues to these organisms and the toxins they produce.

1.1.2 Infection Control

Infection control is the discipline concerned with preventing nosocomial or healthcare-associated infection, a practical (rather than academic) sub-discipline of epidemiology. It is an essential, though often under recognized and under supported, part of the infrastructure of health care. Infection control and hospital epidemiology are akin to public health practice, practiced within the confines of a particular health-care delivery system rather than directed at society as a whole.

1.1.3 Hospital Acquired Infections [2, 4, 5, 7, 11, 26]:

Those infections which occur in patients in hospitals and manifest only after 48 hours of stay are called "nosocomial". Such nosocomial or hospital acquired infections lead to significant morbidity, mortality and economic burden beyond those expected from the patient's underlying disease alone (2, 4,5,7). This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility (11).

1.1.4 Sources of Hospital Acquired Infection [4, 5, 20]

Endogenous sources are body sites, such as the skin, nose, mouth, gastrointestinal (GI) tract, or vagina that are normally inhabited by microorganisms.

Exogenous sources are those external to the patient, such as patient care personnel, visitors, patient care equipment, medical devices, or the health care environment.

1.1.5 Possible types of Hospital Acquired Infections [4, 5, 20, 27]

- Urinary tract infections (UTI)
- Surgical Site infections (SSI)
- Upper/ Lower respiratory tract infections (URTI/ LRTI).
- Blood stream infections (BSI)

1.1.6 Disease Burden of Hospital acquired Infection ([4, 5, 8, 10, 11,15])

HAI are the most frequent form of adverse event in healthcare delivery worldwide. Hundreds of millions of patients are affected by HAI worldwide each year, leading to significant mortality and financial losses for health-systems. Of every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire at least one HAI.

The endemic burden of HAI is also significantly higher in low- and middle-income than in high-income countries, in particular in-patients admitted to intensive care units and in neonates 5-10% in developed countries, 10-30% in Developing Countries. Rates vary between countries, within the country, within the districts and sometimes even within the hospital itself due to 1) complex mix of the patients, 2) aggressive treatment and 3) local practices.

1.2 • Infection Control Program and Practices [1, 2, 3, 4, 9,12, 25, 27]

For efficient prevention and control of the Hospital Acquired Infections, each healthcare facility needs to have an Infection Control Programme, which in turn will govern all the processes for prevention and control of infection in the healthcare setting.

1.2.1) Objectives of Infection Control Program and Practices

The primary aim of the Hospital Infection Control program is to prevent or minimize the potential for nosocomial infections in patients as well as in staff by breaking the chain of transmission[(1)]. The specific objective of the infection control program may include:

- To develop written policies and procedures for standards of cleanliness, sterilization sanitation, and asepsis.
- To interpret, uphold, and implement the HIC policies and procedures.
- To review and analyse data on infections that occur, in order to take corrective and preventive steps.
- To review and input into investigations of epidemics.
- To develop a mechanism to supervise infection control measures in all phases of hospital activities and to promote improved practice at all levels.
- To ensure continuing education of employees on aspects of infection control.

1.2.2) Components of Infection Control Programme [(1,2,4, 27)]:

The important components of the infection control programme are:

- Basic measures for infection control, i.e. standard and additional precautions;
- Education and training of health care workers;
- Routine practices essential to infection control such as aseptic techniques, use of single use devices, reprocessing of instruments and equipment, antibiotic usage, management of blood/body fluid exposure, handling and use of blood and blood products, sound management of medical waste;
- effective work practices and procedures, such as environmental management practices including management of
    - Protection of health care workers, e.g. immunization;
    - Identification of hazards and minimizing risks;
    - hospital/clinical waste, support services (e.g., food, linen), use of therapeutic devices;
    - Surveillance; Incident monitoring; Outbreak investigation; Infection control in specific situations; and Research.

In addition to implementing basic measures for infection control, health care facilities should prioritize their infection control needs and design their programmes accordingly.

1.2.3) Hospital Infection Control Committee (HICC)

Hospital infection control committee (HICC) aims to improve hospital infection control practices and prevent or minimize the potential for nosocomial infections among patients, relatives, and health care providers. Detailed list of activities of infection control committee is given below:

- The infection control committee is responsible for the development of policies for the prevention and control of infection and to oversee the implementation of the infection control programme.
- Daily surveillance to control and reduce infection rate at health care facilities.
- To review and approve a yearly programme of activity for surveillance and prevention;
- To review epidemiological surveillance data and identify areas for intervention;
- To assess and promote improved practice at all levels of the health facility;
- To ensure appropriate staff training in infection control and safety management, provision of safety materials such as personal protective equipment and products; and
- In an emergency (such as an outbreak), this committee must be able to meet promptly

Hospital Infection Control Committee should have a wide representation from clinical and support services such as management, surgery, medicine, clinical microbiology, pharmacy, sterilizing services, maintenance, housekeeping and training services.

The committee must have a reporting relationship directly to either administration or the medical staff to promote programme visibility and effectiveness. A typical HICC at district level hospital may have following members:

- HICC Chairman -Senior Surgeon
- Senior consultant – Physician
- Lab in-charge/Microbiologist
- Nursing superintendent
- Infection control nurse
- Pharmacy in-charge
- Housekeeping supervisor

1.2.3.1 Responsibility of key Infection Control Committee (ICC) members

a) Chairperson

- Establish an infection control committee.

- Provide funds and resources for infection control program.
- Approval of any new construction, renovation and maintenance based on appropriate measures taken by agencies to prevent infection. This is necessary as construction can generate large amounts of dust and debris that may carry microorganisms including spores such as Aspergillus.

b) Infection Control Officer (ICO)

- Work as convenor of the ICC
- Call HICC meeting in consultation with Chairperson.
- Supervises the functioning of whole program.
- Assists the Chairperson to initiate appropriate action on any matter related to Infection control in hospital.
- To organize training and education in infection control procedures and practices.
- Surveillance of hospital acquired infections.
- Compilation and dissemination of data on all aspects of HAI.
- Detection and investigation of outbreaks.
- To formulate and implement antibiotic policy
- To supervise functioning of CSSD.
- To make cleaning and disinfection policies and supervise its application in coordination with house keeping.
- To formulate policies for biomedical waste management (BWM).

c) Infection Control Nurse (ICN)

- The ICN is a liaison between clinical departments and Microbiology department.
- Collaborates with the ICO on surveillance of infection and detection of outbreaks.
- Ensures that relevant specimens are collected and submitted for processing to Department of Microbiology.
- Training and education of hospital staff on infection control practices under supervision of ICO.
- To increase awareness among patients and visitors about infection control.
- To maintain register for infection control inspection round.

1.2.4) Standard Precautions

Standard precautions are the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where healthcare is delivered. The terms “standard precautions” and “additional (transmission-based) precautions” have

replaced previous terms such as universal blood and body fluid precautions, universal precautions and barrier nursing. Under this one may assume that:

- ALL patients are potentially infectious.
- ALL blood and body fluids and tissue are potentially infectious.
- ALL unsterile needles and other sharps are contaminated.

Measures of standard precautions include

- hand hygiene,
- use of personal protective equipment (e.g. gloves, gowns, masks),
- safe injection practices,
- safe handling of potentially contaminated equipment or surfaces in the patient environment, and
- respiratory hygiene/cough etiquette.

1.2.5.1 Hand Washing and Antisepsis (hand hygiene)

Appropriate hand hygiene (with plain soap and water or antimicrobial agent such as an alcoholic hand rub or waterless antiseptic agent) can minimize microorganisms acquired on the hands during daily duties and when there is contact with blood, body fluids, secretions, excretions, and known and unknown contaminated equipment or surfaces. Healthcare providers need to wash or decontaminate hands after handling any blood, body fluids, secretions, excretions, and contaminated items or immediately after removing gloves. *WHO Guidelines on Hand Hygiene in Health Care* suggests "Five Moments for Hand Hygiene" which acts as quick reminder for healthcare workers about situations which demands to use the hand hygiene.

"My Five Moments for Hand Hygiene "Approach (adopted from WHO guidelines):

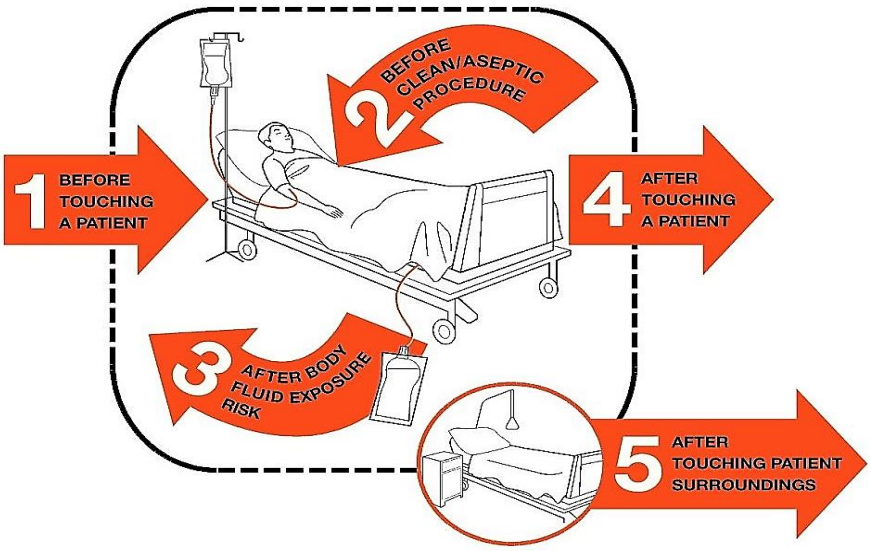


Figure - 1

1.2.5.2 Measures needed to promote hand hygiene:

WHO Guidelines on Hand Hygiene in Health Care suggests following measures to strengthen the hand hygiene measures in the hospital.

- **Training / Education**: Providing regular training on the importance of hand hygiene, based on the "My Five Moments for Hand Hygiene" approach, and the correct procedures for hand rubbing and hand washing, to all healthcare workers.
- **Evaluation and feedback**: Monitoring hand hygiene practices and infrastructure.
- **Reminders in the workplace:** Posters prompting and reminding healthcare workers about the importance of hand hygiene and about the appropriate indications and procedures for performing it.
- **System change:**
  - Access to safe, continuous water supply as well as to soap and towels.
  - Readily accessible alcohol-based hand rubs at the point of care.

1.2.5.3 Steps on how to use alcohol-based hand rub

Steps on how to wash hands when visibly soiled (otherwise, use hand rub. Duration of the entire procedure is 40-60 seconds):

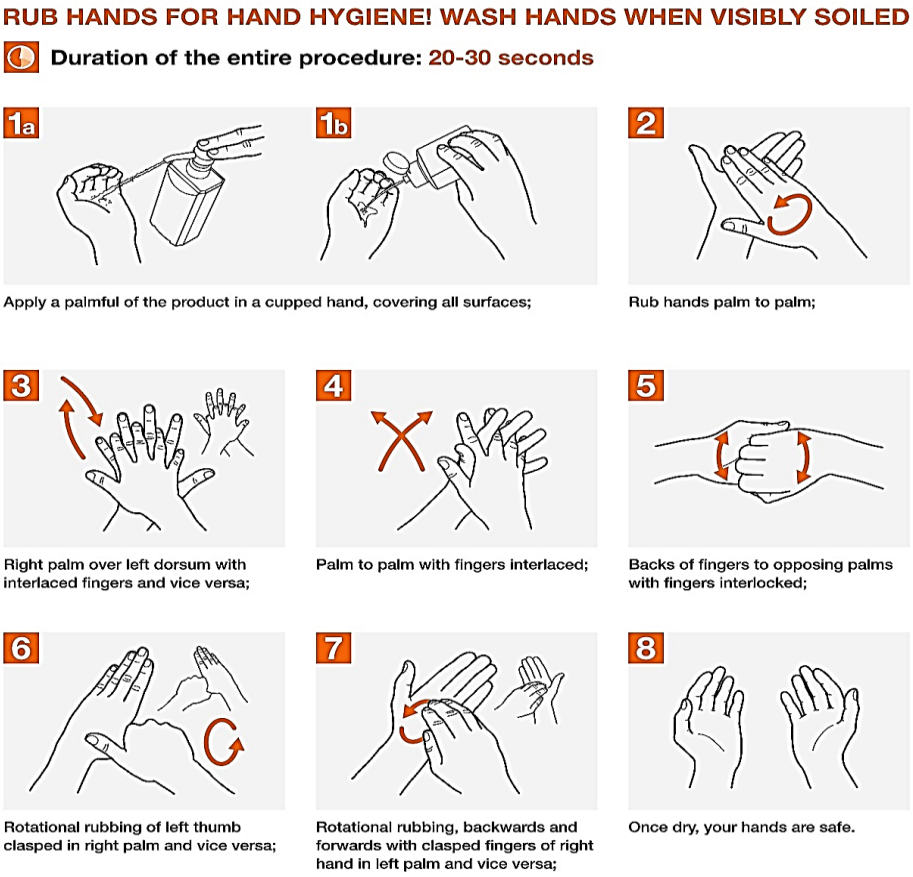


Figure – 2

1.2.5.4 Steps on how to use soap and water for hand rub

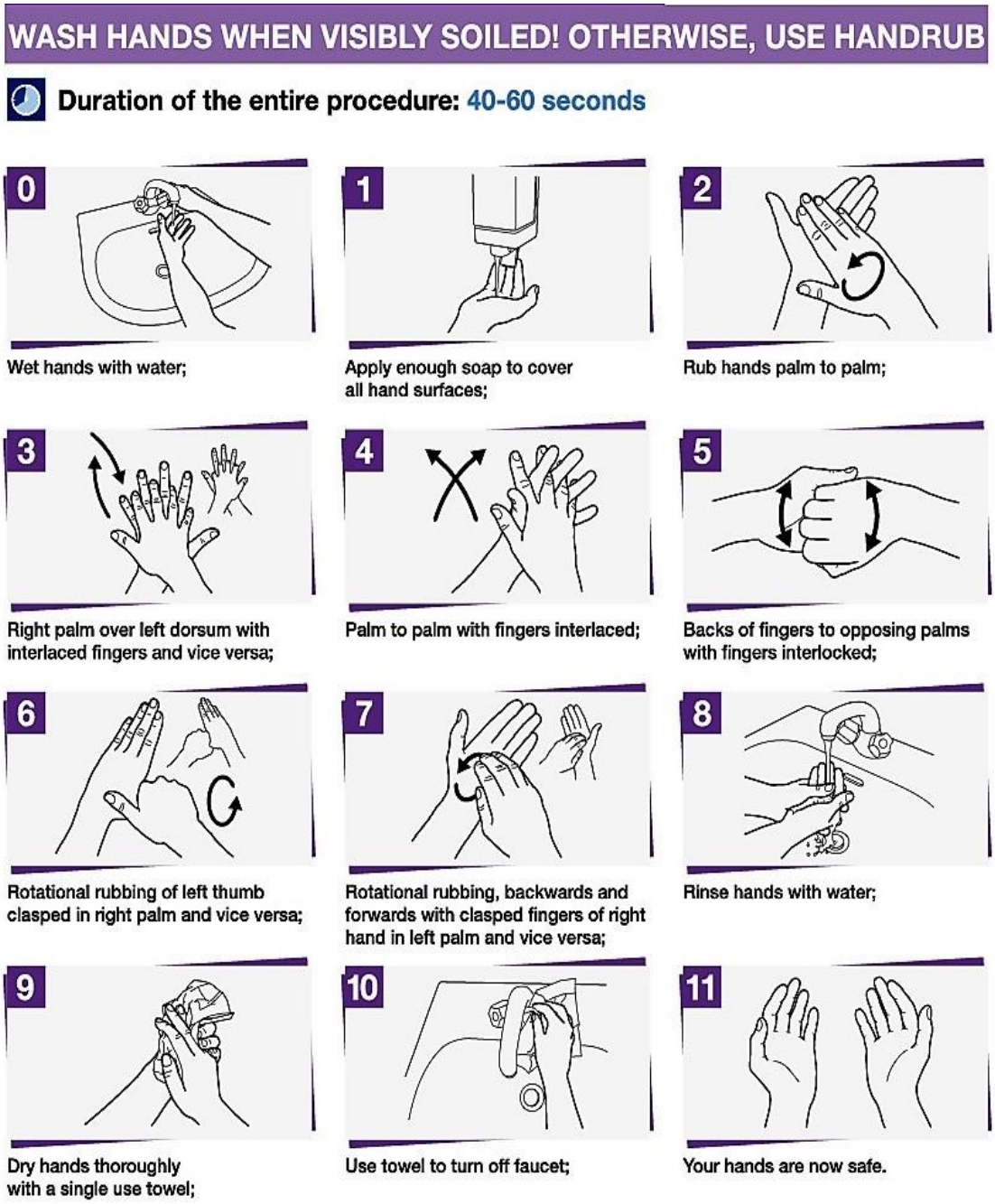


Figure - 3

1.2.5.5 Surgical hand scrubbing:

Surgical scrub refers to the act of washing the fingernail, hands forearms and 5 cms. above the elbow, with a bacterial solution in prescribed manner for specific period before a surgical procedure. The main aim of surgical scrubbing is to minimize the number of microorganisms on hands under the gloves. Thus, reducing the risk of infection to a client if gloves develop a small hole, tears or nicks during the procedure.

- Apply sufficient antiseptic solution; use firm, circular motions to wash hands and arms up to the wrists, covering all areas including palms, back of the hands, fingers, between fingers, and lateral side of thumb, knuckles, and wrists for at least three to five minutes by watch.
- Repeat the procedure twice.
- Rinse both hands one-by-one and keeps the hands above waist level at all times.
- Dry the hands with a sterile towel keeping them above waist level.
- Do not touch anything except the gloves after washing hands for a surgical procedure.

Box 1. Preparation of Surgical Hand Scrub:

1. Article required:

- Betadine 7.5%, 4% Chlorhexidine solution.
- Sterile hand towel.

2. Prior to Surgical Scrub

- Fingernails should not reach beyond the fingertip to avoid glove puncture
- Inspect hand for cuts and abrasions.
- Remove all jewelry.
- Make sure that your hair is covered by cap.
- Performing the surgical scrub without a brush or sponge is acceptable.

Box 2: Step of Surgical Scrubbing

1. Thoroughly wet hand from finger tips to 5 cms above under running water.
2. Apply disinfectant solution and lather on hands and arms.
3. Continue scrubbing as follow for 5 min or repeat all the steps twice keeping hand above the elbow throughout –

- Palm to palm
- Right palm over left finger interlaced
- Back of the finger to opposing palm with finger interlaced
- Rotational rubbing of right thumb and forward with clasped in the left palm and vice versa.
- Rotational rubbing backwards and forward with clasped fingers or right hand in left palm and vice versa
- Rinse hands thoroughly, keeping hands up and away from the body. Avoid splashing of water over OR attire.

4. Turn off the tap using the elbow.
5. Grasp the edge of the sterile towel and dry one hand from fingertip to elbow, and repeat the same grasping the unused end of the towel for other hand.
6. Discard the towel in the receptacle.

1.2.6 Personal Protective Equipment (PPE):

Personal protective equipment includes Gloves, Protective eye wear (goggles), Mask, Apron, Gown, Boots or shoe covers, Cap or hair cover. Personal protective equipment should be used by:

Figure - 4

- Healthcare workers who may have contact with blood, body fluids, excretions, and secretions, Support staff including medical aides, cleaners, and laundry staff in situations where they may have contact with blood, body fluids, secretions, and excretions,
- 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.

1.2.6.1. Use of Gloves

Disposable medical examination gloves needs to be used for providing direct patient care.

- Wear disposable medical examination gloves or reusable utility gloves for cleaning the environment or medical equipment.
- Remove gloves after contact with a patient and /or the surrounding environment (including medical equipment) using proper technique to prevent hand contamination.
- Do not wear the same pair of gloves for the care of more than one patient.
- Do not wash gloves for the purpose of reuse.
- Change gloves during patient care if the hands are moved from a contaminated body site (for example, perineal area) to a clean body site (for example, face)
- Remove all jewelry from the hands when working in the hospital.
- Do not wear artificial fingernails or extenders when in direct contact with patients.
- Keep natural nails short.

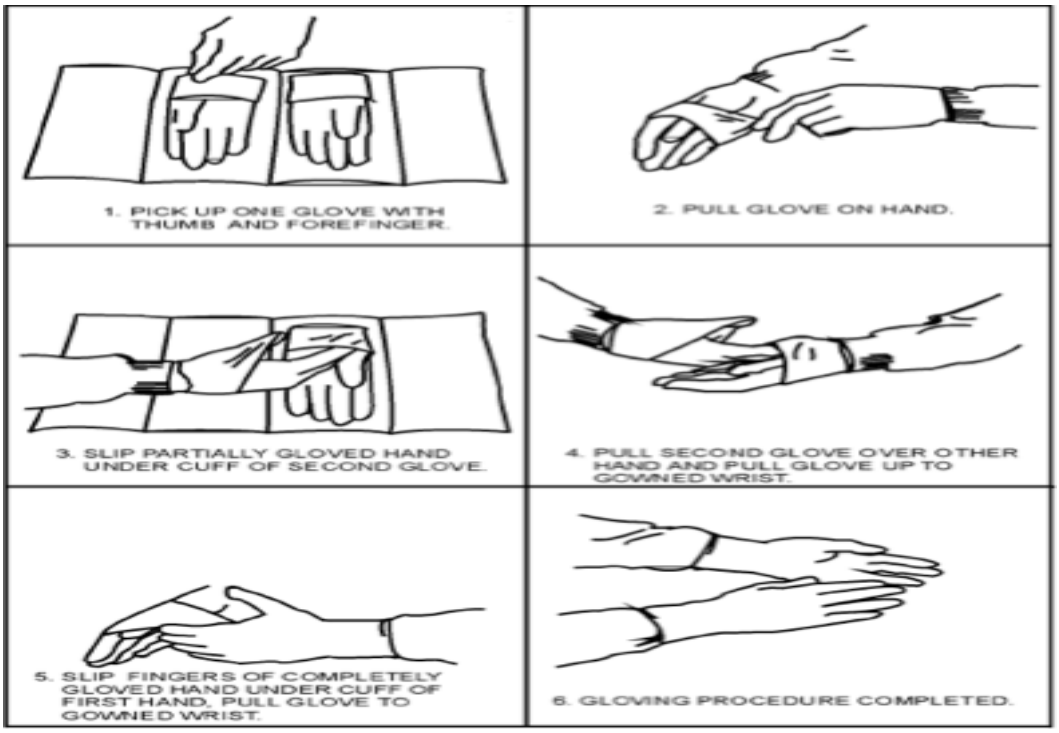


Figure - 5 Steps for using gloves

1.2.6.2 Gown

- Wear a gown that is appropriate to the task, to protect skin and prevent soiling or contamination of clothing during procedures and patient care activities when contact with blood, body fluids, secretions, or excretions is anticipated.
- Wear a gown for direct patient contact if the patient has uncontained secretions or excretions.
- Remove the gown and perform hand hygiene before leaving the patient's environment.
- Do not reuse gowns, even for repeated contacts with the same patient.
- Routine donning of a gown when entering a high-risk unit (for example, ICU, NICU, HSCT unit) is not indicated.

1.2.6.3 Mouth, Nose, Eye Protection

- Use PPE to protect the mucous membranes of the eyes, nose, and mouth during procedures and patient care activities that are likely to generate splashes or sprays of blood, body fluids, secretions and excretions. Select masks, goggles, face shields, and combinations of each according to the need anticipated by the task performed.
- The use of double gloves is not recommended. Heavy duty rubber gloves should be worn for cleanings instruments, handling soiled linen, or when dealing with spills.

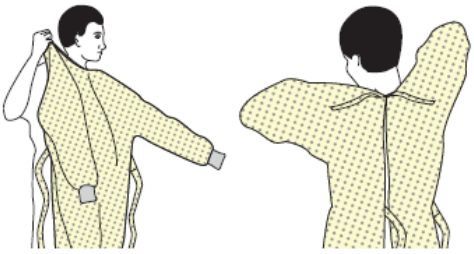
For the ready reference of the healthcare providers a Doffing and Donning guidelines are given in picture.

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.

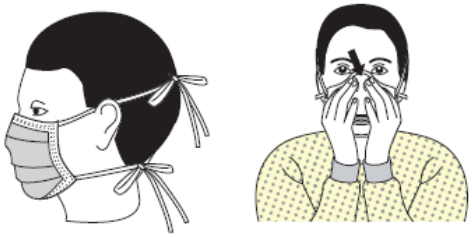
1. GOWN

- 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

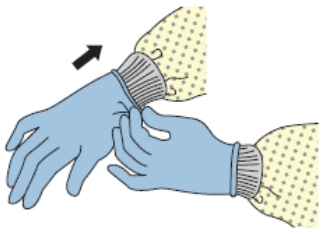


3. GOGGLES OR FACE SHIELD

- 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

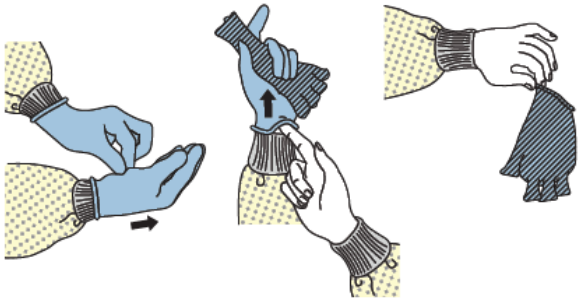
Figure - 6

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

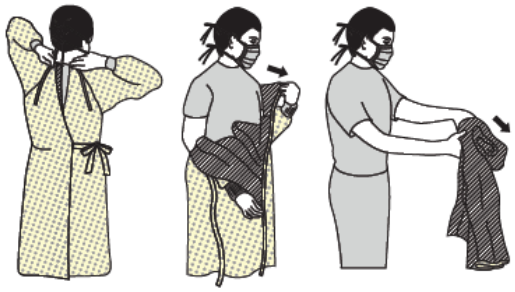


2. GOGGLES OR FACE SHIELD

- 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

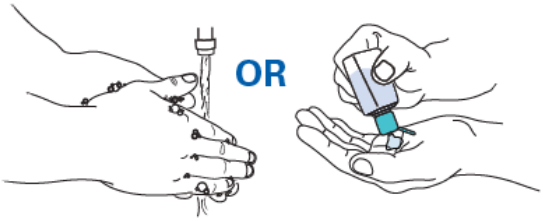
- Gown front and sleeves are contaminated!
- If your hands get contaminated during gown removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Unfasten gown ties, taking care that sleeves don't contact your body when reaching for ties
- Pull gown away from neck and shoulders, touching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

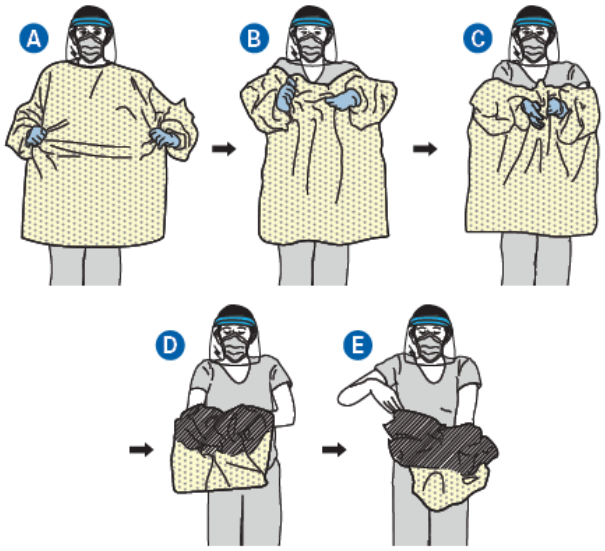
Figure - 7

HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE) EXAMPLE 2

Here is another way to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. **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. GOWN AND GLOVES

- Gown front and sleeves and the outside of gloves are contaminated!
- If your hands get contaminated during gown or glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp the gown in the front and pull away from your body so that the ties break, touching outside of gown only with gloved hands
- While removing the gown, fold or roll the gown inside-out into a bundle
- As you are removing the gown, peel off your gloves at the same time, only touching the inside of the gloves and gown with your bare hands. Place the gown and gloves into a waste container

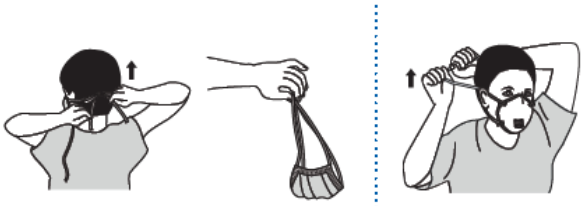


2. GOGGLES OR FACE SHIELD

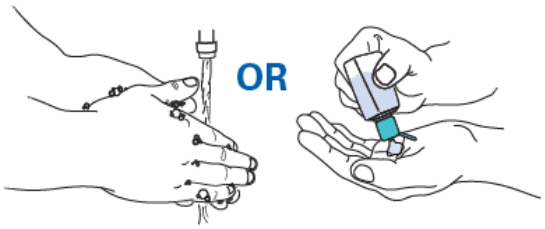
- Outside of goggles or face shield are contaminated!
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Remove goggles or face shield from the back by lifting head band and without touching the front of the goggles or face shield
- If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container

3. 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



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



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

Figure - 8

1.2.7 Guidelines for Collection of Blood Samples:

- Use gloves and take special care if there are cuts or scratches on the hands. Take care to avoid contamination of hands and surrounding area with the blood.
- Use disposable or autoclaved syringes and needles.
- Use 70 percent ethanol or isopropyl alcohol swabs or sponges for cleaning the site of needle puncture.
- Use thick dressing pads or adsorbent cotton below the forearm when drawing blood and tourniquet above. Tourniquet must be removed before the needle is withdrawn.
- Place dry cotton swab and flex the elbow to keep the swab in place till bleeding stops.
- Place used needles and syringes in a puncture-resistant container containing disinfectant.
- Do not recap used needles.

1.2.8. Proper Disposal of Needles and Sharps:

- Needles and sharps are the commonest mode of transmission of blood-borne pathogens to the healthcare worker.
- ALWAYS dispose of your own sharps. NEVER pass used sharps directly from one person to another.
- Precautions should be taken to prevent injuries by sharp instruments, especially hollow bore needles that have been used for venipuncture or other vascular access procedures.
- During exposure-prone procedures, the risk of injury should be minimized by ensuring that the operator has the best possible visibility; for example, by positioning the patient, adjusting the light source, and controlling bleeding.
- Needles should not be recapped, bent or broken by hand. Disposable needles and other sharps should be disposed immediately after use into puncture-resistant containers which should be located at the site of the procedure.
- When a needle has to be removed from a syringe, do it with utmost care.
- Locate sharps disposal containers close to the point of use, for example, in patient's room, on the medicine trolley, and in the treatment room. Do not overfill a sharps container.

1.2.9 Isolation Policies and Procedures:

Isolation procedures are meant to prevent or interrupt transmission of pathogenic microorganisms within the hospital. Selected patients may require specific precautions to limit transmission of potential infecting organisms to other patients. Since microorganisms are transmitted by three main routes as given below the patient's isolation be specific to these three categories:

- **Contact;** between the source of infection and the recipient or indirectly through contaminated objects
- **Air;** infectious particles less than 5 µm in diameter
- **Droplet;** Large droplets carry the infectious agent (greater than 5 µm in diameter).

1.2.9.1 Contact Precautions:

- Prioritize placement of patients in an examination room if they have stool incontinence, draining wounds and/or skin lesions that cannot be covered, or uncontrolled secretions.
- Perform hand hygiene before and after touching the patient and after removing gloves.
- PPE use
- Clean or disinfect the examination room accordingly.
- Instruct patients with known or suspected infectious diarrhea to use a separate bathroom,
- IN ADDITION to Standard Precautions, use contact precautions for specified patients known or suspected to be infected or colonized with epidemiologically important microorganisms that can be transmitted by direct contact with the patient or patient care items.
- **Patient placement:** A single room is preferable. Cohort only with patients who are affected by the same organism.
- **Patient transport:** Limit the movement and transport of the patient from the room for essential purposes only. Where necessary ensure that adequate precautions are taken to minimize the risk of transmission to others, and contamination of environmental surfaces or equipment.
- **Patient care equipment:** Where possible dedicate the use of patient care equipment to a single patient. Otherwise, ensure that all items are adequately cleaned or disinfected before use for another patient.

1.2.9.2 Droplet precautions:

- Place the patient in an examination room with a closed door as soon as possible (prioritize patients who have excessive cough and sputum production); if an examination room is not available, the patient should be provided a face mask and placed in a separate area as far from other patients as possible while awaiting care.
- PPE use
- **Patient placement:** Single Room. Special air handling or ventilation is not necessary. Only cohort with patient/patients who are infected with the same organism.
- **Spacing between beds:** Optimum spacing between beds is 1-2 meters.
- **Patient transport:** Limit the movement and transport of the patient. If transport or

movement is necessary, minimize dispersal of droplets from the patient.

- **Patient care equipment**. Where possible, dedicate the use of patient care equipment to a single patient. Otherwise, ensure that all items are adequately cleaned/disinfected.

1.2.9.3 Air-borne precautions:

- Have the patient enter through a separate entrance to the facility (for example, dedicated isolation entrance) if available, to avoid the reception and registration area.
- Place the patient immediately in an air-borne infection isolation room (AIIR). If AIIR is not available, provide a face mask (for example, procedure or surgical mask) to the patient and place the patient immediately in an examination room with a closed door.
- **Patient Placement:** Single room. Negative air pressure. Self-closing devices on doors to keep the door closed. Ventilation system should provide a means to discharge air from the room to the outside, such as an exhaust fan.
- **Respiratory Protection:** Heavy-duty N95 or N97 masks should be used. Low immune or pregnant staff should not enter the room of patients known or suspected to have rubella or varicella.
- **Patient Transport:** Limit movement or transport of patient from the room to essential purposes only.
- If transport or movement is necessary, minimize patient dispersal of organisms.

1.3 • Visitor's Policy For Isolation Patients

The ward sisters and doctors of the isolation ward have the responsibility of informing the patients' relatives about the importance of restricted movement of visitors and measures to be taken. The patient and the relatives must be given health education about the cause, spread, and prevention of the infection in detail. The need for isolation and restriction of visitors should be discussed with them. Key points which should be part of visitors policy is mentioned below:

- Be aware of restrictions on visits due to outbreak or other conditions within the facility.
- Visitors need to wear an N95 respirator.
- No more than two adult visitors are allowed at a time during the hospital visiting hours
- Duration of stay with patient is governed by the needs of the patient.
- Children below 12 years of age are not allowed into the isolation areas.

