Hospital Infection Prevention & Control Manual

Version 3



2021

Hospital Infection Control Committee
King George's Medical University, Lucknow

Version 3rd	
Name of responsible (ratifying) committee	**Hospital Infection Control Committee**
Document Manager	**Hospital Infection Control Team**
Date issued	**September 2021**
Edited & Compiled by	**Prof. Amita Jain** **Prof. Prashant Gupta** **Dr. Sheetal Verma**

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KING GEORGE'S MEDICAL UNIVERSITY
U.P., LUCKNOW
किंग जार्ज चिकित्सा विश्वविद्यालय, उ०प्र०
लखनऊ



MESSAGE

"Prevention is better than cure" has always been relevant in public health fora. Healthcare associated infections (HAIs) are preventable and require strict implementation of best prevention and control practices. Infection prevention and control refers to measures aimed at preventing and controlling infections and transmission of infections in health care settings. Our overall aim is to ensure a safe hospital environment for both patients and health care providers.

I congratulate the HICC, KGMU for this manual which presents guidelines that are developed to provide a coordinated approach for the prevention and management of HAIs. This last year, our healthcare personnel have been on the frontline for caring for patients with Coronavirus disease 2019 (COVID-19). Prevention has remained the best weapon for protecting healthcare workers against the COVID-19 infection. We firmly believe that practice of these guidelines will improve IPC practices in KGMU and will be used by healthcare workers, management and support staff alike. I recommend them to be followed and implemented for promoting good and safe practices in all health care facilities according to local need.

Finally, I appreciate the colossal effort of the Hospital Infection Control Committee, KGMU to put this document together and strongly believe that this manual will be useful for all health care providers in their daily practice.

(Lt. Gen. (Dr.) Bipin Puri)
Vice Chancellor

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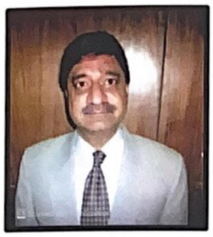
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किंग जार्ज चिकित्सा विश्वविद्यालय, उ0प्र0, लखनऊ
KING GEORGE'S MEDICAL UNIVERSITY, U.P., LUCKNOW

प्रोफेसर विनीत शर्मा
प्रति-कुलपति
Professor Vineet Sharma
Pro-Vice Chancellor

Ref. No. KGMU/Pro-VC/ 06 /2021

Date: September 09 , 2021



FOREWORD

It is a matter of great pleasure to write to you today on the occasion of launch Version 3 of the Hospital Infection Prevention and Control Manual.

Healthcare workers are in the front line to deliver quality health care and protect the patients from Hospital Associated Infections (HAI). They perform clinical procedures and other relevant & necessary activities that can expose themselves and patients to potentially infective organisms including COVID-19. Adherence to infection prevention and control protocols is critical at minimizing healthcare workers' exposure to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Many of our patients are sick and they are more susceptible to infections or they have infections that can be transmitted to others. It is essential to prevent the transmission of infections at all times while providing health care services. This manual on infection prevention and control (IPC) provides information regarding appropriate IPC practices in health care settings.

I am sure that implementing the programmatic approach proposed in this manual will effectively ensure Infection Prevention and Control (IPC) in our hospital services. This manual aims to ensure that the various departments and individuals participate in the prevention and control of Hospital Associated Infections (HAIs) activities.

(Prof. Vineet Sharma)
Pro-Vice Chancellor
& Chairman - HICC

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KING GEORGE'S MEDICAL UNIVERSITY UP, LUCKNOW
DEPARTMENT OF MICROBIOLOGY

Ref. No. .....



Prof. Amita Jain
Head, Department of Microbiology
Member Secretary, HICC
King George's Medical University

MESSAGE

I am delighted to present "KGMU Hospital Infection Prevention & Control Manual Version 3 document". It lays down the policies and guidelines required for the practice of a nationally acceptable standard of IPC in health care settings. We all know that the Healthcare-associated infections (HAI) are infections that are acquired in healthcare facilities or as a result of healthcare interventions and lapses in infection prevention. The scenario becomes even more challenging due to recent COVID-19 pandemic. Compliance with infection prevention and control (IPC) protocols is critical in minimizing the risk of coronavirus disease (COVID-19) infection among healthcare workers.

I must appreciate the technical contributions of the members of HICC, KGMU who are committed to create and sustain an environment that is safe and ensures that no patient is harmed due to an avoidable healthcare associated infection (HAI). I believe this will be an effective and useful document for all health care providers and will be followed at each and every level of healthcare service delivery. It is also a very useful document for to prevent and curtail COVID-19 infection. I hope that by acquiring knowledge from this document, health professionals will play their respective roles in infection prevention and control in KGMU.

I hope these Hospital Infection Control Guidelines and accompanying compendium of checklists will facilitate to build a sound and credible infection control system in KGMU.

(Dr. Amita Jain)

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CHAPTER - 1

INFECTION PREVENTION & CONTROL IN COVID-19

Dr. Sheetal Verma, Dr. Amita Jain

Healthcare personnel (HCP) are on the front lines for caring patients with confirmed or possible infection with Corona virus disease 2019 (COVID-19) and therefore have an increased risk of exposure to this virus. HCPs can minimize their risk of exposure when caring confirmed or possible COVID-19 patients by following these guidelines.

IPC strategies for preventing/limiting the spread of COVID-19

- Applying *standard precautions* for all patients
- Ensuring *triage, early recognition, and source* control
- Implementing empiric *additional precautions* for suspected cases of COVID-19 infection
- Implementing *administrative controls*
- Using *environmental and engineering controls.*

General advice for COVID-19

- Avoid close contact with people suffering from acute respiratory infections
- Frequent hand hygiene, especially after direct contact with ill people or their environment
- Wear a triple layered mask
- Seek medical care for advice

Elements of Standard Precautions

A. Personal protection

1. Hand hygiene (Refer to Chapter-2)
2. Respiratory hygiene & cough etiquettes
3. Personal protection according to the risk
4. Safe injection practices, sharps management and injury prevention (Refer to Chapter 7)

B. Institutional practices

1. Regular Hospital disinfection- All surfaces, walls, touch points (Refer to Chapter 4)
2. Safe handling, cleaning of patient care equipment (Refer to Chapter 4)
3. Safe handling and cleaning of soiled linen (Refer to Chapter 4)
4. Biomedical Waste management (Refer to Chapter 9)

Sample Collection from Corona Suspect

- Only trained health care personnel must collect specimen
- Wear full PPE while sample collection from COVID suspect patient
- Sent the collected samples to Virus Research and Diagnostic Laboratory (VRDL) under the Microbiology Department.

Droplet Precautions: Refer Chapter 7

Bio-medical Waste Protocol Guidelines in Covid-19 (Refer to Chapter 9)

- Double layered bags for collection of waste
- Use dedicated trolleys and collection bins
- Label the waste as “COVID-19 Waste”
- Inner and outer surfaces of bins/containers/trolleys to be disinfected with 1%

Spill Management- (Refer to Chapter 4)

Patients Clothes and Other Belongings

- Place patient clothes in leak-proof bag or bucket for laundering
- Ensure that all persons who handling the soiled linen must use Standard Precautions, and perform hand hygiene after removing PPE.

- Used patient clothes to be dipped in 1% hypochlorite solution before washing and then send it for autoclaving.
- Preferably disposable linen should be used for the patients.

Common Instruction for COVID Isolation Areas and ICUs

- All stationary items (paper materials including case sheet) should not be taken outside the Wards/ICU
- N-95 mask should be removed outside the Doffing area

Patients suspected or confirmed COVID-19

- Preferably patient should be in a single room:
  - Natural ventilation with air flow of at least 160 L/s per patient or
  - In negative pressure rooms with at least 12 air changes per hour and controlled direction of air flow when using mechanical ventilation
- Cohort: All patients with respiratory illness may be in a single room, or minimum 1m away from other patients when in waiting for a room
- Avoid transporting suspected or confirmed cases
- Limit the number of HCW, visitors, and family members who are in contact with the patient. If necessary, everyone must wear PPE.
- All persons entering the patient's room (including visitors) should be recorded (for contact tracing purposes).

Respiratory hygiene/cough etiquette

DO'S

- Cough/sneeze with a tissue paper or into your sleeve if no tissue is available
- Turn head away from others when coughing/sneezing
- If tissues are used, discard into yellow bag
- Clean your hands with soap and water or alcohol based products
- Do not spit here and there
- Maintain 1 meter (2 arms) distance from people with respiratory symptoms

DON'Ts

- Don't cough/sneeze on your hands
- Don't cough/sneeze on nearby people
- Do not stay within 1 meter from others
- Don't discard tissues into other BMW bags

COVID-19: Guidelines on rational use of Personal Protective Equipment
Source: Modified from MOHFW, DGHS

	Risk of Exposure	Triple layered Mask	N-95 Mask	Gloves	Gown/Coverall	Goggles	Head Cover	Shoe Cover
Help Desk/ Registration Counter	Moderate risk	✗	✓	✓	✗	✗	✗	✗
Waiting Area	Moderate risk	✗	✓	✓	✗	✗	✗	✗
Temperature recording station	Moderate risk	✗	✓	✓	✗	✗	✗	✗
Doctors Chamber in OPD	Moderate risk	✗	✓	✓	✗	✗	✗	✗
Visitors attending OPD	Low risk	✓	✗	✗	✗	✗	✗	✗
Visitors accompanying patients in IP facility	Low risk	✓	✗	✗	✗	✗	✗	✗
Non-COVID Wards	Low risk	✓	✗	✓	✗	✗	✗	✗
Non-COVID ICUs/OTs (Aerosol generating procedures only)	Moderate risk	✗	✓	✓	✓	✓	✗	✗
SARI Ward	High risk	✗	✓	✓	✓	✓	✓	✓
Specimen collection for suspected or confirmed COVID	High risk	✗	✓	✓	✓	✓	✓	✓
COVID Lab (Personnel directly handling specimen)	High risk	✗	✓	✓	✓	✓	✓	✓
COVID (ICU/HDU/OT/Isolation Wards)/Triage/Holding & screening area	High risk	✗	✓	✓	✓	✓	✓	✓
Post COVID Wards	Moderate risk	✗	✓	✓	✓	✓	✗	✓
Ambulance (Transporting patients not on any assisted ventilation	Moderate risk	✗	✓	✓	✗	✗	✗	✗
Ambulance (Transporting SARI patients)	High risk	✗	✓	✓	✗	✓	✗	✗
Driving in the ambulance	Low risk	✓	✗	✓	✗	✗	✗	✗
Dead body packaging	High risk	✗	✓	✓	✓	✓	✓	✓
Mortuary- Dead body transport (COVID positive)	Moderate risk	✗	✓	✓				
Mortuary- Dead body handling (COVID positive)	High risk	✗	✓	✓	✓	✓	✓	✓
CSSD/Laundry- Handling linen of COVID-19 patients	Moderate risk	✗	✓	✓	✗	✗	✗	✗
Supportive services- Administrative, Financial, Engineering, Security,etc.	Low risk	✓	✗	✗	✗	✗	✗	✗

Handling Dead Bodies

- Fill all openings of dead body with cotton balls or gauge dipped in 1% hypochlorite.
- Wrap the body in leak-proof plastic body bag
- Disinfect the surface with 1% hypochlorite
- Transfer the body through separate passage to vehicle
- Bathing, kissing, hugging, etc. of the dead body should not be allowed.

Autopsies on COVID-19 Dead Bodies

- **Autopsies should be avoided**
- If autopsy is to be performed for special reasons, the team well trained in infection prevention control practices must use full complement of PPE.
- Reduce aerosol generation during autopsy using appropriate techniques especially while handling lung tissue.
- After the procedure, body should be disinfected with 1% Sodium Hypochlorite and placed in a body bag.
- The exterior of the bag will again be decontaminated with 1% Sodium Hypochlorite solution.
- The body thereafter can be handed over to the relatives.
- Autopsy table to be disinfected as per standard protocol.

Salient Points to remember

- Restrict visitors in the hospital.
- Restrict HCWs from entering the Corona ward if they are not involved in direct care.
- Consider **bundling activities** to minimize the number of times a room is entered (e.g., check vital signs during medication administration or have food delivered by HCWs while they are performing other care) and plan which activities will be performed at the bedside.
- **Screening area: Restrict HCWs evaluating suspected cases** of COVID-19 disease, one HCW can evaluate/screen, others can maintain distance and interact; thus minimizing the need for these individuals to go to healthcare facilities for evaluation.
- Use **physical barriers** to reduce exposure to the COVID-19 virus, such as glass or plastic windows. This approach can be implemented in areas of the healthcare setting where patients will first present, such as triage areas, the registration desk at the emergency department or at the pharmacy window where medication is collected.
- **Direct contact** refers to coming closer to patients by less than one meter.
- **Cleaners** should preferably wear boot and heavy duty gloves, in addition.
- **Full PPE** means gloves (2 pairs), mask, coverall, shoe cover and goggles. Coverall may be replaced with gown and head cover.

Aerosol generating procedure (AGPs) include: Endotracheal intubation, extubation and related procedures such as manual ventilation and open suctioning, tracheotomy/tracheostomy procedures (insertion/open suctioning/removal), bronchoscopy, surgery and post-mortem procedures involving high-speed devices, some dental procedures (such as high-speed drilling), non-invasive ventilation (NIV) such as bi-level positive airway pressure (BiPAP) and continuous positive airway pressure ventilation (CPAP), high-frequency oscillating ventilation (HFOV), high flow nasal oxygen (HFNO), also called high flow nasal cannula, induction of sputum. Use N95 mask for COVID patients. Nebulization (ultrasonic, jet) are possibly aerosol generating procedures.

IPC is the key for containment
Based on key principles- Hand Hygiene, Respiratory etiquette, safe distance
Hospital Infection Prevention & control- Standard & additional precautions
Judicious and Appropriate use of PPE with attention to donning and doffing
Home care precautions
VACCINATION AGAINST COVID-19

CHAPTER - 2

HAND HYGIENE

Dr. Sheetal Verma, Dr. Prashant Gupta, Dr. Amita Jain

Introduction

Our hands are our main tool for work as health care workers- and they are the key link in the chain of transmission. Hand hygiene is the most important measure for the prevention and control of COVID-19. Hand hygiene can be performed with soap and water or alcohol-based hand rubs.

Hand hygiene: It is the first and foremost step to prevent transmission of infection in the hospital. Hand hygiene may be performed either by alcohol-based hand rub or antiseptic soap-based hand wash.