- Visitors' footwear, bags, and other belongings should be left outside the room.
- Visitors are not allowed to sit on the patient's bed.
- Visitors need to wash their hands well with soap and water before entering and when leaving the room.

Any prophylactic medication or active immunization for attendants should be conducted by the physician in charge.

1.4 • Protocol for Needle-stick Injury

1.4.1 Immediately wash your needle stick injury

- **For Injury**: Wash with soap and running water.
- **For Non-intact Skin Exposure**: Wash with soap and water.
- **For Mucosal Exposure**: Wash thoroughly.

1.4.2 Reporting:

All sharps injury and mucosal exposure MUST be reported to the immediate supervisor and to the Casualty Medical Officer to evaluate the injury. Details of the needle-stick injury should be filled by the supervisor and handed over to the HIC nurse for further follow-up.

1.4.3 Management:

Management is on a case to case basis.

1.4.4 Follow-Up:

Follow-up and statistics of needle-stick injury are done by the HIC nurse on a weekly basis. This information is presented at the HICC meeting and preventive actions to avoid needle-stick injuries, if any, are recorded**.**

1.5 • Post-HIV Exposure Management / Prophylaxis (PEP):

It is necessary to determine the status of the exposure and the HIV status of the exposure source before starting post exposure prophylaxis (PEP).

1.5.1 Immediate measures: Wash with soap and water. Do not use antiseptic or bleach.

1.5.2 Next steps: Prompt reporting

- All needle-stick/sharp injuries should be reported to the immediate supervisor, and then to the Casualty Medical Officer.
- An entry is made in the Needle-Stick Injury Register in the Casualty.
- Post exposure treatment should begin as soon as possible preferably within two hours, and is not recommended after 72 hours.
- PEP is not needed for all types of exposures.

1.5.3 Post exposure Prophylaxis: The decision to start PEP is made on the basis of degree of exposure to HIV and the HIV status of the source from where the exposure/infection has occurred.

2 • Disinfection and Sterilization

This unit will cover:

- Basics of Infection control.
- Infection Control Programme; Infection Control Team.

2.1 • Disinfection and Sterilization [1, 2, 3, 4, 9,12]

2.1.1 Disinfection:

Disinfection is a process where most microbes are removed from a defined object or surface, except bacterial endospores. There are three types of the disinfectant i) high level disinfectants (such as glutaraldehyde 2 percent, ethylene oxide), ii) intermediate level disinfectants (alcohols, chlorine compounds, hydrogen peroxide, chlorhexidine, glutaraldehyde (short-term exposure), iii) Low level disinfectants (benzalkonium chloride, some soaps).

The agent which destroys only vegetative bacteria is termed a low-level disinfectant. If the agent is capable of rendering mycobacteria nonviable, it is termed as an intermediate level disinfectant. High level disinfection is in other words sterilization wherein all microbial life is destroyed inclusive of endospores.

2.1.1.2 List of Disinfectants with technical Specifications for Hospitals

S.N.	Disinfectant Category	Ingredients Required
1	**Environment Disinfectants/ fogging**	1. ≥ 7% w/v Hydrogen peroxide (fumigate for 2. ≥ 7% w/v Hydrogen peroxide with 0.01 % w/v silver nitrate (may corrode metal) **3.** Gluteraldehyde based compounds

S.N.	Disinfectant Category	Ingredients Required
2	**Floor cleaning/ Discard jars**	i. Sodium hypochlorite or (5.25-6.15% household bleach diluted 1:500 provides >100 ppm available chlorine) ii. Lysol
3	**All Endoscopes, bronchoscopes etc.**	Endoscope cleaning- by enzymatic cleaners and detergent and water Endoscope disinfectants- i. >2% Glutaraldehyde followed by rinsing in 70% isopropyl alcohol **ii.** 2% Gluteraldehyde with 0.55% Orthopthaldehyde (OPA) followed by rinsing in 70% isopropyl alcohol
4	**Rubber/polyethylene Tubing and Catheters**	i. >2% Glutaraldehyde ii. glutaraldehyde (1.12%) and 1.93% phenol/phenate iii. Ortho-phthalaldehyde (OPA) 0.55% iv. Hydrogen peroxide 7.5% (will corrode copper, zinc, and brass) v. Hydrogen peroxide (7.35%) and 0.23% peracetic acid acid (will corrode metal)
5	**Applanation tonometer, rectal/vaginal probes, cryosurgical instruments, and diaphragm fitting rings**	i. 3% hydrogen peroxide, or 5000 ppm chlorine, or 70% ethyl alcohol, or 70% isopropyl alcohol
6	**Equipment surface Disinfectants**	Carbolic acid (5% phenol) or 1% Sodium hypochlorite (5.25-6.15% household bleach diluted 1:500 provides >100 ppm available chlorine) followed by cleaning with 70% Ethyl or isopropyl alcohol
7	**Hand Rubs**	i. Chlorhexidine Gluconate 2-2.5% v/v + Iso propyl alcohol 60-70% v/v ii. Non Alcoholic Hand Sanitizer (benzalkonium based) for Alcohol allergic personals

S.N.	Disinfectant Category	Ingredients Required
		iii. 70% ethyl or isopropyl alcohol or propanol with emoliments and moisturiser
8	**Skin disinfectants**	i. 70% ethyl or isopropyl alcohol ii. 2% Chlorhexidine with 70% isopropyl or ethyl alcohol iii. Tincture iodine iv. 10% povidone iodine
9	**Hand Wash/ Body wash/surgical scrubs**	**(i)**. Chlorhexidine Gluconate 20% v/v or equivalent to 4% w/v CHG For OT/ICU With FDA Approval
10	**Miscellaneous Category**	i. Indicator Strips for checking efficacy of 2% Gluteraldehyde solution used to disinfect endoscopes ii. Sodium dichlororoisocyanurate (NaDCC) 55% tablets (alternative to hypochlorite solution) iii. Chemical indicators (Class V integrators) to check autoclave iv. Biological indicator tubes to check autoclave
11	**Metallic surgical instrument cleaning (before autoclaving)**	Enzymatic cleaners with detergents
12	**Hand Wash**	Chlorhexidine Gluconate 20% v/v or equivalent to 4% w/v CHG with detergent
13	**Wipes for Body cleaning**	2.0% Chlorhexidine based wipes
14	**Hair wash**	2% Chlorhexidine Impregnated shampoo
15	**Soiled linen**	Soak in Bleaching powder 0.5% for 30 minutes followed by washing in hot water (70-80^{o}C) with detergent.
16	**Miscellaneous Category**	i. Indicator Strips for 2% Gluteraldehyde sol., a pack of 60. ii. Bleaching Powder Solution iii. Sodium dichlororoisocyanurate (NaDCC) 55% tabs for water treatment.

2.1.1.3 Disinfection of General Equipment:

S.No.	Equipment	Frequency of Change	Recommendation
1	Oral Thermometer	Single for all IPD patients	After each use, the thermometer is disinfected by wiping with a swab saturated with 70 percent isopropyl alcohol. For OPD: Each thermometer is kept in a separate
2	Rectal Thermometer	After each patient	Thoroughly wash with detergent and water, then dry. Store dry and separately from oral thermometers.
3	Auriscope	After each patient	Disposable earpieces should be used where possible; when not available clean in detergent and water.
4	Ear pieces	After each patient	Wash with hot water and detergent, store dry. Disinfect in CSSD or 70 percent alcohol for 5
5	Sphygmomanometer Cuffs	As required	Wash inflatable section in detergent and water, dry thoroughly or wipe with 70 percent alcohol.

2.1.2 Decontamination:

The objective of decontamination is to protect individuals who handle surgical instruments and other items, which have been in contact with blood or body fluids, from serious diseases. Once instruments and other items have been decontaminated, they can be safely further processed. This consists of cleaning and finally either sterilization or high-level disinfection.

WHO recommends 0.5 percent chlorine solution to be used for decontaminating instruments before cleaning them. The objective of **decontamination** is to protect individuals who handle surgical instruments and other items which have been in contact with blood or body fluids, from serious diseases. Once instruments and other items have been decontaminated, they can safely be further processed. This consists of **cleaning** and finally either **sterilization** or **high-level disinfection**.

Table-1

Equipment	Recommendation
Bed ends and frames, Bedside locker, Cardiac table, Baby bassinets	Mop with 1 percent sodium hypochlorite. Allow to dry.
Bowls-Bedpans / Urinals	Heat disinfection in a rinse temperature of minimum 82°C for 2 minutes. If not possible, bed pans, urine pots, and kidney trays should be kept in 7 percent Lysol for 24 hours or 3-5 percent sodium hypochlorite solution for 30 minutes; then they are washed with soap and water and dried in sunlight.
Bowls (washing)	Clean with detergent and water and store dry or as above.
Cleaning cloths, Brushes, and Equipment	Supplied daily from the laundry. They are provided for use and then discarded to wash. Wash brushes and buckets in detergent and water, then hang or invert to dry, then store dry. Disposable cloths are also available.
Curtain Rails	As for bed ends.
Hand Basins	Clean with detergent and water.
Lockers	Detergent and water as necessary and after patient discharge.
Mattresses and Pillows	All should be covered with an impervious plastic cover and should be wiped over with detergent and water if visibly contaminated. Mattresses should be cleaned regularly, and if contaminated, with the covers removed. If possible keep in sunlight for 24 hours. Plastic and rubber covers of mattresses and pillows should be washed with soap and water, cleaned with a suitable disinfectant, for example, 7 percent Lysol.
Mop Heads	Daily cleaning of mops. At the completion of each task of floor mopping, the mops should be thoroughly washed in a bucket containing HOT water and detergent. Squeeze as much water out of mop as possible and shake strands loose; leave hanging to dry in the sun if possible, or alternatively, in the cleaner's room. The bucket should be turned upside down to allow overnight drainage. Detachable mop heads should be sent to the laundry, while

Equipment	Recommendation
	reusable mops should be cleaned in hot soapy water, then left to dry ideally in the sun.
Nail Brushes	The use of nail brushes is discouraged as they cause skin damage that may cause an increase in bacterial flora. If a nailbrush is required, a sterile, antiseptic impregnated brush may be used. Reusable brushes require autoclaving between uses.
Toilet Bowls	At least daily brushing with a commercial bowl cleanser. Additional cleaning as necessary for stubborn stains.
Toilet Brushes	Should be rinsed in flushing water, and stored to dry.
Walls	Remove visible soiling with detergent as necessary.
Clinic Trolleys	Clean with a cloth dampened with detergent and water.
Ampoules/ vials	Wipe neck (ampoule) or top surface of rubber cap (vials) with a 70 percent isopropyl alcohol impregnated swab and allow to dry before opening or piercing.
Cardiac monitors, Defibrillators and ECG equipment	If patient contact, then surface is cleaned and disinfected.
Fixtures and fittings	In clinical areas wipe damp, dust daily with detergent solution. In known contaminated and special areas, wipe damp dust with a disinfectant solution
Furniture and ledges	In clinical areas, clean damp dust daily with warm water and detergent.

2.1.3. Fumigation or Fogging:

Fumigation is done only in the high-risk areas like ICU, PICU, NICU, Labour room and operating rooms. OT wards are excluded for fumigation (done only if required). Surface fumigation can be done using disinfectant. The room must be kept closed for 6 hours before use by housekeeping personnel. Cleaning for the wards may be done using disinfectant.

2.1.4 Sterilization:

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

- Steam autoclave

- Hot air oven
- Ethylene trioxide (ETO)
- Plasma technology
- Gamma irradiation

Out of the above-mentioned methods, two commonly used sterilization methods at district level hospitals are Hot Air Oven or Autoclave machines. The temperature/pressure and holding time for effective sterilization under the commonly used methods are as follows.

Table - 2

Sterilization	**Recommendations**
Hot Air Oven	160 ^{0}C for 1 hr., 180 ^{0}C for 30 min
Autoclave	Gravity-Displacement: 30min holding time at 121 ^{0}C/ 1.1 kg/cm^2 or 15 lb/in^2 (PSI) Prevacuum: 4 min holding time at 134 ^{0} C/ 2.2 kg/cm^2 or 32 lb/in^2 (PSI)

2.1.4.1 Rational Approach to Disinfection and Sterilization [(3)]:

2.1.4.1.1 Critical Items:

This category includes surgical instruments, cardiac and urinary catheters, implants, and ultrasound probes used in sterile body cavities. Most of the items in this category should be purchased as sterile or be sterilized with steam if possible. Heat-sensitive objects can be treated with ETO, hydrogen peroxide gas plasma; or if other methods are unsuitable, by liquid chemical sterilant.

Germicides categorized as chemical sterilant include ≥2.4% glutaraldehyde-based formulations, 0.95% glutaraldehyde with 1.64% phenol/phenate, 7.5% stabilized hydrogen peroxide, 7.35% hydrogen peroxide with 0.23% peracetic acid, 0.2% peracetic acid, and 0.08% peracetic acid with 1.0% hydrogen peroxide.

Liquid chemical sterilant reliably produces sterility only if cleaning precedes treatment and if proper guidelines are followed regarding concentration, contact time, temperature, and pH.

2.1.4.1.2 Semi critical Items:

Semi critical items contact mucous membranes or nonintact skin. This category includes respiratory therapy and anaesthesia equipment, some endoscopes, laryngoscope blades 24, oesophageal manometry probes, cystoscopes 25, anorectal manometry catheters, and diaphragm fitting rings.

These medical devices should be free from all microorganisms; however, small numbers of bacterial spores are permissible. Intact mucous membranes, such as those of the lungs and the gastrointestinal tract, generally are resistant to infection by common bacterial spores but susceptible to other organisms, such as bacteria, mycobacteria, and viruses. Semi critical items minimally require high-level disinfection using chemical disinfectants. Glutaraldehyde, hydrogen peroxide, ortho-phthalaldehyde, and peracetic acid with hydrogen peroxide are cleared by the Food and Drug Administration (FDA) and are dependable high-level disinfectants provided the factors influencing germicidal procedures are met.
High-level disinfection traditionally is defined as complete elimination of all microorganisms in or on an instrument, except for small numbers of bacterial spores. Cleaning followed by high-level disinfection should eliminate enough pathogens to prevent transmission of infection. Laparoscopes and arthroscopes entering sterile tissue ideally should be sterilized between patients. Meticulous cleaning must precede any high-level disinfection or sterilization process.

2.1.4.1.3 Noncritical Items:

Noncritical items are those that come in contact with intact skin but not mucous membranes. Noncritical items are divided into noncritical patient care items and noncritical environmental surfaces. Examples of noncritical patient-care items are bedpans, blood pressure cuffs, crutches and computers. In contrast to critical and some semi critical items, most noncritical reusable items may be decontaminated where they are used and do not need to be transported to a central processing area. Noncritical environmental surfaces frequently touched by hand (e.g., bedside tables, bed rails) potentially could contribute to secondary transmission by contaminating hands of health-care workers or by contacting medical equipment that subsequently contacts patients.

Mops and reusable cleaning cloths are regularly used to achieve low-level disinfection on environmental surfaces. However, they often are not adequately cleaned and disinfected, and if the water-disinfectant mixture is not changed regularly (e.g., after every three to four rooms, at no longer than 60-minute intervals), the mopping procedure actually can spread heavy microbial contamination throughout the health-care facility. Frequent laundering of mops (e.g., daily), therefore, is recommended. Single-use

disposable towels impregnated with a disinfectant also can be used for low-level disinfection when spot-cleaning of noncritical surfaces is needed.

2.2 • Infection Monitoring at District Hospitals

For Better infection prevention and control it is recommended to monitor selected hospital acquired infections as discussed below.

2.2.1 Prevention of Healthcare Associated Pneumonia:

Healthcare Associated Pneumonia (HAP) is the second most common nosocomial infection in the United States and is associated with high mortality and morbidity. HAP occurs at a rate between 5 and 15 cases per 1,000 hospital admissions and accounted for approximately 15% of all hospital-acquired infections (HAIs). Other terms of HAP are Healthcare-associated pneumonia (HCAP), and Ventilator associate pneumonia (VAP). However the term HAP is often used to represent both VAP and HCAP.

Definition of Key terms:

- **Hospital-acquired pneumonia (HAP)** is defined as pneumonia that occurs 48 hours or more after hospital admission that was not present at the time of admission.
- **Healthcare-associated pneumonia (HCAP)** includes patients who have recently been hospitalized within 90 days of the infection, resided in a nursing home or long-term care facility, or received parenteral antimicrobial therapy, chemotherapy, or wound care within 30 days of pneumonia.
- **Ventilator-associated pneumonia (VAP)** refers to hospital-acquired pneumonia that develops in patients who have been intubated and have received mechanical ventilation for at least 48 hours. The National Healthcare Safety Network defines VAP as any pneumonia that develops after the patient has been intubated, regardless of the time elapsed.

For effective prevention of healthcare associated pneumonia healthcare facilities should have policies and procedures for the prevention of healthcare-associated pneumonia. Continuing education should be provided to all HCWs and HCPs on infection control principles in the prevention of transmission of healthcare associated infections as well as the prevention of HAP. Mechanical ventilation is the primary

risk factor for the development of pneumonia in acute care settings.

2.2.1.1 Prevention Techniques:

The key prevention strategies therefore focus on three main issues namely a) ***aspiration, b) colonization of the aero digestive tract and c) contamination of respiratory care equipment***.

Hospitals are required to have an ongoing quality improvement programs including infection surveillance for outcome measures, direct observation and audit for compliance and education of healthcare personnel who care for patients undergoing ventilation.

- Intubation and mechanical ventilation should be avoided whenever possible.
- The risk of aspiration around an artificial airway can be reduced by noninvasive positive pressure ventilation, using either a full-face mask or a nasal mask.
- Nurse the ventilated patient in semi-recumbent position between 30 – 40 degrees, especially during feeding and transportation, unless there is a contraindication.
- Decrease the duration of intubation by assessing the patient's readiness for weaning and the appropriateness of spontaneous breathing trials on a daily basis.
- Avoid continuous use of paralytics.
- Avoid over-sedation
- Interrupt or lighten sedations daily at an appropriate time
- Ensure gastric tube is in the proper position every time before feeding.
- The rate of tube feeding should be carefully monitored according to the individual's tolerance by auscultating for bowel sounds and measuring the abdominal girth frequently to prevent gastric over-distention.
- For long term-ventilated patients, use of gastrostomy tube feeding can lower the risk of aspiration.

2.2.1.2 Prevent colonization of the aero digestive tract:

- Consistent and thorough hand hygiene is the most effective means of preventing colonization / infection caused by exogenous microorganisms. All healthcare workers should diligently observe the five moments of hand hygiene. Gloves should be worn if contact with respiratory secretions or contaminated objects are anticipated, and appropriate hand hygiene should be performed before and after glove use.
- Provide oral care to ventilated patients such as 0.12% Chlorhexidine antiseptic oral rinse at regular interval.

- The use of stress ulcer prophylaxis to prevent peptic ulcers for ventilated patients can reduce gastric acidity which can result in greater gastric colonization with pathogenic bacteria and should be used judiciously.

2.2.1.3 Prevent contamination of respiratory care equipment:

- Practice Standard Precautions during respiratory care.
- Maintain aseptic technique when performing intubation procedures. Mask and gloves should be worn.
- Use the oral route for insertion of the endotracheal tube if there is no contraindication.
- Perform endotracheal suctioning only when indicated. Measure the depth of suction catheter insertion beforehand and carry out suctioning procedures using aseptic technique.
- Saline instillation to loosen sputum for suction should be avoided. If there is a need to do so, single dose sterile solution should be used.
- Whenever possible, use steam sterilization or high-level disinfection for reprocessing respiratory equipment.
- Sterile water should be used to rinse reusable respiratory equipment
- All respiratory care items should be stored in a clean area away from exposure to dust, excess heat or moisture.
- The humidifier on the ventilator should be positioned below the bed level to prevent condensation from draining towards the patients.
- Condensate from ventilator circuits should be removed before repositioning the patient. During condensate removal, the ventilator circuit should be kept closed.
- Change the ventilator circuit only when visibly soiled or malfunctioning.

2.2.2 Prevention of Surgical Site Infections (SSI):

Surgical Site Infections (SSI) are defined as infections occurring up to 30 days after surgery (or up to 90 days after surgery in patients receiving implants where day 1 is the date of procedure and affecting either the incision or deep tissue at the operation site).

Most SSIs are believed to be acquired at the time of surgery. However, there is currently no data on the actual proportion acquired in the operating theatre versus post-operative care. The commonest source of pathogens for most SSIs is the endogenous flora of the patient's skin, mucous membranes or hollow viscera as the exposed tissues are at risk of contamination when mucous membranes or skin is incised. Exogenous sources of SSI pathogens include members of the surgical team, the

operating room environment including air, and all surgical instruments and materials brought to the sterile field during an operation. The symptoms and other details of SSI are given blow:

CRITERIA	Patient has at least one of the following: ➢ Infection occurs within 30 days after any operative procedure (where day 1 = the procedure date), **AND** ➢ involves only skin and subcutaneous tissue of the incision **AND** ➢ patient has at least ***one*** of the following: a. purulent drainage from the superficial incision. b. organisms isolated from an aseptically-obtained culture from the superficial incision or subcutaneous tissue. c. superficial incision that is deliberately opened by a surgeon and is culture positive or not cultured **AND** patient has at least ***one*** of the following signs or symptoms: pain or tenderness; localized swelling; erythema; or heat. A culture negative finding does not meet this criterion. d. diagnosis of a superficial incisional SSI by the surgeon

a. Deep SSI – 90 day surveillance: Infection occurs within 90 days after any operative procedure listed in **Table 2** (where day 1 = the procedure date) and involves deep soft tissues of the incision (e.g., fascial and muscle layers) and/or part of the body deeper than the fascial/muscle layers, that is opened or manipulated during the operative procedure and meets either of the following criteria (A or B):

CRITERIA A	Infection occurs within 90 days after the operative procedure (where day 1 = the procedure date) **AND** involves deep soft tissues of the incision (e.g., fascial and muscle layers) **AND** patient has at least one of the following: (a)purulent drainage from the deep incision. (b)a deep incision that spontaneously dehisces, or is deliberately opened or aspirated by a surgeonand is culture positive or not cultured **AND** patient has at least one of the following signs or symptoms: fever (>38°C); localized pain or tenderness. A culture negative finding does not meet this criterion. (c) an abscess or other evidence of infection involving the deep incision that is detected on gross anatomical or histopathologic exam, or imaging test.
CRITERIA B	Infection occurs within 90 days after the operative procedure (where day 1 = the procedure date) **AND** infection involves any part of the body deeper than the fascial/muscle layers, that is opened or manipulated during the operative procedure **AND** patient has at least one of the following: (a) purulent drainage from a drain that is placed into the organ/space (e.g., closed suction drainage system, open drain, T-tube drain, CT guided drainage) (b) organisms isolated from an aseptically-obtained culture of fluid or tissue in the organ/space

	(c)an abscess or other evidence of infection involving the organ/space that is detected on gross anatomical or histopathologic exam, or imaging test **AND** meets at least one criterion for a specific organ/space infection site listed in Table 3.

A. Most SSIs are believed to **OUTCOME FORMULA:**

a. Superficial Incisional SSI: Number of infections /Total no. of surgeries in the month **X** 100

b. Deep SSI (90 day surveillance surgeries): Number of infections (deep incisional/organ/space) / no. of surgeries (as per Table 2) in the month of initial surgery **X** 100

2.2.2.1 Pre-operative measures:

2.2.2.1.1 Preparation of patient

- Whenever possible, identify and treat all infections remote to the surgical site before elective operation. Postpone elective operations until the infection has resolved.
- Adequately control serum blood glucose levels in all diabetic patients particularly avoid hyperglycemia peri-operatively. Reduce glycosylated hemoglobin A1c levels to <7% before surgery, if possible. For patients undergoing cardiac surgery, maintain the postoperative blood glucose level at 108-180mg/dl (6-10mmol/L).
- Unless contraindicated, patients should be instructed or assisted to perform two preoperative shampoo and baths or showers the night before and on the morning of the surgery with chlorhexidine gluconate (CHG), or equivalent, before surgery to reduce the number of microorganisms on the skin and reduce the risk of subsequent contamination of the surgical wound.
- Caution should be exercised to avoid CHG contact with the eyes, the inside of the ears, the meninges, or other mucous membranes. If CHG solution gets into the eye, immediately rinse the area with copious amounts of running water for at least 15 minutes and seek medical attention. CHG should not be used on the head if the patient's tympanic membrane is not intact. CHG should not be used on patients for whom it is contraindicated, including patients with a known hypersensitivity to CHG or any other ingredient in the product.
- Do not remove hair preoperatively unless the hair at or around the incision site will interfere with the operation. If hair is to be removed, remove immediately just before the operation preferably with electric clippers with a single-use head. Alternatively, a depilatory agent could be used if testing has been performed without tissue irritation.
- Do not routinely use nasal decontamination alone with topical antimicrobial agents aimed at eliminating *Staphylococcus aureus* to reduce the risk of surgical site infection.

2.2.2.1.2 Skin preparation prior to operation:

- Thoroughly wash and clean at and around the incision site to remove gross contamination before performing antiseptic skin preparation.
- Use an alcohol containing antiseptic agent for skin preparation.
- Apply preoperative skin preparation in concentric circles moving towards the periphery. The prepared area must be large enough to extend the incision or create new incisions or drain sites, if necessary.

2.2.2.1.3 Theatre wear:

It is good practice to discard all used theatre wear prior to leaving the operating area to prevent healthcare workers, patients and visitors being exposed to the risk of contamination. Staff should not leave the operating theatre suite wearing non-sterile theatre wear as this is important in the maintenance of theatre discipline which is important in minimizing the risk of SSI.

2.2.2.1.4 Patients:

Patients may be given theatre wear that is appropriate for the procedure and that provides easy access to the operative site and areas for placing devices, e.g., intravenous cannula.

2.2.2.1.5 Healthcare personnel (HCPs) in all areas:

- Wear dedicated non-sterile attire.
- Staff should keep their movements in and out of the operating area to a minimum.
- HCPs at semi-restricted and restricted areas of the surgical or invasive procedure setting:
- Wear clean surgical attire, including shoes, head covering, surgical masks, and identification badges.
- Head cover or cap should cover the hair on the head and face fully when entering the operating room.
- Surgical mask should cover the mouth and nose fully when entering operating room if an operation is about to begin or already under way, or if sterile instruments or equipment are exposed. Wear the mask throughout the operation.
- Scrubbed team members are required to put on sterile gloves after donning a sterile gown. Use surgical gowns that are effective barriers to liquid penetration.

2.2.2.1.6 Hand decontamination

- The operating team should remove hand jewelry, artificial nails before operations. Hand decontamination prior to surgery is required to minimize the risk that either the resident flora of microorganisms that normally colonize the skin or transient organisms acquired by touch contaminate the surgical wound.
- While transient microorganisms are readily removed by soap and water, scrubbing with antiseptics such as alcohol or detergent solutions containing chlorhexidine and povidone-iodine may be required to eliminate microorganisms that reside in deep crevices and hair follicles. Although alcohol rapidly kills microorganisms, it does not physically remove organic material and it should, therefore, not be used when the hands are visibly soiled.
- The operating team must decontaminate their hands many times a day. However, the regimen chosen should not damage the skin. Hence, hand rubbing may be preferred compared to traditional hand scrubbing.
- HCPs should keep natural finger nails short. HCPs should follow a standardized procedure for hand hygiene. A surgical hand cleansing should be performed by staff before donning sterile gloves for surgical or other invasive procedures. HCPs should use either an antimicrobial surgical scrub agent intended for surgical hand antisepsis or an alcohol- based antiseptic surgical hand rub with documented persistent and cumulative activity.
- The operating team should wash their hands prior to the first operation on the list using an aqueous antiseptic surgical solution with a single-use brush or pick for the nails, and ensure that hands and nails are visibly clean. This is followed by preoperative surgical scrub, or a rinse-free alcohol-based surgical hand antisepsis (refer to manufacturer's recommendations on duration).
- After performing a preoperative surgical scrub or alcohol-based surgical hand antisepsis, keep hands up and away from the body (elbows in flexed position) so that water runs from the tips of the fingers toward the elbows. Dry hands with a sterile towel and don a sterile gown and gloves.
- Before subsequent operations, hands should be washed using either an alcoholic hand rub or an antiseptic surgical solution. If hands are soiled then they should be washed again with an antiseptic surgical solution.
- Management of infected or colonized surgical personnel
- Educate and encourage surgical personnel who have signs and symptoms of a transmissible infectious illness to report conditions promptly to their supervisory and occupational health service personnel.
- Surgical personnel who have draining skin lesions should be excluded from duty until infection has

been ruled out or resolved.

- Do not routinely exclude surgical personnel who are colonized with organisms such as S. aureus (nose, hands, or other body site) or group A Streptococcus, unless such personnel have been linked epidemiologically to dissemination of the organism in the healthcare setting.
- Antibiotic prophylaxis and mechanical bowel preparation
- Administer an antibiotic prophylaxis only when indicated, and select it based on its efficacy against the most common pathogens causing SSI for a specific operation and published recommendations. Do not use antibiotic prophylaxis routinely for uncomplicated clean surgeries without prosthetic implants.
- Inform patients before the operation, whenever possible, if they will need antibiotic prophylaxis, and afterwards if they have been given antibiotics during their operation.
- Before giving antibiotic prophylaxis, consider the timing and pharmacokinetics (for e.g., the serum half-life) and necessary infusion time of the antibiotic. Give a repeat dose of antibiotic prophylaxis when the operation is longer than the half-life of the antibiotic given.
- Administer by the intravenous route the initial dose of prophylactic antimicrobial agent, within one hour before incision to maximize tissue concentration. Vancomycin and fluoroquinolones can be given 2 hours before incision. However, do not routinely use vancomycin to reduce the risk of surgical site infection.
- Stop prophylaxis within 24 hours after non-cardiac surgeries; and within 48 hours for cardiac surgeries.
- Before elective colorectal operations in addition to the above, mechanically prepare the colon by use of enemas and cathartic agents. Administer non- absorbable oral antimicrobial agents in divided doses on the day before the operation. Do not use mechanical bowel preparation routinely to prevention of surgical site infection.
- Give antibiotic treatment (in addition to prophylaxis) to a patient having surgery on dirty or infected wounds.
- Consider screening for MRSA carriage and decolonization with nasal mupirocin ointment or octenidine nasal gel and chlorhexidine/octenidine body washes before elective surgery such as cardiac and implant surgery.

2.2.2.2 Intra-operative measures

2.2.2.2.1 Ventilation and movement of staff

- Follow the recommendations of the Facility Guidelines Institute (FGI Guidelines for Healthcare Facilities) or local authorities on the ventilation requirements of an operating room.
- Do not routinely use ultraviolet radiation in the operating room to prevent surgical site infection.
- Keep operating room doors closed except as needed for passage of equipment, personnel and patients. Limit the number of people entering the operating room to necessary personnel only.
- The traffic in the operating room should be minimized. Scrubbed personnel should remain close to the sterile field.

2.2.2.2.2 Sterile gown, gloves and drapes

- Surgical attire is intended to function as a barrier between the surgical field and the potential sources of microorganisms in the environment, skin of the patient or the staff involved in the operation. It also performs an additional function of protecting the operator from exposure to blood or body fluids. The extent to which the materials used for gowns and drapes act as a barrier depends on the closeness of the weave and water-resistant properties.
- Use of gloves is part of the aseptic surgical ritual to reduce the risk of introducing infection. They protect the operating team's hands and also protect the team from viral transmission from patients' body fluids (hepatitis and HIV) during surgery. The use of two pairs of gloves has also been suggested as a means of reducing glove puncture and hence potential contamination of the surgical wound by microorganisms from the operator's skin.
- There is no difference between reusable and disposable drapes and gowns in terms of SSI incidence. Although the use of reusable or disposable drapes and gowns is not an issue with regard to reducing risk of SSI, disposable drapes and gowns can be considered when the patient is at risk of or is infected with blood borne pathogens such as HIV.
- The operating team should wear sterile gowns or sterile procedure attire in the operating theatre during the operation or procedure.
- Change scrub suits that are visibly soiled, contaminated, and/or penetrated by blood or other potentially infectious materials.
- Consider wearing two pairs of sterile gloves when there is a high risk of glove perforation as the consequences of contamination may be serious (e.g., operating on a patient who is a hepatitis C carrier or known to have a high viral load of any blood borne virus).
- Sterile drapes should be used to establish a sterile field and should be placed on the patient,

furniture, and equipment to effectively prevent cross contamination. Once the sterile field is established, shifting or moving of the sterile drape should be avoided.

- Use sterile drapes that are effective barriers to liquid penetration.
- Do not use non-iodophor-impregnated incise drapes routinely for surgery as they may increase the risk of surgical site infection. If an incise drape is required, consider using an iodophor-impregnated drape unless the patient has an iodine allergy.

2.2.2.2.3 Asepsis and surgical technique

- Adhere to standard principles of asepsis for all procedures including placement of intravascular devices, spinal or epidural anaesthesia catheters, and when dispensing and administering intravenous drugs.
- Assemble sterile equipment and solutions immediately prior to use.
- Handle tissue gently, maintain effective hemostasis, minimize devitalized tissue and foreign bodies, and eradicate dead space at the surgical site.

2.2.2.2.4 Maintaining effective hemostasis:

- Maintain patient normothermia and prevent 'inadvertent perioperative hypothermia'.
- Maintain optimal oxygenation during surgery and ensure that appropriate haemoglobin saturation is maintained during surgery and recovery.
- Maintain adequate perfusion during surgery.
- Do not use intra-operative skin re-disinfection or topical antimicrobials in abdominal surgery to reduce the risk of surgical site infection.
- At the end of the operation, cover surgical incisions with an appropriate interactive dressing such as semi-permeable film membrane with our without an absorbent.
- Use delayed primary skin closure or leave an incision open to heal by second intention if the surgeon considers the surgical site to be heavily contaminated.
- If drainage is necessary, use a closed suction drain. Place a drain through a separate incision distant from the operative incision. Remove the drain as soon as possible.
- There is no formal recommendation on the duration of operation although it is known that longer surgeries are associated with higher risks for SSI. Sterilize all surgical equipment according to published guidelines. Minimize the use of immediate-use steam sterilization.
- Use impervious plastic wound protectors for gastrointestinal and biliary tract surgery.