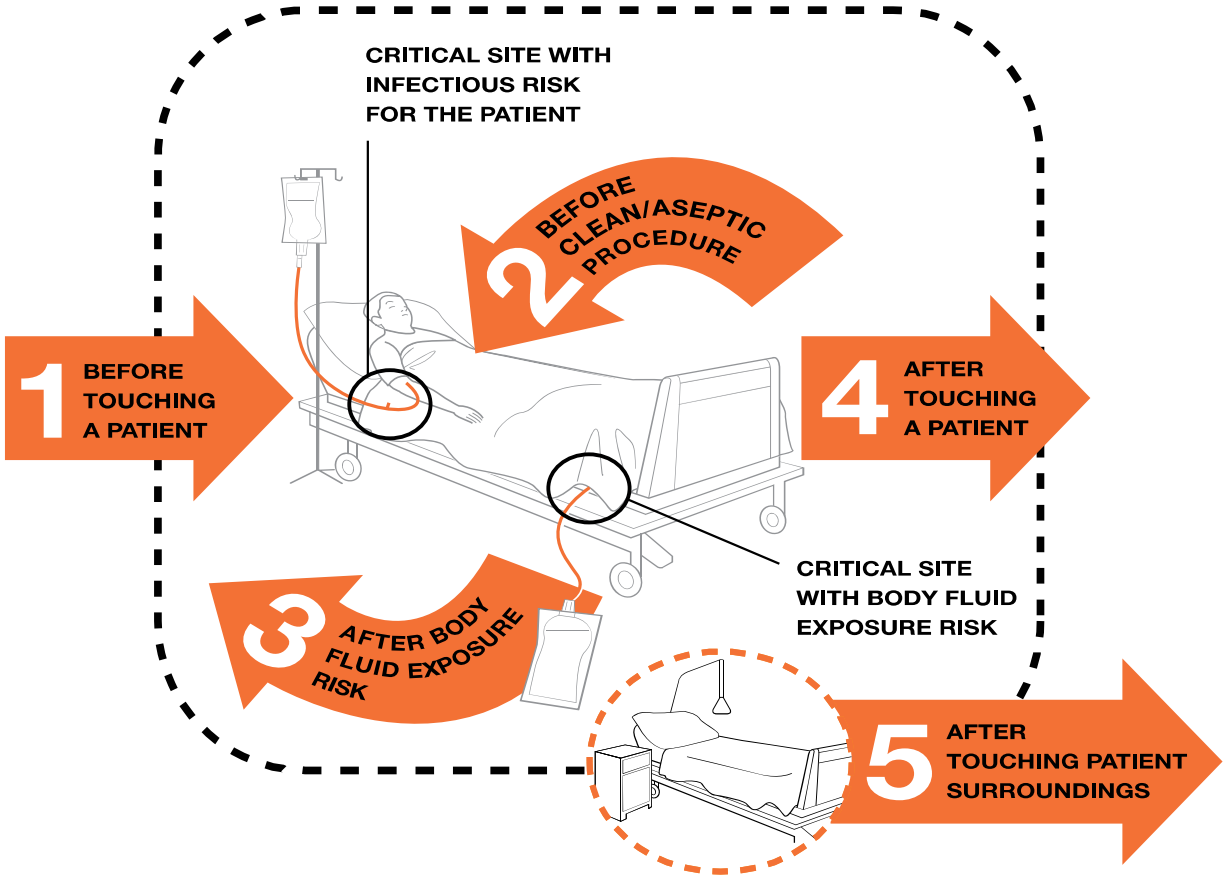
1. **Indications for using handrub**
   - Handrub should be used during routine handling the patient, clinical rounds and laboratory work
   - If the hands are not visibly dirty, not contaminated with blood, or body fluids

2. **Indications for using hand wash**
   - Hands are visibly dirty, contaminated with blood, or body fluids
   - Potential exposure to spore forming organisms (e.g., *Clostridium difficile*); non enveloped viruses (e.g. Norovirus, rotavirus, enteroviruses)
   - Handling patients having diarrhoea
   - After using restroom
   - Before handling medication or food

3. **Prerequisites before performing hand hygiene**
   - Do not wear Bangles, rings, watch, artificial nails, nail polish, kalawa etc.
   - Keep the nails short.

Remember, Hand wash is the most important measure for COVID-19 prevention

Hand hygiene has to be followed as per World Health Organization "5 moments"



Moment-1 and 4 : Before and after touching a patient	Moment-2 and 3: Before and after aseptic procedure/body fluid exposure	Moment-5: After touching patient surroundings
Before and after • Taking pulse, blood pressure • Auscultation and palpation • Shaking hands • Helping a patient to move around • Applying oxygen mask • Giving physiotherapy • Recording ECG • Use of gloves	Before and after • Oral/dental care • Aspiration of secretions or accessing draining system • Skin lesion care, wound dressing • Giving injection • Drawing of blood or sterile fluid • Handling an invasive device (catheter, central line, ET tube) • Clearing up urines, faeces, vomit, • Handling bandages, napkin etc • Instilling eye drops • Moving from a contaminated body site to another body site during care of the same patient	After contact with • Handling the case sheet • Medical equipment in the immediate vicinity of the patient • Bed or bed rail • Changing bed linen • Decanting urobag

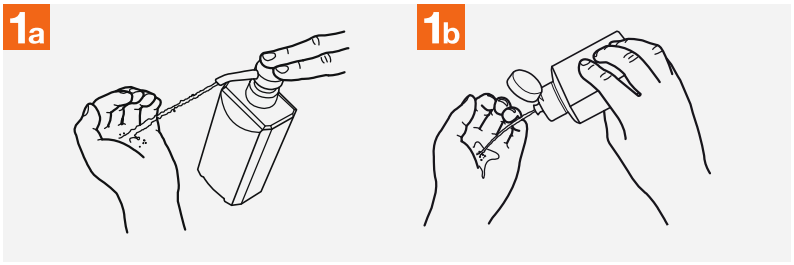
Hand rub

- Handrub is done for 20–30 seconds
- An alcohol-based hand rub or mixture of 0.5% w/v Chlorhexidine gluconate and 70% v/v ethyl alcohol solution

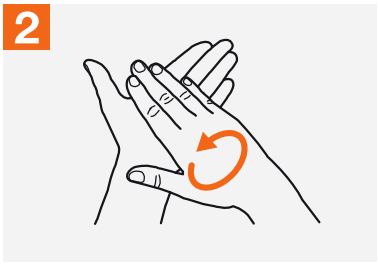
How to Handrub?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

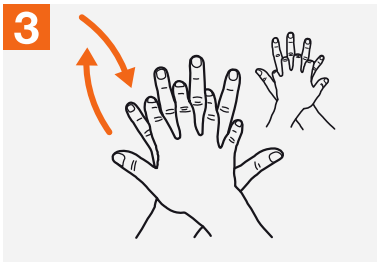
Duration of the entire procedure: 20-30 seconds



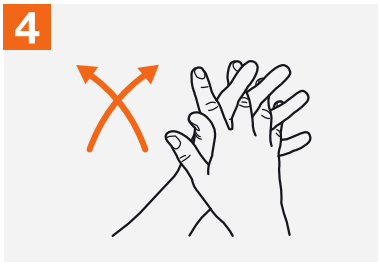
Apply a palmful of the product in a cupped hand, covering all surfaces;



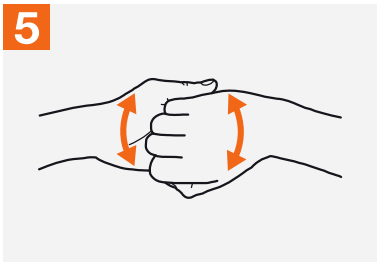
Rub hands palm to palm;



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



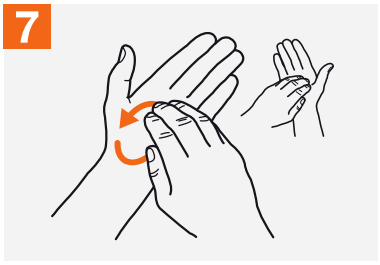
Palm to palm with fingers interlaced;



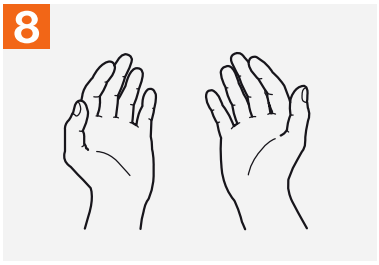
Backs of fingers to opposing palms with fingers interlocked;



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



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



Once dry, your hands are safe.

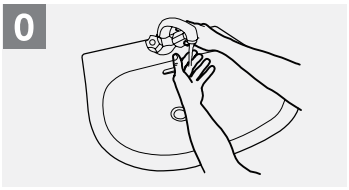
Hand washing

- Soap, running water and single use towel, when visibly dirty or contaminated
- Wash hands for 40–60 seconds

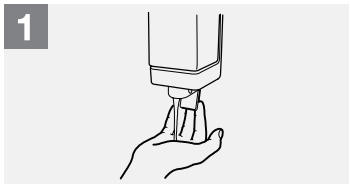
HOW TO HANDWASH?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

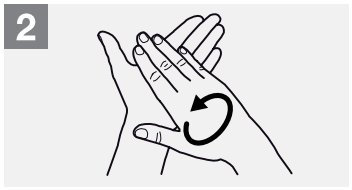
Duration of the entire procedure: 40-60 seconds



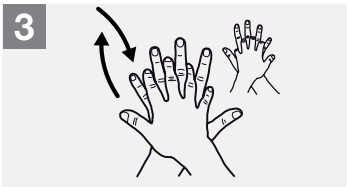
Wet hands with water;



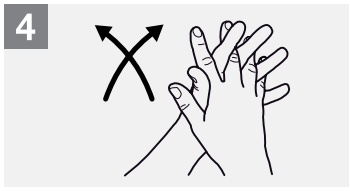
Apply enough soap to cover all hand surfaces;



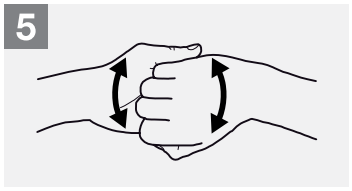
Rub hands palm to palm;



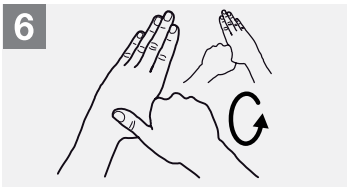
Right palm over left dorsum with interlaced fingers and vice versa;



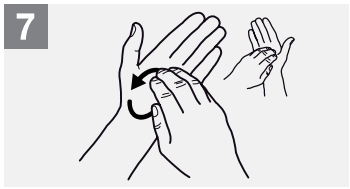
Palm to palm with fingers interlaced;



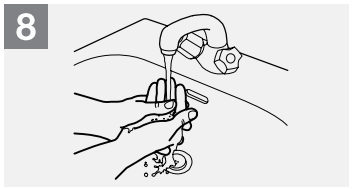
Backs of fingers to opposing palms with fingers interlocked;



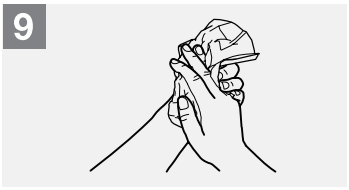
Rotational rubbing of left thumb clasped in right palm and vice versa;



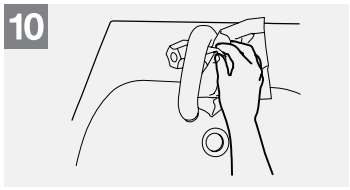
Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



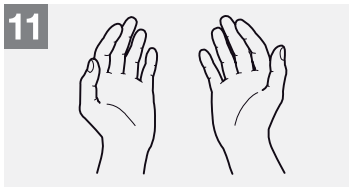
Rinse hands with water;



Dry hands thoroughly with a single use towel;



Use towel to turn off faucet;



Your hands are now safe.

Steps of Surgical Hand Wash/Rub

1. Remove rings, wrist-watch, and bracelets before beginning surgical hand preparation. Artificial nails are prohibited.
2. Sinks should be designed to reduce the risk of splashes.
3. If hands are visibly soiled, wash hands with plain soap before surgical hand preparation. Remove debris from underneath fingernails using a nail cleaner, preferably under running water.
4. Brushes are not recommended for surgical hand preparation.
5. Surgical hand antisepsis should be performed using either a suitable antimicrobial soap or suitable alcohol-based hand rub, preferably with a product ensuring sustained activity, before donning sterile gloves.
6. If quality of water is not assured in the operating theatre, surgical hand antisepsis using an alcohol-based hand rub is recommended before donning sterile gloves when performing surgical procedures.
7. When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms for the length of time recommended by the manufacturer, typically 2–5 minutes. Long scrub times (e.g. 10 minutes) are not necessary.
8. When using an alcohol-based surgical hand rub product with sustained activity, follow the manufacturer's instructions for application times. Apply the product to dry hands only. Do not combine surgical hand scrub and surgical hand rub with alcohol-based products sequentially.
9. When using an alcohol-based hand rub, use sufficient product to keep hands and forearms wet with the hand rub throughout the surgical hand preparation procedure. The technique for surgical hand preparation using alcohol-based hand rubs is illustrated below.
10. After application of the alcohol-based hand rub as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves.

Surgical Handrubbing Technique

- Handwash with soap and water on arrival to OR, after having donned theatre clothing (cap/hat/bonnet and mask).
- Use an alcohol-based handrub (ABHR) product for surgical hand preparation, by carefully following the technique illustrated in Images 1 to 17, before every surgical procedure.
- If any residual talc or biological fluids are present when gloves are removed following the operation, handwash with soap and water.


1

Put approximately 5ml (3 doses) of ABHR in the palm of your left hand, using the elbow of your other arm to operate the dispenser.


2

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


3


4


5


6


7

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


8

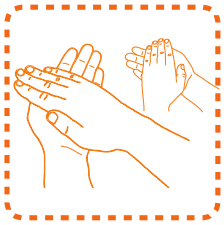

9


10

Images 8-10: Now repeat steps 1-7 for the left hand and forearm.


11

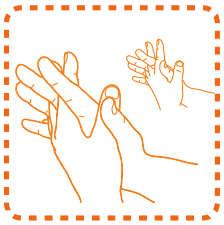
Put approximately 5ml (3 doses) of ABHR in the palm of your left hand as illustrated, to rub both hands at the same time up to the wrists, following all steps in images 12-17 (20-30 seconds).


12

Cover the whole surface of the hands up to the wrist with ABHR, rubbing palm against palm with a rotating movement.


13

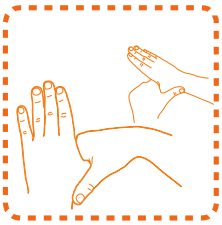
Rub the back of the left hand, including the wrist, moving the right palm back and forth, and vice-versa.


14

Rub palm against palm back and forth with fingers interlinked.


15

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


16

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


17

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

Repeat this sequence (average 60 sec) the number of times that adds up to the total duration recommended by the ABHR manufacturer's instructions. This could be two or even three times.

CHAPTER - 3

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Dr. Sheetal Verma, Dr. Prashant Gupta, Dr. Amita Jain

PRINCIPLES FOR USING PPE

- Hand Hygiene
- It should be available where and when it is indicated
- In the correct size
- Select according to risk or per transmission based precautions
- Always put on before contact with the patient.
- Always remove immediately after completing the task and/or leaving the patient care area
- Donning & doffing to be done in designated area
- It should not be adjusted or touched during patient care
- Use PPE when contact with blood or other body fluid is anticipated
- Remove and dispose of PPE properly

- **Gloves:** Wear when touching blood, body fluids, secretions, excretions, mucous membranes, non-intact skin. Change between tasks and procedures on the same patient after contact with potentially infectious material. Remove gloves after use, before touching non-contaminated items and surfaces, and before going to another patient. Perform hand hygiene with soap and water immediately after removal. Use of sterile or non-sterile glove is given in Chart 4.

- **Facial protection (eyes, nose, and mouth):** Wear (1) a surgical or procedure mask and eye protection (eye visor, goggles) or (2) a face shield to protect mucous membranes of the eyes, nose, and mouth during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.

- **Gown:** Wear to protect skin and prevent soiling of clothing during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions. Remove soiled gown as soon as possible, and perform hand hygiene with soap and water.

- **Shoe cover:** Wear shoe covers while removing the spilled sample or when entering the critical area of hospital such as OT and ICU. Remove the shoe covers in yellow bin after leaving these areas.

- PPE related to COVID and Non-COVID see (Chapter no. 1)

Personal protective equipment (PPE)



SEQUENCE FOR DONNING (PUTTING ON)

Remove home clothes, jewellery, watches, electronic etc. and wear clean hospital scrubs

↓

Hand hygiene

↓

Shoe covers – tie lace in front of the shin

↓

First set of gloves – should be smaller than second pair, comfortable size, can be sterile or unsterile

↓

Coverall Gown

↓

N-95 respirator

↓

Goggles

↓

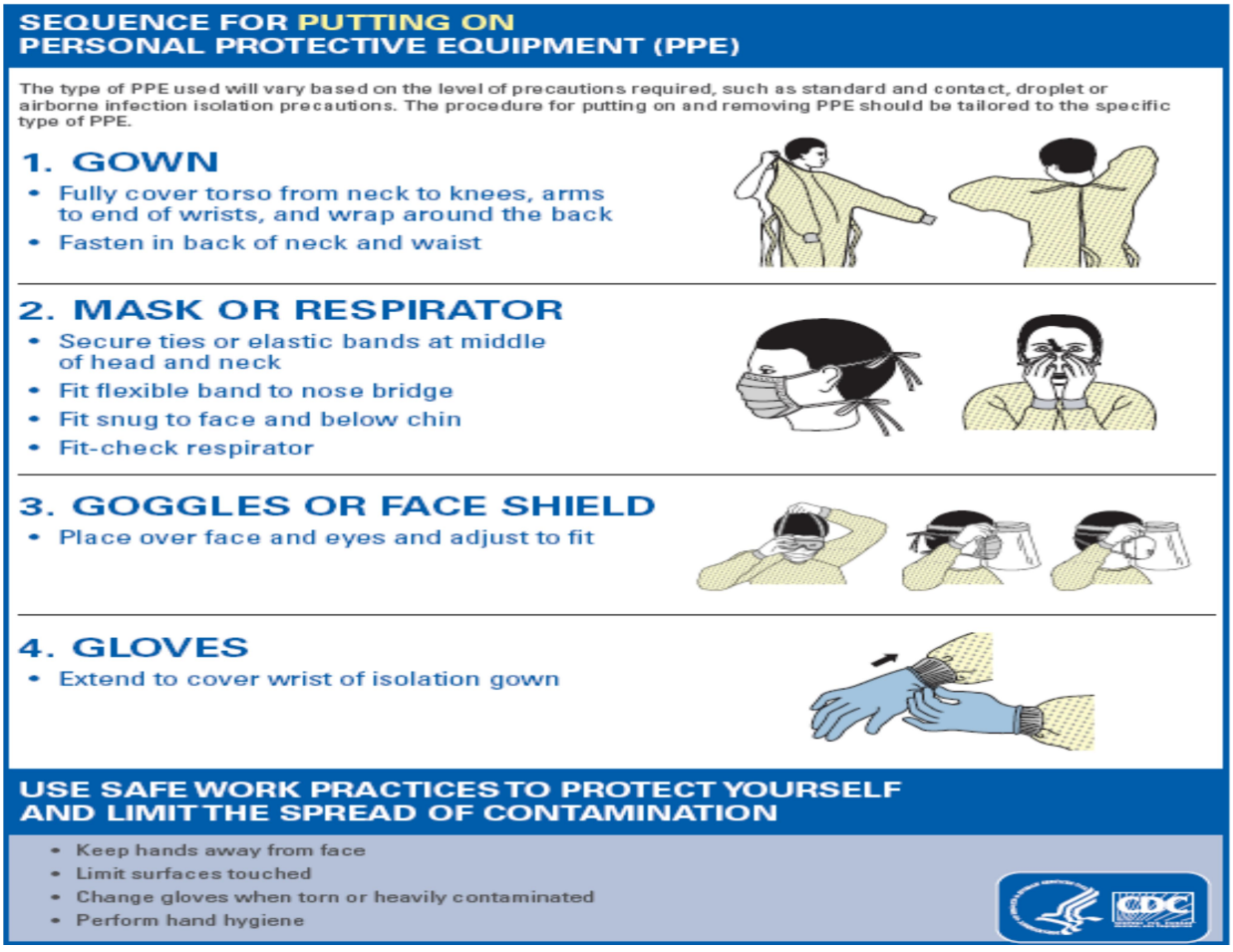
Face shield

↓

Outer gloves

↓

Gown fitness check



SEQUENCE FOR DOFFING (REMOVAL OFF) OF PPE

Hand hygiene MUST be performed after every step

Handrub

↓

Remove outer gloves

↓

Remove face shield

↓

Remove goggles

↓

Remove coverall gown

↓

Remove shoe covers

↓

Remove inner gloves

↓

Wear another pair of sterile /unsterile gloves

↓

Remove N-95 respirator

↓

Remove last pair of gloves and perform hand hygiene

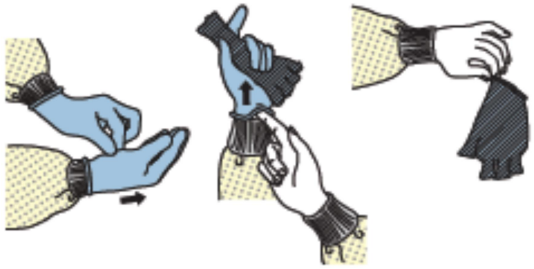
SEQUENCE FOR REMOVING PPE

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

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

1. GLOVES

- Outside of gloves are contaminated!
- If your hands get contaminated during glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Using a gloved hand, grasp the palm area of the other gloved hand and 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

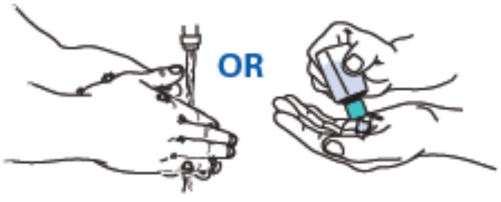


4. MASK OR RESPIRATOR

- 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

CHAPTER – 4

ENVIRONMENTAL CLEANING, DISINFECTION AND STERILIZATION PROTOCOL

Dr. Sheetal Verma, Dr. Prashant Gupta, Dr. Amita Jain

Definitions

Cleaning	Cleaning is the removal of visible soil (e.g., organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products.
Disinfection	Disinfection describes a process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects. In a health facility, there are a wide range of chemicals and disinfectants used for various clinical, nursing, laboratory and radiological procedures.
Asepsis	Asepsis is a condition in which no living disease-causing microorganisms are present. Asepsis covers all those procedures designed to reduce the risk of bacterial, fungal or viral contamination, using sterile instruments, sterile draping and the gloved 'no touch' technique.
Sterilisation	Sterilization describes a process that destroys or eliminates all forms of microbial life and is carried out in health-care facilities by physical or chemical methods.

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

Level of disinfectants	**Bacterial spores**	**Vegetative bacteria**	**Tubercle bacilli**	**Non enveloped viruses**	**Fungi**	**Enveloped viruses**	**Examples**
High Level disinfectants	May be	Yes	Yes	Yes	Yes	Yes	2.4% Glutaraldehyde, Ethylene Oxide, H_2O_2 (>7%)
Intermediate Level disinfectant	No	Yes	Yes	Yes	Yes	Yes	Alcohols, chlorine compounds, hydrogen peroxide (3-6%), chlorhexidine
Low level disinfectants	No	No	No	+/-	Yes	Yes	Quaternary ammonium compounds such as Benzalkonium chloride etc.

Spaulding Classification

Earle H. Spaulding devised a rational approach to classify the patient-care items and equipment into four categories (table) according to the degree of risk for infection involved in use of the items. This classification scheme is so clear and logical that it has been retained, refined, and successfully used by infection control professionals in the hospital.

Spaulding classification of medical devices

S.no.	Types of equipment	Definition	Recommended Method	Examples
1	Critical	Those which penetrate skin & mucous membrane	Sterilization (before & after use)	Surgical instruments, cardiac and urinary catheters, implants, eye and dental instruments
2	Semi critical	In contact with intact mucous membrane without penetration	High level disinfection before use & intermediate level disinfection	Respiratory therapy equipment, anaesthesia equipment, endoscopes, laryngoscope, rectal/vaginal/oesophageal probes
3	Non-critical	In contact with intact skin	Intermediate/low level disinfection	BP cuff, ECG electrodes, bedpans, crutches, stethoscope, thermometer
4	Non-critical environment surfaces	Less direct contact with patient	Low-level disinfectant	Surfaces of medical equipment, examination table, computers

LIST OF DISINFECTANTS AND THEIR PURPOSE

HIGH RISK AREAS (OT/ICU/TRANSPLANT WARDS/UNITS/ CSSD)			
Procedure	**Frequency of cleaning**	**Disinfectant to be used (type of disinfectant)**	**Precautions to be taken/method to use**
Floor/ wash basins/ commodes	Clean trice a day or early if visibly dirty or whenever soiling occurs	Hydrogen peroxide (7.35%)+Peracetic acid(0.23%) formulation	Damp mop with detergent and water followed by use of disinfectant (Use triple bucket system). Use microfibre mops
High touch surface cleaning (surfaces with frequent contact) E.g. O.T table, OT lights, shelves, Bedrails, bed surfaces, doorknobs, medicine trolly, telephones, call bells, computer keyboard,	Thrice a day or more frequently if required	Hydrogen peroxide (with 0.5% H2O2) wipes (Intermediate level)	First damp mop with detergent and water followed by disinfectant wipe.

light switches, i.v poles, baby cribs, ventilator surfaces etc.)			
External surfaces of some equipment (e.g., stethoscopes, thermometers, ventilator surfaces, rubber stoppers of multiple dose vials and blood culture bottles) Permanent equipment's with plastic or rubber surfaces (e.g. BP cuffs, chair seats etc.)	Daily	Alcohols (70-90%) i.e. ethyl or isopropyl alcohol (Intermediate level) Quaternary ammonium compound wipes (polyster or nylon wipes)	Alcohol may cause discoloration, swelling, hardening, and cracking of rubber and certain plastics after prolonged and repeated use and may damage the shellac mounting of lenses in medical equipment. Do not use QAC with cotton wipes (as cotton decreases efficiency of QAC)
Low touch surfaces (Walls/ ceilings/ mirrors/window sills etc.)	Clean once a month or early if visibly dirty or whenever soiling occurs)	Damp mop with detergent and water	Do not use vacuum dryers
Spill management		For small spill- use 1% hypochlorite For Large spill- use 10% hypochlorite	
Patients body surface cleaning	Before emergency operations	Chlorhexidine (2%) based wipes (Intermediate level disinfectant)	
Part preparation	Before surgery	2% w/v Chlorhexidine with 70% alcohol or 10% povidone iodine	Do not use 2% Chlorhexidine with 70% alcohol on mucosal areas.
Wound care	Whenever required	5% povidone iodine	
Hand hygiene	Must be done as mentioned in Chapter 2	- Hand rub containing Chlorhexidine gluconate 2.5% v/v or 0.5% w/v and ethanol or isopropyl alcohol 70% v/v with moisturizer and emoluments - For people allergic to alcohol use hand rub containing Quaternary ammonium compounds	Chlorhexidine Gluconate 2% w/w based antiseptic hand wash

		(Benzalkonium chloride/ 4th& 5th generation QAC)	
Hand wash For surgical hand scrub	Must be done as mentioned in Chapter 2	(Chlorhexidine gluconate 4% w/v with detergent)	
Surgical hand rub	Must be done as mentioned in Chapter 2	(Chlorhexidine gluconate 1% w/v with 61% w/w Ethyl alcohol)	For use in between the surgical cases or in emergency surgeries
For general hand wash	Must be done as mentioned in Chapter 2	General medicated hand wash (Liquid soap)	
Fogging of OT and ICU	Weekly or more frequently as per usage of OT or when indicated in ICU	Hydrogen peroxide 7.35% + 0.23% peracetic acid (High level disinfectant)	Dissolve 25 ml solution in 1 litre of water and use for fogging of 1000 cu ft room with fogging machine.
Washing of slippers	Once a day or more frequently if required	Soap & water	
MODERATE RISK AREAS (WARDS/ LABORATORIES/ RADIOLOGY)			
Procedure	**Frequency of cleaning**	**Disinfectant to be used (type of disinfectant)**	**Precautions to be taken**
High touch surfaces such as nurse/ doctor counter/ machine surfaces	Twice daily	1% Sodium Hypochlorite	Metal surfaces have to be wiped with 70% alcohol after 5 minutes of hypochlorite application
Mopping of floor	Twice a day or more frequently if required	Damp Mop with detergent and water followed by disinfection with disinfectant (enhanced H2O2 based)	(**Use microfiber mops**) Mop in figure of 8 and start from clean area to dirty area and from inside to outside of room
Ward bed/ i.v poles	Daily and after every patient being discharged	Damp mop all the surfaces of bed (rails and stand) and mattress followed by wiping with 1 % chlorine (Sodium hypochlorite), after 5 minutes wipe with 70% isopropyl	Check for mattress leak whenever the patient is discharged.