2.2.2.3 Post-operative measures

The main purposes of surgical dressings are to allow appropriate assessment of the wound postoperatively, to absorb exudates, to ease pain and to provide protection for newly forming tissue. They maintain an optimal moist wound environment without causing maceration of the surrounding skin as the dressing material is permeable to moisture and gas. Some dressings allow early bathing or showering of the rest of the patient in the first few postoperative days, which is part of early mobilization. It is generally accepted good clinical practice to cover the wound with an appropriate interactive dressing for a period of 48 hours unless otherwise clinically indicated, for example, if there is excess wound leakage or hemorrhage.

2.2.2.3.1. Changing dressings

To prevent microorganisms on hands, surfaces and equipment from being introduce into the wound, aseptic non-touch dressing technique should be employed for the management of post-operative wound.

2.2.2.3.2. Postoperative cleansing

The most appropriate and preferred cleansing solution is sterile normal saline because it is non-toxic and the isotonic solution does not damage healing tissues. The objective is to remove excess wound exudate or any mobile slough and wound debris.

2.2.2.3.3. Topical antimicrobial agents for wound healing by primary intention

Primary intention healing is healing of a wound where the wound edges heal directly touching each other. This result in a small line of scar tissue, which is the goal whenever a wound is sutured, closed. To reduce the risk of surgical site infection, do not use topical antimicrobial agents for surgical wounds that are healing by primary intention.

2.2.2.3.4. Dressings for wound healing by secondary intention

Do not use Eusol and gauze, or moist cotton gauze or mercuric antiseptic solutions to manage surgical wounds that are healing by secondary intention. Use an appropriate interactive dressing to manage surgical wounds that are healing by secondary intention.

2.2.2.3.5. Antibiotic treatment of surgical site infection and treatment failure

Antibiotic treatment is not routinely recommended for all SSIs. For minor infections pus can be drained by removal of sutures and application of antisepsis. When surgical site infection is suspected, patient should be given an antibiotic that covers the likely organisms. In choosing an antibiotic, one

should consider the results of microbiological sensitivity tests and local sensitivity patterns.

2.2.2.3.6. Debridement: Debridement is the process of removing necrotic material or slough within the wound margin. The slough acts as a medium for bacterial proliferation therefore delaying the healing process. Currently there are a number of accepted methods available for wound debridement, including sharp debridement, hydrocolloid dressings and hydrogels. The promotion of wound healing is enhanced by appropriately timed dressing changes which allow granulation of tissue.

2.2.2.3.7. Specialist wound care services: To improve overall management of surgical wounds, a structured approach to wound care including preoperative assessments to identify individuals with potential wound healing problems should be developed. This can be achieved by providing specialist wound care services, enhanced education to health care professionals, patients and careers, and sharing of clinical expertise.

2.2.2.3.7. Things to remember:

- Do not remove hair unless hair will interfere with the operation. If hair removal is necessary, remove outside the OT by clipping. Do not use razors.
- Control serum blood glucose levels for all surgical patients, including patients without diabetes. For patients with diabetes mellitus, reduce glycosylated hemoglobin A1c levels to less than 7% before surgery, if possible.
- Use a dual agent for patient skin preparation containing alcohol, unless contraindications exist.
- Administer surgical prophylaxis only when indicated, within 1 hour of incision to maximize tissue concentration.
- Stop surgical prophylactic agents within 24 hours after the procedure for all procedures except cardiothoracic surgery where 48 hours is acceptable.
- Sterilize all surgical equipment according to published guidelines. Minimize the use of immediate-use steam sterilization.
- Optimize tissue oxygenation by administering supplemental oxygen during and immediately following surgical procedures involving mechanical ventilation.
- Use impervious plastic wound protectors for gastrointestinal and biliary tract surgery.

3 • INFECTION PREVENTION & CONTROL IN OPERATION ROOM

This unit will cover:

- Basics of Infection control.
- Infection Control Programme; Infection Control Team.

Working in the Operating Room (OR) requires highly skilled staff members to coordinate and deliver the care necessary to surgically treat a wide variety of patients. The OR staff works in an intense, fast-paced, detail oriented, technically advanced environment to safely perform surgical procedures. In the perioperative setting, good infection prevention and control is essential to ensure that patients who undergo any surgical procedure receive safe and effective care. Safe working practices are also necessary to ensure the safety of the OR team members as well. Risk of exposure to blood borne pathogens and toxic chemicals is a major concern among healthcare providers who work in the OR. In response to these risks, there should be a focus on the impact of the surgical procedure on the perioperative team and how to prevent the surgical team from acquiring infections as they administer care to the surgical patient. Operation rooms/Suites are specially designed and operated under aseptic environment to prevent HAI. The following points are discussed to ensure an aseptic environment in the Operating Room.

3.1 Objective

3.2 Layout

3.3 Standard and Universal precautions (CDC recommendations)

3.4 Risk factors

3.5 Management of blood spillage

3.6 Role of CSSD

3.7 Role of Laundry

3.8 Evaluation of infection control

3.1 Objectives: The Objectives of infection prevention & control in operation room is to provide a sterile field for a safe surgery, to prevent all HAIs (not only SSI) & to prevent occupational hazards.

3.2 Layout of OT:

Zoning of OT room complex is the first step towards planning for infection control practices in Operation Theatre.

3.2.1 Protective Zone/ Outer Zone - Main Access corridor, transfer area, supervisor office or control station, documentation area, preoperative patient holding areas.

3.2.2 Clean/ Semi restricted zone - Clean corridor, sterile and equipment sterile store, anesthesia and recovery room, rest areas the changing facilities.

3.2.3 Clean/ Restricted zone – Scrub, sinks etc.
Staff must change into theatre clothes and shoes before entering the clean/ semi restricted area. The operating theatre (restricted zone) should be restricted to just the personnel involved in the actual operation

3.2.4 Sterile Zone – Main operation theatre areas. Do not allow sterile personnel to reach across unsterile areas or to touch unsterile items or vice versa.

3.3 Standard and Universal precautions (Standard Precautions): CDC recommendations for prevention of SSI. 1. Hand hygiene 2. PPE 3. Aseptic technique- Prevention of needle stick 4. Environmental Cleaning 5. Instruments reprocessing 6. Waste management Universal precautions: Blood spillage management/ blood and body fluid post exposure management.

- Preparation of the patient: Identify and treat all infections remote to surgical site before elective operations.
- Do not remove hair preoperatively unless it will interfere with the operation.
- If needed, remove hair immediately before the operation preferably with electric clippers.
- Preparation of the patient require patients to shower or bath with an antiseptic agent at least the night before the operative day.
- Thoroughly wash and clean at and around the incision site to remove gross contamination before performing skin preparation.
- Hand/forearm antisepsis for surgical team Keep nails short and do not wear artificial nails, Perform preoperative surgical scrub for at least 2 to 5 minutes using an appropriate antiseptic,

Dry hands with sterile towels and don a sterile gowns and gloves.

.

Ventilation - Maintain positive pressure ventilation in the operating room Maintain a minimum of 15 air changes per hour with at least 3 fresh air. Do not use UV radiation in the operating room to prevent SSI. Keep operating room doors closed except as needed for passage of equipment personnel and the patient.

Cleaning and disinfection of environmental surfaces- When visible soiling or contamination with blood or other body fluids of surfaces or equipment occurs use an approved disinfectant to the clean the affected area before the next operation. Closing the operation room after contaminated or dirty operation.

Sterilization of surgical instruments- Sterilize all surgical instruments according to the guidelines.

Surgical attire and drapes - Wear full PPE Surgical mask that fully covers the mouth and nose, Cap or hood to fully cover hair on head and face, Sterile gloves, Impermeable sterile gowns. Change scrub suits when visibly soiled or contaminated with blood or body fluids.

Asepsis and surgical technique - Adhere to principles of asepsis when placing intravascular devices. If drainage is used, use a closed suction drain, insert it through a separate incision distant from the operative incision and remove it as soon as possible.

3.4 Risk Factors: Classify the risk factors according to setting situation. Target the- modifiable and high priority, Easy to change and high priority, Easy to change and not high priority, Hard to change and high priority, Hard to change and not high priority.

3.5 Cleaning Spills of Blood and Body Fluids

3.5.1. Procedures for dealing with small spillages e.g., splashes and droplets-gloves and a plastic apron must be worn. The area should be wiped thoroughly using- disposable paper roll / towels. The areas should be cleaned using a neutral- detergent and warm water. Recommended concentration of Presept (Sodium Dichlorocyanurate) 1 tab- in 2.5 water liters to decontaminate surfaces. Used gloves, apron / towels should be disposed in yellow waste bag. Wash hands.

3.5.2. Procedures for dealing with Large blood spills in 'dry' areas (such as clinical areas). Where possible, isolate spill area. The area must be vacated for at least 30 minutes. Wear protective equipment like disposable cleaning gloves, eyewear, mask and plastic apron. Cover the spill with paper towels

Place all contaminated items into yellow plastic bag or in sharp container for disposal. Pour (3.5

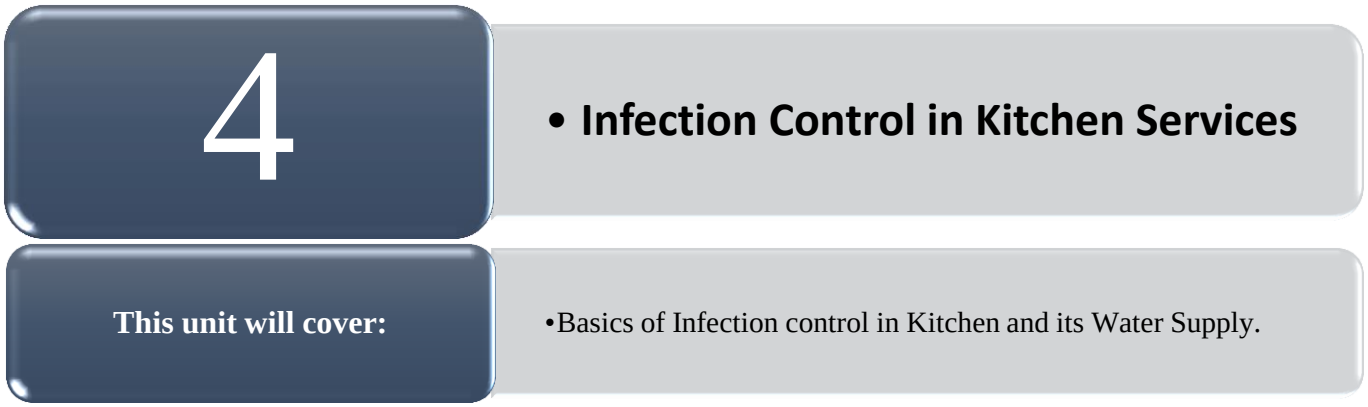
tab Presept in 1 water liter) solution and allow 10 minutes to react then wipe up. Decontaminated areas should then be cleaned thoroughly with warm water and neutral detergent.
Follow this decontamination process with a terminal disinfection. Discard contaminated materials (absorbent toweling, cleaning cloths, disposable gloves and plastic apron). Wash hands.

3.6 Role of CSSD: Central sterile supply Department established for sterilization of instrument linen & other surgical/s consumables to be monitored for quality control. Otherwise this will become a major source of infection in OT.

3.7 Role of Laundry: A good mechanized laundry washing position removes more than 95% contamination. Linen washing quality to be monitored regulating for quality control.

3.8 Evaluation of Infection Control Practices:

- Checklists used to evaluate everyday performance and compliance to infection control practices.
- Provide feedback to OT staff to rapid intervention.
- Evaluation of infection control practices Surveillance use CDC case definitions to identify SSIs and all other HAIs, either during hospital stay or after patient discharge. It provides incidence rate of infection, stratifies risk factors, HAIs that need strong intervention.



4. Kitchen service and water supply – Infection control

Providing optimum nutrition to patients should be an important and critical part of patient care in health care services. Food is at risk in all areas where it is stored, prepared, transported and served. Good food and hygienic conditions are indispensable to avoid these risks. Dietetic services should be well organized, staffed and equipped to ensure that food is received, stored, prepared, cooked, transported and served in such a way to minimise bacterial contamination and wastages**.**

There should be a provision of "therapeutic diets" in hospital food service which may require additional preparation, storage or distribution space and equipment. Food items should be of good quality and procured from sources approved or considered satisfactory by federal, state or local authorities. Before accepting delivery shelf-life of items must be checked. Replacement of poor quality items or arrange for extra deliveries for items not received should be arranged.

All foods items should be stored above the floor, on shelves, racks, or other surfaces in a well ventilated room which facilitate thorough cleaning There should be thermometer in refrigerator /freezer or/ and cold storage area. Floors in kitchen area should be of smooth, impervious and durable material. All exterior doors and windows must be tight fitting and capable of restricting the entrance of insects and rodents

All utensils, counters, shelves and equipment should be kept clean, maintained in good repair and free from breaks, corrosion and cracks. Maintenance of various service areas should be done as per cleaning schedule. All kitchen staff should be trained enough to maintain personal cleanliness and maintain good hygienic practices.They should wear clean uniform, head cover, footwear, gloves and mask etc. There should be a separate changing room for kitchen staff Medical fitness should be done for kitchen

staff at the time of commencement of work and thereafter every six months Waste should be stored and disposed of properly so it should not contaminate food service premises, equipment or food. A pest and rodent control program should be done regularly. Only potable water should be used.

The water should be examined chemically and bacteriologically by a NABL accredited lab (monthly basis) as per FSSAI guidelines. Water should be checked for organoleptic and physical parameters like colour, odour, taste, pH, turbidity, total dissolved solids (TDS), alkalinity, total hardness as $CaCO_3$, presence of heavy metals like arsenic, lead etc. and presence of E- Coli and total coliform etc. Complaints regarding food quantity and quality should be assessed through feedback from patients and suitable action is taken as soon as possible There should be kitchen advisory/ monitoring committee to prepare SOP and advise for continuous improvement and quality control. Ccontinuous improvements in hospital dietary services can help to improve patient's outcome.

Staff hygiene / health: Everyone who handles, prepares, processes and distributes food must understand the principles of basic food hygiene and the need for trained personnel and catering hygiene.

- ❖ All food handlers should complete a pre-employment health check-up.
- ❖ All food handlers with infectious diarrhoea, GI infection, must stop working and return only after communicable disease personnel certify their fitness.
- ❖ Hair and nails of all food handlers should be checked weekly and recorded.
- ❖ Routine medical check-up should be done twice in a year.

Inspection: Daily inspection of kitchen and food handling areas is a must for hygiene, and reports documented.

Kitchen: Cleaning procedures should be done on a regular basis.

- ❖ Any food capable of supporting microbial growth should be stored either below 8°C or above 65°C. Cooked-chilled food should be stored below 3°C.
- ❖ Food trolleys should be used to make transport easier and reduce movement of people.
- ❖ Trolleys should be cleaned daily or more frequently if contamination occurs.
- ❖ A cleaning schedule for the kitchen is suggested so as to ensure that hygiene is maintained.
- ❖ Milk should be purchased on a daily basis and stored in the refrigerator at (8° C).Food should be prepared half an hour before service and stored in a bain-marie at a temperature of 75–100°C.

Waste Disposal-Waste should be identified and collected in colour coded containers. Left over waste, vegetable peels should be collected in the green container and sent for disposal thorough municipal authorities.

5 • Laundry Services of the Hospital

This unit will cover:

- Principles and key steps in laundry management.
- Washing Drying and Transport of the linen.

5.1 • Laundry Services of the Hospital

Soiled linen can be a source of large amounts of microbial contamination, which may cause infections in hospital patients and personnel. In addition, improperly processed linen can cause chemical reactions or dermatitis in those who come in contact with the linen. Hospital's linen service should process soiled linen such that the risk of disease to patients who may be unusually susceptible or to employees, who may handle linen, is avoided. Adequate procedures for collecting, transporting, processing, and storing linen should therefore be established.

5.1.1 Principles and Key Steps in Processing 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.

5.1.2 Sorting Soiled Linen:

- Soiled linen should be handled as little as possible with a minimum amount of agitation to prevent gross microbial contamination of the air and of personnel handling the linen.
- The processing area for soiled linen must be separate from other areas such as those used for folding and storing clean linen, patient care areas, and food preparation areas.
- In addition, there should be adequate ventilation and physical barriers (walls) between the clean and soiled linen areas.
- Soiled linen may also contain non-infectious items such as dentures, eye glasses, and hearing aids. These items pose no threat of infection and require no special handling.

5.1.3 Washing and Drying:

- All linen items (for example, bed sheets, surgical drapes, masks, gowns) used in the direct care of a patient must be thoroughly washed before reuse.
- Decontamination only if linen is heavily soiled and will be hand washed (repeated soaking of linen in chlorine, even dilute solutions, will cause the fabric to deteriorate more quickly).
- In addition, workers should not carry wet, soiled linen close to their bodies even if they are wearing a plastic or rubber apron.
- Wash the entire item in water with liquid soap to remove all soilage, even if not visible.
- Add bleach (for example, 30–60 ml [about 2–3 tablespoons], of a 5 percent chlorine solution) to aid cleaning and bactericidal action.
- Add sour (a mild acid agent) to prevent yellowing of linen, if desirable.
- Check the item for cleanliness.
- Rewash if dirty or stained.
- Wash heavily soiled linen separately from non-soiled linen.

5.1.4 Sterile Linen:

Only **l**inen used in procedures requiring sterile technique should be sterilized. This process is done in the TSSU and CSSD. Storing, Transporting, and Distributing Clean Linen:

- Keep clean linen in clean, closed storage areas.
- Use physical barriers to separate folding and storage rooms from soiled areas.
- Keep shelves clean.
- Handle stored linen as little as possible.

5.1.5 Transporting Clean Linen:

- Clean and soiled linen should be transported separately.
- Containers or carts used to transport soiled linen should be thoroughly cleaned before being used to transport clean linen. If different containers or carts are used to transport clean and soiled linen, they should be labelled.
- Clean linen must be wrapped or covered when transporting to avoid contamination.

5.1.6 Distributing Clean Linen:

- Protect clean linen until it is distributed for use.
- Do not leave extra linen in patients' rooms.
- Handle clean linen as little as possible.
- Avoid shaking clean linen. It releases dust and lint into the room.
- Clean soiled mattresses before putting clean linen on them.

6 • Housekeeping Services of the Hospital

This unit will cover:

•Principles and key steps in Housekeeping of the hospital.

6.1 • General Principles of housekeeping in the healthcare organization

Housekeeping is one of the important aspects of infection prevention in the hospital. For better housekeeping frequency of cleaning and cleaning agents used for walls, floors, windows, beds, curtains, screens, fixtures, furniture, baths and toilets, and all reused medical devices must be clearly specified. Also, housekeeping methods must be appropriate for potential contamination, and the necessary level of asepsis. This may be achieved by classifying areas into one of four hospital zones mentioned below:

Table - 3

Zone A	Zone B	Zone C	Zone D
No patient contacts. Normal domestic cleaning is recommended (for example, administration, and library).	Care of patients who are not infected, and not highly susceptible, should be done by a procedure that does not raise dust. Dry sweeping or vacuum cleaners are not recommended. The use of a detergent solution improves the quality of cleaning. Disinfect any areas with visible contamination with blood or body fluids prior to cleaning.	Infected patients (isolation wards). Clean with a detergent or disinfectant solution, with separate cleaning equipment for each room.	Highly susceptible patients (protective isolation) or protected areas such as operating suites, delivery rooms, intensive care units, premature baby units. Clean using a detergent or disinfectant solution and separate cleaning equipment.

Housekeeping surfaces can be divided into two groups – those with minimal hand contact (for example, floors, and ceilings), and those with frequent hand contact ("high touch surfaces").

6.1.1 General Housekeeping:

- The floor should be cleaned at least three times in 24 hours. Germ-free solution (floor cleaning) or any other equivalent disinfectant may be used to mop the floor for the remaining time.
- The walls should be washed with a scrubber, using detergent and water whenever necessary.
- High dusting should be done once in a month and whenever necessary.
- Fans and lights should be cleaned with soap and water once a month. This may be handled by the electrical department.
- All work surfaces should be disinfected by wiping with disinfectant and then cleaned with detergent and water twice a day.
- Cupboards, shelves, beds, lockers, IV stands, stools and other fixtures should be cleaned with detergent and water once a week.
- Curtains should be changed once a month and once every 15 days in critical areas or whenever soiled.
- In certain high-risk areas, such as the ICU, more frequent changes of curtains are required.
- Patients' cots should be cleaned every day with disinfectant solution. Hypochlorite should be used when soiled with blood or body fluids. In the isolation ward, cleaning should be done daily.
- Bathroom floors should be scrubbed with a broom and cleaning powder once a day and cleaned at frequent intervals. For disinfection, phenol can be used.
- Toilets should be cleaned with a brush using a detergent thrice daily. Disinfection may be done using phenol. A stain removing liquid can be used to remove stains.
- Wash basins should be cleaned with cleaning powder every morning and with a stain removing liquid once a month.
- Regular air-conditioning maintenance is essential. The electrical section should draw up a protocol for this.
- The mop head should be changed every day and the wash sent to the laundry every day.
- When cleaning patient rooms or contaminated areas at any time, washing laundry or instruments, collecting and disposing of trash, or using any type of cleaner (cleaning equipment), personnel must wear utility gloves and protective shoes. Wear a mask, rubber apron, and goggles if there are spills or when expecting anything to splash.

6.1.2 Handling Patient Linen:

- Bed linen may be changed once in two days and whenever soiled with blood and body fluids.
- Dry dirty linen should be sent to the laundry for regular wash.
- Linen soiled with blood or body fluids and all linen should be packed in leak-proof bags and sent for primary wash.
- Clean and disinfect moisture-resistant mattress covers between patient uses by using bacillocid. If the mattress cover is completely made of fabric, change these covers and launder before patient use.
- Rubber sheets should be cleaned with soap and water, disinfected, dried, powdered, rolled and stored.
- **Miscellaneous items:** K basins, bed pans, urinals, should be cleaned with detergent powder and water once in a week.

6.2 • Housekeeping in Operating Theatre (OT)

The OT complex should be absolutely clean at all times. Dust should not accumulate on any part of the OT. Soap solution is recommended for cleaning floors and other surfaces. Operating rooms (ORs) should be cleaned daily and the entire OT complex cleaned thoroughly once a week.

Table - 4

Before the start of the first case	After each case	After the last case
Wipe all furniture, equipment, room lights, suction points, OR table, surgical light reflectors, other light fittings, slabs with 2 percent bacillocid solution. This should be completed at least one hour before the surgery.	**Linen:** Gather all soiled linen and towels that are blood-stained, pack in a leak- proof bag or closed bin, and transport to laundry suite for wash. **Appropriate PPE** should be used while handling soiled linen. **Instruments:** Used instruments should be cleaned immediately by the scrub nurse and the attender. All the instruments should first be decontaminated in 1 percent sodium hypochlorite solution for 20 minutes and then soaked in a multienzyme cleaner for 30 minutes followed by scrubbing with a brush using liquid soap in warm water and then dried. They should then be sent for sterilization to CSSD. **Environment:** Wipe used equipment, furniture, OR table with detergent and water.	The same procedure as mentioned above should be followed. In addition, the following should be carried out: Wipe overhead lights, cabinets, waste receptacles, equipment, and furniture with a detergent. Wash floor and wet mop with liquid soap and then remove water, and wet mop with a disinfectant solution. Clean the storage shelves, scrub and clean sluice room.

If there is a blood spill, disinfect with sodium hypochlorite before wiping. Empty and clean suction bottles and tubing with disinfectant.

6.2.1 Cleaning in OT

- **Surface Cleaning:** All surfaces in OT have to be cleaned with disinfectant thoroughly in between cases.
- **Biohazard Cleaning:** After biohazard or infected cases, all surfaces must be cleaned with disinfectant spray.

6.2.2 Primary Disinfection

- Following surgery, primary decontamination should be performed before forwarding to Laundry or CSSD. Use freshly prepared disinfectant and discard disinfectant after use. Persons handling linen should be adequately protected with gloves.
- The air-conditioner filter should be washed once a week before refixing.
- Complete servicing for OT should be done for a week, once a year. Each OT is done in rotation. Housekeeping in Intensive Care Unit, Labor Room, and Postpartum Recovery Room

6.3 • Housekeeping in ICU, Labour Room , and Postpartum Recovery Room

In addition to routine cleaning it a thorough cleaning is recommended with soap and water. Thorough cleaning is done at least once a week. A brush can be used in hard-to-reach areas.

6.3.1 Routine Cleaning Procedure:

Remove all portable equipment. Damp wipe lights and other fixtures with detergent. Clean doors, hinges, facings, glass inserts, and rinse with a moistened cloth. Wipe down walls with clean cloth and detergent. Scrub floor using detergent and water.

6.3.2 Stainless Steel Surfaces:

Wash with detergent, rinse and clean with warm water. Replace portable equipment: clean wheel castors by rolling across towelling saturated with detergent. Wash (clean) and dry all furniture and equipment, such as suction holders, foot and sitting stools, Mayo stands, IV poles, basin stands, X-Ray view boxes, hamper stands, all tables in the room, hoses to oxygen tank, kick buckets and holder, and wall cupboard. After washing floors, allow disinfectant solution to remain on the floor for 5 minutes to ensure destruction of bacteria.

Do not remove or disturb delicate equipment. While wiping cabinets, see to it that the solution does not get inside and contaminate sterile supplies. Operating rooms and scrub rooms should never be dry dusted.

6.3.3. Cleaning for Blood Spills and Body Substances:

- Clean spills with a 0.5-1.0 percent chlorine solution.
- Clean spills of blood, body fluids and other potentially infectious fluids immediately:
- Cover the area immediately with any absorbent material like tissue paper, old newspaper, and gauze piece.
- For small spills: While wearing utility or examination gloves, remove visible material using a cloth soaked in a 0.5-1.0 percent chlorine solution, then wipe clean with a disinfectant cleaning solution.
- For large spills: While wearing gloves, flood the area with a 0.5-1.0 percent chlorine solution, mop up the solution, and then clean as usual with detergent and water.
- Wait for a few minutes, preferably 15 minutes after pouring chlorine solution. After disinfection thorough cleaning of the floor with soap and water is necessary.

WHO (1989) recommends 0.5 percent chlorine solution for decontaminating instruments and surfaces before cleaning. In addition, because of the potentially high load of microorganisms and/or other organic material (blood or other body fluids) on soiled items, using a 0.5 percent solution for decontamination provides a wider margin of safety.

6.3.4 Cleaning of Soiled and Contaminated Cleaning Equipment:

- ❖ Decontaminate cleaning equipment that has been contaminated with blood or body fluids by soaking it for 10 minutes in a 0.5 percent chlorine solution or other locally available and approved disinfectants.
- ❖ Wash cleaning buckets, cloths, brushes and mops with detergent and water daily, or sooner if visibly dirty.
- ❖ Rinse in clean water.
- ❖ Dry completely before reuse. (Wet cloths and mop heads are heavily contaminated with microorganisms).
- ❖ Hot water may be used as an alternative to disinfection for environmental cleaning for some objects.

Table - 5

Disinfection with hot water	**Temperature**	**Duration**
1. Sanitary Equipment	80 degrees Celsius	45–60 seconds
2. Linen	70 degrees Celsius	25 minutes
	or 9 5 degrees Celsius	10 minutes

7

• Central Sterile and Suply Department (CSSD)

This unit will cover:

•CSSD Protolcols

The purpose of the CSSD is to provide all the required sterile items in order to meet the needs of all patient care areas.

7.1 Items Supplied by CSSD

- Instrument packs for various procedures
- Dressing pad
- Dressing packs, cotton and gauze

Protocol:

The central processing area(s) ideally should be divided into at least three zones:

1. **Soiled zone (decontamination):** In the decontamination area, reusable contaminated supplies (and possibly disposable items that are reused) are received, sorted, and decontaminated.
2. **Clean zone (packaging):** Clean zone include packaging area, which is used for inspecting, assembling, and packaging clean, but not sterile, material.
3. **Sterile zone (sterilization and storage):** Sterile zone includes sterilisation and storage areas, which is limited access area. Following the sterilization process, medical and surgical devices must be handled using aseptic technique in order to prevent contamination. Medical and surgical supplies should not be stored under sinks or in any other locations where they can become wet. Sterile items that become wet are considered contaminated because moisture brings with it microorganisms from the air and surfaces. Closed or covered cabinets are ideal but open shelving may be used for storage.

Collection and Distribution of Items

- ❖ All items should be collected and distributed twice a day, if necessary whenever required.
- ❖ CSSD items should be transported to the wards in a manner so as to ensure that sterility of the items is maintained

- ❖ Items which have crossed the expiry date should be returned and new ones obtained.

Monitoring Sterilization:

There are two ways of monitoring sterilization of CSSD items:

- ❖ All sterile items can be monitored by using the chemical indicator tape which shows that the item has been adequately sterilized
- ❖ In addition to chemical sterilization, microbiological surveillance may be conducted using B. stearothermophilius spore suspension which is kept in the autoclave to check the efficiency.

Moist Heat Sterilization

This is used for steel instruments, latex rubber tubes, gloves, dressing packs, cotton and gauze. CSSD has electric autoclaves, gravity type of autoclaves, and a high-pressure autoclave. The high-pressure autoclaves operate using a central steam supply.

Recommended Practice Guidelines for All Types of Steam Sterilizers: Table - 6

Device Preparation	**Packaging:**	**Unloading**
❖ Devices should be prepared for sterilization in the following manner: ❖ Clean, and remove excess water. ❖ Jointed instruments should be in the open or unlocked position. ❖ Multipiece or sliding pieces should be disassembled unless otherwise indicated by the device manufacturer. ❖ Devices with concave surfaces that retain water should be placed in a manner such that condensate does not collect. ❖ Instruments with lumens should be moistened with distilled water immediately prior to sterilization. ❖ Heavy items should be arranged so as to not damage lighter more delicate items. ❖ Sharp instruments should have tips protected.	Packaging materials for steam sterilization should: ❖ Be validated for steam sterilization. ❖ Contain no toxic ingredients or dyes. ❖ Be capable of withstanding high temperatures. ❖ Allow air removal from packages and contents. ❖ Permit sterile contact with the package contents. ❖ Permit drying of the package and contents. ❖ Prevent the entry of microbes, dust, and moisture during storage and handling. ❖ Have a proven and tamper-proof seal. Withstand normal handling and resist tearing or puncturing	Upon completion of the cycle, the operator responsible for unloading the sterilizer should: ❖ Review the sterilizer printout for the following: ❖ Correct sterilization parameters. ❖ Cycle time and date. ❖ Cycle number matches the lot control label for the load. ❖ Verify and initial that the correct cycle parameters have been met. ❖ Examine the load items for: • Any visible signs of moisture. • Any signs of compromised packaging integrity. Printed records of each cycle parameter (that is, temperature, time) should be retained in accordance with the healthcare settings requirements.

Load Cool-Down:

Upon removal of the sterilized load the operator should:

- ❖ Visually verify the results of the external chemical indicators.
- ❖ Allow the load to cool to room temperature (the amount of time for cooling depends on the devices that have been sterilized).
- ❖ Ensure cool down occurs in a traffic-free area without strong warm or cool air currents.

Packages are considered wet when moisture in the form of dampness, droplets or puddles is found on or within a package. There are two types of wet packs; those with external wetness and those with internal wetness. Sterility is considered compromised and the package contents considered contaminated when wet packs are found.

Flash Sterilization / Immediate Use Steam Sterilization:

This form of sterilization is used only when there is an immediate requirement for items to be sterilized. Containers used for Immediate Use Steam Sterilization of devices should be validated for that purpose.

Immediate Use Steam Sterilization should not be used to:

- ❖ Sterilize implants.
- ❖ Sterilize complete sets or trays of instruments.

Quality Assurance

All documentation should be dated and signed by the person completing the documentation and/or verifying the test results. Documentation of the sterilization process should include:

Package label:

- ❖ Name of device (when necessary).
- ❖ Initials of technician packaging the device.
- ❖ Lot control information which includes a load or cycle number, sterilizer number, and the date of sterilization.
- ❖ Detailed list of sterilizer load contents
- ❖ Date, time, and results of all tests performed (for example, printout, Chemical Indicator, Biological Indicator, Bowie-Dick, leak test).
- ❖ Sterilizer physical parameters should be verified by the individual responsible for releasing the load prior to load release. Verification should be documented (for example, printout is initialed).

- ❖ If any indicator fails, the failure should be investigated. Loads may be recalled according to the results of the investigation. All actions associated with an investigation should be documented.
- ❖ A process to address any indicator failure, for example, printout, chemical indicator or biological indicator.
- ❖ Record retention according to corporate administrative directives and/or quality management system requirements.

Recall Procedure

As soon as CSSD staff receive the result from the microbiologist about biological indicators not being satisfactory, the CSSD In-charge or Staff nurse should take the following action:

- ❖ Inform to the Chief Nursing Officer and Hospital Infection Control Committee.
- ❖ Check the autoclave number, batch number, and expiry date.
- ❖ Trace out the department which issued the items and the specific date.
- ❖ Inform the ward in-charge regarding the biological indicator growth.
- ❖ Take back all the items to CSSD.
- ❖ Rewash all the articles and repack for autoclave.
- ❖ Clean the autoclave thoroughly with clean water.
- ❖ Sterilize the items with Bowie-Dick and biological indicator.
- ❖ Wait for the report; only then issue the items to the wards.
- ❖ Update the register.

8

• Bio Medical Waste management of the Hospital (25)

This unit will cover:

•Principles and key steps Bio Medical Waste management of the Hospital .

Management of bio medical waste is governed under Bio-Medical Waste Management Rule 2016. Hospitals are required to take all necessary steps to ensure that bio-medical waste is handled without any adverse effect to human health and the environment in accordance with BMW rule 2016.