		alcohol	
Bed linen	Must be changed when visibly dirty or whenever its soiled/ after discharge of every patient	Soak in disinfectant followed by Washing with detergent and warm water.	Send all heavily soiled linen in yellow bags. All non-soiled linens are to be sent to laundry for cleaning and disinfection
Hand rub and hand wash	Refer Chapter 1	Same as for high risk areas	
Fogging of ward	Not required	Surface disinfection of environmental surface is sufficient	May be required if any outbreak with potential spread in hospital has been suspected (consultation with Infection Control team will be required)
Discard Jars in Laboratories	Daily	2% Sodium Hypochlorite/ 5% Phenol (for TB labs)	Hypochlorite solution must be freshly prepared daily
LOW RISK AREAS (OFFICE AREAS, KITCHEN ETC):			
Procedure	**Frequency of cleaning**	**Disinfectant to be used (type of disinfectant)**	**Precautions to be taken**
Floor Mopping	Thrice daily or earlier when soiled	Lyzol/Harpic cleaners	Lyzol contains benzalkonium chloride which is a low- level disinfectant
Toilets and Bathrooms	Twice a day	Lyzol/Harpic cleaners	
Hand wash	Whenever hands are soiled. Before eating and after using toilets. Follow hand hygiene steps described in chapter 1	General medicated liquid soap	
Garbage removal	Thrice a day and more when	As per the BMW guidelines	

INSTRUMENT CLEANING/ DISINFECTION/STERILISATION			
Procedure	**Frequency of cleaning**	**Method & type of disinfectant**	**Precautions to be taken**
Surgical non disposable metal instruments	After every use	Enzymatic multi-enzyme cleaners (Containing Protease, Lipase & amylase, cellulose etc.) with neutral pH followed by autoclaving	Discard enzymatic cleaners after every use as they lack antimicrobicidal activity. See autoclave QC table below
Endoscopes or other heat sensitive instruments	After every use, clean with multi enzyme cleaners after every use followed by sterilization with chemical or high-level disinfection	Enzymatic multi-enzyme cleaners (Containing Protease, Lipase & amylase, Cellulose etc.) with neutral pH followed by (0.55% OPA or 2.4% glutaraldehyde) or plasma sterilization.	Discard enzymatic cleaners after every use as they lack antimicrobicidal activity.
Humidifiers	After every patient use and whenever its visibly dirty	Clean with multi enzyme cleaners followed by autoclaving (if autoclavable) or soak in Glutar-aldehyde overnight. Soak in 2.4 % Glutar-aldehyde for 10 hours at 20-25 ^{o}C (for chemical sterilization) or autoclave if it is autoclavable	Discard enzymatic cleaners after every use as they lack antimicrobicidal activity.
Disinfectant	**Type**	**Method**	**Precautions**
0.55% OPA	High level disinfectant (does not need activator)	Soak time is 12 minutes. This should be followed by rinsing with sterile water. Use OPA solution test strips (Used to check efficacy of OPA solution)	• OPA Solution should not be utilized to process any urological instrumentation used to treat patients with a history of bladder cancer. In rare instances OPA Solution has been associated with anaphylaxis-like reactions in bladder cancer patients undergoing repeated cystoscopies. • Should not be utilized to process instrumentation for patients with known sensitivity to OPA Solution or any of its components

2.4% Glutaraldehyde with activator and solution test strips	High level disinfectant (Needs activator)	Soak time is 20 minutes. This should be followed by rinsing with sterile water.	• Gluteraldehyde can be toxic and need to be neutralized if accidents occur in the disinfection room. • Neutralization of aldehydes can generally be achieved with dilution to less than 5 ppm, with addition of reducing agents (sodium bisulfite) or alkalizing agents (sodium hydroxide).

AUTOCLAVE AND PLASMA STERILISER QC INDICATORS

Type of indicator	Usage frequency	Use	Precautions
Biological Indicator tubes for <u>Autoclave & Plasma sterilizers</u> • Self-contained spore strips of *B. stearothermophilus* with outer tube containing modified tryptic soy broth (growth medium) and indicator (Bromocresol purple) • Could be incubated at 56 ^{o}C and be read at 24/48 hours	Daily	For Autoclave & Plasma sterilizer QC	• Must be provided with quality certificates and D value • Incubator to read the tubes must be provided.
Biological Indicator tubes for <u>ETO</u> • Self-contained spore strips of *B. atrophaeus* with outer tube containing modified tryptic soy broth (growth medium) and indicator (Bromothymol blue) • Could be incubated at 37^{o}C and be read at 24/48 hours	Daily		• Must be provided with quality certificates and D value
Biological Indicator tubes for <u>Autoclave</u> (rapid read out biological indicator with rapid read out incubator)	Daily	Indicator detects presence of viable spores by production of fluorescence in 1 to 3 hours • Use for autoclaves with 121 ^{o}C gravity steam autoclaves	• Do not use to monitor 132 ^{o}C gravity steam autoclaves • Incubator to read the tubes must be available.

		• 121 °C to 132 °C vacuum assisted autoclaves	
Chemical indicator tapes (type 1)	With every load	Used with every load. They indicate whether the instrument has been fully exposed to sterilization cycle.	
Bowie Dick tests	With every load	Used for steam sterilizers with pre-vacuum cycle. Used to prove that air removal is effective.	

Triple bucket system

- Floor cleaning
- Procedure for washing, rinsing, and sanitizing where a different bucket and sponge or mop is used for each task
- **For washing:**
  - ✓ First bucket with water and detergent is used only for this purpose and will not be used for rinsing or sanitizing
- **For Rinsing:**
  - ✓ Second bucket with water only, will be used solely for this purpose.
- **A third bucket:**
  - ✓ Containing water and a disinfectant solution shall be used for disinfection only

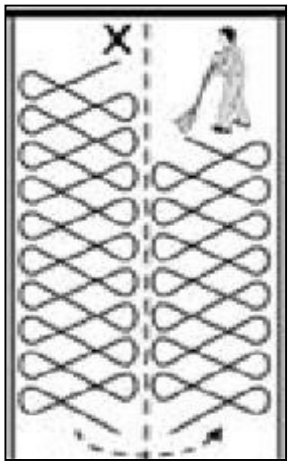


Figure of eight stroke technique for mopping

CLEANING AND DISINFECTION OF COVID-19 VENTILATOR SURFACES/UNITS

General Instructions:

1. Parts of ventilator surfaces to be cleaned and disinfected
   a. Ventilator monitor
   b. Ventilator plug and power cord
   c. Dust filters (of fan/ main air outlet/ air intake)
   d. Ventilator tubing's- inspiratory and expiratory (or use disposable)
   e. Inspiratory and expiratory valves
   f. Humidifier (autoclavable/non-autoclavable)
   g. Ambu bag

h. Reusable mask for non-invasive ventilation
i. Other tubing surfaces
j. Laryngoscope
k. Suction device (discard disposable parts)
l. Bain circuit- disposable
m. T piece- disposable
n. Nebuliser bottle

Disinfection Protocols of ventilator surfaces/parts:

S.No.	Type of surface/ part of ventilator/ suction machine	Cleaning	Disinfection	Frequency
1.	Ventilator monitor/ surfaces	Wipe with detergent water followed by water	Wipe with accelerated H2O2 wipes (BS hydro)	Three times daily
2.	Ventilator plug and power cord (**Do not unplug while being used on patient**)	Wipe with detergent water followed by water	Wipe with accelerated H2O2 wipes (BS hydro)	Three times daily
3.	Dust filters (of fan/ main air outlet/ air intake)	Dip in detergent water followed by soaking in water and air dry	Dip in 1% Bleach for 30 minutes followed by rinsing with water	Every 4 weeks or when necessary
4.	Ventilator tubing's- inspiratory and expiratory (or use disposable)	For reusable tubes- wash with detergent and water, both the lumen and outer surfaces followed by rinsing thoroughly in water	Dip in 1% Bleach for 30 minutes followed by rinsing with water	After 5 days
5.	Inspiratory and expiratory valves	Wipe with detergent water followed by water	Wipe with accelerated H2O2 wipes (BS hydro)	After patient use
6.	Humidifier (autoclavable/non autoclavable)	Wash using soft scrub or brush with detergent and water followed by rinsing in water	**Non-autoclavable:** Dip in activated 2.4% Glutaraldehyde for 20 minutes for high level disinfection or for 6 hours for chemical sterilisation **Autoclavable:** Autoclave as per manufacturer instructions	After every 48 hours
7.	Ambu bag	Same as humidifier	Same as humidifier	After every patient use
8.	Reusable mask	Same as humidifier	Same as humidifier	After 48 hours
9.	Other tubing surfaces	Wipe with detergent and water followed by water and air dry	Wipe with H2O2 wipes (0.5%)	Thrice Daily
10.	Laryngoscope (except the laryngoscope bulb) Laryngoscope with video (Dispose disposable parts such as blades)	Dip in detergent and water followed by rinsing in water. Clean lumen with brush	Dip in activated 2.4% Glutaraldehyde for 20 minutes for high level disinfection (HLD) or for 6 hours for chemical	After every patient use

			sterilisation or autoclave Wipe the laryngoscope bulb with 70% alcohol swab	
11.	Suction device (discard disposable parts/ never submerge the electrical parts)	• Wipe the electrical parts with detergent and water and air dry • Reusable jars must be scrubbed with detergent water and rinsed with water • Discard disposable tubing's	• Wipe with H2O2 wipes • Reusable jars/ tubing's should be autoclaved if autoclavable or dipped in activated 2.4% glutaraldehyde for 20 minutes (HLD) or 6 hours for chemical sterilisation	When 1/3rd full
12.	Nebuliser bottle	Same as humidifier	Same as humidifier	Every 48 hours/ or early if necessary

Check list

S.No.	Type of surface/ part of ventilator/ suction machine	Cleaning	Disinfection	Frequency
1.	Ventilator monitor/ surfaces	Yes No	Yes No	Date:
2.	Ventilator plug and power cord (**Do not unplug while being used on patient**)	Yes No	Yes No	Date:
3.	Dust filters (of fan/ main air outlet/ air intake)	Yes No	Yes No	Once a month Date:
4.	Ventilator tubing's- inspiratory and expiratory (or use disposable)	Yes No	Yes No	After 5 days Date:
5.	Inspiratory and expiratory valve surfaces	Yes No	Yes No	After patient use Date:
6.	Humidifier (autoclavable/non autoclavable)	Yes No	Yes No	After every 48 hours Date:
7.	Ambu bag	Yes No	Yes No	After every use Date:
8.	Resusable mask	Yes No	Yes No	After 48 hours
9.	Other tubing surfaces	Yes No	Yes No	Thrice Daily
10.	Laryngoscope (except the laryngoscope bulb) Laryngoscope with video (Dispose disposable parts such as blades)	Yes No	Yes No	After every use
11.	Suction device (discard disposable parts/ never submerge the electrical parts)	Yes No	Yes No	When 1/3rd full Date:
12.	Nebuliser bottle	Yes No	Yes No	Every 48 hours/ or early if necessary Date:

In Ambulance

- Use single use or single patient use medical equipment where possible
- Use disposable linen if available
- Cleaning and disinfect the ambulance after patient transfer (1% hypochlorite solution)
- Surfaces (stretcher, chair, door handles etc.) should be cleaned with a freshly prepared 0.5-1% hypochlorite solution

Cleaning Of Mobile Phones

- Mobile phones and landline phones to be cleaned with Alcohol wipes from Front and back
- Twice per shift
- Before leaving workplace
- Switch off during wiping

Lift Infection Control

- Only 3-4 people maximum per lift at a time
- Maintain two arm distance
- Hand rub/wash before and after lift use
- Clean high touch area of lift such as lift-buttons, rails and adjacent-wall area, door every one hour with 70% alcohol.
- Clean other area of lift every 8 hourly

GENERAL GUIDELINES FOR DISINFECTION OF ENDOSCOPES:-

***Clean*:** Mechanically clean internal and external surfaces, including brushing internal channels and flushing each internal channel with water and a detergent or enzymatic cleaners.

Disinfect: Immerse endoscope in high-level disinfectant such as 2.4 % glutaraldehyde after activation or 0.55% OPA and perfuse disinfectant into all accessible channels, such as the suction/biopsy channel and air/water channel and expose for a time recommended for specific products.

***Rinse*:** Rinse the endoscopes and all channels with sterile or filtered water followed by 70-90% ethyl or isopropyl alcohol to remove all traces of disinfectant.

***Drying*:** After rinsing, purge the channels using forced air. Hang endoscopes in a vertical position to facilitate drying.

Plasma sterilization (Low temperature hydrogen peroxide plasma)

Indications: Materials and devices that cannot tolerate high temperatures and humidity, such as some plastics, electrical devices, and corrosion-susceptible metal alloys, can be sterilized by hydrogen peroxide gas plasma.

Examples: Electrocautery instruments, dopplers, laser probes, defibrilator paddles, thermometers, Ophthalmic lenses, and harmonic cables, Laryngoscopes and their blades, shaver handpieces, fiber optic light cables, and surgical power drills, endoscopes, such as rigid and flexible endoscopes.
Follow manufacturer's instruction for usage.

Use biological indicators, such as a commercial preparation of spores of *Bacillus atrophaeus*, at least weekly to monitor the effectiveness of plasma sterilization.

Fogging

In patient care areas regular fogging is not recommended. Appropriate decision to be taken by in charge of concerned patient care area. **Fogging is recommended for OT**. Dissolve 5 ml of H2O2 with peracetic acid (see table 4) solution in 1 litre of water and use for fogging of 1000 cu ft room with fogging machine. Before fogging remove large debris with scoop and damp mop all the surfaces of OT and ICU (including floor and walls) with the same chemical. However, the dilution for this shall be 10 ml in 1 litre of water.

Environmental Surfaces:

Clean housekeeping surfaces (e.g., floors, walls, tabletops) on a regular basis, when spills occur, and when these surfaces are visibly soiled.
Disinfect environmental surfaces (e.g., bedside tables, bedrails, wheel chairs, door handles, light switches and laboratory surfaces) on a regular basis and when surfaces are visibly soiled.
Clean walls, blinds, and window curtains in patient-care areas when these surfaces are visibly contaminated or soiled.
Decontaminate mop heads and cleaning cloths regularly to prevent contamination (e.g., launder and dry in sunlight at least daily).

Note: A neutral detergent and warm water solution should be used for all routine and general cleaning. When a disinfectant is required for surface cleaning, e.g. after spillage or contamination with blood or body fluids, the manufacturer's recommendations for use and occupational health and safety instructions should be followed.