8.1 The key points of Bio-Medical Waste Management:

- Provision within the premises for a safe, **ventilated and secured location for storage** of segregated biomedical waste in coloured bags or containers in the manner as specified in Schedule I, to ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals and the bio-medical waste from such place or premises shall be directly transported in the manner as prescribed in these rules to the common bio-medical waste treatment facility or for the appropriate treatment and disposal, as the case may be, in the manner as prescribed in Schedule I;
- **Pre-treat the laboratory waste**, microbiological waste, blood samples and blood bags through disinfection or sterilisation on-site in the manner as prescribed by the World Health Organisation (WHO) or National AIDs Control Organisation (NACO) guidelines and then sent to the common bio-medical waste treatment facility for final disposal;
- **Phase out use of chlorinated plastic bags**, gloves and blood bags within two years from the date of notification of these rules;
- Dispose of solid waste other than bio-medical waste in accordance with the provisions of respective waste management rules made under the relevant laws and amended from time to time;
- not to give treated bio-medical waste with municipal solid waste;
- Provide training to all its health care workers and others, involved in handling of bio medical waste at the time of induction and thereafter at least once every year.
- ensure occupational safety **and immunise all its health care workers** and others, involved in handling of bio-medical waste for protection against diseases including Hepatitis B and as

prescribed in the National Immunisation Policy or the guidelines of the Ministry of Health and Family Welfare issued from time to time;

- establish a Bar- Code System for bags or containers containing bio-medical waste to be sent out of the premises or place for any purpose;
- ensure segregation of **liquid chemical waste** at source and ensure pre-treatment or neutralisation prior to mixing with other effluent generated from health care facilities;
- ensure **treatment and disposal of liquid waste** in accordance with the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974);
- conduct health check up at the time of induction and at least once in a year for all its health care workers and others involved in handling of bio- medical waste.
- maintain and update on day to day basis the bio-medical waste management register and display the monthly record on its website according to the bio-medical waste generated in terms of category and colour coding as specified in Schedule I;
- report major accidents including accidents caused by fire hazards, blasts during handling of biomedical waste and the remedial action taken and the records relevant thereto,
- inform the prescribed authority immediately in case the operator of a facility does not collect the bio-medical waste within the intended time or as per the agreed time;
- establish a system to review and monitor the activities related to bio-medical waste management, either through an existing committee or by forming a new committee.
- maintain all record for operation of incineration, hydro or autoclaving etc., for a period of five years;
- existing incinerators to achieve the standards for treatment and disposal of bio-medical waste as specified in Schedule II for retention time in secondary chamber and Dioxin and Furans within two years from the date of this notification.

8.2 Categories of Bio-Medical Waste and Their Management: Table - 7

Category	**Type of Waste**	**Type of Bag or Container to be**	**Treatment and Disposal options**
(1)	**(2)**	**(3)**	**(4)**
Yellow	**(a) Human Anatomical Waste:** Human tissues, organs, body parts and fetus below the viability period	Yellow colored 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 animals used in experiments or testing in veterinary hospitals.		

Category	Type of Waste	Type of Bag or Container to be	Treatment and Disposal options
	(c) Soiled Waste: Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and		Incineration or Plasma Pyrolysis or deep burial*
	bags containing residual or discarded blood and blood components.		hydroclaving followed by shredding or mutilation or combination of sterilization and shredding.
	(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 colored 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 0C
	(e) Chemical Waste: Chemicals used in production of biological and used or discarded disinfectants.	Yellow colored containers or non-chlorinated plastic bags	Disposed of by incineration or Plasma Pyrolysis or Encapsulationin 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, house-keeping 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 another wastewater. The combined discharge shall conform to the discharge norms given in Schedule- III.
	(g) 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.
	(h) Microbiology, Biotechnology 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 Organization or World Health Organization guidelines thereafter for Incineration
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 vacutainers with their needles cut) and gloves.	Red colored non-chlorinated plastic bags or containers	Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Plastic waste should not be sent to landfill sites.

Category	Type of Waste	Type of Bag or Container to be	Treatment and Disposal options
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
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	Cardboard boxes with blue colored marking	

9 • Antibiotic Policy of the Hospital

This unit will cover:

•Principles and key steps in antibiotic policy of the hospital.

Background:

Infections remain important threat to humans. Despite advances in medicine there is emergence of antimicrobial resistance both in community as well as in the hospital. One of the key factors contributing to antibiotic resistance is inappropriate use of antibiotics. These guidelines are developed by a multi-disciplinary working group to ensure balanced input. It has considered the antimicrobial choice for specific conditions, and the existing policies for specific agents. The latest available evidence backed guidelines and recommendations were followed with due modification to the antibiotic choices where it was warranted by local anti-bio-gram. The list of drugs includes commonly used antibiotics in the OPD and Inpatients. These guidelines do not include anti-tubercular, antiviral and antiretroviral drugs.

This manual will be revised as and when new recommendations come or with the change in the local anti-bio-gram within a time period not extending more than a year as recommended by (National Board of Hospitals and Health Care Providers (NABH).

The choice of antimicrobial may need to be modified in the following situations:

- Hypersensitivity to first choice antimicrobial (see guidance on hypersensitivity)
- Recent antimicrobial therapy or preceding cultures indicating presence of resistant organisms
- In pregnant or lactating patients
- In renal or hepatic failure(see data for individual antimicrobials)
- Where significant drug interactions may occur.

With present day knowledge we can only provide a general guideline in choosing the best available antibiotic, and hence any deviation must be justified in documentation in the case records, as this will be followed by prescription. The compliance to general principles (as mentioned in the section – **GOOD PRACTICE**) is especially subjected to clinical audit as deviation in these aspects without a evidence backed and peer approved reason will be considered as endangering the patient safety.

Antimicrobial Prescribing: Good Practice

- Send for the appropriate investigations in all these infections as recommended. These are the minimum required for diagnosis, prognosis and follow up of these infections.
- All antibiotic initiations would be done after sending appropriate cultures. Rapid tests, such as Gram stain, can help determine therapeutic choices when empiric therapy is required.
- Change in antibiotic would be done after sending fresh cultures
- Follow the Hospital policy when choosing antimicrobial therapy whenever possible. If alternatives as chosen, document the reason in the case records.
- Check for factors which will affect drug choice & dose, e.g., renal function, interactions, allergy.
- Check that the appropriate dose is prescribed. If uncertain, contact Infectious disease physician, Pharmacy, or check in the formulary.
- The need for antimicrobial therapy should be reviewed on a daily basis. For most infections 5 – 7 days of antimicrobial therapy is sufficient (simple UTIs can be adequately treated with 3 days of antibiotic).
- All IV antibiotics may only be given for 48 – 72 hours without review and consideration of oral alternatives. New microbiological or other information (e.g. fever defervescence for at least 24h, marked clinical improvement; low CRP) should at this stage often permit a switch to oral antibiotic(s), or switch to an IV narrow spectrum alternative, or cessation of antibiotics (no infection present).
- Once culture reports are available, the physician shall step down to the narrowest spectrum, most efficacious and most cost-effective option. If there is no step down availed, the reason shall be documented and is subjected to clinical audit.
- Differentiation between contamination, colonization and infection is important to prevent overuse of antibiotics.

9.1. Choice of antibiotics: This depends on antibiotic susceptibility of the causative organism. There are some infections which can be treated by one of several drugs. The choice can be based on toxicity, efficacy, rapidity of action, pharmacokinetics and cost. **Use the most effective, least toxic and least expensive antibiotic for the precise duration of time needed to cure or prevent infection.** Before prescribing consider following**:**

a) Which organism is likely to cause the syndrome?

b) What is the clinical diagnosis and what are the steps should be taken to improve the diagnostic precision?
c) Which antimicrobial agents are available and active against the presumed cause of the illness? Is their range of antimicrobial activity appropriate and what information is available about the likelihood of drug resistance?
d) Check for factors which will affect drug choice &dose, e.g. renal function, interactions, allergy, pregnancy and lactation.
e) Check that the appropriate dose is prescribed. If uncertain, contact Physician or check in the formulary.
f) What is the duration of treatment?
g) Is treatment working?

9.2. Clinical Diagnosis:

The antibiotic treatment chosen must be based on some assumption regarding nature of disease. The treating doctor may not have difficulty in choosing the appropriate antibiotic to treat a disease caused by a single microorganism e.g., typhoid, anthrax, as microbiological diagnosis is implicit in clinical diagnosis. However, diseases such as pneumonia, meningitis and urinary tract infection can be caused by any number of different micro-organism and doctor may be wrong if he has to guess which antimicrobial agent to use. In such instances one should seek a bacteriological diagnosis.

9.3. Empiric Therapy:

Empiric Therapy may be started, if the causative agent is not known and there is urgency to initiate the therapy and delay would be life threatening or risky. In such cases, Antimicrobial Therapy based on a clinically defined infection and in consonance with hospital Anti-bio-gram is justified. However, following points should be taken into consideration:

a) Must collect the necessary specimens before commencing therapy.
b) Cover all possible microbial causes.
c) Try to attain synergy.
d) Consider possible interaction with other drugs.
e) Accuracy of diagnosis should be reviewed regularly and treatment altered / stopped when microbiological results become available.
f) Use drugs which are available in Hospital formulary, where possible.

9.4. The need for antimicrobial therapy should be reviewed on daily basis. For most infections 5-7 days of antimicrobial therapy is sufficient.

9.5. In critical cases, the therapy to be started with Injectable antibiotics for 48–72 hours, subsequently the consideration for oral alternatives to be explored. This should be done in the light of new microbiological or other information (e.g. fever, effervescence, for at-least 24 hrs, marked clinical improvement; low CRP) should at this stage often permit as oral antibiotic(s), or switch to an IV narrow spectrum alternative, or cessation of antibiotics (no infection present).

9.6. Once culture reports are available, the physician should step down to the narrowest spectrum, most efficacious and most cost effective option. If there is no step down availed, the reason shall be documented and is subjected to clinical audit.

9.7. Some guiding principles for de-escalation/escalation:

a) If ESBL+ve: drug choice is monotherapy with carbepenems. Group I carbepenem. Piperacillin – Tazobactum & Cefoperazone – Sulbactum can be used if invitro sensitive and for mild infections.
b) Vancomycin should be used only for confirmed MRSA infections and not MSSA.
c) In case of Pan drug resistant *Pseudomonas* / *Acinetobacter spp.* combination therapy using Colistin along with β lactams should be discussed with microbiologist / physician.

9.8. Treatment with antibiotic combinations:

In order to avoid antagonism between drugs and undesirable side effects of several antibiotics it is advisable to use a single drug wherever possible. There are situations however, when the use of antibiotic combination is desirable. The situations are:

a) During the investigation of an obscure illness
b) To prevent the development of bacterial resistance in long term therapy e.g. treatment of tuberculosis.
c) To achieve synergistic effect, e.g. in treating infective endocarditis.
d) Mixed infection, when one drug is not effective against the pathogen.
e) To permit a reduction of the dose of potentially toxic drug.

The choice of drug should be that they act synergistically. Following combinations are synergistic

i. Aminoglycoside and β–lactam antibiotic.
ii. β–lactam antibiotic and β–lactamase inhibitor.
iii. β–lactam antibiotic and cell wall inhibitor (Vancomycin)
iv. Sulphamethoxazole and Trimethoprim.

9.9. Is Treatment working?

Where treatment is apparently failing, advice from an physician should normally be sought rather than blindly changing to an alternative choice of antimicrobial agent. Antimicrobial drug therapy cannot be considered in isolation and other aspects of therapy must be taken into account in judging the effect of treatment. Even an appropriate antibiotic may be ineffective if pus is not drained, septic shock treated and hypoxia and anemia corrected. There are several conditions in which chemotherapy alone cannot eliminate an infection. Obstructive lesions can cause infection to recur, unless they can be dealt with surgically. Also chemotherapy cannot obviate the necessity for draining an abscess or removing sequester or calculi. Failure of treatment can also be due to a super-added infection, e.g. phlebitis, development of resistance during therapy or poor tissue penetration.

9.10. Laboratory control of the effects of the treatment:

Whether treatment has been successful or not is best judged by clinical criteria, but it is useful to know whether the infecting organism has been eliminated. Repeated cultures are, therefore sometimes indicated.

9.11. Reserve Antimicrobials

These antibiotics are held in reserve to maintain their effectiveness in treating certain difficult infections by reducing the spread of microbial resistance and to encourage cost effective prescribing. The reserve antibiotic to be done only on request of treating consultant.

The following criteria have been proposed to protect the Carbapenems and Linezolid from overuse:

1. Severe sepsis as defined by more than one organ failure of new onset and/ or elevated serum lactate.
2. Clinical failure of other classes of antibiotics over 48 hours in terms of worsening inflammatory markers, un-resolving fever and new /worsening hemodynamic instability.
3. Underlying severe immune–suppression–Neutropeniea, immuno-suppressive therapy, or Diabetic Ketoacidosis (DKA).
4. The organism is susceptible to only carbapenems / linezolid, as per culture report.

The following criteria have been proposed for initiating Colistin:

1. Pan-resistant organism as per culture report with evidence of invasive disease–fever/ leucocytosis /elevated procalcitonin (PCT) or culture from a sterile site.
2. Clinical failure of all other classes of antibiotics over 72 hours.

The following criteria have been proposed for initiating Rifampicin:

1. Empiric or proven TB as a part of ATT (4 drug regimen)
2. As anti-bacterial, only if prescribed as a combination regimen where the companion drug and Rifampicin, both are proven as susceptible as per culture report.

RIFAMPICIN WILL NOT BE ISSUED ALONE AS AN ANTI-BACTERIAL.

The following criteria have been proposed for initiating amino glycosides:

1. Only as a part of initial empiric regimen of a combination therapy–shall step down to single drug after culture report.
2. Others after drug options have been ruled out in a culture report.

Hypersensitivity

All patients should be asked about drug allergies. This is the responsibility of the doctor who writes the patient's history. If a patient reports a drug allergy clarify whether this is an allergy or drug intolerance. In some cases there will be an overlap between drug allergy and drug intolerance.

- **Clinical features suggestive of drug allergy:**

  One or more symptoms developed during or following drug administration including difficulty breathing, swelling, itching, rash, and anaphylaxis, swelling of the lips, loss of consciousness, seizures or congestion involving mucous membranes of eyes, nose and mouth.

- **Clinical features suggestive of drug intolerance:**

  One or more symptoms developed during or following drug administration including gastrointestinal symptoms e.g. nausea, vomiting, diarrhea, abdominal pain and feeling pain and giddiness.

- **If patients are unable to give an allergy history**:

The doctor should take reasonable steps to contact someone who can provide are liable allergy history. It is the prime responsibility of the prescribing doctor to ensure that allergy history is documented in drug chart as

a) No known allergy (NKA).
b) History not available.

9.12. Importance of Infection Control (IC) to Control Antimicrobial Resistant

The use of antimicrobial agents inevitably adds to the emergence of resistant microorganisms. It also destroys the normal flora of the body and renders patients far more susceptible to colonization with micro-organisms introduced from elsewhere in the hospital through the process of cross infection. Some important points related to managing drug resistance are:

- Hospitals may be considered as reservoirs and breeding grounds within the world of antibiotic resistance.
- Prevention of cross infection and good quality antimicrobial prescribing contribute to the prevention of antimicrobial resistance. Infection Control and Clinical Microbiology are inextricably linked.
- There is no substitute of hand washing in preventing hospital acquired infection and the spread of antibiotic resistant micro-organisms.
- High standards of hospital cleanliness may be important in controlling the spread of resistant organism in the environment .e.g. MRSA, *Acinetobacter baumannii* etc.

9.12.1 Clinical features suggestive of drug intolerance: One or more symptoms developed during or following drug administration including gastrointestinal symptoms e.g. nausea, vomiting, diarrhoea, abdominal pain and giddiness. If patients are unable to give an allergy history, the doctor clerking in the patient should take reasonable steps to contact someone who can provide a reliable allergy history.

It is the prime responsibility of the prescribing doctor to ensure that:

- The allergy box on the patient's drug chart is completed when a new prescription chart is written or transcribed. If no allergy - specify "No known allergy or NKA". The box should be signed and dated. If allergy history cannot be obtained, then specify "history not available." Under no circumstances should the allergy box be left blank. A pharmacist or nurse may complete the allergy box if the allergy status is documented in the clerking in notes.
- The allergy box is completed before prescribing a new drug, except in exceptional circumstances. If patients have a suspected drug allergy then the drug and suspected reaction should be documented in the clerking-in notes and the drug chart.

9.13. Patient Risk Stratification:

Patient Type 1	Patient Type 2	Patient Type 3	Patient Type 4
No contact with health care system	Contact with health care system (e.g. recent hospital admission, nursing home, CAPD) without/minimal invasive procedures	Hospitalization >5 days and or infections following invasive procedures	Type 3 patient with fever despite antibiotic therapy (>5days) with no obvious source / after appropriate source control

Patient Type 1	Patient Type 2	Patient Type 3	Patient Type 4
No prior antibiotic treatment in last 90 days	Antibiotic therapy in last 90 days	Recent & multiple antibiotic therapies	± severe sepsis/septic shock PLUS
Patient young with no co-morbid conditions	Patient old (> 65years) with few co-morbidities	Patient with multiple Co-morbidities eg: cystic fibrosis, structural lung disease, advanced AIDS, neutropenia, other severe immunodeficiency	Has 1 or more than 1 of the following factors. (but not limited to) for invasive fungal infections TPN, Hemodialysis Immunodeficiency of variable origin, Major Abdominal surgery, Multi-focal candida colonization Diabetes
Bacterial infections with minimal risk of Multidrug resistant pathogens like ESBL producing Enterobacteriacea e, MRSA or Non-fermenters like Pseudomonas and Acinetobacter Invasive Fungal Infections are unlikely	Risk of Bacterial infections with pathogens like ESBL producing Enterobacteriaceae and MRSA. Minimal risk of Nonfermentors like Pseudomonas and Acinetobacter Minimal risk of Invasive Fungal infections.	High risk of Bacterial infections with any of Multi drug resistant pathogens like ESBL producing Enterobacteriaceae, MRSA and non- fermenters like Pseudomonas and Acinetobacter Risk of invasive fungal infections in special cases like patients undergoing Allogenic BMT, Liver transplant or chemotherapy induced neutropenic patients.	Risk of Bacterial infections with Pan-drug resistant Pseudomonas and Acinetobacter High Risk of Invasive fungal infections
Limited use of broad spectrum antibacterial No role of Antifungal agents	ESBL infections to be treated with Non-Pseudomonal antibiotics like Group 1 Carbapenem BL+BLI's can also be preferred for mild ESBL infections. Vancomycin/Teicoplani n to be used for MRSA No role of Antifungal agents	Bacterial infections to be treated with broad spectrum antibiotics like Group 2. Carbapenem or Anti-Pseudomonal BL-BLI's in combination with Fluoroquinolones/aminogly cosides/ Glycopeptides. Prophylaxis for fungal infections in select cases as per IDSA guidelines	Bacterial infections to be treated with novel combination of antibacterial suggested for Pan resistant bacteria using alternate drug delivery systems/PK-PD parameters. Empiric treatment of fungal infections for both stable and unstable patients as per IDSA guidelines.

1. For treating the Indoor patients, the Microbiology data should be considered mainly for patients belonging to Patient Types 2, 3 and 4. Patient type 1 refers to the patients reporting with Community acquired infections, and for them the treatment options are based on the guidelines.

2. Avoid Antipseudomonal Fluoroquinolones (e.g. Ciprofloxacin and Levofloxacin) and Antipseudomonal 3rd generation Cephalosporins (e.g. Ceftazidime and Cefoperazone) in Patients Type 1 and 2 since they have potent antipseudomonal activity
3. Treatment of serious infections caused by ESBL +ve pathogens with BL-BLI combinations (eg Piperacillin-Tazobactam, Cefepime-Tazobactam and Cefoperazone-Sulbactam) should be avoided as there is limited clinical data and evidence available for the use of these drugs in such infections.
4. In infections with MDR Pseudomonas/ Acinetobacter, Carbapenems should be used as Extended Infusions e.g. Imipenem (2 -3 hrs infusion), Meropenem (3hrs infusion), Doripenem (4hrs infusion)
5. Linezolid and Daptomycin are reserved drugs for inpatients and should be used only in cases of Vancomycin Resistant Staph Aureus (VRSA) or Vancomycin Resistant Enterococci (VRE)
6. De-escalation to Fluconazole if: Isolates susceptible to Fluconazole (eg: Candida Albicans) + Patient clinically stable. Deescalation to Voriconazole if : C. Krusei or Voriconazole susceptible C.Glabrata + Patient clinically stable. De-escalation to fluconazole or voriconazole not recommended without confirmation of isolate susceptibility

9.14. Antibiotic Protocol for In-patient Department (IPD)

1. For treating the Indoor patients, the Microbiology data should be considered mainly for patients belonging to Patient Types 2 and 3. Patient type 1 refers to the patients reporting with Community acquired infections, and for them the treatment options are based on the guidelines.
2. Avoid Antipseudomonal Fluoroquinolones (e.g. Ciprofloxacin and Levofloxacin) and Antipseudomonal 3rd generation Cephalosporins (e.g. Ceftazidime and Cefoperazone) in Patients Type 1 and 2 since they have potent antipseudomonal activity
3. Treatment of serious infections caused by ESBL +ve pathogens with BL-BLI combinations (eg Piperacillin-Tazobactam, Cefepime-Tazobactam and Cefoperazone-Sulbactam) should be avoided as there is limited clinical data and evidence available for the use of these drugs in such infections.
4. In infections with MDR Pseudomonas/ Acinetobacter, Carbapenems should be used as Extended Infusions E.g. Imipenem (2 -3 hrs infusion), Meropenem (3hrs infusion), Doripenem (4hrs infusion)
5. Linezolid and Daptomycin are reserved drugs for inpatients and should be used only in cases of Vancomycin Resistant Staph Aureus (VRSA) or Vancomycin Resistant Enterococci (VRE)

9.15. Antibiotic Protocols for Out-patint Departments (OPD)

For treating the outdoor patients, the Microbiology data should be considered mainly for patients belonging to Patient Types 2 and 3. Patient type 1 refers to the patients reporting with Community acquired infections, and for them the treatment options are:

1. Avoid Antipseudomonal Fluoroquinolones (e.g. Ciprofloxacin and Levofloxacin) and Antipseudomonal 3rd generation Cephalosporins (e.g. Ceftazidime and Cefoperazone) in Patients Type 1 and 2 since they have potent antipseudomonal activity

2. Treatment of serious infections caused by ESBL +ve pathogens with BL-BLI combinations (eg Piperacillin-Tazobactam, Cefepime-Tazobactam and Cefoperazone-Sulbactam) should be avoided as there is limited clinical data and evidence available for the use of these drugs in such infections.
3. OPAT - Out Patient parenteral antibiotic therapy.

9.16. Guideline for Isolation Precautions[1]

1. The following recommendations apply to the use of needles, cannulas that replace needles, and, where applicable, intravenous delivery systems.
2. Use aseptic technique to avoid contamination of sterile injection equipment.
3. Do not administer medications from a syringe to multiple patients, even if the needle or cannula on the syringe is changed. Needles, cannulae and syringes are sterile, single-use items; they should not be reused for another patient or to access a medication or solution that might be used for a subsequent patient.
4. Use fluid infusion and administrations sets (i.e. intravenous bags, tubing and connectors) for one patient only and dispose appropriately after use. Consider a syringe or needle/cannula contaminated once it has been used to enter or connect to a patient's intravenous infusion bag or administration set.
5. Use single-dose vials for parenteral medications whenever possible.
6. Do not administer medications from single-dose vials or ampoules to multiple patients or combine leftover contents for later use.
7. If multi-dose vials must be used, both the needle or cannula and syringe used to access the multi-dose vial must be sterile.
8. Do not keep multi-dose vials in the immediate patient treatment area. Store in accordance with the manufacturer's recommendations and discard if sterility is compromised or questionable.
9. Do not use bags or bottles of intravenous solution as a common source of supply for multiple patients.
10. Infection control practices for special lumbar puncture procedures: Wear a surgical mask when placing a catheter or injecting material into the spinal canal or subdural space (i.e., during myelograms, lumbar puncture, and spinal or epidural anaesthesia.
11. Worker safety: Adhere to federal and state requirements for protection of healthcare personnel from exposure to bloodborne pathogens (see OSHA Bloodborne Pathogens Standard CFR 1910.1030 and Needlestick Safety and Prevention Act on the OSHA website at http://www.osha.gov/SLTC/bloodbornepathogens/index.htm

[1] **CDC Healthcare Infection Control Practices Advisory Committee, 2007**

9.7 Antibiotic Summary Chart

Antibiotics	Major Spectrum of Activity	Bactericidal or Bacteriostatic	Mechanism of Action	Major Adverse Reactions
Penicillin G and Penicillin V	Gram+cocci Some anaerobes	bactericidal	Inhibits cell wall synthesis	Allergy
Penicillin Penicillinase Resistant Penicillin	Staphylococci	bactericidal	Inhibits cell wall	Allergy
Penicillin Aminopenicillins	Gram+cocci Some Gram - bacilli	bactericidal	Inhibits cell wall synthesis	Allergy
Penicillin Antipseudomonal and Extended- Spectrum Penicillin	Gram + cocci gram+bacilli Pseudomonas sp.	bactericidal	Inhibits cell wall synthesis	Allergy
Carbapenem Imipenem Ertapenem	Gram-vespecies Anaerobes	bactericidal	Inhibits cell wall synthesis	Allergy
Monobactam Aztreonam	Gram-bacilli	bactericidal	Inhibits cell wall synthesis	N A
Cephalosporin First Generation- eg.: cefazolin, cephalexin	Gram+cocci Some Gram-bacilli	bactericidal	Inhibits cell wall synthesis	Allergy
Cephalosporin Second-Generation eg: Cefuroxime	Gram-vecocci Gram-ve bacilli Some anaerobes	bactericidal	Inhibits cell wall synthesis	Allergy
Cephalosporin Third-Generation eg: ceftriaxone, ceftazidime Fourth-Generation- eg: cefepime	Many Gram-bacilli Pseudomonas sp.	bactericidal	Inhibits cell wall synthesis	Allergy
Aminoglycosides	Gram-bacilli	bactericidal	Inhibits bacterial protein synthesis	Nephrotoxicity Ototoxicity
Quinolones Second-Generation	Gram-bacilli Staphylococcus Sp. Atypical organisms	bactericidal	Inhibits DNA gyrase	CNS reactions Photosensitivity Developmental bone/joint lesions
Quinolones Second-Generation	Gram-bacilli Staphylococcus sp. Streptococcus sp. Atypical organisms	bactericidal	Inhibits DNA gyrase	CNS reactions Photosensitivity Developmental bone/joint lesions
Macrolides eg: azithromycin	Gram+/Gram-organisms. Some Haemophilus sp. Atypical organisms	bacteriostatic	Inhibits bacterial protein synthesis	well tolerate Some GI intolerance
Tetracyclines	Gram+/Gram-aerobes & anaerobes Atypical organisms	bacteriostatic	Inhibits bacterial protein synthesis	GI intolerance Photosensitivity Developmental tooth staining
Co trimoxazole	Gram+/ Gram-organisms	bactericidal	Inhibits Formation of vital metabolic compound	GI intolerance CNS effects Skin rash Hematologic reactions
Glycopeptides eg: Vancomycin	Staphylococcus sp. Streptococcus sp. Enterococci	bactericidal bacteriostatic vs. enterococci	Inhibits cell wall synthesis	Skin rash nephrotoxicity Ototoxicity

Initial choice of antimicrobial therapy for common infections/empirical therapy for common infections

These recommendations are for initial empirical treatment, based on likely microbial etiology and antimicrobial susceptibility pattern observed in our setting. The antimicrobial agent with narrowest spectrum, least toxicity and cost should be chosen once culture reports are available.

a). GI and Intra-Abdominal Infections:

S.No	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
1.	Acute gastroenteritis	Viral Entertoxigenic and Entero-pathogenic E.coli	None	Rehydration
2.	Cholera	V.cholerae	Doxycycline 300 mg p.o. x 1 dose	Prompt rehydration essential
3.	Bacillary dysentery	Shigella sp	Not needed for previously healthy patient with mild symptoms. Ciprofloxacin 500 mg p.o.BID 3-5 d in: 1) Patients with severe symptoms, 2) Immunocompromised patients.	
4.	Amoebicdysentery	*E. histolytica*	Metronidazole400mg p.o.TID / Tinidazole 300 mg BD x 5 days	
5.	Giardiasis	*Giardia lamblia*	Tinidazole 2gm p.o.x1dose **OR** Metronidazole 250mg TIDx5d	
6.	Enteric fever	*S.enterica* ser. *Typhi* *S.enterica* ser. *Paratyphi A*	**Multi Drug Resistant** Ciprofloxacin 500 mg BD 5-7d Ceftriaxone 2-3 g/d i.v 7-14 d Azithromycin1 g/d (p.o.) x 5 d **Nalidixic acid Resistant** [2] Ceftriaxone 2-3 gm i.v/d x 14 d Azithromycin 1gm/d/p.o. Ciproflox 400 mg i.v. 12 hrly x 14 days switch to 750 mg/BID p.o. when clinically possible .	Microbiologically confirmed diagnosis: Obtain AST &Ciprofloxacin MIC. • if MIC ≤0.25 µg/ml, Ciprofloxacin 750 mg BID p.o. x 14 days • If MIC>0.25 µg/ml, treat as per AST report. • Empiric therapy: Co-trimoxazole if the prevalence of MDR S.Typhi is very low(<10%).

[2] Majority of strains are nalidixic acid resistant

7.	Cholangitis / Acutecholecystitis[3]	Enterobacteriacea e Anaerobes	Ertapenem1gm IV OD **Alternatives:** Piperacillin+Tazobactam 4.5 gm IV 8 Hourly **OR** 3.375 gm IV 6 hourly	• Duration: 7–10 days • Patients unresponsive to antibiotics may require surgery.
8.	Spontaneous bacterial peritonitis	Enterobacteriacea e (most often E. coli)	Piperacillin+Tazobactam 4.5 gm I.V. 8H **OR** 3.375gm IV 6hourly **Alternatives:** Ertapenem1gm IV D	• Duration:5-7days • Prophylaxis(only inpatients with cirrhosis & ascites): Co-trimoxazole 1DS tablet OD×5-7days or Norfloxacin 400 mg
9.	Secondary peritonitis (bowel perforation)[4]	*Enterobacteriace ae B. fragilis Enterococcus*	Ertapenem 1 gm i.v. OD **Alternatives:** • Tigecycline 100 mg initialdose, followed by 50 mg i.v. (over 30 to 60 minutes) Q12H Piperacillin + Tazobactum 4.5 gm i.v. 8 hourly	• Surgery to eliminate source of contamination, reduce bacterial load, and prevent recurrence • Duration: 5-7 days;Longer if leukocytosis/ left shift and fever are slow to resolve or source control inadequate.
10.	Intra-abdominal abscess H. pyloriassociated disease. Peptic ulcer disease, gastric MALT[5] lymphoma	As above	As above PPI2 (i.e. omeprazole 20 mg BID)+ clarithromycin 500 mg P.O. BID + Amoxycilin 1000 mg p.o. BID	Drainage of abscess Duration 14 days
11.	Amoebic liver	*E. histolytica*	Metronidaole 500 mg i.v. TID/ 800 mg PO TID	Ultrasound guided drainage indicated in large abscesses, signs of imminent rupture and no response to medical treatment

[3] Ertapenem is suggested as initial empiric choice because of high prevalence of ESBL producing strains among *E.coli* and *Klebsiella* spp. De-escalate therapy once antibiotic susceptibility is known.
[4] Majority of strains are nalidixic acid resistant
[5]Mucosa associated lymphoid tissue.

b). **CNS Infections:**

S. No.	**Condition**	**Etiology (Likely pathogen)**	**Antibiotics**	**Comments**
1.	Brain abscess	Coagulase-negative *Staphylococci*,*S. aureus*, Anaerobes	Ceftriaxone 2 gm i.v. Q12H + Metronidazole 500 mg i.v. Q8H	Until resolved.
2.	Septic cavernous sinus thrombosis	*S. aureus*	Cloxacillin 2 gm i.v. Q4H + Gentamicin 1 mg/kg i.v. Q8H	Duration 3-4 weeks
3.	Acute Bacterial meningitis (Community acquired)	S.pneumoniae N. meningitidis H. influenza	CP 20L i.v. Q2H· • Penicillin intermediate susceptible (MIC 0.12-1 µg/mL) pneumococci. Ceftriaxone 2 gm i.v Q12 H. • Penicillin–resistant (MIC≥ 2 µg/ml) Pneumococci :Ceftriaxone 2 gm i..Q12H + Vancomycin 500 mg i.v. Q6H	Duration 10-14 days Steroids Indication : • Cloudy CSF· •Bacteria in gram stain • WBC count> 1000/ml (CSF) Dose Dexamthazone 0.15 mg/kg × 4 d. 1st dose 15 min before 1st dose of antibiotic.
4.	Neuro-cysticercosis.	Taenia solium	• Albendazole 400 mg p.o. Q12H, with Dexamethasone 2 mg p.o. Q8H x 10 days • Antiepileptic therapy for seizures	Individualized therapeutic decisions, basedon the number location, and viability of the parasites within CNS. 1. Single enhancing lesions– anti-epileptics alone. 2.>1-<100 live cysts– albendazole with steroids. 3.>100 enhancing lesions (cysticercotic encephalitis)– steroids alone; no anti-parasitic drug.

c). CVS Infections:

S.No.	**Condition**	**Etiology (Likely pathogen)**	**Antibiotics**	**Comments**
1.	Infective endocarditis (native valve)	Penicillin susceptible (MIC ≤ 0.1 µgm/ml) Strep viridans	CP 120–180 L units/ day i.v. x 4 wks OR Ceftriaxone 2 gm i.v. OD x 4 wks OR CP 120–180 L units /day i.v. + Gentamicin 1 mg/kg i.v. Q8H x 2 wks	2-week regimen only for un-complicated cases of native valve IE due to highly Penicillin susceptible Strep. viridans (MIC< 0.1 µgm/ml) Patients with penicillin allergy, use Vancomycin

		Enterococcus S. viridianswith Penicillin MIC>0.5 µgm/ml. "Culture negative"	CP 240 L units/day i.v. **OR** Ampicillin 2gm i.v. Q4H+ Gentamicin 1 mg/kg i.v. Q8H x 4-6 weeks. Ampicillin 2 gm i.v. Q4H+ Gentamicin 1 mg/kg i.v. Q8H x 46 weeks.	
2.	Infective endocarditis (prosthetic valve)	MSSA MRSA	Cloxacillin 2 gm i.v. Q4H+ Rifampicin 600 mg p.o. BID Gentamicin 1 mg/kg i.v. Q8H x 2 wks Vancomycin 15 mg/kg i.v. Q12H + Rifampicin 300 mg p.o. Q8H+ Gentamicin 1 mg/kg i.v. Q8H x 2 weeks	Cardiothoracic surgery consultation

d). Skin and Soft Tissue Infections:

S.No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
1.	Cellulitis	S. pyogenes, S. aureus	Cefazolin 1 gm i.v. Q8H× 7-10 days (until clinical cure) Alternatives : Cloxacillin 500-1000 mg p.o. Q6H × 7-10 days Cephalexin 500 mg p.o. Q6H× 7- 10 days	
2.	Furunculosis	S. aureus	Cloxacillin 500-1000 mg p.o. Q6H × 7-10 days Cephalexin 500 mg p.o. Q6H× 7- 10 days	
3.	Diabetic foot– mild (localized cellulitis, no systemic symptoms)	S. aureus	Cloxacillin 500-1000 mg p.o. Q6H × 7-10 days Cefazolin 1 gm i.v. Q8H / Cephalexin 500 mg p.o. Q6H × 7-10 days	
4.	Diabetic foot– moderate to severe (limb threatening-severe cellulitis /gangrene/ SIRS)	Polymicrobial – (S. aureus S. pyogenes, aerobic gram- negative bacilli, anaerobes)	Cefazolin 1 gm i.v. Q8H+ Gentamicin 5 mg/kg i.v. Q24H OR Ciprofloxacin 400mg i.vQ12H + Metronidazole 500 mg i.v. Q8H Alternate regimens: 1.Tigecycline 100 mg initial dose, followed by 50 mg i.v. (over 30 to 60minutes) Q12 H 2.Ertapenem 1gm i.v.OD 3.Piperacillin Tazobactam4.5 gm i.v. Q8H	Surgical consultation for drainage or debridement

S.No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
5.	Necrotizing fasciitis	S. pyogenes	CP 20 L Units i.v. Q4H+ Clindamycin 600 mg i.v. Q6H	Surgical debridement.
6.	Tinea versicolor	Malassezia furfur	Topical treatment: 1.Ketoconazole 2% cream locally BD × 2 weeks 2.Selenium Sulfide 2.5% lotion locally (apply; leave for 10 minutes&wash off) × 7 days Systemic treatment: 1.Fluconazole 400 mg p.o. × 1 dose 2.Itraconazole 400 mg p.o. OD × 3–7 days	
7.	Tinea corporis cruris / pedis	T.rubrum	Topical treatment: 1.ClotrimazoleBD × 6 weeks 2.MiconazoleBD × 6 weeks 3.TerbinafineBD × 2-weeks Systemic treatment: 1.Terbinafine250 mg p.o. OD × 2 weeks. 2.Fluconazole 150 mg p.o. once-a-week × 4 weeks (T.corporis) and × 8 weeks (T. pedis)	
8.	Tineacapitis	T.tonsurans M.canis	Terbinafine 250 mg p.o. OD × 4– 8 Weeks.	
.	Onychomycosis	T.rubrum	Finger nails : 1.Terbinafine250 mg p.o. OD×6 weeks. 2.Itraconazole200 mg p.o. BID× 1 week / monthx 2 months. 3.Fluconazole150–300 mg p.o. once-a-week ×3–6 months. Toe nails: 1. Terbinafine 250 mg p.o. OD x 12 weeks. 2.Itraconazole 200 mg p.o. BID ×1 week / month × 3–4 months 3.Fluconazole150–300 mg p.o. once-a-week × 6–12 months.	

S.No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
10.	Mycetoma: Actinomycotic mycetoma Eumycotic mycetoma	Aerobic actinomycetes Eumycetes	Streptomycin 15 mg/kg/ day i.m.+Cotrimoxazole DS 1 tab p.o. BID OR Amikacin 15 mg/kg/day with Co-trimoxazole DS1 tab p.o. BID Itraconazole 200 mg	Duration: Until clinical cure •Aminoglycosides are given in cycles of 3 weeks each × 2 or more, as needed, with interval of 2 weeks between cycles •Surgical debridement as needed
11.	Scabies	Sarcoptes scabiei	Topical treatment: • Permethrin 5% cream (apply to entire skin below neck & leave for 8 hours) Systemic treatment:· • Ivermectin 200 mg m/kg p.o. × 1 dose	
12.	Surgical site infections caused by rapidly growing (atypical) mycobacteria	M. abscessus M. fortuitum M.chelonei	• Surgical debridement, with removal of all foreign bodies • Antibiotics : Clarithromycin 500 mg p.o. BID + Ciprofloxacin 500 mg p.o. BID + Amikacin 500 mg i.v. OD × 3 months	
13.	Bites (cat, dog, human,rat)	Pasteruella multocidaCapnocytophaga Eikenella S. viridans Spirillumminus Streptobacillus moniliformis	Amoxicillin-Clavulanate 625 mg p.o. TID	

e). Bone & Joint Infections:

S.No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
1.	Acute osteo- myelitis – (Haematogenous) NormalHost	S. aureus	Cloxacillin 1 gm i.v. Q4H OR Cefazolin 1 gm i.v. Q8H + Gentamicin 80 mg i.v. Q12H OR Amikacin500 mg i.v. Q12H	For optimal treatment, microorganism(s) should be identified By blood culture or aspiration or bone biopsy. Duration: 6 weeks Can switch to oral therapy once clinical improvement occurs.

2.	Osteomyelitis: Contiguous focus (Decubitus ulcer/ diabetic foot)	Polymicrobial	No empiric therapy unless acutely ill Severe condition Cloxacillin 1 gm i.v. Q4H OR Cefazolin 1 gm i.v. Q8H + Gentamicin 80 mg i.v. Q12H OR Amikacin 500 mg i.v. Q12H	•Surgical debridement will enhance cure rate •Definitive treatment guided by bone biopsy/deep curettings (NOT superficial swabs) culture & susceptibility studies Duration: minimum 6 weeks after surgical debridement
3.	Chronic osteomyelitis		No empiric therapy	Definitive treatment guided by bone biopsy, culture &susceptibility studies.
4.	Septic arthritis	S. aureus	Cloxacillin 1 gm i.v. Q4H Alternative: Cefazolin 1 gm i.v. Q8H Duration: 14 – 28 days	Obtain synovial fluid cultures. Orthopedic consultation (for surgical drainage)
5.	Prosthetic joint infections	Coagulase - negative Staphylococci, S. aureus, Streptococci, Gram negative bacilli	No empiric therapy unless acutely ill In severely ill patients (awaiting results of diagnostic studies): Vancomycin 15 mg/kg i.v. Q12H + Gentamicin 1 mg /kg i.v. Q8H + Rifampicin 300 mg p.o.Q8H	Obtain culture of periprosthetic tissue / synovial fluid. Avoid culturing superficial wound/sinus tracts

f). Respiratory Tract Infections:

S.No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
1.	Acutepharyngitis	S. pyogenes(Strep.GrpA) Viral	Benzathine penicillin 12 L units i.m. x 1dose Alternatives:· • PenicillinV 500 mg p.o. Q8H x 10 d • Amoxicillin 500 mg Q8H p.o. x 10 d Penicillin allergic patients: • Erythromycin 500 mg p.o. Q6H x 10 days	The large majority of adults with acute pharyngitis have a self- limited illness, for which supportive care (analgesics, antipyretics ,saline gargles)only is needed •Antibiotic treatment benefits only those patients with GABHS infection •Limit antibiotic prescriptions to patients who are most likely to have GABHS infection - fever, tonsil are xudates, no cough, &tender anterior cervical lymphadenopathy •Throat swab cultures recommended for routine evaluation of pharyngitis

2.	Acute epiglotitis	H. Influenzae	Ceftriaxone 1 gm i.v. OD	Airway management
3.	Ludwig'sangina Vincent'sangina	Polymicrobial (oralanaerobes)	x 7-10 d Clindamycin 600 mg i.v. Q8H Alternative: Amoxicillin Clavulanate 1000 mg p.o.BID× 7-10days	Airway management •Surgical drainage
4.	Acute bronchitis	Viral	Non required	
5.	Acute bacterial rhinosinusitis. (Antibiotics if symptoms for 7– 10 days, facial pain, purulentnasal discharge)	S. pneumoniae H. influenzae M. catarrhalis	Amoxicillin 500 mg p.o. TID x 10-14 d.	
6.	Acute bacterialexacerbation of COPD(increased dyspnea, increased sputum volume, and increased sputum purulence).	S. pneumoniae H. influenzae M. catarrhalis	Amoxicillin 500 mg p.o. TID x 7 d Alternatives: • Doxycycline 100 mg p.o. BD × 7 d • Azithromycin 500 mg p.o. OD× 3d	·
7.	Community acquired pneumonia* CURB-65 score=1 CURB-65 score=2 CURB-65 score=3	S.pneumoniae Legionella spp. Enterobacteriaceae	Amoxycillin 500 mg p.o. Q8H x 7d CP 20 L units i.v. Q4H x 7-10 d Ceftriaxone 1 gm i.v. Q12H + Azithromycin 500 mg i.v./ p.o. OD Alternative: Levofloxacin 750 mg i.v. (to be changed to p.o.) ODx7-0d	
8.	Ventilator associated pneumonia	Gram-negatives: E. coli, Klebsiella, Enterobacter, Pseudomonas aeruginosa		See VAP atpageno. 28-29
9.	Pneumocystis pneumonia (PCP)in AIDS	P. jiroveci	Co-trimoxazole Dose:Trimethoprim 15 mg/kg/d x 21d	

CURB-65 scoring system: 6 point score (range 0-5). Gives one point each for:

C Confusion (abbreviated mental test score≤8 or new disorientation in person, place, or time)

U Urea>7 m mol / l (55 mg / dL)

R Respiratory rate ≥30/min

B Low Blood pressure (SBP <90 mmHg or DBP ≤60 mmHg)

Age≥65 years; Severe pneumonia=CURB-65 score of >3

f). GU Infections:

S.No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
1.	Acute uncomplicated cystitis in women – dysuria and Frequency in healthy, adult, non-pregnant women with normal urinary tract	*E. coli*	Ciprofloxacin 500 mg p.o. BID x 3 d **Alternative:** Nitrofurantoin 100mgp.o.BIDx 7days	
2.	Pyelonephritis –uncomplicated (no underlying GU disease)	*E.coli*	Amikacin 15 mg/kg i.v. Q24H **Severely ill** (MODS, septic shock): Ertapenem 1 gm i.v. Q24H; de-escalate as per AST reports	Duration : Mild to moderate cases –7 days; Severe cases –14 days; hospitalize patient
3.	Complicated UTI (underlying GU disease)	*E. coli, Proteus, Pseudomonas aeruginosa, Acinetobacter spp.*	Carbapenem (Imipenem /Meropenem) de-escalate as per AST reports.	Duration: 10-14 days.
4.	Foley catheter associated UTI	Gram-negative bacilli	As per AST reports A.Treat only when patient has systemic symptoms (fever, SIRS)	Urine sample for culture obtained through a new catheter (after removing the indwelling catheter) When this is not possible, obtain sample through catheter port, (and **not** the drainage bag).

g). Parasitic Infections:

S. No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
1.	Malaria	P. vivax	For blood stage: Chloroquine phosphate. Day1: 1,000 mg p.o. (600 mg base)(4 tablets) Day 2: 1,000 mg p.o. (600 mg base)(4 tablets) Day 3: 500 mg p.o. (300 mg base)(2 tablets). For radical cure: Chloroquineplus Primaquine phosphate.15 mg p.o. OD x 14 d. In G6PD deficiency (mild) primaquine 0.75 mg/kg once a week x 6 weeks. Not in severe G6PD deficiency	
		P. falciparum	Artemether 20 mg+ Lumefantrine 120 mg (co-formulated tablets) 4 tablets BID x 3 d	
2.	Severe malaria	P. falciparum	Preferred: Artesunate 2.4 mg/kg i.v. given as a bolus at 0, 12, and 24 h, &then daily + Doxycycline 100 mg p.o.Q12H Alternative: Quinine dihydrochloride(in 5% dextrose) 20 mg/kg i.v. over 4 hours, followed by 10 mg/kg i.v. Q8H, with Doxycycline or Clindamycin. Switch to p.o. therapy as soon as possible to complete 7day	Patients with one or more of the following clinical criteria are considered to have 'severe malaria' and should be treated with i.v. antimalarials •Coma •Severe anemia •Renal failure •ARDS •Shock • DIC •Acidosis •Hemoglobinuria •Jaundice, •Parasitemia>5% *Consider exchange transfusion for persons with parasitemia >10%

S. No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
3.	Visceral leishmaniasis (kalaazar)	L.donovani	1.Amphotericin B 0.5 mg/kg/day i.v. OD x 30 d. 2.Amphotericin B 1.0 mg/kg/day i.v. on alternate days x 15 doses. 3.Miltefosine 2.5 mg/kg/ day (bodyweight >25 kg 50 mg BD; bodyweight<25 kg 50 mg OD) p.o. x28d.	
4.	Helminthiasis	Ascaris, Enterobius, Hookworm	Albendazole 400 mg p.o. x 1 dose Repeat dose after 2 weeks for Enterobius	

h). Acute Undifferentiated Febrile Illnesses:

S.No.	Condition	Etiology (Likely pathogen)	Antibiotics	Comments
1.	Leptospirosis	Leptospia interrogas	Crystalline penicillin10 L unitsi.v. Q4H Alternative regimen: 1.Ceftriaxone 1 gm i.v. OD 2.Doxycycline 100 mg p.o. BID	Duration 7 days.
2.	Scrub typhus	Orientia tsutsugamushi	Doxycycline 100 mg p.o. BID x 7 day	
3.	Spotted fever		Doxycycline 100 mg p.o. BID x 5-7 days	
4.	Dengue fever Chikungunya	Dengue virus Chikungunya virus	No antiviral effective.	Prompt and meticulous fluid replacement for DSS.
5.	Acute undifferen-tiated fever with severe sepsis (community acquired)	Orientia tsutsugamushi Gram-negative bacteria Leptospira S.Typhi	Doxycycline 100 mg p.o. BID+ Ertapenem 1gm i.v. Q24H Tailor antibiotic regimen once diagnosis confirmed malaria should be ruled out.	These patients present with fever for 5 – 15 days with no evident focus of infection and features of severe sepsis (multi-organ dysfunction and/or shock);
6.	Melioidosis	Burkholderia pseudomallei	Initial intensive therapy: Ceftazidime 2 gm i.v. Q8H x 14 days Eradication therapy : Cotrimoxazole DS 2 tab p.o. BID+ Doxycycline 100 mg p.o. BID x3 months	4-8 weeks of intensive therapy for patients who are critically ill, have extensive pulmonary disease, deep seated collections or organ abscesses, osteomyelitis, septic arthritis or neurologic melioidosis.

Guidelines for the use of antimicrobial agents in neutropenic patients with cancer:

1. **Principles:**

- Empirical antibiotic therapy should be administered promptly to all neutropenic patients at the onset of fever
- Antibiotics of choice to:
  a) Provide adequate coverage of Pseudomonas aeruginosa
  b) Be based on local antimicrobial susceptibility pattern i.e., frequently identified bacterial pathogens in the hospital in similar condition.

2. **Definition:**

a) Fever: single oral Temperature of 38.3^{o}C(101^{o}F) or temperature of>38.0^{o}C (100.4^{o}F) for >1 hour

b) Neutropenia: Neutrophil count < 500 cells / mm^3

or

count < 1000cells/mm^3 with a predicted decrease to < 500cells/mm^3

3. **Initial evaluation:**

a) Determine whether the patient is at high risk for complications – haematological malignancy, bone marrow transplantation, Absolute neutrophil count (ANC)<100 cells/cu mm, clinically unstable patient, clinically evident focus of infection, significant co- morbidities.

b) Determine whether Vancomycin therapy is needed –evidence of i.v. catheter infection, presence of severe mucositis, known to be colonized / infected with MRSA, clinically unstable patient (Hypotension).

4. **Initial antibiotic therapy:**

a) Oral route : for low risk adult only, use ciprofloxacin + amoxicillin–clavulanate

b) Monotherapy when Vancomycin not indicated: cefepime 2gm i.v. BD or Ceftazidime 2 gm i.v. Q8H

c) Two drugs without Vancomycin:
Amikacin (15 mg/kg i.v.Q24H) + piperacillin + Tazobactum (4.3 gm i.v. Q8h) or Cefepime (2 gm i.v. BD) or Ceftazidime (2 gm i.v. Q8H).

d) Vancomycin plus 1 or 2 antibiotics, if criteria for use of Vancomycin are met: As above + Vancomycin (15 mg /Kg i.v. Q12h).

Modification of therapy during the first week of treatment with duration of treatment:

THERAPY	DURATION
A. Patient becomes safe/ afebrile in 3 days· • Etiologic agent identified–adjust therapy to most appropriate drugs. • No etiologic agent identified: ✓ Patient at low risk initially, and on oral antibiotics with no subsequent complications – continue use of the same drugs ✓ Patient at low risk initially and therapy with i.v. drugs begun with no subsequent complications – change to oral ciprofloxacin + amoxicillin – clavulanate after 48 hours. ✓ Patient at high risk initially with no subsequent complication–continue use of same i.v. drugs	**1.Patient afebrile by day 3** • ANC> 500 cells /cu mm for 2 consecutive days, no definite site of infection, and no positive cultures – stop antibiotic therapy when the patient is afebrile for more than 48 hrs • ANC< 500 cells/cu mm ✓ Patient initially at low risk and no subsequent complications – stop therapy when patient is afebrile for 5-7 days ✓ Patient initially at risk and no subsequent complications – continue same antibiotics
B. Persistent fever throughout the first 3 days : ✓ Reassess therapy on day 3 ✓ If no clinical worsening, continue use of the same antibiotics. ✓ Stop Vancomycin (if part of initial regimen) if cultures negative ✓ If there progressive disease, change antibiotics (Imipenem 0.5 gm i.v. Q6H / Meropenem 1 gm i.v. Q8H). ✓ If patient febrile after 72-96 hours, consider adding Amphotericin B, with and without a change in antibiotic regimen. ✓ Additional indications for Amphotericin B /Voriconazole : Pleural rub, pulmonary infiltrates suggestive of invasive aspergillosis, paranasal sinusitis.	**1. Persistent Fever on day 3.** • ANC >500 cells/cu mm – stop antibiotics 4-5 days after ANC > 500 cells/ cu mm • ANC < 500 cells/ cu mm – reassess and continue antibiotic for 2 more weeks; reassess and consider stopping therapy if no disease site found

Empirical Antibiotic Policy for ICU:

Patient Risk Stratification

Patient Type 1: Community Acquired Infection (CAI)	**Patient Type 2: Hospital and Healthcare Associated Infections(HAI)**
• No , contact, with, health care system • No prior antibiotic treatment • No, procedures done • Patient young with few co morbid, conditions	• A HAI infection is specifically one that was not present or incubating prior to the patient's being admitted to the hospital, but occurring within 72 hours after admission to the hospital. • Contact, with healthcare system like dialysis or any invasive procedure may lead to HAI.

Presumptive Treatment is Based on Above Risk Stratification:

1. Blood stream infections: possible pathogens *Acinetobacter sp, Pseudomonas sp, E. coli, Klebsiellasp, Staphylococcus aureus***,** *Enterococcus* sp, and Coagulase Negative *Staphylococcus*(CONS).		
Ceftriaxone **OR** Amoxicillin –Clavulanate **OR** Cefperazone -sulbactum	Ceftriaxone **OR** Cefperazone –sulbactum **OR** Ertapenem **± Vanconycin /Teicoplanin +Amikacin**	Imipenem **OR** Meropenem* + Vancomycin or Teicoplanin *If prior exposure-Carbapenems use Colistin
2. Complicated intra-abdominal infections in ICU: possible pathogens *Pseudomonas sp, E.coli, Klebsiella spp, Enterococcus spp.*		
Ceftriaxone/ Cefotaxime +Metronidazole	Piperacillin+Tazobactum **OR** Cefperazone+Sulbactum **OR** Ertapenem +Vancomycin/ Teicoplanin	Meropenem **OR** Imipenem +Vancomycin **OR** Teicoplanin ±Amikacin
3. Respiratory Tract Infections In ICU and VAP: Possible pathogens *Acinetobacter sp, Pseudomonas sp, E.coli, Klebsiella sp, Enterobacter spp. and Staphylococcus aureus***.**		

Ceftriaxone **OR** Co-amoxiclav,+ Macrolide **If Beta lactum allergy** Levofloxacin/moxifloxacin **OR** Clindamyin + azetronam	Piperacillin + Tazobactum **OR** Cefopeazone + Sulbactum **OR** Ertapenem **Add One of the following as per diagnosis** ✓ Aspiration after recent abdominal surgery- Clindamycin ✓ Renalfailure,MRSA- Vancomycin/ Teicoplanin ✓ Patients on high dose of steroids- Clarithromycin / Levofloxacin (Cover Legionella)	Imipenem **OR** Meropenem+ Newer Fluroquinolones+ Linezolid or Vancomycin **If prior exposure to** **Carbapene-use Colistin**
4. Urinary Tract Infections in ICU : Possible pathogens *Escherichia coli, Klebsiella spp., Pseudomonas spp., Enterococcus spp.*		
Nitrofurantoin **OR** Cefuroxime **OR** Ertapenem**OR** Fluroquinolones	Piperacillin + Tazobactum **OR** Cefperazone + Sulbactum **OR** Ertapenem	**No exposure to Carbapenem** Imipenem **OR** Meropenem **Prior exposure to carbapenem** Colistin–until culture report

NOTE:

- Send samples for culture before starting antimicrobial therapy.
- Escalate/ de-escalate the antibiotic dose/ change as per the culture sensitivity report.
- Preferably choose narrowest spectrum antibiotic to which the isolated pathogen is susceptible
- Patients transferred from OT to the ICU. The surgical antibiotic policy should be continued in ICU unless there is evidence and a change or withdrawal of antibiotic is required.

Suspect VAP:

1. If patient has
   - New or progressive radiographic in filtrate,
   - New onset of fever,
   - Purulent sputum,
   - leukocytosis,
   - Decline in oxygenation.

2. A clinical pulmonary infection score (CPIS) >6 highly suggestive of VAP. Obtain sample (ET aspirate or BAL) for quantitative culture before starting Antibiotics as given above.
   After 48 to 72 hours, de-escalate antibiotics as per AST reports. (if clinical improvement) Stop antibiotics after 7 to 8 days.

Central Venous Catheter (CVC) related blood stream infections (BSI)

- Two sets of blood samples for culture (at - least 1 drawn percutaneously) should be obtained from all patients with suspected CVC related BSI
- A positive culture result for a blood sample drawn through a CVC requires clinical interpretation (presence or absence of features of SIRS, MODS, hypotension), but a negative result excludes CVC-related bloodstream infection.
- CVC should be removed and cultured if the patient has erythema or purulence overlying the catheter exit site, or clinical signs of severe sepsis (signs and symptoms of MODS and/or hypotension) Culture of catheter tips should be done only when catheter-related blood stream infection is suspected

Interpretation of culture results:

Scenario	Diagnosis
Blood culture negative	Look for another source
Blood culture positive; catheter tip negative	CVC related BSI (if no other source) evident
Blood culture positive; catheter tip positive	CVC related BSI
Blood culture negative; catheter tip positive	Colonization. Consider CVC related BSI if accompanied by features of SIRS, and no other source evident

(From: Guidelines for the management of intravascular catheter related infections. Clin Infect Dis.2001;32:1249-72)

Antibiotic Therapy for Surgical Cases

1. Empirical antibiotic therapy for surgical cases:

Clean cases: Only one dose recommended at the time of induction. Repeat second dose if surgery lasts for more than 4 hours.

• Cefuroxime plus Metronidazole - for anaerobic cover if required. Add Gentamicin, if gram negative cover is required

2. **Clean cases where contamination is not suspected.**

The following surgical situations are identified:

a) Road traffic accidents (RTA)
b) Biliary and GI surgery
c) Genitourinary system

Recommendation:

a) Road traffic accident : assess the extent and site of injury Cefuroxime or Amoxicillin – Clavulanic acid (With or without Metronidazole)
b) Biliary and GI surgery Cefuroxime or Cefperazone – sulbactum (With or without Metronidazole)
c) Genitourinary system Ofloxacin plus gentamicin

3. **Contaminated Septicemia cases**

Evidence of sepsis is likely to be present before surgery. If already on definitive therapy this can be continued pre-operatively. However in case of no antibiotics are being used, empirical therapy with Beta-lactam – Beta-lactamase inhibitor combination with or without metronidazole to be considered. Therapy may vary with type and site of infection.

a) Soft tissue infection – cover Staph. aureus
b) GI infections – cover E.coli and anaerobes
c) GU infections - E.coli and Pseudomonas sp

4. **Surgical cases involving surgical implants:**

a) **Choice I:** Clindamycin + Ofloxacin
b) **Choice 2:** Teicoplanin /Vancomycin + Ofloxacin

Two doses recommended:

a) **Dose 1** - at the time of induction of anesthesia,
b) **Dose 2**- 4 hours after surgery (except Teicoplanin / Vancomycin)

Empirical Antibiotic Therapy for Neurosurgery:

No antibiotics is recommended for clean cases other than chemoprophylaxis.

Routine use: Cefuroxime + Amikacin

1. **Fracture Skull with CSF leak:** same as above. Look for evidence of infection and use evidence based definitive therapy.
2. **Neurosurgery lasting less than 4-6 hours:** Single dose of Cefuroxime before induction.

3. **Neurosurgery lasting more than 4-6 hours**: 2 doses → Cefuroxime + Amikacin. First dose at induction and 2nd dose after 8 hours.
4. **Community acquired bacterial meningitis in immuno competent cases:** Ceftriaxone
5. Elderly group and immuno-compromised patients with bacterial meningitis: Cefotaxime/ Ceftriaxone with or without Vancomycin.
6. **Shunt associated infections:** Cefuroxime (in case of strong clinical evidence MRSA: Vancomycin / Teicoplanin).
7. **Complicated meningitis:** 3rd Generation cephalosporins (Ceftriaxone) + Amikacin with or without Vancomycin.
8. **Brain abscess:** Piperacillin /Piperacillin +Tazobactum with or without Metronidazole.

Empirical Antibiotic Therapy For orthopedics:

1. Clean non-infected cases with minor implants (K wires) / no implants:
    - Inj. Cefazolin 1 gm i.v. Q8H OR Cefuroxime 1.5 gm i.v. Q12H + Gentamicin 80 mg i.v. Q12H OR Amikacin 500 mg i.v. Q12H for 3 days
2. Surgeries with major implants (T.H.R / T.K.R):
    - Inj Cefuroxime 750 mg/1.5 g IV thrice daily
    - Inj Cefoperazone + Sulbactum 1 g /1.5 g IV twice daily
    - Given for 2-3 days and converted to oral antibiotics
    - Oral antibiotics of choice: for one week
        a) Amoxycillin + Clavulanate 625 mg thrice daily
        b) Cefixime 200 mg twice daily
        c) Levofloxacin 500 mg / 750 mg once daily
3. Spine cases:
    - Inj Cefoperazone + Sulbactum 1 g IV twice daily for 2 days (or)
    - Inj Cefuroxime 750 mg IV twice daily for 2 days → followed by oral antibiotics
    - Amoxycillin+ Clavulanate 625 mg thrice daily for 5 daily
    - Cefixime 200 mg twice daily for 5 days
4. Open Injuries /Fractures:
    - Inj Cefuroxime 1.5 g IV twice daily (or) Inj Amoxycillin + Clavulanic acid 1.2 g IV twice daily with Inj Gentamicin 80 mg IV twice daily for 72 hours
5. Gas gangrene:
    - Penicillin G 10 lac units i.v. Q4H + Clindamycin 600 mg i.v. Q8H + Gentamicin 80 mg i.v. Q12H OR Amikacin 500 mg i.v. Q12H

Empirical Antibiotic Therapy For Obstetrics and Gynecology

Condition	**Common organisms**	**Antibiotic of choice**	**Alternate antibiotics and comments**
Clean surgical Wound, Elective LSCS without labour, PROM	Mainly skin bacteria	Cefazolin 2 g IV repeat If wt >120 kgs 3g IV after 4 hrs (or) Cefotaxime 1g IV repeat after 3 hr	Administer before the skin Incision
Clean episiotomy and minor tear		No antibiotics	
Clean contaminated surgical wound– LSCS in labour or with PROM,		Inj. Cefotaxime 1 g IV 8th hourly Inj. Metrogyl 500 mg IV 8th hourly For 24-48 hours	1st dose being given 0-60 minutes prior to skin incision
Perinatal Group B Streptococcal infection	Group B Streptococci	Ampicillin 1 g i.v Q 6 h; in labour, or after membranes rupture (whichever is earlier) until delivery	Group b Streptococci (GBS) UTI during pregnancy Should be treated and these women should get GBS prophylaxis in labour or after membrane rupture. Routine screening for GBS by vaginal culture is not recommended.
Valvular heart disease	*Streptococci*	Ampicillin 2g IV+ Gentamicin 1.5 mg / Kg IV stat. Follow-up With Ampicillin 1g IV after 6hrs	
Manual removal of Placenta **OR** 3rd or 4th degree perineal tear**s**	Vagianl and perineal flora	Inj Cefotaxime 1g IV 8th hrly Inj Metrogyl 500mg IV 8th hrly	
Septic abortion Pelvic abscess Peritonitis	Polymicrobial	Inj Ceftriaxone 2 g i.v BD + Inj Amikacin 500 mg i.v BD within Metronidazole 500 mg i.v 8 H for 5-7 days	Modify as per culture report

Condition	Common organisms	Antibiotic of choice	Alternate antibiotics and comments
Elective minor procedures(MTP,MTP with ligation, D&C, endometrial aspiration)		Single dose of Inj Cefotaxime 1g IV stat	
Local wound infection	Mainly skin, anaerobic bacteria and vaginal flora	**With systemic signs** Inj Ceftriaxone -2 gm IV BD for 48 hour followed by Ceftriaxone 1 gm IV BD for 5-7 days + InjAmikacin 500 mg IV BD for 5 Days **with or without** Metronidazole	Modify as per culture report. Remove sutures and drain pus if required
Asymptomatic bacteriuria in pregnancy Cystitis	*E.coli*	Cap. Cephalexin 500 mg 8th hourly for 3 days	To be started after collecting urine for culture sensitivity
Post operative respiratory tract infection		Tab Co-Amoxyclav 625 mg 8H x 10d (or) Tab Levofloxacin	Consult Infection control officer
Post operative fever with no localizing signs	Multiple etiology -malaria, enteric fever, UTI,	Intermittent fever ✓Course of chloroquine Continuous fever ,toxic ✓Inj Ceftriaxone -2 gm IV BD for 48 hour followed by Ceftriaxone 1gm IV BD for 5-7 days plus Inj Amikacin 500 mg IV BD for 5 days with or without Metronidazole **If no response 48 hrs** Inj Clindamycin + Gentamicin till culture report available	Consult Infection control officer Identify and treat cause Collect appropriate samples before starting therapy.

Management of OPD patients:

a) PID:

1st line: Inj Ceftriaxone 500 mg IM stat + Tab Doxycycline 100 mg BD × 14 days + Tab Metronidazole 400mg BD × 14 days

2nd line: Tab Ofloxacin 200 mg BD × 14 days Plus Tab Metronidazole 400mg BD ×

14 days

Note : Partner treatment: Inj Ceftriaxone 500mg IM stat + Tab Azithromycin 1 gm stat

b) Vaginal infection (Vaginitis):

Tab Fluconazole 150mg stat + Tab Tinidazole 2 gm stat + Tab Azithromycin 1g stat

c) Candidiasis

Tab Fluconazole 150mg stat (or) Clotrimazole vaginal pessary 100 mg HS × 6days

(or) Clotrimazole vaginal pessary 200 mg HS ×3 days

d) Recurrent candidiasis:

Tab Fluconazole 150 mg on day 1, 4, and 7 then weekly × 6 months

Antibiotic Policy for Burn Patient:

Prophylactic antibiotics:

Prophylactic antibiotic in burns are indicated in all admitted patients.

1. **Patient without Tetanus immunization**
   - Inj Crystalline Penicillin
   - Inj Gentamicin
2. **Patient coming to hospital after 48 hours and without any culture report**
   - Inj Amoxicillin + Clavulanic acid
   - Inj Gentamicin

Empirical Therapy:

1st Line antibiotics: for patients who develop fever or any sign/symptom of infection without microbiological proof of infection.

- Inj Ceftazidime or Inj Ciprofloxacin + Inj Amikacin

2nd line therapy or Curative therapy: Given on basis of pus culture and sensitivity report.

- For Gram negative: Inj Cefoperazone + Sulbactum (OR) Piperacillin + Tazobactum plus Netilmicin
- In Gram negative resistant to above: Ertapenem (OR) Meropenem (OR) Imipenem. (Ertapenem is not used for Pseudomonas)

3rdline therapy: For multidrug resistant organism

- For Gram Negative: Injection Colistin, Inj. Tigecycline
- Tigecycline used as mono-therapy for soft tissue infections and combination therapy for blood stream infections.
- For Gram positive (MRSA): Inj Vancomycin (OR) Inj Clindamycin (OR) Inj Teicoplanin.

Indication for antifungal agents:

- Patient with extensive burn not responding to 3rd line therapy
- Empirical therapy: azoles Inj Fluconazole

After culture report: Non candida albicans - Caspofungin

Amphotericin B is toxic to all burn patient as renal system compromised, hence Caspofungin is used.

Antibiotic Policy for Plastic Surgery:

Antibiotic used in peri-operative period

- Inj Amoxy-Clav (or) Inj Ceftriaxone (or) Inj Cefotaxime
  PlusInj Amikacin (or) Inj Gentamicin
- After 4-5 days switch to oral antibiotics, which include Tab Amoxy + Clavulanic acid (or)Tab Cefuroxime (or)Tab Ciprofloxacin

Antibiotic Policy for Genitourinary Surgery: Based on American Urologic Surgery Antimicrobial Prophylaxis :**Indications for Prophylactic antibiotic usage:**

Patient-related factors affecting Host Response to Surgical infections:

Factor	**Result**
Impair natural defence mechanisms	
• Advanced age • Anatomic anomalies of the urinary tract • Poor nutritional status • Smoking • Chronic corticosteroid use • Immunodeficiency	↓ natural defence mechanisms of the urinary tract and immune system
Increase local bacterial concentration and / or spectrum of flora	
• Externalized catheters • Colonized endogenous/exogenous material • Distant coexistent infection • Prolonged hospitalization	↑ local bacterial concentration and/or spectrum

Prophylaxis for Lower Tract Instrumentation:

Procedure (organisms)1	**Prophylaxis Indicated**	**Antimicrobial (s) of Choice 2**	**Alternative Antimicrobial (s) 2**
Removal of external urinary catheter,3,4 (GU tract)	Patients with risk factors5	Fluoroquinolone, Trimethoprim-sulfamethoxazole 3rd gen cephalosporin	Aminoglycoside ± Ampicillin 1st/2nd gen. Cephalosporin Amoxicillin/Clavulanate
Cystography, urodynamic study or simple cystourethroscopy (GU tract)	Patients with risk factors5	Fluoroquinolone, Trimethoprim-sulfamethoxazole 3rd gen cephalosporin	Aminoglycoside ± Ampicillin 1st/2nd gen. Cephalosporin Amoxicillin/Clavulanate

Cystourethroscopy with manipulation6 (GU tract)	All patients	Fluoroquinolone, Trimethoprim-sulfamethoxazole 3rd gen cephalosporin	Aminoglycoside ± Ampicillin 1st/2nd gen. Cephalosporin Amoxicillin/Clavulanate
Prostate brachytherapy or cryotherapy (Skin)	Uncertain	1st gen. Cephalosporin	Clindamycin
Trans-rectal prostate biopsy (Intestine)	All patients	Fluoroquinolone, 1st/2nd/3rd gen. Cephalosporin	TMP-SMX Aminoglycoside (Aztreonam)

Key: gen, generation; GU, genitourinary.