Preparation of 1% bleaching powder solution
Use 1% bleaching powder solution (14 grams in 1litre water (bleaching powder with 70% strength)

Preparation of chlorine solution using Hypochlorite solution

Concentration of commercially available hypochlorite solution	Required chlorine Concentration	To prepare 1000 ml	
		Solution in ml	Add water in ml
5%	2%	400	600
	1%	200	800
	0.50%	100	900
10%	0.50%	50	950
	1%	100	900
	2%	200	800

King George's Medical University, Lucknow

CHECK LIST FOR DAILY CLEANING OF FLOOR, BATHROOMS & TOILETS

Department_____ Unit_____ Area_____

Month:_____

Date	FLOOR						BATHROOM & TOILET						UTENSILS CLEANING (Urinal Bedpan, Urine Measuring Jar)						CHAPPEL WASH ICU	SIGNATURE OF THE SUPERVISOR			SIGNATURE OF ICU/WARD SISTER		
Shift	I Shift		II Shift		III Shift		I Shift		II Shift		III Shift		I Shift		II Shift		III Shift		Night shift	I Shift	II Shift	III Shift	I Shift	II Shift	III Shift
Time / Date	8 AM	12 PM	3 PM	6 PM	9 PM	6 AM	9 AM	11 AM	2PM	7PM	10 PM	5 AM	8 AM	12 PM	3PM	6PM	9 PM	6 AM							

OPD TOILET CLEANING CHECK LIST

Location:_____Month:_____

DATE	TOILET					SIGNATURE OF SUPERVISOR		SIGNATURE OF ICU/WARD SISTER	
	7 am (Full cleaning)	9 am	11 am	1 pm	3pm (Full cleaning)	9am	3 pm	9am	3 pm

NOTE:

Every two hours Toilet cleaning →Basin & Commode → Brush → Detergent → Disinfectant

PREPARED BY HOSPITAL INFECTION CONTROL COMMITTEE (HICC), KGMU

King George's Medical University, Lucknow
CHECK LIST FOR HIGH TOUCH SURFACE CLEANING

S. NO	Date																									
	High Touch Area	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
1	Pt's Cot Side Rails & Control Keys																									
2	Pt's Bed Side Locker																									
3	Dressing Trolley																									
4	Injection Trolley																									
5	Diet Trolley																									

6	**Telephone**																							
7	**Fridge Handle**																							
8	**Entrance Door**																							
9	**Computer & Accesssories**																							
10	**Cardiac Table**																							
11	**BP Cuff**																							
12	**Oxygen Flow Meter**																							

13	**Pulse Oximeter-probe**																							
14	**Ventilator / knobs**																							
15	**Stethoscopes**																							
16																								
17																								
Signature of Ward sister																								

PREPARED BY HOSPITAL INFECTION CONTROL COMMITTEE (HICC), KGMU

CHAPTER - 5

PREVENTION OF HEALTHCARE ASSOCIATED INFECTIONS (BUNDLE APPROACH)

Dr. Avinash Agrawal, Dr. Armin Ahmed, Dr. Shweta Jaiswal, Dr. Akshay Anand, Dr. A.A Sonkar, Dr. Prashant Gupta

Introduction:-

Healthcare associated infections (HAIs) are a major cause of morbidity and mortality in hospitalized patients. The magnitude of the problem is significantly bigger in developing countries due to financial constraints, variability in healthcare standards, lack of awareness and proper training of healthcare workers. Common healthcare associated infection include

1. Central line associated bloodstream infection (CLABSI)
2. Ventilator associated pneumonia (VAP)
3. Catheter associated urinary tract infection (CAUTI)
4. Surgical site infection (SSI)

In order to combat the problem of HAIs, bundle approach is recommended by various healthcare quality improvement guidelines.

DEFINITION OF BUNDLE:

A small set of evidence-based intervention for a defined patient segment/population and care setting that, when implemented together will result in significantly better outcomes than when implemented individually.

Salient features of Bundle Approach:

1. Bundle has 3 or 5 interventions with strong evidence.
2. Bundle is used in a specific patient population in a particular location.
3. Bundles are mostly descriptive and can be modulated according to local requirement of the unit.
4. Compliance of bundle is measured using all or none principle. Either the bundle is followed or it is not followed. There is nothing like “partially” followed or some points followed and others not.

1. **Central Line Associated Bloodstream Infections (CLABSI)**: defined as “Laboratory-confirmed bloodstream infection with a qualifying Central Line in place for >2calendar days on the date of event (DOE) AND the line was in place on the DOE or the day before = CLABSI”

Aetiology :

- Gram-positive organisms (coagulase-negative *Staphylococci)*, *Enterococci, Staphylococcus aureus*, Gram negative micro-organisms, *(Klebsiella, Enterobacter, Pseudomonas, E. coli, Acinetobacter spp.)*, *Candida species*

Sources of CLABSI:-Routes for contamination of catheters leading to blood stream infection (Figure1).

1. Migration of skin organisms at the insertion site into the cutaneous catheter tract and along the surface of the catheter with colonisation of the catheter tip. This is the most common route of infection for short term catheters
2. Direct contamination of the catheter or catheter hub by contact with hands or contaminated fluids or devices
3. Contaminated infusate may lead to CLABSI though this is rare.

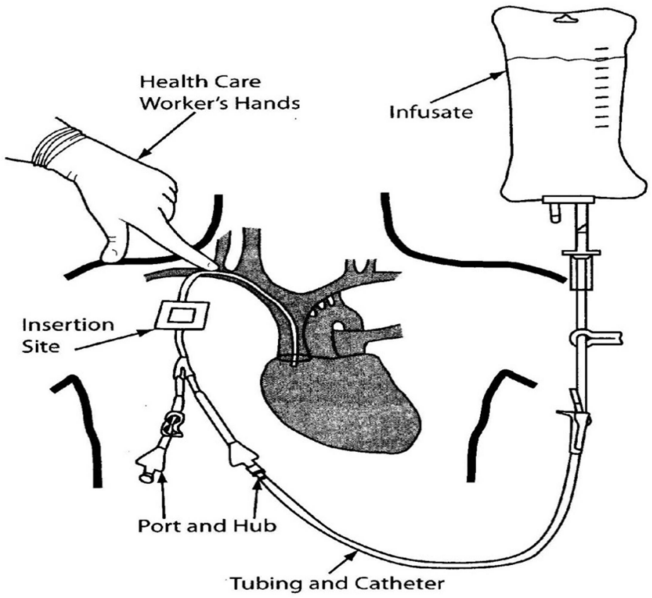


Figure 1

Central Line Insertion Bundle components:

- Hand washing /hand hygiene
- Maximal Barrier Precautions Upon Insertion
- Chlorhexidine 2% w/v for Skin Antisepsis
- Optimal Catheter Site Selection
- Daily Review of Line Necessity with Prompt Removal of Unnecessary Lines

Check list for insertion bundle is given in Table 1

Central line Insertion Bundles (Figure 2)

Perform hand hygiene & Maximal Barrier Precautions for provider

Use following steps:

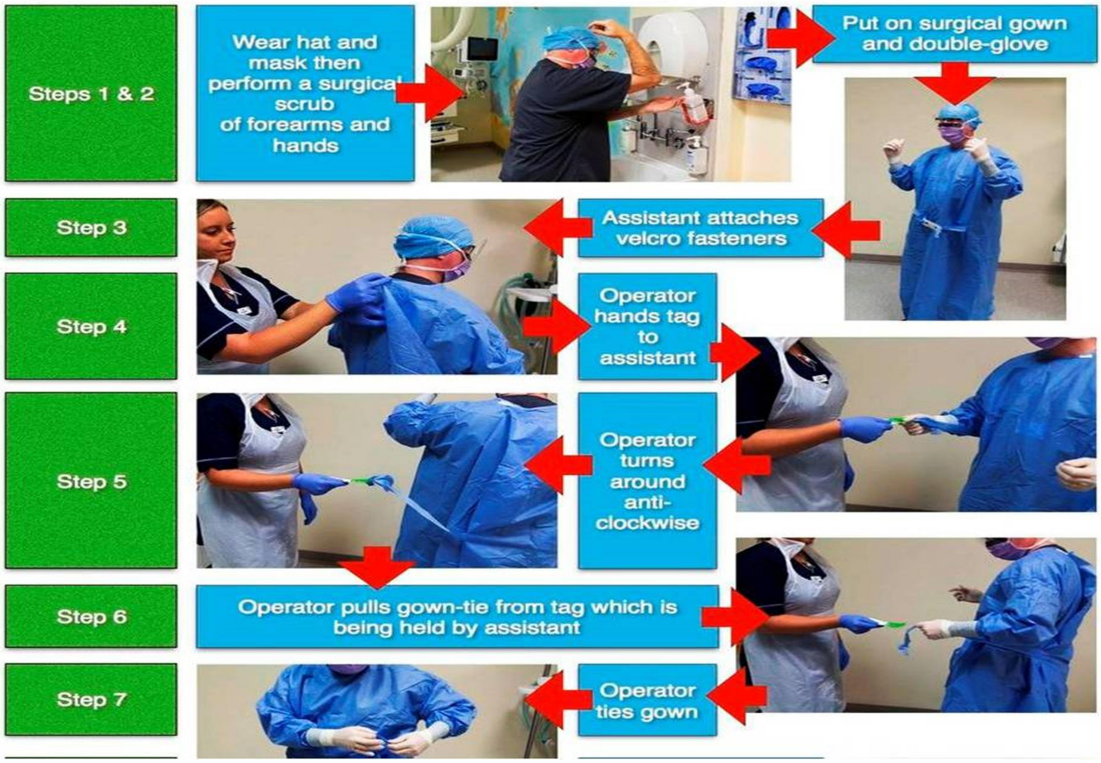


Figure 2

Maximal Barrier Precautions for patient (Figure 3):

- Cover patient's head and body with large sterile drape (angiosheet) (Figure 3)



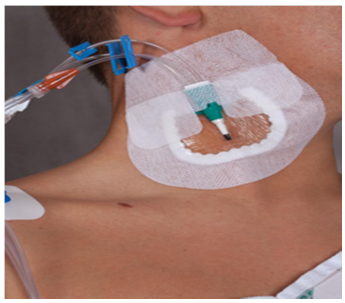
Figure 3

Optimal Site selection & Site preparation with 2% w/v Chlorhexidine:

- Prepare the skin with **2% w/v Chlorhexidine in 70% alcohol** (for children >2 months)
- The skin disinfectant MUST be allowed to dry prior (30-60 sec) to the insertion of any device.
- Prefer **subclavian site** except in hemodialysis and patients with advanced kidney disease, to avoid subclavian vein stenosis. (Figure 4)
- Internal jugular access is associated with a low rate of severe mechanical complications as compared with subclavian access, and it is preferable for short-term access (<5–7 days) and for haemodialysis catheters.
- Subclavian access is associated with a lower risk for infection and is the route of choice, in experienced hands, if the risk for infection is high (central venous catheter placement >5–7 days) or if the risk for mechanical complications is low.
- The femoral route is associated with a higher risk for infection and thrombosis (as compared with the subclavian route). It should be restricted to patients in whom pneumothorax or haemorrhage would be unacceptable.



(Subclavian vein)
Most preferred



(Internal jugular vein)



(Femoral vein)

Figure 4

Catheter Securement Devices (Figure 5):

Use a suture less securement device to reduce the risk of infection for intravascular catheters.



Sutureless securement device (Preferred)

Suture securement

Figure 5

Catheter Site Dressing Regimens (Figure6):

- Prefer a sterile transparent semi-permeable dressing e.g. (Tegaderm dressing)



Figure 6

- Inspect insertion site in 8 hrs for signs of pain, swelling, inflammation or discharge.
- Monitor the catheter sites visually or by palpation through an intact dressing on a regular basis.
- If patients have tenderness at the insertion site, fever without obvious source, or other manifestations suggesting local or bloodstream infection, the dressing should be removed to allow thorough examination of the site.

CVP- Kit for insertion (On Sterile cloth; Figure 7)



Figure 7

Table 1: CLABSI Insertion Bundle checklist :

	BEFORE PROCEDURE	
1	Hand wash followed by hand rub with **>0.5% w/v Chlorhexidine Gluconate with 70%v/v isopropyl alcohol** by operator and assistant	Yes/No
2	Site cleaning with **2% w/v Chlorhexidine** and allowed to dry (Femoral site avoided whenever possible)	Yes/No
3	Use a large full body drape to cover the patient in a sterile manner	Yes/No
	DURING PROCEDURE	
4	Sterile gloves and sterile gown worn by operator and assistant	Yes/No
5	Head cover and mask worn by operator and assistant	Yes/No
6	Sterile field maintained	Yes/No
7	Sterile sheath and sterile gel used with ultrasound probe (if applicable)	Yes/No
	AFTER PROCEDURE	
8	Ports capped using sterile technique	Yes/No
9	Sterile dressing applied using sterile technique	Yes/No
10	Chest X-ray to confirm position	Yes/No

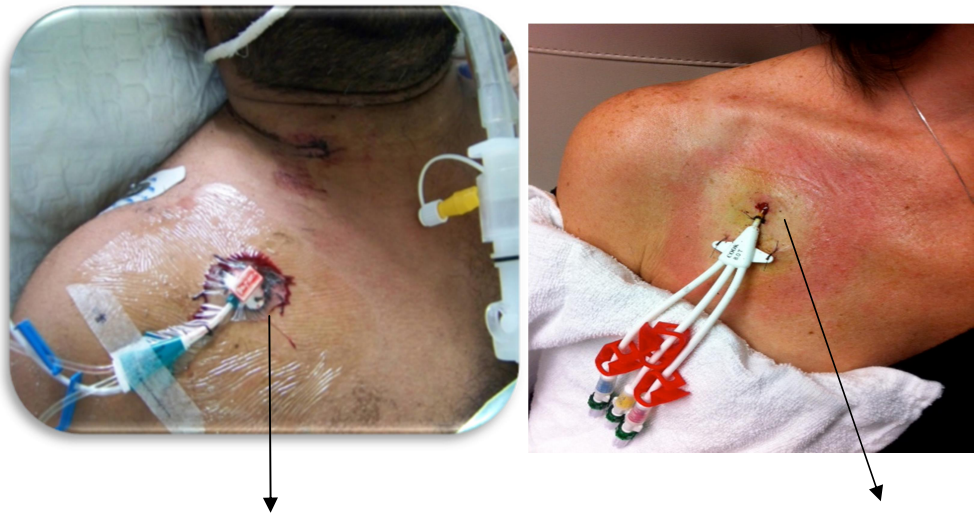
CLABSI Maintenance bundle

- Perform Hand hygiene.
- Bathe ICU patients >2 months of age with a chlorhexidine on a daily basis.
- Monitor the catheter sites visually or by palpation through an intact dressing on a regular basis.
- Scrub the access port or hub with friction immediately prior to each use with a single use application of 2% Chlorhexidine gluconate in 70% alcohol for 30 sec & allowed to dry (30-60 sec) prior to any manipulation.
- If not in continuous use catheter hubs and stopcocks should be covered with a sterile protective cap at all times.
- Change gauze dressings at least every 2 days & semi-permeable dressings at least every 7 days.
- Replace catheter site dressing if the dressing becomes damp, loosened, or visibly soiled OR patient complains of pain at the site.