1) Organisms common to the GU tract − *E.coli, Proteus sp., Klebsiella spp., Enterococcus;* Intestine − *E.coli, Klebsiella spp., Enterobacter, Serratia spp., Proteus spp., Enterococcus,* and Anaerobes; Skin − *S. aureus,* coagulase negative *Staphylococcus spp.,* Group A *Streptococcus spp.*
2) Order of agents is not indicative of preference.
3) If urine culture shows no growth prior to procedure, antimicrobial prophylaxis is not necessary.
4) Or full course of culture-directed antimicrobials for documented infection (treatment not prophylaxis).
5) Risk factors-see above table.
6) Includes transurethral resection of bladder tumor and prostate, and any biopsy, resection, fulguration, foreign body removal, urethral dilation or urethrotomy, or ureteral instrumentation including catheterization or stent placement/removal.

Prophylaxis for Upper Tract Instrumentation:

Procedure(organisms) 1	**Prophylaxis Indicated**	**Antimicrobial (s) of Choice 2**	**Alternative Antimicrobial (s) 2**
Shock-wave lithotripsy [Genitourinary (GU) tract]	If risk factors	Fluoroquinolone, trimethoprim-sulfamethoxazole 3rd generation cephalosporin	Aminoglycoside ± Ampicillin 1st/2nd generation. Cephalosporin Amoxicillin/Clavulanate
Percutaneous renal surgery [Genitourinary (GU) tract and skin]	All patients	1st/2nd generation. Cephalosporin, Aminoglycoside + Metronidazole or Clindamycin 3rd generation cephalosporin	Aminoglycoside/ Sulbactam Fluoroquinolone
Ureteroscopy [Genitourinary (GU) tract]	All patients	Fluoroquinolone, trimethoprim-sulfamethoxazole 3rd generation. cephalosporin	Aminoglycoside ± Ampicillin 1st/2nd generation. Cephalosporin Amoxicillin/Clavulanate

Procedure(organisms) 1	Prophylaxis Indicated	Antimicrobial (s) of Choice 2	Alternative Antimicrobial (s) 2
Note: Organisms common to the GU tract – *E. coli, Proteus sp., Klebsiella spp., Enterococcus;* Skin – *S. aureus*, coagulase negative *Staphylococcus spp*., Group A *Streptococcus spp*.			
Vaginal surgery (GU tract, skin and Group B Strep.)	All patients	1st/2nd gen. Cephalosporin Aminoglycoside + Metronidazole or Clindamycin	Ampicillin/Sulbactam Fluoroquinolone
Involving entry into the urinary tract (GU tract and skin)	All patients	1st/2nd gen. Cephalosporin Aminoglycoside + Metronidazole or Clindamycin	Ampicillin/Sulbactam Fluoroquinolone
Without entering urinary tract (skin)	Patients with risk factors3	1st gen. Cephalosporin (single dose)	Clindamycin (single dose)
Involving intestine (GU tract, skin, and intestine)	All patients	2nd/3rd gen. Cephalosporin, Aminoglycoside + Metronidazole or Clindamycin	Ampicillin/Sulbactam Ticarcillin/Clavulanate Pipercillin/Tazobactam Fluoroquinolone
Involving implanted prosthesis (GU tract and skin)	All patients	Aminoglycoside + 1st/2nd gen. Cephalosporin or Vancomycin	Ampicillin/Sulbactam Ticarcillin/Clavulanate Pipercillin/Tazobactam

Key: gen., generation; GU, genitourinary.

1. Organisms common to the GU tract – E.coli, Proteus spp., Klebsiella spp., Enterococcus; Intestine – *E.coli, Klebsiella spp., Enterobacter, Serratia spp., Proteus spp., Enterococcus*, and Anaerobes; Skin – *S. aureus*, coagulase negative *Staphylococcus spp*., Group A *Streptococcus spp.*
2. Order of agents is not indicative of preference.
3. Risk factors - see Table of patient related factors
4. For surgery involving colon, bowel preparation with oral neomycin plus either erythromycin base or metronidazole can be added to or substituted for systemic agents

Antimicrobial Agents and Doses for Peri-procedural Use:

Fluoroquinolones	Levofloxacin: 500 mg PO single dose Ciprofloxacin: 500 mg PO [Q12h] Ofloxacin: 400 mg PO [Q 12h]
Aminoglycosides	Gentamicin: 5 mg/kg IV single dose Tobramycin: 5 mg/kg IV single dose Amikacin: 15 mg/kg IV single dose

1st Generation cephalosporins	Cephalexin: 500 mg PO [Q 6h] Cephradine: 500 mg PO [Q 6h] Cefadroxil: 500 mg PO [Q 12h] Cefazolin: 1 g IV [Q 8h]
2nd Generation cephalosporins	Cefaclor: 500 mg PO [Q 8h] Cefprozil: 500 mg PO [Q 12h] Cefuroxime: 500 mg PO [Q 12h] Cefoxitin: 1 - 2 g IV [Q 8h]
3rd Generation cephalosporins (oral agents not listed)	Ceftizoxime: 1 g IV [Q 8h] Ceftazidime: 1 g IV [Q 12h] Ceftriaxone: 1 - 2 IV single dose Cefotaxime: 1 g IV [Q 8h]
Others	Amoxicillin/clavulanate: 875 mg PO [Q 12h] Ampicillin: 1 - 2 g IV [Q 6h] Ampicillin/sulbactam: 1.5 - 3 g IV [Q 6h] Aztreonam 1 - 2 g IV [Q 8h] Clindamycin: 600 mg IV [Q 8h] Erythromycin base (for bowel preparation): 1 - 2 g PO [variable] Metronidazole: 1 g IV [Q 12h]; (for bowel preparation) 1 - 2 g PO [variable] Neomycin(for bowel preparation): 1 - 2 g PO [variable] Pipercillin/tazobactam: 3.375 g IV [Q 6h] Ticarcillin/clavulanate: 3.1 g IV [Q 6h] Trimethoprim-sulfamethoxazole: 1 double-strength tablet PO[Q 12h] Vancomycin: 1 g IV [Q 12h]

Key:g=gram;h=hour;IV=intravenous; kg=kilogram; mg=milligram; PO=orally; Q=every

Criteria for Antimicrobial Prophylaxis for Patients with Orthopedic and Urological Conditions:

Criteria	
Increased risk of haematogenous total joint infection	Increased risk of bacteremia associated with urologic procedures
Within 2 years of prosthetic joint replacement	Stone manipulation (includes shock- wave lithotripsy)
Immuno compromise and prosthetic joint replacement • Inflammatory arthropathies (e.g., rheumatoid arthritis, systemic lupus erythematosus) • Drug-induced immunosuppression • Radiation-induced immunosuppression	• Transmural incision into urinary tract (does not include simple ligation with excision or percutaneous drainage procedure) • Endoscopy of upper tract (ureter and kidney) • Procedures including bowel segments
Comorbidity • Previous prosthetic joint infection • Malnourishment • Hemophilia • HIV infection • Diabetes • Malignancy	Transrectal prostate biopsy Urinary tract entry (except for urethral catheterization) in individuals with higher risk of bacterial colonization: • Indwelling catheter or intermittent catheterization • Indwelling ureteral stent • Urinary retention • History of recent/recurrent urinary tract infection or prostatitis • Urinary diversion

Adapted from American Urological Association; American Academy of Orthopaedic Surgeons: Antimicrobial prophylaxis for urological patients with total joint replacements. J Urol 2003; 169: 1796

Indications for Post Prophylaxis continuation (Oral & IV):

- Existing infection/ pyuria/ bacteruria
- Placement of catheter/ stents/ nephrostomy tubes/ mesh
- Large stone burden
- High pressure irrigation
- Unexpected turbid urine
- Presence of devitalized tissue
- Bleeding/ haematoma formation

Antibiotic Policy for Surgical Gastroenterology:

Upper GI Surgeries:

Inj Cefaperazone+ Sulbactam 1.5g IV twice a day
Inj Metronidazole 500mg IV thrice a day
} for 3-5 days followed by oral antibiotics

Hepatobiliary & Pancreatic Surgeries:

Inj Piperacillin+ Tazobactum 4.5g IV twice a day
Inj Metronidazole 500mg IV thrice a day
} for 3-5 days followed by oral antibiotics

Colorectal Surgeries:

Inj Cefaperazone 1.5g IV twice a day
Inj Metronidazole 500mg IV thrice a day
} for 3-5 days followed by oral antibiotics

Hernia with Mesh repair:

Inj. Amoxycillin+Clavulanic acid 1.2g IV twice a day → for 3-5 days followed by oral antibiotics

Antifungal Therapy:

Fungal therapy usually started based on positive cultures or systemic evidence of fungal infection. It is advised to take paired cultures if fungal infection is suspected. Evidence includes persistent sepsis / SIRS despite broad spectrum antibiotic (exclude sepsis, abscess, drug fever, DVT etc.). Treat according to identification and sensitivity of Candida isolate.

- Fluconazole IV/oral 400mg OD if fluconazole naïve or sensitive

(or)

2nd line Caspofungin IV (for Candida krusei and C. glabrata as inherently resistant to Fluconazole.)

- Caspofungin dose: 70mg on Day 1 (loading), 50mg OD (<80kg) or 70mg OD (if >80kg) thereafter.
- Moderate to severe hepatic dysfunction: reduce the subsequent daily dose to 35mg OD. Check for drug interactions.

(or)

3rd line – Ambisome / Liposomal Amphotericin B IV 3mg/kg OD.

(As Caspofungin is inherently inactive against Zygomycetes, Cryptococcus, Fusarium and Trichosporon Spp) To be decided by Microbiologist / Intensivists based On Patient's Hepatic / RenalFunctions/ Severity of Infection / Drug Interactions e.g. Rifampicin, Carbamazepine, Phenytoin, Efavirenz, Nevirapine, Cyclosporin, Dexamethasone, Tacrolimus etc.

Alert Antibiotics: Guidelines for Optimising Use of Key Antimicrobials

To Prevent and Control the Emergence and Spread of Antimicrobial-Resistant Micro- organisms in the hospitals, one major strategic goal is to "define guidelines for use of key antibiotics", injectables ("Alert" antibiotics) targeted in these guidelines are Ciprofloxacin, Ceftazidime, Cefotaxime, Ceftriaxone, Vancomycin (or Teicoplanin), Imipenem, Levofloxacin, Meropenem, Moxifloxacin, Tazocin, Linezolid (oral/IV), Voriconazole, Caspofungin, Valganciclovir, Ertapenem and Newer Preparations of Amphotericin.

Collectively, these are among the drugs most frequently prescribed irrationally which is largely responsible for the current escalation of antibiotic costs. They also account for a significant proportion of serious antibiotic toxicity including Clostridium difficile diarrhoea and CNS toxicity/seizures as well as the emergence of major antimicrobial resistance. Safer, cheaper and equally effective alternatives are often available which allow such agents to be kept in reserve for occasions when there are clear cut microbiological indications. It is critical, therefore, that these Alert antibiotics be prescribed only on the recommendation of senior medical staff or after discussion with the Microbiologist or Infection control officer.

Alert Antibiotics and Their Indications:

Ciprofloxacin (intravenous)

Oral ciprofloxacin is well absorbed and this is therefore the preferred route of administration.

Intravenous therapy is only indicated in the following situations:

- When the patient is unable to swallow or the oral route is otherwise compromised·
- In serious sepsis (e.g. nosocomial pneumonia in ICU) when the recommended dose is 400 mg 8 hourly.

Indications for Ciprofloxacin in the Antibiotic Policy, either alone or in combination, are as follows:

- Second line therapy in exacerbation of chronic bronchitis
- Pyelonephritis
- Acute inflammatory infective diarrhoeas
- Serious infected diabetic ulcers, infected burn wounds with coliforms or Pseudomonas infection present
- Treatment of documented or presumed gram-ve bacilli resistant to penicillins or cephalosporins or when the patient is allergic (history of anaphylactic reaction or rash) to these agents
- Selected haematology patients requiring prophylaxis
- Severe acute pelvic inflammatory disease

Note: Fluoroquinolones are the only oral agents with activity against Pseudomonas aeruginosa

CEFTAZIDIME

Limited use only Main indication is documented or suspected Pseudomonas aeruginosa infection.

Other indications currently listed in the Antibiotic Policy are as follows:

- Second line agent in neutropenic patients with septicaemia or pneumonia
- Empiric therapy of CAPD associated peritonitis (not children), 1g IV stat then 125mg/ litre in each bag
- Empiric therapy of post-operative, post traumatic or shunt associated meningitis
- Empiric therapy of infective exacerbation of cystic fibrosis

PIPERACILLIN + TAZOBACTUM

Currently listed in the antibiotic policy for the following:

- Pneumonia or septicaemia in neutropenic patients (+ Gentamicin)
- As a single agent (or in combination with Gentamicin) for treatment of sepsis which has not responded to first line treatment or if it is not appropriate for Gentamicin to be added to first line therapy.

CEFTRIAXONE

IV Ceftriaxone is currently listed in the Antibiotic Policy for the following:

- Epiglotitis
- Brain abscess
- Bacterial meningitis
- Pyelonephritis in children
- Empiric therapy of septicaemia in children
- In ascites for treatment of sub-acute bacterial peritonitis
- Skin and soft tissue infections managed via out-patients or the home IV antibiotic programme
- Acute septic monoarthritis if penicillin allergic
- Spontaneous bacterial peritonitis

APPROPRIATE USE OF CARBEPENEMS

- Very high rates (60-75%) of resistance to 3rd and 4th generation cephalosporins (due to extended spectrum beta-lactamases (ESBL) production) observed in E. coli and Klebsiella species.
- This pattern of resistance although seen primarily among nosocomially acquired infections, is also seen isolates of E coli and Klebsiella species isolated from community acquired infections.
- These strains of bacteria are frequently resistant to other major classes of antibiotics (fluoroquinolones, β-lactam + β-lactamase inhibitor (BL + BLI) combinations and aminoglycosides)
- Carbapenems (Imipenem, Meropenem and Ertapenem), β-lactam antibiotics with exceptionally broad spectrum of activity, are the only class of antimicrobials which remain effective against ESBL-producing isolates of E coli and Klebsiella species
- Imipenem is susceptible to degradation by the enzyme dehydropeptidase-1 (DHP-1) located in renal tubules and requires co administration with a DHP-1 inhibitor cilastatin. Meropenem and Ertapenem are administered without a DHP-1 inhibitor.

Indications for Carbapenems use:

1. Infections [e.g., bacteremia, pyelonephritis, intra-abdominal infections (peritonitis, cholangitis, abscesses), nosocomial pneumonia etc.] confirmed (by appropriate culture and susceptibility studies) to be caused by Gram-negative bacteria (E coli, Klebsiella spp., Enterobacter spp.,

Pseudomonas aeruginosa, other non-fermenting Gram-negative bacilli) resistant to other classes of antimicrobials and susceptible only to carbapenems in-vitro

2. Initial empiric treatment for severe, life-threatening infections (associated with multi-organ dysfunction, septic shock) caused by Gram-negative bacteria.
    - Febrile neutropenia
    - Ventilator associated / nosocomial pneumonia
    - Pyelonephritis / complicated urinary tract infections
    - Complicated intra-abdominal infections

Once the culture and susceptibility reports are available, choose the most appropriate antibiotic based on spectrum of activity, toxicity and cost ('de-escalation').

Indications for Ertapenem use:

Ertapenem has excellent in-vitro and in-vivo activity against ESBL producing Enterobacteriaceae, but lacks activity against *Pseudomonas aeruginosa*, and is therefore not considered appropriate for the treatment of conditions like febrile neutropenia and serious nosocomial infections. Ertapenem does not select Carbapenem-resistant *Pseudomonas aeruginosa* (at least in the short-term). Its use should be restricted to severe Gram-negative or polymicrobial community acquired infections confirmed to be caused by susceptible bacterial pathogens. Hence, this drug may be recommended as the initial choice for ESBL producing strains of *E.coli* and *Klebsiella pneumoniae.*

Indication of Meropenem and Imipenem:

But both Meropenem and Imipenem regarded as third line agents and are reserved for:

- serious infections due to multiple resistant strains (e.g. ESBL)
- empiric use in the seriously ill patient in either ITU or Haematology
- the treatment of infective exacerbations in Cystic fibrosis (CF)
- severe acute necrotising pancreatitis
- Outside these clinical settings it should only be used after consultation with a Microbiologist or Infection control officer.

Unlike Imipenem, Meropenem has not been associated with CNS toxicity. In addition, it is administered by convenient IV bolus injection. Clinicians must be aware that mechanism of resistance to Meropenem and Imipenem are different and hence in-vitro test for one carbapenem cannot be used to interpret the other.

Dose

Imipenem*: 500 mg i.v. Q[6] 6H

Meropenem: 1gm i.v. Q 8H

Ertapenem : 1gm i.v. /i.m. Q 24H

***Note: Anti-infective Sub-committee recommends use at a more frequent dosing interval. They believe that optimum plasma concentrations are more reliably maintained with 6-hourly dosing.**

LINEZOLID (IV AND ORAL FORMS):

Linezolid should only be prescribed after consulting an Infection control officer/ ID specialist or microbiologist and a mandatory order form completed.

- Restricted indications including infections due to proven glycopeptide-insensitive Staphylococcus aureus or Vancomycin-resistant enterococcus (currently uncommon).
- To enable IV/oral switch from IV Vancomycin (used for MRSA or MRSE) to oral Linezolid (when patient discharge is possible and continuation treatment using combination rifampicin /trimethoprim is inappropriate.
- May be an option in surgical site infections (e.g. large bowel surgery, vascular surgery etc.).
- Poor IV access and a glycopeptide is indicated.
- Use in out-patient home parenteral antibiotic therapy for skin and soft tissue infections as an alternative to IV Teicoplanin.
- Rare cases of proven hypersensitivity/allergy to the glycopeptides.

VANCOMYCIN:

Vancomycin is the drug of choice for in-patient treatment of the following infections.

- Serious (e.g. bacteraemia, osteomyelitis) coagulase negative staphylococcal and MRSA infections and penicillin resistant enterococcal infections
- Empiric therapy in febrile neutropenic patients not responding to first line therapy
- Continuous ambulatory peritoneal dialysis (CAPD) associated peritonitis
- Prosthetic valve endocarditis

[6] Q : Quaque, a latin word which means every

TEICOPLANIN:

Teicoplanin is a suitable alternative to Vancomycin only for:

- patients receiving out-patient/home parenteral therapy with glycopeptides
- inability to tolerate Vancomycin
- oncology/haematology patients
- Rare cases of Vancomycin resistant and teicoplanin sensitive strains

Treatment of Multi-Drug Resistant Bacterial Pathogens:

Methicillin- resistant *S. aureus* (MRSA)

a) These organisms are considered resistant to all penicillins, Cephalosporins and Macrolides.
b) Though MRSA strains may be reported as susceptible to Fluoroquinolones, Aminoglycosides, Chloramphenicol and Doxycycline in-vitro, these drugs are NOT to be used alone or as initial treatment for serious MRSA infections.
c) Similarly Rifampicin is not to be used as monotherapy for MRSA infections
d) The drug of Choice for treatment of infections due to MRSA is the glycopeptides i.e Vancomycin and Teicoplanin.
e) Linezolid can be used to treat skin and soft tissue infections caused by MRSA.
f) Mupirocin local application (intranasally bid x 5 days) for eradicating nasal carriage.

Extended spectrum β-lactamases (ESBL) producing *Klebsiella spp.*and *E.coli*:

a) ESBL sare plasmid mediated â-lactamases that confer resistance to broad spectrum β-lactum antibiotics including third and fourth generation Cepahlosporins, Azetronam, and extended spectrum penicillins. These plasmids often encode mutations which confer reresistance to other broad spectrum agents including Aminoglycosides, Co- trimoxazole and Fluoroquinolones, resulting in organism resistant to most broad spectrum antibiotics.
b) A major problem with ESBLs is their capacity to cause therapeutic failure with Cephalosporins and Azetronam when host organism appears to be susceptible to these agents in laboratory tests. Hence CLSI recommends that laboratories should report ESBL producing isolates as resistant to all penicillins, Cephalosporins (including Cefepime and Cefpirome), and azetronam irrespective of the in-vitro test results.
c) The emergence of ESBL producing enterobacteriaceae is related to indiscriminate use of third generation cephalosporins.
d) The carbapenems (Ertapenem,Meropenem and Imipenem)are currently considered the drug of choice for serious infections caused by these pathogens. Piperacillin– tazobactam and

Cefperazone sulactum may be considered options in mild infections and when ESBL producers are demonstrably susceptible in–vitro.

e) Recommended measures to control spread of ESBL producing organism:
   (i). Improved lab detection and reporting of ESBL
   (ii). Enhanced infection surveillance and control in ICUs
   (iii). Prevent spread by barrier precautions: Gowns and gloves
   (iv). Hand Washing
   (v). Restricted use of 3rd generation Cephalosporins

Carbapenem resistant *Klebsiella spp*. and *E.coli* :

a) Mechanism of resistance:

Combinations of ESBL or AmpC beta-lactamase (AmpC) and porin loss: Porin are beta barrel proteins that cross a cellular membrane and act as a pore, through which molecules can diffuse. Porin loss is often unstable and may impose a fitness cost, meaning that these strains rarely spread. Ertapenem is particularly affected.

b) Acquired carbapenemases

Treatment:

- Most carbapenemase producers are extremely drug resistant: being resistant to β-lactum antibiotics, aminogycosides, and β-lactum or β-lactum inhibitor combinations..
- Polymyxins, Tigecycline & Fosfomycin are the agents with most frequent in vitro activity, but all have limitations. Dosage will vary with the patient and infection site, but should be on the principle of 'highest safe' rather than 'minimum potentially effective; durations should be as standard for the infection type.

c) Colistin: Case reports of successful use in infections due to Carbapenemase producers.

d) Tigecycline: Active in vitro vs. most carbapenem- resistant E. coli. Licensed for skin and soft tissue and complicated intra-abdominal infections. Case reports of success in various infections with carbapenemase producers. Low blood concentrations; off-label use should be cautious for blood stream infections, unsuitable in urinary infections as only 22% excreted in urine. Excess deaths in some trials, esp. ventilator pneumonia (not a licensed indication).

e) Others:

A few isolates are susceptible to other antibiotics including e.g. Chloramphenicol, Ciprofloxacin and Cotrimoxazole. Most producers, however, are resistant to these drugs.

List of High End Antibiotics:

1. Meropenem 2. Doripenem 3. Imipenem 4. Ertapenem 5. Colistin 6.Tigecycline 7. Linezolid 8. Teicoplanin 9. Vancomycin

List of High End Anti fungals: Caspofungin, Anidulafungin, Voriconazole

Monitoring Antimicrobial Use

The evolution of resistant strains is a natural phenomenon the use and misuse of antimicrobial drugs accelerates the emergence of drug-resistant strains. The evolving public health threat of AMR is driven by both appropriate and inappropriate use of antimicrobial agents. Overuse plays an important role in the emergence of AMR. Paradoxically, underuse through inappropriate choice, inadequate dosing, poor adherence to treatment, and substandard antimicrobials, also plays an important role in the emergence and spread of AMR. Hence, there is need to monitor the use of antimicrobials at all levels of health care, study the antimicrobial use practices in various infections and behaviour of stakeholders for antibiotic use and resistance.

Need For Surveillance

To Track Antimicrobial Use And Resistance Increasing levels of antimicrobial resistance correlate with inappropriate antibiotic use as shown at the population and individual level. Therefore, our goal should be to use antimicrobials rationally and for that we need to know how antimicrobials are being used. Monitoring of antimicrobial use is a crucial component to identify targets for improving antimicrobial use and to further correlate with antimicrobial resistance surveillance programmes.

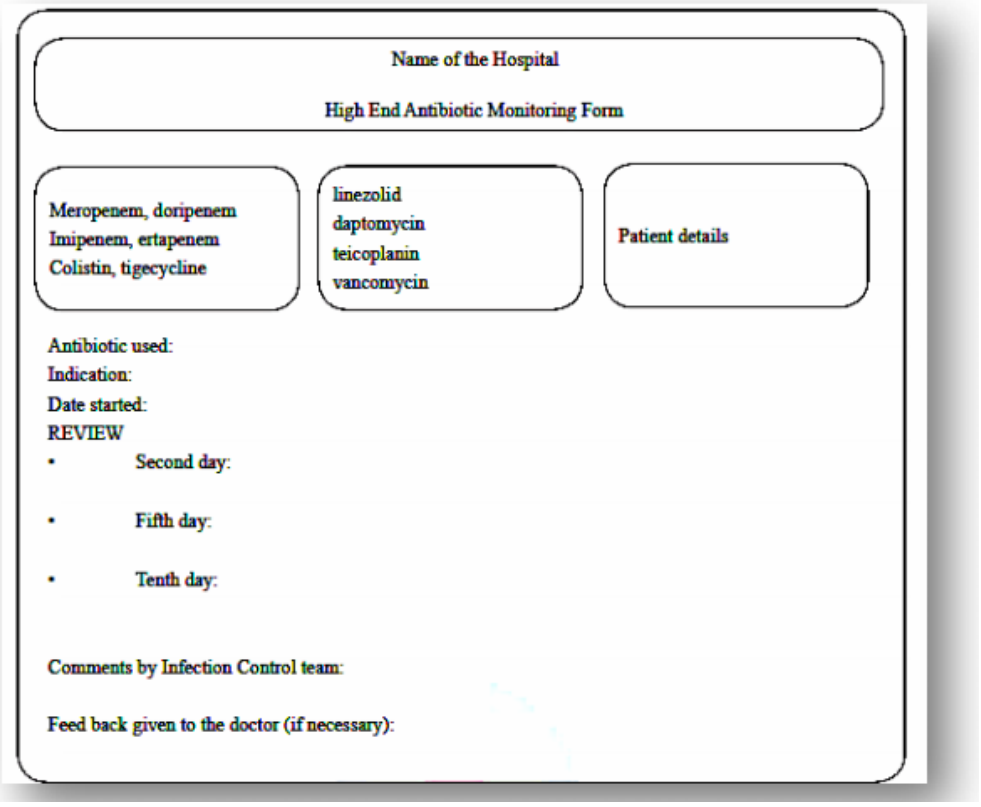
Situation in Developing Countries:

There are wide variations between regions and countries, in their capacity to carry out surveillance system. In resource -poor countries with comparatively weak health systems, there are constraints related to infrastructure, trained personnel, networking and coordination. Currently it is not possible in resource-poor countries to quantify the effects of Antimicrobial Resistance(AMR) on the individual or the community, because of lack of availability of good quality data in sufficient quantities. Therefore, developing validated, reproducible and sustainable surveillance methodologies to quantify AMR and antibiotic use in the community, and to inform the development of interventions and evaluate their impact is a priority.

The methods for obtaining data are often problematic, especially with regards to data on antimicrobial use. About 80% of antibiotics are used in the community and the rest are used in hospitals. There is a lack of community -based databases on AMR and antibiotic use in developing countries. Moreover, antibiotics can be obtained easily from private retail pharmacies without prescription and pharmacists also advise and dispense antibiotics to patients. Therefore, developing a methodology, which is reproducible and sustainable, is needed to measure antimicrobial use in the community for developing country.

To initiate with monitoring two forms need to be used for restricting antibiotic usage

High-end Antibiotic Monitoring Sheet



Name of the Hospital

High End Antibiotic Monitoring Form

Meropenem, doripenem
Imipenem, ertapenem
Colistin, tigecycline

linezolid
daptomycin
teicoplanin
vancomycin

Patient details

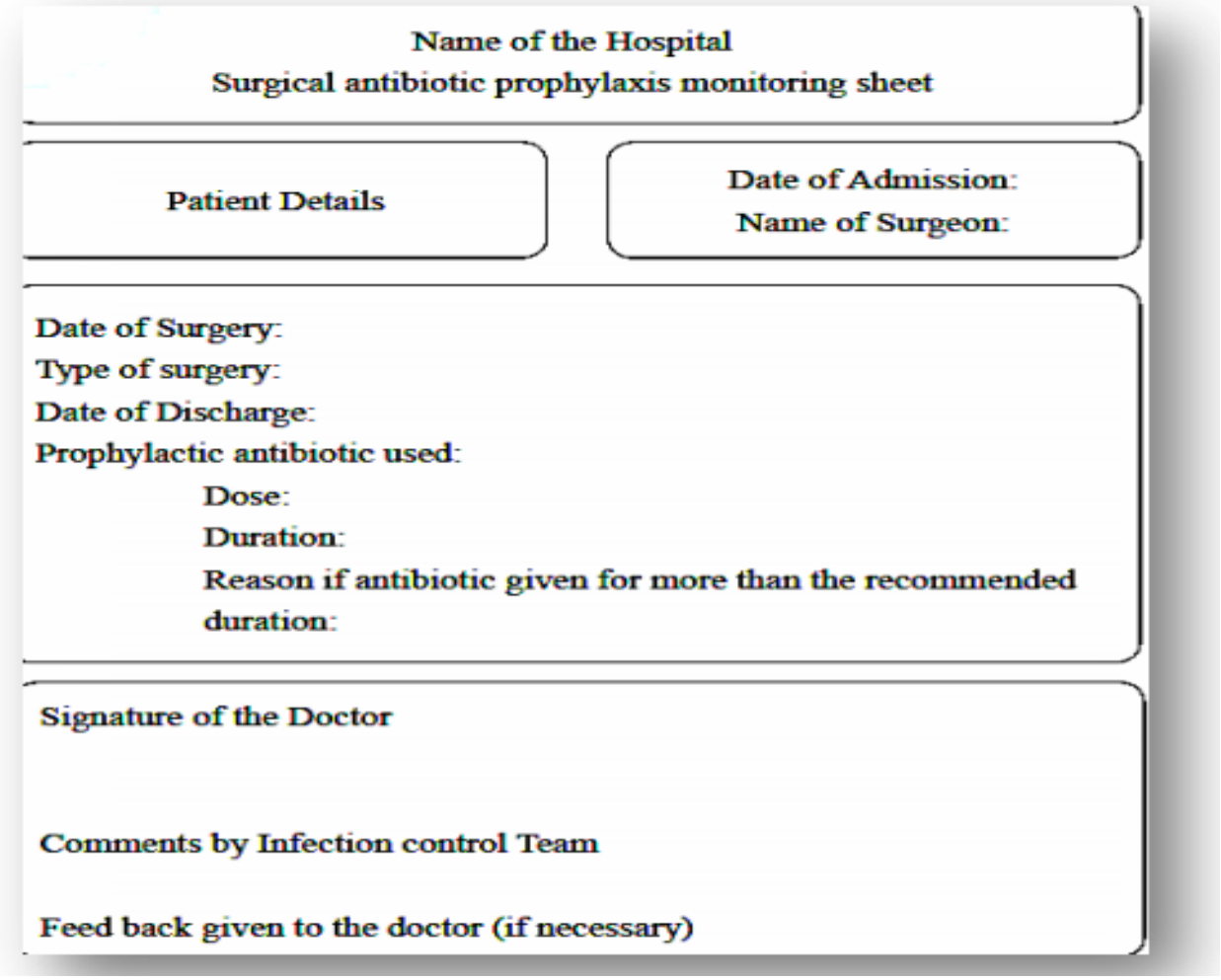
Antibiotic used:
Indication:
Date started:
REVIEW

- Second day:
- Fifth day:
- Tenth day:

Comments by Infection Control team:

Feed back given to the doctor (if necessary):

Surgical Prophylaxis Monitoring Sheet



Name of the Hospital
Surgical antibiotic prophylaxis monitoring sheet

Patient Details

Date of Admission:
Name of Surgeon:

Date of Surgery:
Type of surgery:
Date of Discharge:
Prophylactic antibiotic used:
Dose:
Duration:
Reason if antibiotic given for more than the recommended duration:

Signature of the Doctor

Comments by Infection control Team

Feed back given to the doctor (if necessary)

9.17. Monitoring of Treatment:

As part of the treatment monitoring continued need for antimicrobial therapy should be reviewed at least daily. For most types of infection treatment should continue until the clinical signs and symptoms of infection have resolved – exceptions to this are indicated in the relevant sections. Parenteral therapy is normally used in seriously ill patients and those with gastrointestinal upset. Oral therapy can often be substituted as the patient improves. Where treatment is apparently failing, advice from the microbiologist and ID Physician should normally be sought rather than blindly changing to an alternative choice of antimicrobial agent.

10

• Hospital Audits: Planning and Preparation

This unit will cover:

•Definition, Audit, Activities.

10.1 Definition:

Hospital audit is a process to maintain standards of patients care which help in providing and safe patient care for quality care.

10.2Audits: Planning and Preparation

- Planning and preparation for audits
- Schedules
- Gathering information and evidence
- Audit questions
- Communication

10.3 Activity: Patients, staff and Professionals

Functional Audit

Audits require time to plan and prepare for both:

a. Auditors**:** Internal audit and External audit

b. Auditees: Bed occupancy

Staff duty distribution

Professional duties.

Duty roster

Inventory

- Auditors should arrange for a suitable time to be relieved from normal duties to perform the audit
- If possible, estimate approximately
- How long the audit will take
- Staff members who will need to be involved

- Planning & Preparation
- Auditors need to familiarize with the area to be audited, for example:
- Type of Hospital work
- Equipment that is used and record of AMC
- Number of staff and their work distribution
- Familiarise with the scope of the audit
- Read the appropriate standards, guidelines
- Read relevant procedures, SOPs
- Read previous audit and/or assessment reports

This information will help to create an **audit checklist**!