Change administrations sets:

- For continuous infusions no more frequently than every 4 days, but at least every 7 days.
- If blood or blood products or fat emulsions are administered change tubing every 24 hours.
- If propofol is administered, change tubing every 6-12 hours or when the vial is changed.
- Administration sets must be discarded once detached from CVC lines.

Check the site daily for soiling and inflammation (Figure 8):

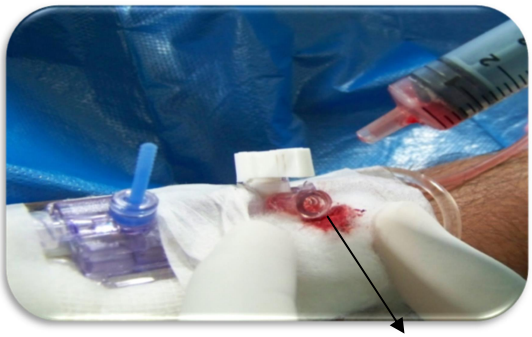


Inflammation

Soiled dressing- change immediately

Figure 8

Scrub the hub with friction immediately prior to each use with a single use application of 2% Chlorhexidine gluconate in 70% (Figure 9)



(Blood In hub source of CRBSI)

Figure 9

Check list for maintenance bundle is given below in table 2.

Table 2: CLABSI Maintenance bundle checklist:

S.No	Parameter	Morning Shift (Y/N)	Evening Shift (Y/N)	Night Shift (Y/N)
1	Hand hygiene performed with 0.5%w/v CHG and sterile gloves before handling the line			
2	Friction scrubbing of hub with 70% alcohol immediately prior to each use			
3	Transparent dressing change every 7 days			
4	If dressing is wet or soiled, replace the dressing IMMEDIATELY			
5	Change administration set (PM line/syringes) for continuous infusion every 48 hrs			
6	For Propofol infusion change tubing and syringe every 6 hrs			
7	FOR DIALYSIS CATHTER ONLY; Application of topical antibiotic cream at the time of dressing change			

Ventilator-associated pneumonia (VAP) :

A pneumonia where the patient is on mechanical ventilation for >2 calendar days on the date of event, with day of ventilator placement being Day 1, AND Ventilator was in place on the date of event or the day before.

Etiology:

Organisms of family Enterobacteriaceae, Staphylococcus aureus, Pseudomonas aeruginosa, Haemophilus influenza and Streptococci spp.

Pathogenesis

Exogenous source: Hands of health care worker, contaminated ventilator circuit (Figure 10)

Endogenous source: colonization of oropharynx and nasopharynx (Figure 11)

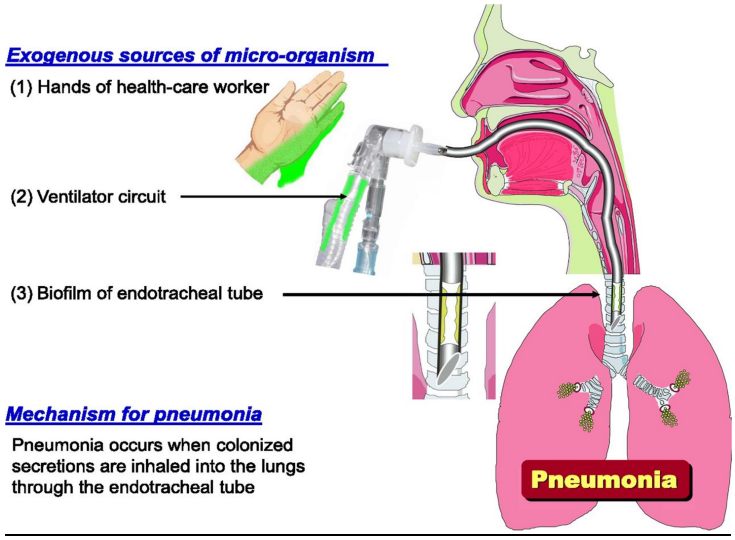


Figure 10

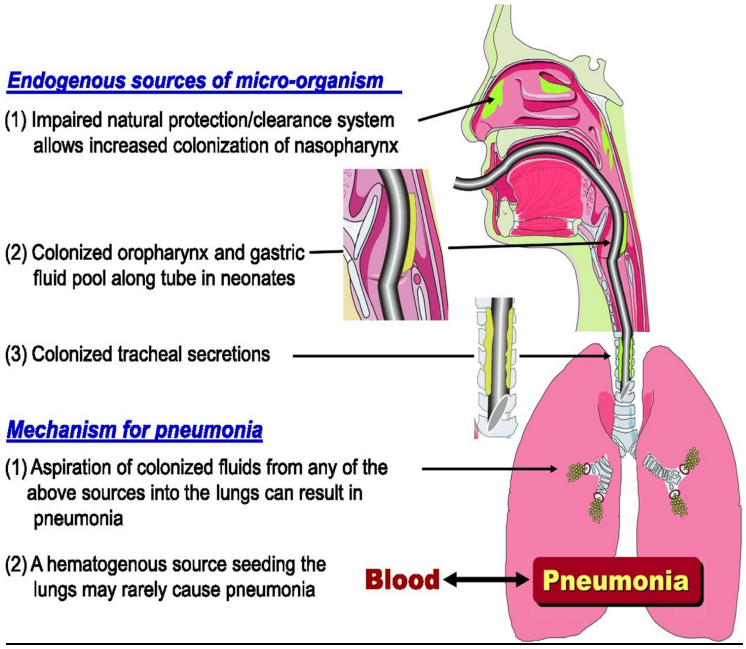


Figure 11

VENTILATOR ASSOCIATED PNEUMONIA PREVENTION BUNDLE COMPONENTS:-

- Hand hygiene (Refer Chapter1)
- Head-of-bed elevation must be at 30-45 degree (Figure 12)
- Daily interruptions of sedative infusions and spontaneous breathing trials

- Oral care with chlorhexidine gluconate (0.12%- 0.2% w/v; Figure 13)
- Control of endotracheal cuff pressure (must be at 20-30 cm water; Figure 14)
- Subglottic secretion drainage (must be done every 2 hourly; Figure 14)

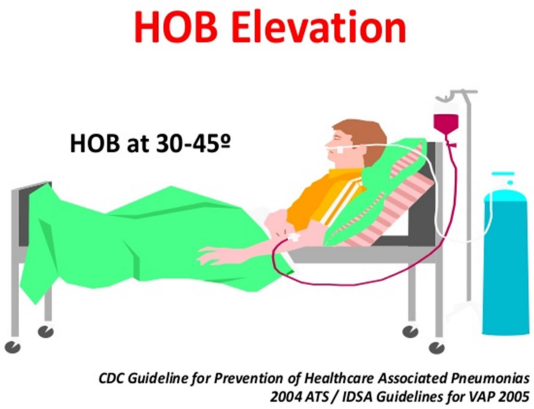


Figure 12

Oral care with chlorhexidine gluconate (0.12%- 0.2% W/V)



Figure 13

Check list for VAP prevention bundle is given in table 3.

Table 3: VAP- prevention Bundle checklist:

S.No	Parameter	Morning Shift (Y/N)	Evening Shift (Y/N)	Night Shift (Y/N)
1	Head-of-bed elevation: 30-45^0			
2	Daily interruption of sedative infusions (If not, mention reason from below*)			
3	Daily spontaneous breathing trials (If not, mention reason from below*)			
4	Routine oral care with suction tooth brush			
5	Oral care with chlorhexidine gluconate			
6	Endotracheal cuff pressure reading:			
7	Subglottic Suctioning: every 2 hourly in each shift			

Catheter-Associated Urinary Tract Infection (CAUTI)

CDC & NHSN surveillance definition criteria for CAUTI

Patient must meet 1, 2, and 3 below:

1. Patient had an indwelling urinary catheter that had been in place for > 2 consecutive days in an inpatient location on the date of event AND was either present for any portion of the calendar day on the date of event or removed the day before the date of event.
2. Patient has at least one of the following signs or symptoms: Fever (>38.0°C), Suprapubic tenderness, Costovertebral angle pain or tenderness, Urinary urgency, Urinary frequency, Dysuria
3. Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of ≥10^5 CFU/ml

Aetiology :

Escherichia coli, *Candida spp, Enterococcus spp*, *Pseudomonas aeruginosa* , *Klebsiella pneumoniae*, *Enterobacter spp.*

A smaller proportion was caused by other gram-negative bacteria and Staphylococcus spp.

Pathogenesis of CAUTI:

Source of microorganisms:

- ***Endogenous*:** (meatal, rectal, or vaginal colonization)
- ***Exogenous*:** contaminated hands of healthcare personnel during catheter insertion or manipulation of the collecting system

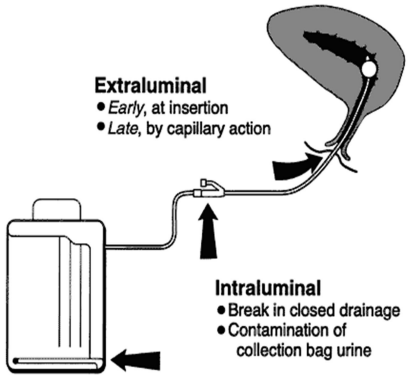


Figure 15

- Formation of biofilms by urinary pathogens is common on the surfaces of catheters and collecting systems.

What is special about CAUTI bundle?

- Variant from Classical bundle concept
- Emphasizes on preventing CAUTI by optimizing use of urinary catheters.(*studies have shown that only half of the catheters have appropriate indication)*

Core Prevention Strategies:

- Hand hygiene.
- Insert catheters only for appropriate indications.
- Leave catheters in place only as long as needed.
- Ensure that only properly trained persons insert and maintain catheters.
- Insert catheters using aseptic technique and sterile equipment (acute care setting).
- Maintain a closed drainage system.
- Maintain unobstructed urine flow.

Indications for appropriate insertion of a urinary catheter:

1. Patient has acute urinary retention or bladder outlet obstruction
2. Need for accurate measurements of urinary output in critically ill patients.
3. Perioperative use for selected surgical procedures
4. Healing of open sacral or perineal wounds in incontinent patients.
5. Patient requires prolonged immobilization (potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic fractures).
6. To improve comfort for end of life care if needed.

Use Houdini protocol to remove urinary catheter (Table 4)

Table 4: Houdini protocol to decide on removal of urinary catheter

HOUDINI Process

Indwelling Urinary Catheter Day: _____. Tick the indication.

	Indication	Yes	No
H	Haematuria		
O	Obstruction, urinary/ catheterized by Urologist		
U	Urology Surgery/ abdominal/ gynaecological or perineal surgery		
D	Decubitus Ulcer		
I	Input and output measurement		
N	Nursing end of life care		
I	Immobility: Bedbound/ Uncommunicative		

ALL NO'S ARE MET, REMOVE URINARY CATHETER

IF NOT REMOVED, reason: _____

RN Name: _____Date/ Time:_____

Indwelling Urinary Catheter Insertion Bundle (Figure 16):

1. Hand wash followed by hand rub with > 0.5%w/v Chlorhexidine Gluconate with 70% isopropyl alcohol formulation by trained operator.
2. Perform peri-care, then, re-perform hand hygiene
3. Maintain strict aseptic technique throughout insertion procedure Use sterile gloves and equipment and maintain sterile field.
4. A single use packet of lubricant jelly was used for insertion.
5. Insert catheter to appropriate length and check urine flow before balloon inflation to prevent urethral trauma. In males, insert fully to the IUC "y" connection & in females, advance ~1 inch or 2.5 cm beyond point of urine flow.
6. Inflate catheter balloon correctly: Inflate to 10 ml for catheters labelled 5 ml or 10 ml per manufacturer's instructions.
7. Perform Triple Action for catheter/Drainage System:

- Secure catheter to prevent urethral irritation.
- Position drainage bag below the bladder (but not resting on the floor).
- Check system for closed connections and no obstructions/kinks.

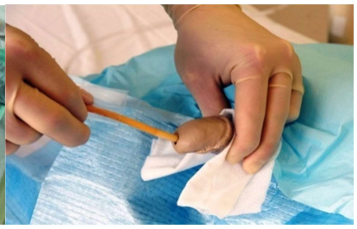
Check list for insertion and maintenance of urinary catheter has been provided in Table 5 & 6.



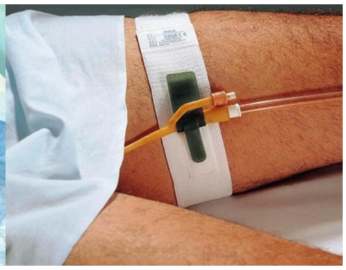


Hand hygiene | Wear gloves & perform pericare | After peri-care again perform hand hygiene





Wear sterile gloves | Maintain sterile field | Insert sterile lignocaine gel & catheter

Inflate balloon | Secure the catheter

Figure 16

Maintain a closed drainage system & unobstructed urine flow (Figure 17):

- If breaks in aseptic technique, disconnection, or leakage occur, replace catheter and collecting system using aseptic technique and sterile equipment.
- Obtain urine samples aseptically.
- Keep catheter and collecting tube free from kinking
- Keep collecting bag below level of bladder at all times (do not rest bag on floor)
- Empty collecting bag regularly using a separate, clean container for each patient. Ensure drainage spigot does not contact nonsterile container.

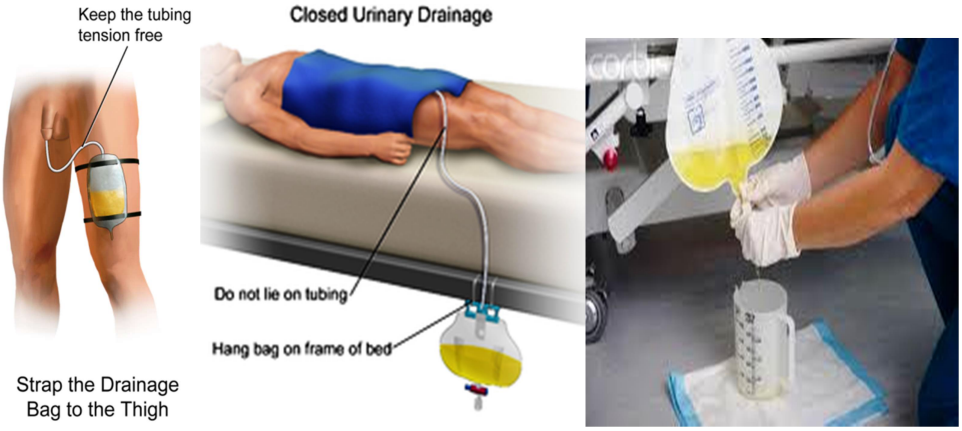


Figure 17

Drainage bag must be below level of the bladder and must not touch the floor (Figure 18)

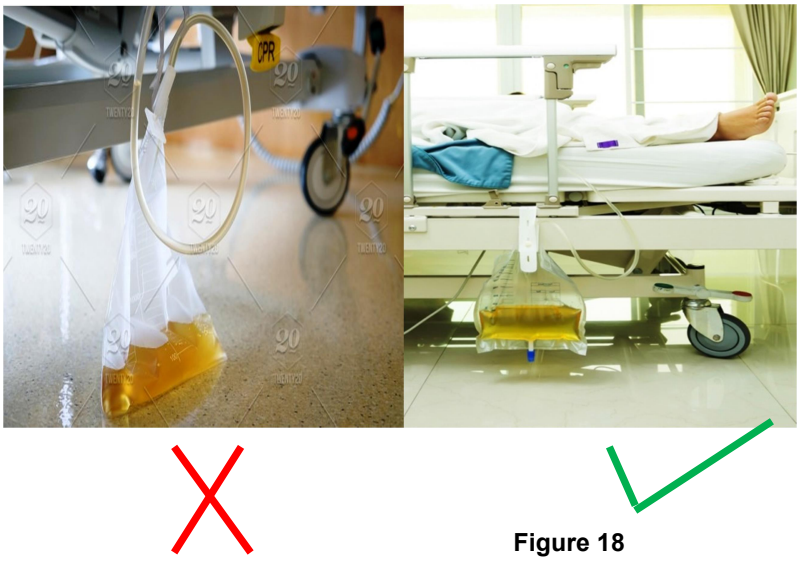


Figure 18

Strategies NOT recommended for CAUTI prevention:

- Antiseptic-releasing cartridges in drain port.
- Changing catheters or drainage bags at routine, fixed intervals (clinical indications include infection, obstruction, or compromise of closed system)
- Routine antimicrobial prophylaxis.
- Cleaning of periurethral area with antiseptics while catheter is in place (use routine hygiene).
- Irrigation of bladder with antimicrobials.
- Instillation of antiseptic or antimicrobial solutions into drainage bags.
- Routine screening for asymptomatic bacteriuria (ASB).

Table 5: CAUTI Insertion Bundle checklist:

1	**Indications for appropriate insertion of a urinary catheter: (tick the correct one)** • Patient has acute urinary retention or bladder outlet obstruction • Need for accurate measurements of urinary output in critically ill patients. • Perioperative use for selected surgical procedures • Healing of open sacral or perineal wounds in incontinent patients. • Patient requires prolonged immobilization (potentially unstable thoracic or lumbar spine, multiple traumatic injuries such as pelvic fractures). • To improve comfort for end of life care if needed.	
2	Hand wash followed by hand rub with >0.5%w/v Chlorhexidine Gluconate with 70% isopropyl alcohol formulation by trained operator.	Yes /No
3	Perform peri-care, then, re-perform hand hygiene	Yes /No
4	Maintain strict aseptic technique throughout insertion procedure • Use sterile gloves and equipment and maintain sterile field. • Do not pre-inflate the balloon to test it. A single use packet of lubricant jelly was used for insertion?	Yes/No
5	Insert catheter to appropriate length and check urine flow before balloon inflation to prevent urethral trauma • In males, insert fully to the IUC "y" connection. • In females, advance ~1 inch or 2.5 cm beyond point of urine flow.	Yes/No
4	Inflate catheter balloon correctly: Inflate to 10 ml for catheters labelled 5 ml or 10 ml per manufacturer's instructions.	Yes/No
5	Perform Triple Action for catheter/Drainage System: • Secure catheter to prevent urethral irritation. • Position drainage bag below the bladder (but not resting on the floor). • Check system for closed connections and no obstructions/kinks.	Yes/No

Table 6: CAUTI Maintenance bundle check list:

S.No	Parameter
1	Assessment whether catheter is needed?
2	Hand hygiene was performed and gloves were used to manipulate catheter or drainage system?
3	Catheter and tubing are free of kinks and well secured?
4	Catheter has been continuously connected to tubing? If NO, document reason for the break and if it was managed aseptically
5	Urine is draining well (i.e., no obstruction or blockages noted)

	if NO, determine what action may be required
6	Drainage bag is below level of the bladder and does not touch the floor?
7	Drainage bag was emptied regularly into a clean dedicated container, with no contact between the container and the drainage spout?
8	Perineal cleansing was provided at least once daily and **AFTER EACH BOWEL MOVEMENT**
9	Assess need for catheter change (soiled/ dirty/ blocked)

Surgical Site Infection (SSI):

The Centers for Disease Control and Prevention's (CDC's) & National Health care Safety Network (NHSN) definitions for SSI are widely used for public reporting, interfacility comparison, and for performance comparisons.
B. SSIs are classified (Figure1) as follows

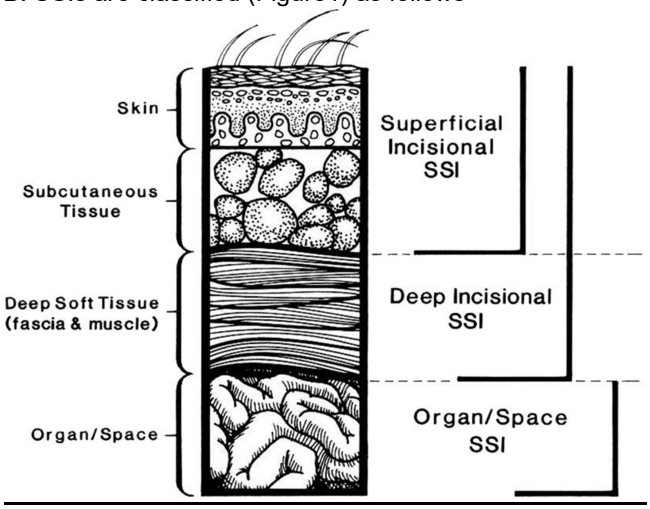


Figure 1

Superficial incisional SSI: Must meet the following criteria:
Date of event occurs within 30 days after any NHSN 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. Organism(s) identified from an aseptically-obtained specimen from the superficial incision or subcutaneous tissue by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment.
c. Superficial incision that is deliberately opened by a surgeon, attending physician* or other designee and culture or non-culture based testing of the superficial incision or subcutaneous tissue is not performed AND patient has at least one of the following signs or symptoms: localized pain or tenderness; localized swelling; erythema; or heat.
d. Diagnosis of a superficial incisional SSI by the surgeon, attending physician or other designee.

Deep incisional SSI must meet the following criteria:

The date of event occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table 1
AND

involves deep soft tissues of the incision (for example, fascial and muscle layers)
AND
patient has at least one of the following:
a. Purulent drainage from the deep incision.
b. Deep incision that spontaneously dehisces, or is deliberately opened or aspirated by a surgeon, attending physician* or other designee AND organism(s) identified from the deep soft tissues of the incision by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment or culture or non-culture based microbiologic testing method is not performed. A culture or non-culture based test from the deep soft tissues of the incision that has a negative finding does not meet this criterion.
AND
patient has at least one of the following signs or symptoms: fever (>38°C); localized pain or tenderness.
c. An abscess or other evidence of infection involving the deep incision that is detected on gross anatomical or histopathologic exam, or imaging test.

Organ/Space SSI Must meet the following criteria:

Date of event occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table1
AND
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 (for example, closed suction drainage system, open drain, T-tube drain, CT-guided drainage).
b. Organism(s) identified from fluid or tissue in the organ/space by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment.
c. An abscess or other evidence of infection involving the organ/space that is detected on gross anatomical or histopathologic exam, or imaging test evidence suggestive of infection.
AND
meets at least one criterion for a specific organ/space infection site listed in Table 2.
Table 1. Surveillance Periods for SSI Following Selected NHSN Operative Procedure Categories. Day 1 = the date of the procedure.

30-day Surveillance			
Category	Operative Procedure	Category	Operative Procedure
AAA	Abdominal aortic aneurysm repair	LAM	Laminectomy
AMP	Limb amputation	LTP	Liver transplant
APPY	Appendix surgery	NECK	Neck surgery
AVSD	Shunt for dialysis	NEPH	Kidney surgery
BILI	Bile duct, liver or pancreatic surgery	OVRY	Ovarian surgery
CEA	Carotid endarterectomy	PRST	Prostate surgery
CHOL	Gallbladder surgery	REC	Rectal surgery
COLO	Colon surgery	SB	Small bowel surgery
CSEC	Cesarean section	SPLE	Spleen surgery
GAST	Gastric surgery	THOR	Thoracic

			surgery
HTP	Heart transplant	THYR	Thyroid and/or parathyroid surgery
HYST	Abdominal hysterectomy	VHYS	Vaginal hysterectomy
KTP	Kidney transplant	XLAP	Exploratory laparotomy

90-day Surveillance	
Category	Operative Procedure
BRST	Breast surgery
CARD	Cardiac surgery
CRGB	Coronary artery bypass graft with both chest and donor site incisions
CBGC	Coronary artery bypass graft with chest incision only
CRAN	Craniotomy
FUSN	Spinal fusion
FX	Open reduction of fracture
HER	Herniorrhaphy
HPRO	Hip prosthesis
KPRO	Knee prosthesis
PACE	Pacemaker surgery
PVBY	Peripheral vascular bypass surgery
VHN	Ventricular shunt

Superficial incisional SSIs are only followed for a 30-day period for all procedure types.
Secondary incisional SSIs are only followed for a 30-day period regardless of the surveillance period for the primary site.

Table 2. Specific Sites of an Organ/Space SSI:

Category	Specific Site	Category	Specific Site
BONE	Osteomyelitis	MED	Mediastinitis
BRST	Breast abscess or mastitis	MEN	Meningitis or ventriculitis
CARD	Myocarditis or pericarditis	ORAL	Oral cavity infection (mouth, tongue, or gums)
DISC	Disc space infection	OREP	Deep pelvic tissue infection or other infection of the male or female reproductive tract
EAR	Ear, mastoid infection	PJI	Periprosthetic joint infection
EMET	Endometritis	SA	Spinal abscess/infection
ENDO	Endocarditis	SINU	Sinusitis
GIT	Gastrointestinal (GI) tract infection	UR	Upper respiratory tract, pharyngitis, laryngitis, epiglottitis
IAB	Intraabdominal infection, not specified elsewhere	USI	Urinary System Infection
IC	Intracranial infection	VASC	Arterial or venous infection
JNT	Joint or bursa	VCUF	Vaginal cuff infection

	infection		
LUNG	Other infection of the lower respiratory tract		

Pathogenesis:
Endogenous:

1. Patient flora: skin ,mucous membranes, GI tract
2. Seeding from a distant focus of infection

Exogenous

1. Surgical Personnel (surgeon and team)
   - Soiled attire
   - Breaks in aseptic technique
   - Inadequate hand hygiene
2. Physical environment and ventilation
3. Tools, equipment, materials brought to the operative field

Organisms Causing SSI:
Staphylococcus aureus, Coagulase-negative staphylococci, Enterococcus spp.,Escherichia coli, Pseudomonas aeruginosa, Enterobacterspp, Klebsiella pneumoniae, Candida spp., Klebsiella oxytoca, Acinetobacter baumannii.

Core Prevention Strategies (Bundles):

Preoperative Measures

1. Do not remove hair at the operative site unless it will interfere with the operation; do not use razors. If necessary, remove by clipping or by use of a depilatory agent.
2. Do not use antibiotic prophylaxis routinely for uncomplicated clean surgeries without prosthetic implants.
3. Administer prophylactic antibiotic within 1 hour prior to incision (2hr for vancomycin and fluoroquinolones). Select appropriate agents on basis of:
   - Surgical procedure
   - Most common SSI pathogens for the procedure
   - Published recommendations
4. Skin Prep: Use appropriate alcohol containing antiseptic agent (unless contraindicated) and technique for skin preparation.
5. Maintain normothermia in patient throughout the surgery.
6. Maintain normoglycaemia in patient throughout the surgery.

–Colorectal surgery patients
- Mechanically prepare the colon (Enemas, cathartic agents)
- Administer non-absorbable oral antimicrobial agents in divided doses on the day before the operation

Intraoperative Measures:
–Operating Room (OR) Traffic
- Keep OR doors closed during surgery except as needed for passage of equipment, personnel, and the patient

--Wear sterile surgical attire

-- Use sterile drapes and sterile instruments

Postoperative Measures:
–Surgical Wound Dressing

- Protect primary closure incisions with sterile dressing for 24-48 hrs post-op

–Control blood glucose level during the immediate post-operative period (cardiac surgeries)

- Measure blood glucose level at 6AM on post operative day (POD) 1 and 2 with procedure day = POD#0
- Maintain post-op blood glucose level at <200mg/dL

-- Discontinue antibiotics within 24hrs after surgery end time (48hrs for cardiac surgeries)

Supplemental Prevention Strategies:

Preoperative

- Advise patients to shower or bathe (full body) with soap (antimicrobial or nonantimicrobial) or an antiseptic agent on at least the night before the operative day.
- Nasal screen and decolonize only *Staphylococcus aureus* carriers undergoing elective cardiac and other procedures (i.e., orthopaedic, neurosurgery procedures with implants) with preoperative mupirocin therapy
- Screen preoperative blood glucose levels and maintain tight glucose control POD#1 and POD#2 in patients undergoing select elective procedures (e.g., arthroplasties, spinal fusions)

Perioperative

- Redose antibiotic at the 3 hr interval in procedures with duration >3hrs.
- Adjust antimicrobial prophylaxis dose for obese patients (body mass index >30)
- Use at least 50% fraction of inspired oxygen intraoperatively and immediately postoperatively in select procedure.

Postoperative: Before initiating any antibiotic for suspected SSI, wound sample must be sent for culture to microbiology lab.

CHAPTER - 6

PATIENT ISOLATION AND VISITATION PROTOCOL

Dr. D. Himanshu, Dr.Nitin Bhardwaj

The 1996 CDC guidelines include recommendations designed to minimize the risk of occupational exposure (and subsequent transmission to others) to blood and body fluids of patients.

***Standard precautions*:** The new standard precautions consider all patients and their bodily fluids (except sweat) to be potentially infectious, thereby replacing the old universal precautions which applied only to blood and visibly bloody fluids.

1. Gloves are required when hand contact with any of these fluids is anticipated, and hands should be washed after the gloves are removed.
2. Impervious gowns must be worn by heath care workers to prevent soiling of clothes by splashes of blood or body fluids, and masks along with eye protection are mandated if splashes toward the face are anticipated.

***Additional isolation categories*:** In addition to the standard precautions, the guidelines include three isolation categories based upon the three modes of infection transmission:

- Contact,
- Respiratory droplets
- Airborne spread.

Contact may occur directly with the source of the microorganism, or indirectly via contamination of the inanimate environment. Direct contact includes touching, sexual contact, percutaneous or mucous membrane exposure, or exposure via an infectious vector (e.g., an insect). Organisms that can spread by direct contact include Clostridium difficile, herpes simplex virus (mucocutaneous), scabies, and multidrug-resistant organisms in the gastrointestinal tract, sputum, or wounds.