10.3.1 Planning & Preparation

i. Final preparation (~1-2 days before the audit)
ii. Confirm time and place of the audit
iii. Confirm that auditees will still be available
iv. Confirm who will be attending the opening meeting
v. Review the audit background material
vi. Familiarise with standards, guidelines, documents,
vii. Review the audit checklist
viii. Previous audit reports
ix. Check if corrective actions were implemented
X. If working with other auditors, arrange to meet beforehand to discuss the audit approach and objectives
XI. Delegate sections of the checklist to each audit team member
XII. Time management

10.3.2 Audit Schedule

- The quality manager is responsible for planning the audit schedule and assigning an audit number.
- The schedule must cover all of the section activities and aspects of the quality management system over time

- Includes operational and technical processes and house keeping
- Meet requirements of all applicable standards
- Give emphasis to areas of greater importance
- The quality manager and the lead auditor should meet to discuss
- The purpose and scope of the audit
- Scheduled date and time to perform the audit
- Who will be involved in the audit and give notice
- Provides the audit with time to prepare for the audit
- Expected date when the audit report should be completed

Gathering Information & Evidence

- Auditing is a fact finding mission!
- Gather evidence about compliance with audit criteria

Evidence: *what you observe or discover from the records*

Information: *what you are told (question and listen)*

Subjective vs. objective evidence

Subjective: *evidence that you cannot evaluate*

Objective: *evidence that you can examine and evaluate*

How to gather information and evidence:

- **Ask** questions
- **Watch** specific activities
- **Read** procedural documents and record
- **Observe** the facilities and general area
- Ask for **evidence** to support the answers to the questions
- Don't hesitate to ask for **clarification** or to see more!
- Record findings and observations
- Use pre-prepared audit checklists
- Ensure checklists have sufficient space to write additional notes and information
- Record document or reference numbers
- Ask for photocopies of records or documents

- Highlight questions to follow up at the end of the audit

Audit Questions

There are different approaches to questioning during an audit:

1. Closed question
2. Open-ended question
3. Show & Tell question
4. Clarifying question
5. Leading question
6. Hypothetical question

Questions to avoid:

- Self answering
- Trick questions
- Ambiguous
- Irrelevant
- Compound

  Questions directed to the wrong person

Communication

Effective communication is essential to good audit outcomes!

- Total communication is comprised of various components
  a. What you see
  b. What you hear
  c. What the surroundings are
  d. How you interpret the information
- Develop good interviewing skills.
- Be prepared and confident.
- Help set the auditee at ease.
- Be interested in what you see, hear or learn.
- Have a positive attitude and approach.
- Try different styles of questioning.

Explain that finding non-compliance is an opportunity for improvement

Be aware of non-verbal communication

Body language, eye contact, non-responses

Summary

Audits require time to plan and prepare, both for auditor and auditee

Schedule time and date

Purpose and scope of the audit

Familiarise with standards, guidelines, documents

Gathering evidence and information, record observations and use prepared checklists

Use different questioning styles to get the answer Be interested in what you see, hear

10.4 Activity: Virtual Safety Audit

1. Work individually and with group of auditors
2. Look for work plan: Inventory, log book medicine storage
3. For each scene decide if what you see is “SAFE” or “UNSAFE”
4. Record your observations on the worksheet provided.
5 At the end of the audit discuss your findings within group to improve
6. Report writing with Audit No. and date. Submit your copy to the head of institute and higher authority. Compare with your previous report.
7. Keep all the report in one file to improve your functioning.

10.5 Audits: Checklists

Outline

1. Introduction

2. Preparing checklists

3. Examples of checklists

10.5.1 Introduction

Checklists are used as a tool for

1. Planning the audit
2. Managing the audit
3. Recording the audit findings

Checklists are used in the audit:

1. To give start and end points (scope)
2. To maintain the general direction of the audit
3. To ensure key questions are asked
4. To ensure key matters are investigated
5. To record findings and observations

A well prepared and structured checklist ensures confidence that an auditor is properly equipped for the audit!

10.5.2 Preparing Checklists

a. The content of an audit checklist is derived from:

1. The scope of the audit
2. Audit objectives; auditing procedures; time period
3. Written procedures, technical methods, standards, guidelines any other reference that is critical or a requirement
4. Work flow
5. Physical area / location
6. Processes and procedures

b. Checklists should help the auditor maintain the general direction of the audit

c. Cover key points

d. Include relevant questions or topics

e. Checklists should not prevent the auditor from following leads or exploring matters that could be relevant

f. Include sufficient space for observations and comments to be recorded.

10.5.3 Examples of Audit Checklists

Records

a. Auditors need to keep written records or notes as they audit:

1. Record findings and observations in detail.
2. Objective evidence of audit findings e.g. laboratory specimen numbers, document numbers and names, worksheets, dates.

b. Aids in preparing the audit report

c. Avoid relying on memory

d. Checklists are often the best and easiest way to develop these written records

10.6 Using Quality Indicators

Outline

1. Definition
2. Features of a QI
3. Using QI's to make decisions
4. Keeping Track of QI's
5. QI's that lead to improvement

Activity: Quality Indicators & Measures

10.6.1 Definition

Quality Indicators (QI) provide information about laboratory performance

Purpose

Provide a standard of performance that enables a laboratory to identify opportunities for improvement and track changes over time

10.6.2 Features of a Quality Indicator

Measurable

There must be evidence that the event either occurred or did not

Achievable

The laboratory has the tools needed to make the necessary measurement

Clear Limits

Establish the acceptable value in advance

Including upper and lower limit

Consider the action required for a non-conformance

QI: EQAS Performance

What can monitoring this QI tell us?

What level of error is acceptable?

How will you measure it?

Measure number of aberrant results

Divide by total number of samples tested

Multiply by 100 to obtain a percentage

Monitor changes over time

Choose appropriate frequency

Each test event or year

Is performance at an acceptable standard

QI: Stock Outs

What can monitoring this QI tell us?

- Resource management
- Impacts on laboratory productivity

How will you measure it?

- Record-keeping (Stock-book)
- Who is responsible?

How will you monitor stock outs?

- Frequency

Reporting

10.6.3 Use QI's to Make Decisions

A QI can provide evidence of acceptable performance at critical points in the testing process

An operation is working and stable

If a QI is shown to be acceptable and stable, consider changing to a new indicator

Monitoring takes resources and time

QI's should relate to areas that need improvement in your laboratory

Keeping Track of QI's

Balanced scorecard

Quick, visual method for monitoring

Like the dashboard on a car

Use colors to indicate whether each QI is meeting your target

Green = Significant positive change

Red = Significant negative change

Yellow = No significant change

10.6.4 QI's that lead to Improvement

- Communicate QI performance
- Quality Manager
- Monitoring reports for each QI
- QI Performance summary (e.g. Balanced scorecard)
- Director
- Needs to be kept updated
- Heads of Department
- Staff

i. QI's that lead to improvement

- Require action from both management and laboratory staff
- Commitment
- Continual awareness
- Planning
- Priorities, short-term & long-term goals
- Participation

Activity: QI Indicators & Measures

Split into small groups

Each group will be provided with

10 "Quality Indicator (QI)" cards

10 "How is it measured?" cards

Match each QI with the appropriate Measure

Checklist

Storage		
Are medication and supply storage areas well-lit and temperature controlled?	☐	☐
Do medication and supply areas have adequate space to accommodate the inventory without being cramped?	☐	☐
Are medications, vaccines, and products that require refrigeration or freezing stored at the appropriate temperatures (per the product labeling) in purpose-built storage units?	☐	☐
Does the medication/vaccine/product refrigerator or freezer have a temperature log that is monitored daily?	☐	☐
Does your organization have an emergency plan and backup equipment in the event that a medication storage unit fails or needs maintenance? Are staff members trained on the emergency protocol?	☐	☐
Are medication samples, controlled substances, high-alert drugs, and vaccines kept separate from each other and the rest of the medication inventory?	☐	☐
Are products in the inventory separated if they (a) have names that sound similar, (b) have similar packaging, or (c) are the same product but have different routes of administration?	☐	☐
When new medications are added to the inventory, are they compared with the existing inventory to identify potential "look-alike, sound-alike" issues?	☐	☐

Storage (continued)		
Do storage trays/bins/containers hold only one type of product each? Are these storage units clearly labeled?	☐	☐
Does your organization's method for storing medications account for which medications need to be used first (based on expiration date)?	☐	☐
Does your organization have adequate numbers of automated dispensing cabinets (ADCs) that are easily accessible to appropriate staff?	☐	☐
Is ADC inventory determined based on patient needs, prescribing patterns, utilization, and safety considerations? Is the inventory reviewed and replenished on a routine basis?	☐	☐
Security		
Has your hospital or healthcare facility established specific and measurable procedures to safeguard medications and medical supplies?	☐	☐
Are all medication storage areas locked to control access?	☐	☐
Are controlled substances, high-alert medications, syringes, needles, and prescription pads kept in restricted areas?	☐	☐
Is access to restricted areas limited to designated and appropriately trained and credentialed staff members?	☐	☐
Are security processes in place to prevent unauthorized access to ADCs?	☐	☐
Do staff members comply with all policies for witnessing and wasting narcotics?	☐	☐
Do staff members take precautions to prevent the unauthorized use of discarded medications?	☐	☐
Are nonpharmacy personnel prohibited from entering the pharmacy when it's closed?	☐	☐
Documentation		
Does your hospital or healthcare facility have detailed guidance and written policies for logging, storing, and monitoring medications and medical supplies?	☐	☐
Are accurate and detailed records kept for all medications that are prepared and dispensed?	☐	☐

Documentation (continued)		
Are medication storage unit temperatures documented according to your organization's prescribed frequency?	☐	☐
Does your organization maintain an accurate, current list of its high-alert drugs and medications with potential "look-alike, sound-alike" issues? Is this information communicated to appropriate practitioners and staff members?	☐	☐
Are all medications prepared onsite labeled correctly and consistently?	☐	☐
Are pediatric and adult versions of the same medication or vaccine labeled clearly to avoid confusion?	☐	☐
Do all dispensed medications have detailed labels that include the drug name, patient name, date, strength, dosage, frequency, quantity, and expiration date?	☐	☐
Are all medication containers (e.g., syringes, bowls, vials) taken to patient care areas labeled with the medication name and strength/concentration?	☐	☐
Are warning or label enhancements used for medications with problematic names or packaging?	☐	☐
Are multidose vials labeled with an open date and properly discarded according to manufacturer requirements?	☐	☐
Safety Processes and Auditing		
Does your organization's medication inventory management system help detect low inventory levels for ordering purposes and to alert staff about possible medication and supply shortages?	☐	☐
In the event of medication or supply shortages, is a process in place to identify the safest alternatives and educate practitioners about the products?	☐	☐
Does your organization utilize barcode medication administration (BCMA) as part of its inventory control system?	☐	☐
Are the medication and medical supply inventories in the pharmacy and patient care areas routinely audited to verify inventory, remove expired/discontinued products, and identify issues such as mislabeling?	☐	☐

Safety Processes and Auditing (continued)		
Are controlled substances routinely audited, and are staff members aware of the appropriate procedures for reporting loss or theft of drugs to appropriate local, state, and federal authorities?	☐	☐
Are BCMA processes and logs audited to monitor for compliance and identify system gaps and barriers?	☐	☐
Are override reports from ADCs reviewed regularly to identify inappropriate overrides?	☐	☐
Are expired medications and products removed from the inventory and disposed of according to drug class and local/state regulations?	☐	☐
Does the process for discarding expired medications prevent unauthorized access to these items?	☐	☐

11 • Surveillance and Indicator Monitor

This unit will cover:

•Principles and key steps in Surveillance and Indicator Monitor

11.1 • Outbreak Investigation

The occurrence of two or more epidemiologically related infections caused by an organism of the same type relating to place and time is defined as an outbreak. Once the factors causing the occurrence of the outbreak are defined, appropriate control and prevention measures can be formulated. In an outbreak investigation, data are collected, collated according to time, place and person, and analysed to draw inferences. This may be done according to the following steps:

- Identify the outbreak.
- Describe the outbreak.
- Formulate a hypothesis on the type of infection.
- Identify the source and route of infection
- Suggest and implement initial control measures.
- Control measures and follow-up
- Immediate control measures
- Specific control measures
- Evaluation and efficacy of control measures
- Communication.

11.1.1 High-Risk Areas and High-Risk Procedures:

Nosocomial Infection rates in the intensive care units are higher than in the general population. This is related to severity of illness and greater susceptibility to acquiring microorganisms related to the ICU. ICUs have higher rates of invasive procedures, patients on ventilators for prolonged periods, and a large category of health workers. The risk of transmission of Potentially Pathogenic

Microorganisms (PPMs) is very high. In the ICU, during urgent critical care interventions there is often a possibility of suboptimal infection control practices.

Five Main Infection Control Measures to Control Transmission

- ❖ Hand hygiene
- ❖ Personal protective equipment (gloves, gowns and aprons)
- ❖ Isolation where required
- ❖ Proper handling and decontamination of patient care equipment
- ❖ Proper handling of patient care environment.

Certain areas of the hospital are identified as high-risk areas for acquisition and transmission of pathogenic microorganisms. The Manual has identified the following high-risk areas and high- risk procedures which have a high potential for healthcare associated infections.

11.1.2 General Principles to be followed in High-Risk Areas:

High-risk areas are an important area of targeted surveillance. The staff and doctors in high-risk areas should actively liaise with the Infection Control Department in monitoring reporting and analysing infections. Some of the key high risk areas are:

- ❖ Medical**:** Pediatric, Neonatal
- ❖ Intensive care units
- ❖ Surgical: Postoperative ICU
- ❖ Operation theatres
- ❖ Obstetrics and labor room
- ❖ Blood bank
- ❖ Dental clinic
- ❖ Emergency Medicine
- ❖ Hemodialysis unit
- ❖ CSSD
- ❖ Laboratories
- ❖ Gastroendoscopy unit
- ❖ Hemodialysis and Renal transplantation

11.1.2.1 Key measures adopted in high-risk areas are:

Standard precautions: Standard precautions as appropriate should be followed by all staff while handling patients or samples (refer to the section on Standard Precautions in Healthcare described in this manual).

Hand washing: Importance of this cannot be overemphasized in the ICU setting. Use hand rubs with 2 percent chlorhexidine between patients and clinical hand wash solution (4 percent

chlorhexidine) prior to invasive procedures.

Aprons and gloves: Wear aprons and gloves when necessary. Remove and discard them into the appropriate bin immediately after each patient. Use gloves when in contact with body fluids (examination gloves) and invasive procedures (sterile gloves).

Mask: Wear a mask while examining patients with potential air-borne pathogens. Wearing a mask is mandatory when in isolation areas.

Goggles: Use goggles when you anticipate a splash or when handling bio hazardous materials**.**

11.1.2.2 Surveillance of High-Risk Areas:

High-risk areas are an important area of targeted surveillance. Surveillance is done actively in the following cases:

- Hospital acquired infections:
- Catheter Associated Urinary Tract Infection (CAUTI)
- Central Line Associated Bloodstream Infection (CLABSI)
- Surgical site infection (SSI)
- Ventilator associated pneumonia (VAP)
- Bed sore analysis
- Needle-stick injuries
- Multidrug-resistant organisms:
- Methicillin Resistant Staphylococcus Aureus (MRSA)
- Methicillin Resistant Staphylococcus Epidermidis (MRSE)
- Vancomycin Resistant Enterococci (VRE)
- Environmental surveillance.

12 • Patient Safety

This unit will cover:

•Principles of Patient Safety

12.1 • Definition of Patient Safety

Its discipline that determine its role in minimizing the incidence and impact of adverse events, and maximizing recovery from them

12.2 Definition

Patient safety is a discipline in Health care sector that applies safety science methods toward the goal of achieving a trustworthy system of Health care delivery. Patient safety is also an attribute of Health care systems; it minimizes the incidence and impact of, and maximizes recovery from, adverse events.

Objectives

To create awareness among

1. Patients safety
2. Health care professional safety
3. Hospital environmental safety

WHAT IS SAFETY

S – Sense the error

A – Act to prevent it

F – Follow Safety Guidelines

E – Enquire into accidents/ Deaths

T – Take appropriate remedial measure

Y – Your responsibility

WHY SAFETY IN THE HOSPITAL is required

- Hospital is a people intensive place
- Provide services to sick people round the clock24 hours daily 365 days a year.
- People have a free access to enter any part of the hospital any time for advice and treatment
- The hospital atmosphere is filled with emotions, excitement, life & happiness, death & sorrow
- Since hospital operates under tense condition , it gives rise to irritation, confrontation, conflicts & aggression, threatening the life of hospital staff & hospital properties

PATIENT SAFETY

1. Patient safety is the absence of prevents able harm to a patient during the process of healthcare.

A. Communicate the patient clearly the procedure.

B. Make him/her relative to understand the everything clearly

C. Take clear consent for procedure.

D. Do not hid anything from patient and their relatives

2. The discipline of patient safety is the coordinated efforts to prevent harm to patients, caused by the process of health care itself.

A. Educate his/him for any adverse and untoward effect.

B. What are the consequences of the drug which can happen later in the life

3. It is generally agreed upon that the meaning of patient safety is…"Please do no harm"

A. High risk patient should be marked by colour bands but do not discriminate by putting different signage.

B. Document everything in case paper.

SAFETY

Figure - 9

Figure - 10

What are the different injuries can happen to the patient

- Common injuries are IV injuries
- Needle stick injuries
- Mechanical Injuries
- Chemical Injuries
- Sharp (Glass-Cutting) Injuries
- Procedural Injuries
- Operational Injuries
- Hospital Infection Control.

Where Is Hospital Data = There hardly any data available of Indian Hospital for patient safety. Use for following software for collection of your hospital records. These include

i. Use Exposure Prevention and Information Network EPInet format and platform for data submission and analysis. These are various parameters are used to collect the safety measures.

Key Data Elements:

a) Sharp injury and Blood and body fluid (BBF)
b) Variables measured
c) Job categories
d) Location, whether infected, source known or original user
e) Type of the device, Safety device
f) Location of injury
g) Vaccination status

Injuries during medication

i. Injuries during injection and other procedures (Like ampoule breaking) and catheter insertion

ii. Wrong prescriptions (all the prescription should be in generic name with capital letters)

iii. Unsafe medical gadgets. (Should be level like cylinder Empty or Full)

iv. Emergency drug Inventory should be available on table.

v. For laboratory investigation. First take out the sample then labelled with name raised the requisition.

Improved safety of health care workers by periodic health check-up once in six month. Adequate staff will also reduce the burden on any particular job to be done

Adequate numbers of staff and pattern:

	Patient :	Nurse :	doctors
General ward	4	1	1
ICU	2	1	1
Critical care	1	1	1

a. Safety awareness programme should be conducted once in month

b. SOP, Universal precaution

c. Different type of injuries and presentation

d. Splash: Body fluid and Blood, safety display

e. Precautions and training like (Hand washing with soap water every 6 hourly)

f. There is more to hand hygiene than routine training of health workers and display of promotion materials.

g. Prevention of infection by vaccination

h. Vaccination against: HBV, tetanus, swine flu. etc.

Use of safety engineered medical devices for all procedures.

Kotter's 8-Step Change Model

Figure - 11

Kotter's 8-Step Change Model

PATIENTS' RIGHT TO PRIVACY: All the right of his privacy should be maintained at all the cost without any passing on any other relevant information. Without his information nothing should be done.

References:

1. World Health Organization, Practical Guidelines for Infection Control in Health Care Facilities, India, WPRO Regional Publication, ISBN 92 9022 238 7, 2004
2. National Accreditation Board for Hospital and healthcare providers India, Hospital Infection Control Manual**;** NABH New Delhi 2010**.**
3. Centres for Disease Control and Prevention Public Health Service Guideline for infection control in health care personnel; U.S. Department of Health and Human Services,1998.
4. Bearmen, Stevens, Edmond, Wenzel A Guide to Infection Control in the Hospital; International Society for Infectious Diseases; Boston USA 2014
5. Vidya G S, Narendranath V, Asha, Babitha Rajan; Epidemiology of Hospital Acquired Infections among Patients Admitted in a Tertiary Care Hospital, Bangalore**.** Post graduate Dept. of Community Medicine MS Ramaiah Medical College.2014
6. Malhotra S, Sharma S, Hans C, Prevalence of Hospital Acquired Infections in a tertiary care hospital in India; International Invention Journals 2014**.**
7. Angela Revelas; Healthcare – associated infections: A public health problem; Nigerian Medical Journal May June 2012.
8. John P. Burke; Infection Control — A Problem for Patient Safety; The new England journal of medicine; 2003.
9. Ministry of Health and Family Welfare, Government of India; National Infection Control Guidelines; 2016.
10. Dr. A. K. Avasarala; Epidemiology of Nosocomial Infections; Dept. of community medicine & epidemiology prathima institute of medical sciences, Karimnagar, Andhra Pradesh.
11. Chug T.D. Hospital Infection Control: Are we serious? Medicine Update, New Delhi; 2012.
12. Dr Ramanan Laxminarayan; Hospital-acquired infections high in India; Public Health Foundation of India; 2011.
13. World health Organization; Prevention of hospital-acquired infections A practical guide 2nd edition; 2002.
14. Bharati Sharma,K.V. Ramani, Dileep Mavalankar, Lovney Kanguru and Julia Hussein; Using 'Appreciative Inquiry' In India To Improve Infection Control Practices In Maternity Care: Glob Health Action 2015.
15. World health Organization; Health care-associated infections fact Sheet; 2002.
16. Ramasubramanian, Vivek Iyer, Sandeep Sewlikar and Anish Desai; Epidemiology of healthcare acquired infection – An Indian perspective on surgical site infection and catheter related blood stream infection; Indian Journal of Basic and Applied Medical Research, 2014.

17. Praveen mathur, sangeeta patan and anand s. Shobhawat; Need of Biomedical Waste Management System in Hospitals; CWE Journal, 2012.

18. Hema gogia and Jayant k. Das, Awareness and Practice of Infection Control Amongst Doctors And Nurses In Two ICUs of A Tertiary Care Hospital In Delhi; Health And Population - perspectives and issues. 2013.

19. Ruchika Jagota; Study Of Knowledge, Awareness And Practices Of Infection Control, Among Hospital Staff In Intensive Care Unit Of Government Medical College And Hospital (Gmch), Chandigarh; 2010.

20. Vikas Manchanda; Hospital Infection Control -Principles and Practice; CNBC, Delhi; 2011.

21. Julia Hussein, Dileep V Mavalankar, Sheetal Sharma and Lucia D'Ambruoso1; A review of health system infection control measures in developing countries: Globalization and Health 2011.

22. Chantal Backman, Patricia B Marck,Naomi Krogman,Geoff Taylor,Anne Sales,Marc J M Bonten,Ada C M Gigengack-Baars; Barriers and bridges to infection prevention and control: results of a qualitative case study of a Netherlands' surgical unit; British Medical Journal, 2012.

23. European Centre for Disease Prevention and Control; Core competencies for infection control and hospital hygiene professionals, Stockholm, 2013.

24. Taneja Juhi; Evaluation of knowledge and practice amongst nursing staff toward infection control measures in a tertiary care hospital in India; The Canadian journal of infection control, 2009.

25. Ministry of environment and forest, Government of India; Bio Medical Management and Handling Rules 2016; New Delhi, 2016.

26. Ministry of health and family welfare, Government of India; Swachhata Guideline for Public Health Facilities 2015; New Delhi 2015.

27. National Accreditation Board for Hospital and healthcare providers India, NABH standards IVth Edition**;** NABH New Delhi 2015**.**

28. SIGN guidelines: Scottish intercollegiate guidelines network, Antibiotic prophylaxis in surgery (a national clinical guideline).updated April 2014 and ASHP report American journal of health system (2013, 2010)

29. NATIONAL POLICY FOR CONTAINMENT OF ANTIMICROBIAL RESISTANCE INDIA 2011 Directorate General of Health Services Ministry of Health & Family Welfare Nirman Bhawan, New Delhi http://nicd.nic.in/ab_policy.pdf

30. Treatment Guidelines for Antimicrobial Use in Common Syndromes Indian Council of Medical Research Department of Health Research New Delhi, India 2017 http://www.icmr.nic.in/guidelines/treatment%20guidelines%20for%20antimicrobial.pdf

31. National Action Plan Antimicrobial Resistance (NAP – AMR) 2017-2021 April 2017 | India; Government of India http://cseindia.org/userfiles/inap_amr_20170420.pdf

32. National Treatment Guidelines for Antimicrobial Use in Infectious Diseases Version 1.0 (2016) NATIONAL CENTRE FOR DISEASE CONTROL Directorate General of Health Services Ministry of Health & Family Welfare Government of India http://pbhealth.gov.in/AMR_guideline7001495889.pdf

Annexure

Annexure-I

Table : Different Activities, responsible person and their frequency

SN	Particulars	When/Frequency	Responsibility	Refer
	Universal Precautions			
1.	Hand Hygiene (by alcohol or soap-based cleaning)	Every time before and after seeing the patient, performing procedure etc.	All duty medical officers, nursing staff, technicians, ward boy /ayabai etc. engaged in patient care	Section 1.2.5 Fig 1-3
2.	Surveillance of hand hygiene of staff	Daily	Infection control nurse	Surveillance tool in Annexure 2
3.	Surgical Scrub	Before gowning for surgery	All duty surgeon, anesthetist, nursing staff, engaged in operation room	Section 1.2.5.5 Box 1, 2
4.	Use of PPE in OT, ICU, Lab, Labour room, CSSD, Laundry, Kitchen etc.	While performing procedure, etc. in which it is required to be have nursing barrier , reverse barrier and food safety.	All duty medical officers, specialist, nursing staff, technicians, chef, laundry men/ward boy /ayabai etc.	Section 1.2.6 Fig 6-8
5.	Use of gloves to protect from transmission of infection from contact and Airborne and droplet nuclei size < 5 µm	For touching blood, body fluids, secretions, excretions, contaminated items; for touching mucous membranes and non-intact skin and also while handling food items	All duty medical officers, specialist/nursing staff, technicians, Kitchen staff, laundry men/ward boy /ayabai etc.	Fig 6-8
6.	Gown to protect from transmission of infection from contact and Airborne and droplet nuclei size < 5 µm	During procedures and patient-care activities when contact of clothing/exposed skin with blood/body fluids, secretions, and excretions is anticipated.	All duty medical officers, specialist, nursing staff, technicians, kitchen staff, laundry men/ward boy /ayabai etc.	Fig 6-8
7.	Mask, eye protection (goggles), face shield etc. to protect from transmission of infection from droplet size >5 µm and Airborne and droplet nuclei size < 5 µm	During procedures and patient-care activities likely to generate splashes	All duty medical officers, specialist, nursing staff, technicians, chef, laundry men/ward boy	Fig 6-8

SN	Particulars	When/Frequency	Responsibility	Refer
		or sprays of blood, body fluids, secretions, especially suctioning endotracheal intubation etc.	/ayabai etc.	
8.	Respiratory hygiene cough etiquette	While dealing with patient with infectious respiratory secretions	All on duty healthcare providers working in isolation wards, triage and reception area in emergency and physician's office	
9.	Handling soiled patient-care equipment in a manner that prevents transfer of microorganisms to others and to the environment; wear gloves and gown if required; perform hand hygiene.	While handling soiled patient care equipment		Section 1.2.5 Fig 1-3
	Safe Injection precautions and post exposure measures			
10.	Safe Injection Precautions	Administering injections/catheters, central lines and its disposal	All duty medical officers, nursing staff, Cath Lab/ Lab technicians	Section 1.4
11.	Post exposure prophylaxis after any episode of needle stick injury(NSI), Blood and body fluid exposure to mucous membrane exposure or intact skin contact to the healthcare worker	Immediate	In charge of the department/OT/ICU/ward and ICN etc. where ICNident happened	Section 1.4
12.	Event reporting	Immediately after exposure but must be done within 24 hours of occurrence of such events	By staff who was exposed to needle stick, blood or body fluid to ICN	Section 1.4
	Cleaning/decontaminating/disinfecting equipment /surface			
13.	Cleaning floor, toilet, etc. of different areas such as OT, ICU, Ward, OPD, Kitchen, Laundry etc. as per protocols	As per Schedule	Housekeeping staff (both hospital and out sourced agency staff)	Section 2.1
14.	Cleaning and or decontaminating instrument used in procedures	After each use before sending to autoclave	Cleaning staff/In-charge sister/HOD	Section 2.1
15.	General cleaning of medical equipment	Daily after use	Nurse and technician using the instrument	Section **2.1.1.3**
	Through cleaning of medical equipment	As per schedule	Cleaning staff/ In-charge sister/HOD	Section 2.1
16.	Cleaning of OT table, floor	After each procedure	On duty ward boy/Aya /OT Sister	Section 2.1.2
17.	Cleaning Spills of Blood and Body Fluids in OT/ICU/Emergency room/Ward/Lab	Whenever it occur	On duty ward boy/Aya /OT Sister /Technician	Section 3.5
18.	Deep cleaning of OT room	Every day before closing and or as per schedule	On duty ward boy/Aya (or housekeeping staff)/OT Sister	Section 2.1.2
19.	Fumigation or Fogging of high-risk	As per schedule	In-charge sister	Section 2.1.3

SN	Particulars	When/Frequency	Responsibility	Refer
	areas like ICU, PICU, NICU, Labour room and operating rooms.	decided by Director/SIC/CMC		
20.	Decontaminating soil linen in OT, ICU, ward etc.	Within 2 hours of use	Ward boys/Aya of ward (or housekeeping staff) /Sister In-charge	Section **2.1.1.2 2.2.2.1.3** 5.1
21.	Disinfecting soil linen in Laundry	Before washing the soil linen	Laundry boys/lady /Laundry in-charge	Section 5.1
22.	Changing patient linen and sending to laundry for wash	Daily	Staff in-charge /Laundry in-charge	Section 5.1
23.	Washing patient linen	Daily	Laundry boy/laundry in-charge	Section 5.1
	Monitoring of equipment /surface cleaning and disinfection			
24.	Monitoring of general cleaning using checklist	Each shift	Housekeeping supervisor/ Sister In-charge	Section 2.1
		Randomly	Infection control Nurse/Quality Coordinator/Infection control officer/nurse/Hospital Manager	Section 2.1
25.	Surface Monitoring of ICU/OT/Cath lab's etc. wall and equipment	At least every week	Nursing in-charge of functional areas (OT/ICU/CATH Lab)	Section 2.1
	Monitoring of Sterilisation Process			
26.	Mechanical monitoring of all autoclave machines for attainment of ideal temperature and pressure for a given time	Everyday cycle of sterilisation	Autoclave operator / CSSD In-charge	Unit 3, 7
27.	Chemical monitoring of sterilisation process by using chemical indicators on all bins to be autoclaved	Everyday cycle of sterilisation	Autoclave operator / CSSD In-charge	Unit 3, 7
28.	Biological monitoring of sterilisation process by using culture vails	Everyday month in randomly selected autoclaving load	Autoclave operator / CSSD In-charge	Unit 3, 7
29.	Cultures of water all potable water sources and dialysate in haemodialysis unit(Chemical, Bacterial and endotoxins)	Monthly	Infection Control Officer/ ICN	Unit 4
30.	Monitoring of temperature and humidity	Daily	OT In-charge /ICN	18-25degree Tem and 40-60 humidity
31.	OT's air quality by microbiological analysis	weekly	OT In-charge /ICN	Air Culture
32.	Monitoring disinfectants : Cidex	Every day after opening the bottle until 14 days	Persons who prepares the disinfection	Strip Test daily
33.	Monitoring of disinfectant (such as alcohol disinfectants) bottles by writing date of opening of the bottle	Every time the bottle is opened	Nursing in charge or person who opens the bottle	
34.	Culture of sterile fluids (which are of	SOS	In charge nursing	

SN	Particulars	When/Frequency	Responsibility	Refer
	doubtful quality)			
	Monitoring of staff health and vaccination			
35.	Health Check-up of all staff of the hospital: Minimum investigations required are Chest X-ray and CBC for all staff For Kitchen: Test of Ova cyst of stool is must. If the tests come positive then the person is provided with medication and they are advised not to work till repeat samples come negative For Imaging staff: LFT and KFT	Annual	Director/ SIC/CMS	Frequency Annual
36.	Vaccination (for Hep B, Tetanus)of all HCW staff (Doctor, Nurse, housekeeping, Laundry, Kitchen) Post exposure Revaccination if person is known nonresponse (Anti HBsAg Titre below <10mlU/mL)	Once	Director/ SIC/CMS	Annexure 3
37.	Vaccination of Swine Flu to all clinical staff	• Annual before season	Director/ SIC/CMS	NA
38.	Vaccination of Tetanus, Typhoid and hep A to all Kitchen staff	• Once	Director/ SIC/CMS	NA
39.	• Post exposure prophylaxis as per algorithm for unknown/known, cases of Hep B, C and HIV	• After Needle stick injury, Blood and body fluid exposure	Head of department and Director/ SIC/CMS, ICN	Annexure 3
40.	Transfer/or granting leave/Assign task of nonclinical area to staff who develop communicable diseases to duties without direct patient contact	When such cases are reported	Head of department and Director/ SIC/CMS	NA
	Monitoring of Hospital Acquired Infection			
41.	Surveillance of hospital acquired infections through selected indicators (such as VAP, SSI, CLABSI, CAUTI etc.) for all patient admitted in hospitals	As per the protocols defined for different indicators	Infection Control Officer/Infection Control Nurse	
42.	Skin preparation prior to operation	Before each surgery on the day of procedure	On duty nurse	
43.	Theatre wear for patient	Before moving patient to Operating theatre	On duty nurse	
44.	Maintaining effective hemostasis	During surgery	On duty anaesthetist and In-charge surgeon	
45.	Post-operative wound care for all surgical care	After each surgery	In-charge surgeon	
46.	Maintaining body tem while surgery	During Surgery	Surgical Team	
	Infection control in Kitchen			
47.	Floor's cleaning of food preparation areas	After every meal preparation	Housekeeping staff (both hospital and out sourced agency staff)/	

SN	Particulars	When/Frequency	Responsibility	Refer
			Kitchen in-charge	
48.	Floor's cleaning of other areas of Kitchen	Daily	Housekeeping staff (both hospital and out sourced agency staff)/ Kitchen in-charge	
49.	Cleaning food trolleys, and other equipment etc. in Kitchen (as per protocols)	Daily	Housekeeping staff (both hospital and out sourced agency staff)/ Kitchen in-charge /ICN	
50.	Cleaning patient utensils	Daily after each serve	Housekeeping staff (both hospital and out sourced agency staff)/ Kitchen in-charge /ICN	
51.	Hand Hygiene by all staff involved in food preparation	Before food preparation	Dietician/Food and Beverage Manager/Supervisor	
52.	Kitchen Staff's hygiene check	Daily	Kitchen in-charge /ICN	
53.	Use of PPE by Kitchen staff	Daily	Kitchen in-charge /ICN	
54.	Monitoring Food storage condition	Daily	Dietician /Food and Beverage Manager	
55.	Monitoring of temperature of kitchen store and food storage freezer/walk in coolers/refrigerators	Daily	Dietician /Food and Beverage Manager	
56.	General Waste disposal	Daily	Housekeeping staff	
	Infection control in Laundry			
57.	Cleaning floor, etc. of different areas of Laundry	As per Schedule	Housekeeping staff (both hospital and out sourced agency staff)/ Laundry in-charge	
58.	Staff hygiene check	Daily	Laundry in-charge /ICN	
59.	Use of PPE by staff	Daily	Laundry in-charge /ICN	
60.	Sorting and disinfecting line	Daily after receiving the linen	Laundry men/In-charge Laundry	
61.	Washing/storing and issuing linen as per protocols	Daily in different shift as per load	Laundry men/In-charge Laundry	
	Bio Medical Waste Segregation and Disposal			
62.	Segregation of Bio Medical Waste	After every use (as per different types detailed in BMW gazette notification 2018)	Duty Nurse/ medical officers/specialist/technician/ward boy/aya bai who generate bio medical waste etc.	
63.	Transported to hospital disposal unit or common treatment plant for disposal of Bio Medical Waste (as per BMW gazette notification 2018)	Within 48 hours	Designated housekeeping in charge/ CTF coordinator	
64.	Monitoring of segregation and transportation of BMW for disposal	Continuous	Infection control officer/Director/SIC/C	

SN	Particulars	When/Frequency	Responsibility	Refer
			MS	
	Housekeeping			
65.	General housekeeping of floor	at least three times in 24 hours	Housekeeping staff	
66.	Monitoring of general housekeeping	Each shift	Housekeeping supervisor/In charge of department/ICN	
67.	Handling Patient Linen			
	Operation Theatre			
68.	All jewelry (rings & watches) is to be removed prior to hand washing	During scrubbing	All OR staff	
69.	Standard Precautions	Before all aseptic procedures regardless of patient HIV/Hepatitis status	All staff	
70.	Glove and gown technique	Before Surgical Procedure	Senior Staff/ OT In-charge	
71.	Surgical Prophylaxis	Within 30-60 minutes of surgery	Anesthesiologist	
72.	Surgical Safety Checklist	Starts before surgery till surgery completion	Anesthesiologist, All OT personnel / OT manager / Surgeon In-charge / Surgical team.	
73.	Skin preparation and draping	Every Surgery: standard protocol for preparing and draping to ensure safety of patients	All OR Personnel/ Surgeons	
74.	Maintaining asepsis	Every surgery: surgical asepsis to minimize risk of infection	Surgical team, Nursing staff, OT technicians.	
75.	Disposal of anatomical parts	er procedure for disposal of anatomical parts following surgery.	Scrub/Circulating Nurse, Surgeon, Supervisor Housekeeping,	
76.	End cleaning of instruments	maintain standard clean up protocol after every case	All OR personnel	
77.	Cleaning of OT	every case: To reduce microbial counts to near zero by thorough cleaning, removing all the dirt & grime	All OR/ Housekeeping/OT In - Charge	
78.	**Scheduling of infected cases (**patients who have proven or suspected HIV, HCV or any positive infectious diseases)**:**	last case of the day to enable the staff to carryout necessary	Surgical team, Nursing staff, OT technicians.	

SN	Particulars	When/Frequency	Responsibility	Refer
		disinfection procedure after the procedure and to ensure minimum involvement of surgical instrument and linens and to avoid cross infection in the OT.		
79.	Temperature, relative humidity with positive pressure	Tem 18-220 degree Humidity 40-60monitoring daily	All OR staff	
	Dialysis			
80.	Dedicated Dialysis Machine for HBs Ag positive patients	Regular	ICN/Dialysis Technician/Nephrologist	
81.	Machine and other surfaces cleaning with disinfectant after each patient	After each patient	ICN/Dialysis Technician/Nephrologist	
82.	Dialyser and blood lines reuse	Never for HBsAg positive patients	ICN/Dialysis Technician/Nephrologist	
83.	HBsAg positive patients Alpha Fetoprotein and Ultrasound of Liver	Yearly	ICN/Dialysis Technician/Nephrologist	
84.	Monitoring of seroconversion of patient	Six monthly	ICN/Dialysis Technician/Nephrologist	
85.	Dialysis machine should undergo heat rinse	After dialysing a Hepatitis C patient before using the machine to dialyse another patient	ICN/Dialysis Technician/Nephrologist	
86.	Rinsing/Pre-cleaning of dialyser	As per manufracturer guidelines	ICN/Dialysis Technician/Nephrologist	
87.	Performance test	If the total cell volume is more than 80% of the original (pre first use) total cell volume, dialyser can be reused. If a dialyser fails the test it should be discarded immediately	ICN/Dialysis Technician/Nephrologist	
88.	Germicide/disinfectant fill	As per manufracturer guidelines	ICN/Dialysis Technician/Nephrologist	

SN	Particulars	When/Frequency	Responsibility	Refer
	Mortuary			
89.	Dead bodies Cat 1 Standard precautions are recommended. Applicable to all dead bodies other than those with infectious diseases as listed(BLUE label)	Bagging Not necessary Visit by relatives after death Allowed Hygienic preparation after death Allowed	ICN/Microbiologist/Director	
90.	Dead bodies Cat. 2: Handling of dead bodies with infection (a) Human Immunodeficiency Virus infection (HIV) (b) Hepatitis B (c) Hepatitis C and (d) Other infectious disease as advised by the physician or microbiologist(YELLOW label)	Bagging Must Visit by relatives after death Allowed Hygienic preparation after death Not advisable	ICN/Microbiologist/Director	
91.	Cat. 3: Signified by a RED label Stringent infection precautions are recommended. Applicable to dead bodies with known (a) Anthrax (b) Plague (c) Rabies and (d) other infectious disease as advised by the physician or microbiologist	Bagging Must Visit by relatives after death Not Allowed Hygienic preparation after death Not Allowed	ICN/Microbiologist/Director	
92.	High standard of personal hygiene	Always	Mortuary Staff/ICN	
93.	Body Cabinet Cleaning The cabinet is brushed and mopped daily with detergent. The final mopping is done with 1% sodium hypochlorite	After each use	Mortuary Staff/ICN	
94.	Hard surfaces Floors The floors are washed with detergent twice a day. Final mopping is done with 1% sodium hypochlorite. Wall cleaning is done once a week with 1% sodium hypochlorite.	Once a day Weekly wall cleaning	Mortuary Staff/ICN	
95.	Temperature The mortuary chamber must be switched on by the mortuary staff once the call is received and within half an hour, the temperature should reaches below 4oC	Whenever dead body stored	Mortuary Staff/ICN	
		All Areas		
96.			Director, ICN, Engineering, maintenance department	

SN	Particulars	When/Frequency	Responsibility	Refer
	Ambulance			
97.	Standard precautions Cleaning, Disinfection PPE, hand hygiene	After each patient trasnfer	ICN/Ambulance EMT	
	Endoscopy			
98.	Reusable items (like endoscopes, Suction jars) cleaning and disinfection by high end disinfectants like Cidex	After each patient	Technician/ICN	
	TSU, CSSD			
99.	Defining and trackability of reusable items	After each patient	CSSD Technician/ICN	

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

* To be completed by the data manager.
** **Optional**, to be used if appropriate, according to the local needs and regulations.

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.
Revised August 2009

General Recommendations

(refer to the Hand Hygiene Technical Reference Manual)

1. In the context of open and direct observations, the observer introduces him/herself to the health-care worker and to the patient when appropriate, explains his/her task and proposes immediate informal feed back.
2. The health-care worker, belonging to one of the main four following professional categories (see below), is observed during the delivery of health-care activities to patients.
3. Detected and observed data should be recorded with a pencil in order to be immediately corrected if needed.
4. The top of the form (header) is completed before starting data collection (excepted end time and session duration).
5. The session should last no more than 20 minutes (± 10 minutes according to the observed activity); the end time and the session duration are to be completed at the end of the observation session.
6. The observer may observe up to three health-care workers simultaneously, if the density of hand hygiene opportunities permits.
7. Each column of the grid to record hand hygiene practices is intended to be dedicated to a specific professional category. Therefore numerous health-care workers may be sequentially included during one session in the column dedicated to their category. Alternatively each column may be dedicated to a single health-care worker only of whom the professional category should be indicated.
8. As soon as you detect an indication for hand hygiene, count an opportunity in the appropriate column and cross the square corresponding to the indication(s) you detected. Then complete all the indications that apply and the related hand hygiene actions observed or missed.
9. Each opportunity refers to one line in each column; each line is independent from one column to another.
10. Cross items in squares (several may apply for one opportunity) or circles (only a single item may apply at one moment).
11. When several indications fall in one opportunity, each one must be recorded by crossing the squares.
12. Performed or missed actions must always be registered within the context of an opportunity.
13. Glove use may be recorded only when the hand hygiene action is missed while the health-care worker is wearing gloves.

Short description of items

Facility:	to complete according to the local nomenclature	
Service:	to complete according to the local nomenclature	
Ward:	to complete according to the local nomenclature	
Department:	to complete according to the following standardized nomenclature:	
	medical, including dermatology, neurology, haematology, oncology, etc.	surgery, including neurosurgery, urology, EENT, ophthalmology, etc.
	mixed (medical & surgical), including gynaecology	obstetrics, including related surgery
	paediatrics, including related surgery	intensive care & resuscitation
	emergency unit	long term care & rehabilitation
	ambulatory care, including related surgery	other (to specify)
Period N°:	1) pre- / 2) post-intervention; and then according to the institutional counter.	
Date:	day (dd) / month (mm) / year (yy)	
Start/end time:	hour (hh) / minute (mm).	
Session duration:	difference between start and end time, resulting in minutes of observation.	
Session N°:	attributed at the moment of data entry for analysis.	
Observer:	observer's initials (the observer is responsible for the data collection and for checking their accuracy before submitting the form for analysis.	
Page N°:	to write only when more than one form is used for one session.	
Prof.cat:	according to the following classification:	
	1. nurse / midwife	1.1 nurse, 1.2 midwife, 1.3 student.
	2. auxiliary	
	3. medical doctor	3.1 in internal medicine, 3.2 surgeon, 3.3 anaesthetist / resuscitator / emergency physician, 3.4 paediatrician, 3.5 gynaecologist, 3.6 consultant, 3.7 medical student.
	4. other health-care worker	4.1 therapist (physiotherapist, occupational therapist, audiologist, speech therapist), 4.2 technician (radiologist, cardiology technician, operating room technician, laboratory technician, etc), 4.3 other (dietician, dentist, social worker and any other health-related professional involved in patient care), 4.4 student.
Number:	number of observed health-care workers belonging to the same professional category (same code) as they enter the field of observation and you detect opportunities.	
Opp(ortunity):	defined by one indication at least	
Indication:	reason(s) that motivate(s) hand hygiene action; all indications that apply at one moment must be recorded	
	bef.pat: before touching a patient	aft.b.f: after body fluid exposure risk
	bef.asept: before clean/aseptic procedure	aft.pat: after touching a patient
		aft.p.surr: after touching patient surroundings
HH action:	response to the hand hygiene indication(s); it can be either a positive action by performing handrub or handwash, or a negative action by missing handrub or handwash	
	HR: hand hygiene action by handrubbing with an alcohol-based formula HW: hand hygiene action by handwashing with soap and water	Missed: no hand hygiene action performed

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

Observation Form – Basic Compliance Calculation

	Facility:						Period:			Setting:					
	Prof.cat.			Prof.cat.			Prof.cat.			Prof.cat.			Total per session		
Session N°	Opp (n)	HW (n)	HR (n)	Opp (n)	HW (n)	HR (n)	Opp (n)	HW (n)	HR (n)	Opp (n)	HW (n)	HR (n)	Opp (n)	HW (n)	HR (n)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
Total															
Calculation	Act (n) = / Opp (n) =			Act (n) = / Opp (n) =			Act (n) = / Opp (n) =			Act (n) = / Opp (n) =			Act (n) = / Opp (n) =		
Compliance															

Compliance (%) = $\frac{\text{Actions}}{\text{Opportunities}}$ x 100

Instructions for use

1. Define the setting outlining the scope for analysis and report related data according to the chosen setting.
2. Check data in the observation form. Hand hygiene actions not related to an indication should not be taken into account and vice versa.
3. Report the session number and the related observation data in the same line. This attribution of session number validates the fact that data has been taken into count for compliance calculation.
4. Results per professional category and per session (vertical):
   - 4.1 Sum up recorded opportunities (opp) in the case report form per professional category: report the sum in the corresponding cell in the calculation form.
   - 4.2 Sum up the positive hand hygiene actions related to the total of opportunities above, making difference between handwash (HW) and handrub (HR): report the sum in the corresponding cell in the calculation form.
   - 4.3 Proceed in the same way for each session (data record form).
   - 4.4 Add up all sums per each professional category and put the calculation to calculate the compliance rate (given in percent)
5. The addition of results of each line permits to get the global compliance at the end of the last right column.

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

Observation Form – Optional Calculation Form

(Indication-related compliance with hand hygiene)

	Facility:						Period:			Setting:					
	Before touching a patient			Before clean/ aseptic procedure			After body fluid exposure risk			After touching a patient			After touching patient surroundings		
Session N°	Indic (n)	HW (n)	HR (n)	Indic (n)	HW (n)	HR (n)	Indic (n)	HW (n)	HR (n)	Indic (n)	HW (n)	HR (n)	Indic (n)	HW (n)	HR (n)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
Total															
Calculation	Act (n) = Indic1 (n) =			Act (n) = Indic2 (n) =			Act (n) = Indic3 (n) =			Act (n) = Indic4 (n) =			Act (n) = Indic5 (n) =		
Ratio act / indic*															

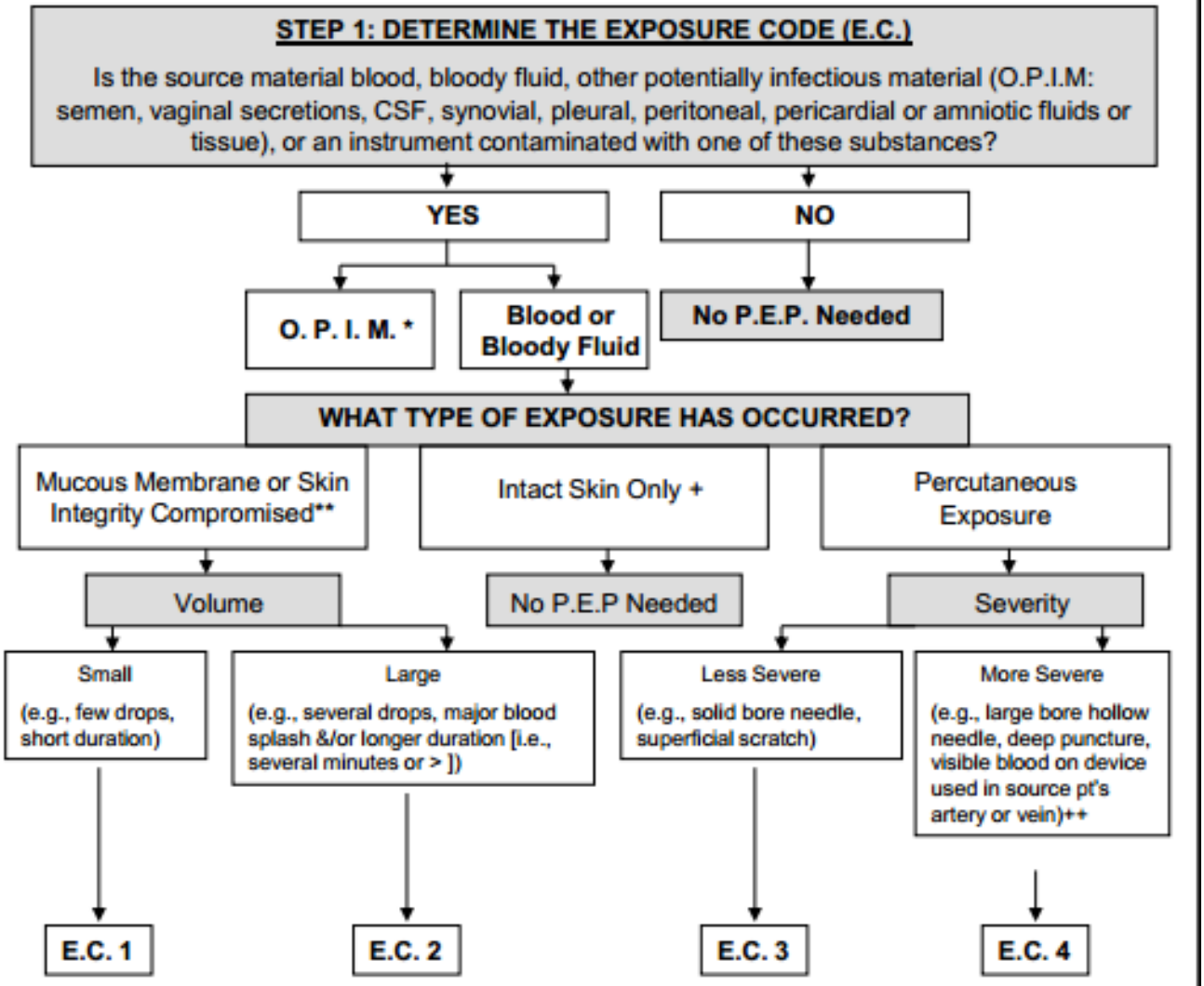
Instructions for use

1. Define the setting outlining the scope for analysis and report related data according to the chosen setting.
2. Check data in the observation form. Hand hygiene actions not related to an indication should not be taken into account and vice versa.
3. If several indications occur within the same opportunity, each one should be considered separately as well as the related action.
4. Report the session number and the related observation data in the same line. This attribution of session number validates the fact that data has been taken into count for compliance calculation.
5. Results per indication (indic) and per session (vertical):
   - 4.1 Sum up indications per indication in the observation form: report the sum in the corresponding cell in the calculation form.
   - 4.2 Sum up positive hand hygiene actions related to the total of indications above, making the difference between handwash (HW) and handrub (HR): report the sum in the corresponding cell in the calculation form.
   - 4.3 Proceed in the same way for each session (observation form).
   - 4.4 Add up all sums per each indication and put the calculation to calculate the ratio (given in percent)

***Note:** This calculation is not exactly a compliance result, as the denominator of the calculation is an indication instead of an opportunity. Action is artificially overestimated according to each indication. However, the result gives an overall idea of health-care worker's behaviour towards each type of indication.

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

DETERMINING THE NEED FOR HIV POST EXPOSURE PROPHYLAXIS (P.E.P.) AFTER AN OCCUPATIONAL EXPOSURE



*Exposure to OPIM must be evaluated on a case by case basis. In general, these body substances are considered low risk for transmission in health care settings. Any unprotected contact to HIV in a research laboratory or production facility is considered an occupational exposure that requires clinical evaluation to determine need for PEP.

**Skin integrity is considered compromised if there is evidence of chapped skin, dermatitis, abrasion or open wound.

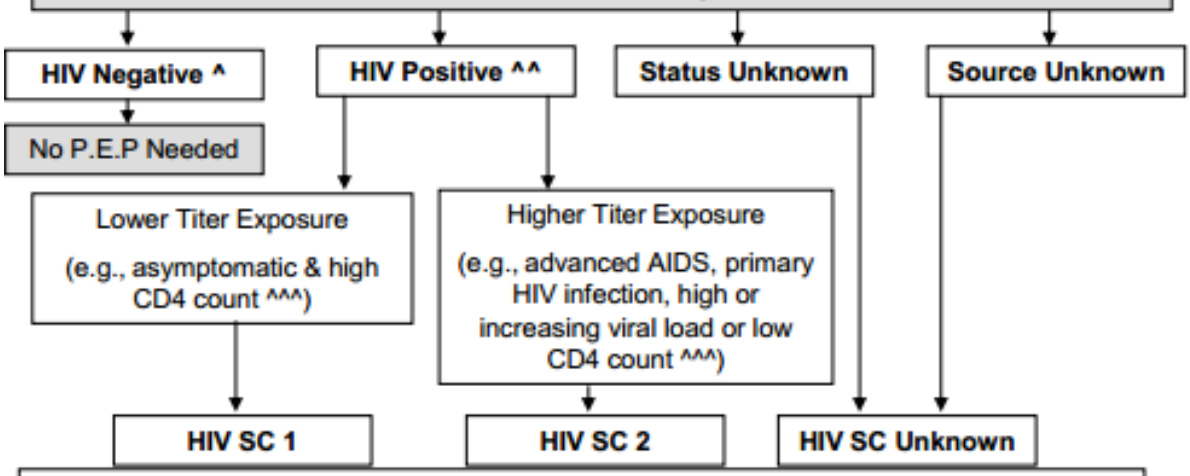
+Contact with intact skin is not normally considered a risk for HIV transmission. However, if the exposure was to blood & the circumstances suggests a higher volume exposure (e.g., an extensive area of skin was exposed or there was prolonged contact with blood), the risk for HIB transmission should be considered.

++The combination of these severity factors (e.g., large bore hollow needle and deep puncture) contribute to an elevated risk for transmission if the source person is HIB positive.

STEP 2: DETERMINE THE HIV STATUS CODE

(HIV S.C.)

What is the HIV status of the exposure source?



^ A source is considered negative for HIV infection if there is laboratory documentation of a negative HIV antibody, HIV polymerase chain reaction (PCR), or HIV p24 antigen test result from a specimen collected at or near the time of the exposure and there is no clinical evidence of recent retroviral-like illness.

^^ A source is considered infected with HIV (HIV positive) if there has been a positive laboratory result for HIV antibody, HIV PCR, or HIV p24 antigen or physician-diagnosed AIDS.

^^^ Examples are used as surrogates to estimate the HIV titer in an exposure source for the purposes of considering PEP regimens & do not reflect all clinical situations that may be observed. Although a high HIV titer (HIV SC2) in an exposure from a source with a low HIV titer also must be considered.

STEP 3: DETERMINE P.E.P. RECOMMENDATION

EC	HIV SC	P.E.P. RECOMMMENDATION:
1	1	**P.E.P. may not be warranted.** Exposure type dose not pose a known risk for HIV transmission. Whether the risk for drug toxicity outweighs the benefit of PEP should be decided by the exposed employee & the treating clinician.
1	2	**Consider basic regimen.** Exposure type poses a negligible risk for HIV transmission. A high HIV titer in the source may justify consideration of PEP. Whether the risk for drug toxicity outweighs the benefit of PEP should be decided by the exposed employee & the treating clinician.
2	1	**Recommend basic regimen** Most HIV exposures are in this category; no increased risk for HIV transmission has been observed but use of PEP is appropriate.
2	2	**Recommend expanded regimen .** Exposure type represents an increased HIV transmission risk.
3	1 or 2	**Recommend expanded regimen** Exposure type represents an increased HIV transmission risk.
Unknown		**If the source or, in the case of an unknown source the setting where the exposure occurred, suggests a possible risk for HIV exposure and the E.C. is 2 or 3, consider P.E.P. basic regimen.**

Basic Regimen: 4 weeks Truvada (Tenovir & Emtricitabine) 1 po daily. Truvada is better tolerated than Combivir, it is 1st choice unless known renal disease. Alternative is Combivir (Zidovudine (AZT) 300mg) and (Lamivudine (Epivir) 150mg) 1 po BID

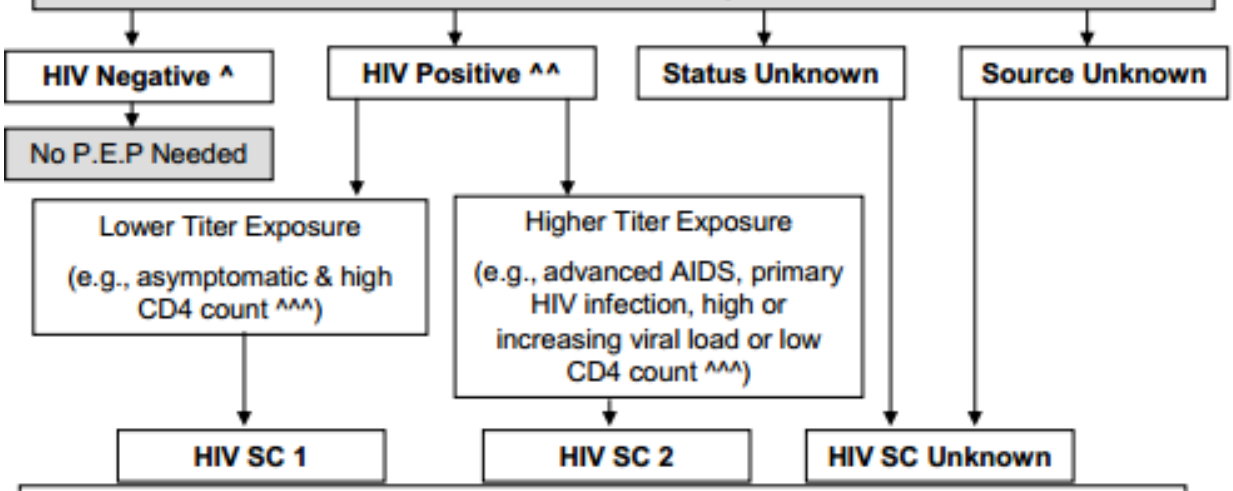
Expanded Regimen: Basic regimen PLUS, Kaletra 200/50 (Lopinavir 200 mg and Ritinavir 50 mg) **2 tablets po BID**

{ updated 9/09}

STEP 2: DETERMINE THE HIV STATUS CODE

(HIV S.C.)

What is the HIV status of the exposure source?



^ A source is considered negative for HIV infection if there is laboratory documentation of a negative HIV antibody, HIV polymerase chain reaction (PCR), or HIV p24 antigen test result from a specimen collected at or near the time of the exposure and there is no clinical evidence of recent retroviral-like illness.

^^ A source is considered infected with HIV (HIV positive) if there has been a positive laboratory result for HIV antibody, HIV PCR, or HIV p24 antigen or physician-diagnosed AIDS.

^^^ Examples are used as surrogates to estimate the HIV titer in an exposure source for the purposes of considering PEP regimens & do not reflect all clinical situations that may be observed. Although a high HIV titer (HIV SC2) in an exposure from a source with a low HIV titer also must be considered.

STEP 3: DETERMINE P.E.P. RECOMMENDATION

EC	HIV SC	P.E.P. RECOMMMENDATION:
1	1	**P.E.P. may not be warranted.** Exposure type dose not pose a known risk for HIV transmission. Whether the risk for drug toxicity outweighs the benefit of PEP should be decided by the exposed employee & the treating clinician.
1	2	**Consider basic regimen.** Exposure type poses a negligible risk for HIV transmission. A high HIV titer in the source may justify consideration of PEP. Whether the risk for drug toxicity outweighs the benefit of PEP should be decided by the exposed employee & the treating clinician.
2	1	**Recommend basic regimen** Most HIV exposures are in this category; no increased risk for HIV transmission has been observed but use of PEP is appropriate.
2	2	**Recommend expanded regimen .** Exposure type represents an increased HIV transmission risk.
3	1 or 2	**Recommend expanded regimen** Exposure type represents an increased HIV transmission risk.
Unknown		**If the source or, in the case of an unknown source the setting where the exposure occurred, suggests a possible risk for HIV exposure and the E.C. is 2 or 3, consider P.E.P. basic regimen.**

Basic Regimen: 4 weeks Truvada (Tenovir & Emtricitabine) 1 po daily. Truvada is better tolerated than Combivir, it is 1st choice unless known renal disease. Alternative is Combivir (Zidovudine (AZT) 300mg) and (Lamivudine (Epivir) 150mg) 1 po BID

Expanded Regimen: Basic regimen PLUS, Kaletra 200/50 (Lopinavir 200 mg and Ritinavir 50 mg) **2 tablets po BID**

{ updated 9/09}

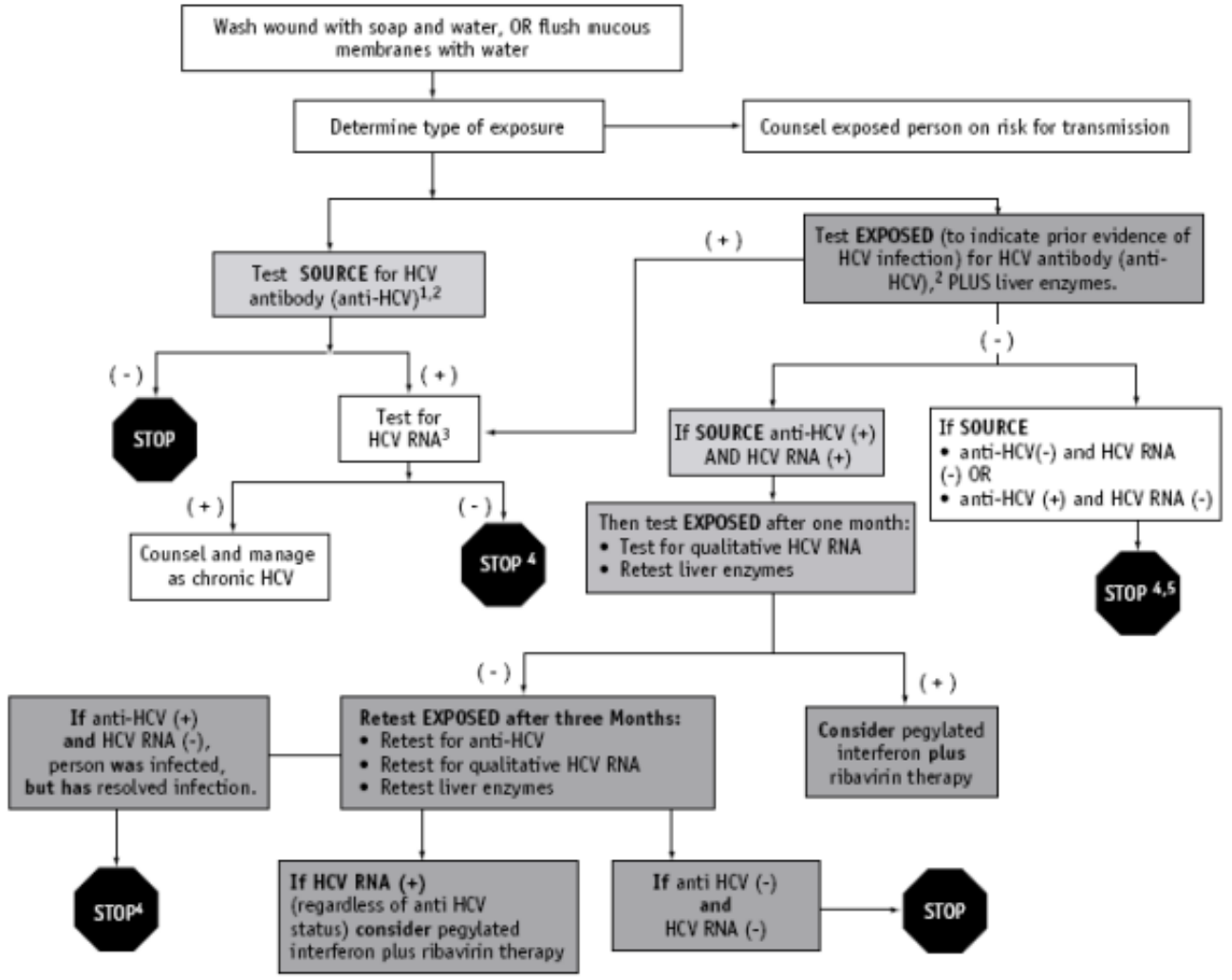
Recommended postexposure prophylaxis for percutaneous or permucosal exposure to hepatitis B virus — Advisory Committee on Immunization Practices, United States

Vaccination and antibody response status of exposed person	Treatment		
	Source HBsAg-positive	Source HBsAg-negative	Source not tested or status unknown
Unvaccinated	HBIG x 1; Initiate HB vaccine series	Initiate HB vaccine series	Initiate HB vaccine series
Previously vaccinated - known responder	No treatment	No treatment	No treatment
Previously vaccinated - known responder: after 3 doses	HBIG x 1 and initiate revaccination	No treatment	- If known high-risk source, treat as if source were HBsAg-positive.
Previously vaccinated - known responder: after 6 doses	HBIG x 2 (separated by 1 month)	No treatment	- If known high-risk source,treat as if source were HBsAg-positive.
Previously vaccinated - Antibody response unknown	Test exposed person for anti-HBs - If adequate,* no treatment, - If inadequate,* HBIG x 1 and vaccine booster	No treatment	Test exposed person for anti-HBs - If adequate,* no treatment - If inadequate,* HBIG x 1 and vaccine booster

Abbreviations: HbsAg = hepatitis B surface antigen; HBIG = hepatitis B immune globulin; anti-HBs = antibody to hepatitis B surface antigen; HB = hepatitis B.

Source: Adapted from CDC. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP). Part II: Immunization of adults. *MMWR* 2006;55(No. RR-16).
* A seroprotective (adequate) level of anti-HBs after completion of a vaccination series is defined as anti-HBs $\geq$10 mIU/mL; a response <10 mIU/mL is inadequate and is not a reliable indicator of protection.
Source: *MMWR* 2011:60(RR-7)42.

Hepatitis C Post-exposure Management



1 If source is unavailable or refuses testing, treat exposed as if source was anti-HCV (+) and HCV RNA (+).
2 Since immunosuppressed persons can be negative for hepatitis C antibody despite viremia, qualitative HCV RNA testing should be performed.
3 Qualitative HCV RNA by PCR or TMA.
4 Person was HCV-infected at one time and spontaneously cleared the virus. Person is NOT able to transmit HCV at that time.
5 Advise and counsel EXPOSED person if SOURCE person is anti-HCV (+) only.

UPHSSP

Training Block -2
SIHFW Campus
C-Block, Indira Nagar
Lucknow-226016 (UP)