Respiratory droplets are large particles expelled during coughing, sneezing, talking, or singing. Transmission through droplets is less than six feet from the source patient. The major organisms spread as respiratory droplets are *Haemophilus influenzae* type b (invasive), *Neisseria meningitidis*, *Mycoplasma pneumoniae*, *Bordetella pertussis*, **influenza virus,** and rubella virus.

Airborne spread depends upon aerosolisation of small particles of the infectious agent that can then travel over long distances through the air. Mycobacterium tuberculosis, varicella-zoster virus, and measles are the most common nosocomial pathogens transmitted by this route.

The specific infection control measures required to prevent spread through contact, droplet, and airborne route are outlined in

Synopsis of recommended infection control measures from HICPAC guidelines:

Contact precautions

- Private room preferred; cohorting allowed if necessary.
- Gloves required upon entering room. Change glovesafter contact with contaminated secretions.
- Wash hands after removing gloves.
- Gown required if clothing likely to come into contactwith the patient or environmental surfaces, or if thepatient has diarrhea.
- Wash hands with antimicrobial soap before leaving the patient's room.
  Minimize risk of environmental contamination duringpatient transport (e.g., patient can be placed in a gown).Non-critical items should be dedicated for use of asingle patient only, if possible.

Droplet precautions

- Private room preferred; cohorting allowed if necessary.
- Wear a mask when within 3 feet of the patient.
- Mask the patient during transport.

Airborne precaution

- Place the patient in a monitored negative pressure roomwith at least 6 -12 air exchanges per hour.
- Room exhaust must be appropriately dischargedoutdoors or passed through a HEPA (high-efficiencyparticulate aerator) filter before recirculation within thehospital.
- A certified respirator must be worn when entering theroom of a patient with diagnosed or suspectedtuberculosis. Susceptible individuals should not enter the room of patients with confirmed or suspectedmeasles or chickenpox.
- Transport of the patient should be minimized; the patient should be masked if transport within the hospitalis unavoidable.

Current Situation and recommendations for KGMU:

Contact precautions

- Adult diarrhea patients sent to Infectious diseases Unit for isolation. Cohort isolation done.
- Hand rubs used as per their availability
- Status of C. diff patients unknown
- Pediatric isolation absent

Recommendation

- Start pediatric isolation ward
- Proper supply of hand rubs
- Testing for C. difficile
- To include herpes patients and scabies patients for isolation in IDH
- To make proper availability of non sterile gloves in wards
- To keep separate gown or apron for wards for health care workers
- Patient gowns to be made available

Droplet Precautions

- Stable adult patients kept in infectious diseases ward
- Unstable adult patients kept in Medicine ward 1
- Cohort isolation being done
- Pediatric patients being isolated in pediatric ward

Recommendation

- Create a ward at the source of entry away from the entrance door with complete oxygen supply. Would be recommended looking at the annual epidemic of influenza cases.
- Provide Oxygen supply for IDH wards so that all patients can be segregated in IDH
- Proper supply of 3 ply masks
- Mask the patient during transport

Airborne precaution

- Isolation of open cases of tuberculosis in TB ward in pulmonary medicine
- Stable adult Chicken Pox patients managed in IDH. Critical patients managed in medicine wards.
- Pediatric cases isolated in trauma

Recommendations:

- Creating pediatric isolation
- Create negative pressure room with HEPA filters specially for MDR and XDR cases
- Presence of N95 masks for these patients
- Isolation wards be made capable to handle high risk and unstable patients

Isolation of Vancomycin resistant cases and Colistin resistant cases is highly recommended. Regular training of all Health Care Workers regarding the policy be made mandatory. IEC material/ posters be installed in high risk wards

Visitors Policy For In Patients:

- One attendant is a must for all patients.
- Different colour code (pink, yellow) be issued for different areas if feasible (intensive care, HDU vs. general ward)
- Two attendant passes will be issued for all admissions.
- Patient attendant waiting area to be made available outside of each HDU/ICU.
- One attendant will be allowed inside for each patient with a pink pass.
- One attendant will be allowed to be a reliever with a yellow pass.
- The general visiting hours for all patients are 4:30 p.m. to 6:30 p.m.
- Visiting hours for the ICU's will vary (as per the ICU in charge faculty) and only two attendants (but one by one)will be allowed during the visiting hours.
- Children are strictly prohibited from entering the ICU's.

Visitor Information:

Written information to be provided in both Hindi and English at time of admission which should include the following instructions.

- The visiting hours are between 4:30 p.m. to 6:30 p.m. (Kindly keep the number of visitors to the barest minimum to avoid cross infections).
- Visiting hours for the ICU's are variable and only two attendants are allowed during the visiting hours.
- Please refrain from visiting patients if you have symptoms such as fever, cough or cold.
- Children of age 12 and under are not encouraged in visiting patients due to their relatively low immunity.
- To respect the privacy of our patients, visitors and staff, taking photographs, audio or video recording using any devices (camera, video-camera, phone-camera, voice recorder) are not allowed within the hospital premises.
- KGMU reserves the right to request for such recordings to be deleted.
- Please wash your hands thoroughly with soap and water or use an alcohol-based hand rub after visiting patients in the hospital.
    - **Do Not Tip:** As a service Organization, we wish to extend every courtesy to all our patients. All of our employees have been instructed not to accept any tip in kind or cash.
    - **No Smoking:** The hospital is a No Smoking Zone. Smoking or Consumption of Alcohol is Strictly Prohibited.
    - **No Chewing Tobacco in Hospital premises**
    - Visitors to use Sulabh Shauchalaya only, available at various locations in hospital premise.

If feasible the instructions be duly signed by the patients relatives or the patient himself, at the time of admission

Quality of security guards to be improved with regular training of gaurds for proper enforcement of rules

Hospital administration to make sure proper display of directions/locations of following, for the patient attendants

- Waiting area
- Canteen
- Toilets
- Blood bank
- Sample Collection centre
- ATM
- Police post

Special Situations

CDC recommendations for the management of Suspected Viral Haemorrhagic Fever (for Ebola suspected patients)

- Place the patient in a private negative pressure room. An ante-room is useful for donning personal protective equipment.
- Non-essential staff and visitors should not enter
- Gloves and gowns should be worn. Surgical masks and eye protection (e.g., goggles) are mandatory when within three feet of the patient.
- HEPA respirators should be used if the patient is coughing, vomiting, or haemorrhaging, or has diarrhoea.
- Standard precautions should be followed to minimise the risk of injuries by sharps.
- Clinical laboratory specimens should be transported to and handled in the lab with special precautions. Consultation with experts in biosafety should be obtained.
- Environmental surfaces and contaminated objects should be cleaned and disinfected. Linen can be autoclaved or incinerated.
- Bodily wastes should be autoclaved or disinfected prior to disposal. Medical waste such as needles and syringes should be incinerated or disinfected.
- If the patient dies, the corpse should be placed in a sealed, leakproof material, and cremated or buried in a sealed casket.
- Exposed persons should be placed under close medical surveillance and receive appropriate follow-up.

CHAPTER - 7

HEALTH CARE WORKERS SAFETY

Dr.D. Himanshu, Dr. Nitin, Prof. Kirti Srivastava

Post Exposure Prophylaxis guidelines for HIV Exposure

GENERAL MEASURE
A. Do not panic, reassure the person
B. Do not disclose identity of source as well as exposed person
C. Clean the wound/exposed area with soap and water
D. Do not squeeze the puncture site, do not apply antiseptic/disinfectant
E. Record baseline data and important particulars

Potentially infectious body fluid
Exposure to body fluid--Considered "at risk" Considered "not at risk"
- Blood Tear
- Semen Sweat
- Vaginal Secretion Urine / Faeces
- CSF Saliva
- Synovial, Pleural, Pericardial Sputum
- Peritoneal fluid
- Amniotic fluid Vomit us
- Any body fluid contaminated with "visible blood" shall be considered "at risk"

Risk of HIV Transmission
Exposure Route Risk of HIV Transmission

- Blood Transfusion 90-95%
- Perinatal 20-40%
- Sexual Intercourse 0.1-10%
- Vaginal 0.05-0.1%
- Anal 0.065-0.5%
- Oral 0.005-0.01%
- Injecting Drug Use 0.67%
- Needle Stick Exposure 0.3%
- Mucous Membrane splash to Eye, Oro-nasal 0.09%

Note: Needle stick Exposure to HBV is 9-30% and to HCV is 1-9%

Management of Exposure site
Splash of Blood/OPIM
– Unbroken skin
• Wash area immediately
• Do not use anti septic
– Eye
• Eye irrigation with water or Saline
• If using contact lens leave them in place while irrigating. Remove once eye is cleaned remove them & clean
-Mouth
• Spit fluid immediately
• Rinse mouth thoroughly with water / saline repeatedly
• Do not use soap or disinfectant

Establish eligibility for PEP
• Designated person/ trained person must assess the risk of HIV/HBV transmission after AEB

• Must be made rapidly so PEP can be given ASAP
• First dose of PEP preferably within 2 hours

HIV status of source of Exposure
• PEP need to within 72 hours of exposure
• Base line rapid HIV testing before PEP
• Do not delay PEP while waiting for result of HIV testing
• Informed consent must before testing of source as per National guidelines
• Positive HIV result help in decision to start PEP but Negative result doesn't exclude HIV infection

Counseling for PEP
• Duration of PEP (4 weeks)
• Importance of drug adherence
• Common side effects, likely to be experienced
• PEP can be stopped at any time; may not get benefit if the source is HIV positive
• Prevention practices at the time of PEP (Barrier protection / contraception)
• Provider should correct misconceptions during all times of counselling sessions

Laboratory follow-up
Timing In persons taking Standard PEP
Weeks 2 & 4 Complete Blood Count (For AZT patients)
Weeks 6 HIV-Ab
Month 3 HIV-Ab
Month 6 HIV-Ab

1. **PEP recommendations**
   a. **Occupational Exposure**

Exposure Codes *	HIV Source Code**	PEP Recommendations	Duration
1	1	Not warranted	28 days
1	2	Recommended	
2	1		
2	2		
3	1 or 2		
2/3	Unknown	Consider PEP, if HIV prevalence is high in the given population & risk categorisation	

**-Details of Exposure codes at Annexure 1*
***-Details of HIV Source Code at Annexure 2*

b. **In case of Sexual Assault:** PEP should be provided to exposed person in case of sexual assault as a part of overall package of post sexual assault care.

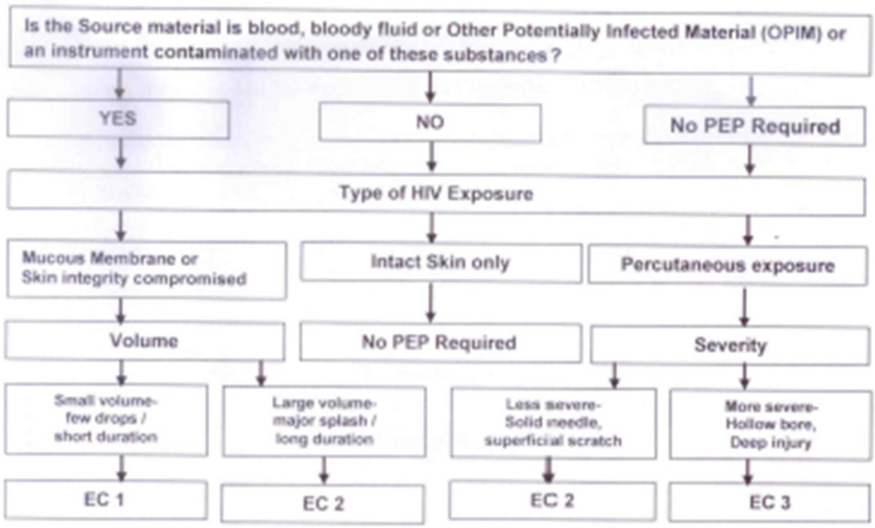
2. **PEP regimen**

a. Wherever PEP is indicated and source is ART naive or unknown: **recommended regimen is Tenofovir 300 mg + Lamivudine 300 mg + Efavirenz 600 mg once daily for 28 days**. Wherever available, single pill containing these formulations should be used. Dual drug regimen should not be used any longer in any situation for PEP.

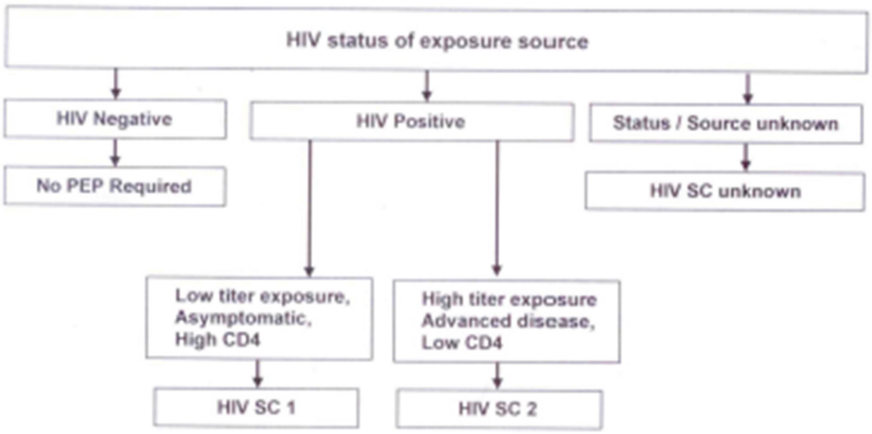
b. The first dose of PEP regular should be administered as soon as possible, preferably within 2 hours of exposure and the subsequently dose should be given at bed time with clear instruction to take it 2-3 hours after dinner & to avoid fatty food in dinner.

c. In case of intolerance to Efavirenz, regimen containing Tenofovir + Lamivudine + PI (ATV/r or LPV/r) can be used after expert consultation by an experienced physician.

Annexure 1: HIV Exposure Code



Annexure 2: HIV Source Code



Post exposure prophylaxis guidelines for Hepatitis B virus:

General Measures

A. Do not panic, reassure the person
B. Do not disclose identity of source as well as exposed person
C. Clean the wound/exposed area with soap and water
D. Do not squeeze the puncture site; do not apply antiseptic/disinfectant
E. Record baseline data and important particulars

For Persons Who Are Unvaccinated

A- If source is HBsAg positive give single dose of Hepatitis B Immunoglobulin (HBIG) and start vaccine series.

B- If source is HBsAg negative no HBIG to be given start vaccine series

C- If source is unknown or not available for testing start vaccine series without giving HBIG

For Persons Who Are Vaccinated

A - If the person exposed is a known responder no treatment required irrespective of the status of the patient (positive, negative, unknown)

B - If the person is a known non responder- give one dose of HBIG and initiate revaccination if source is HBsAg positive, no treatment if source is negative.

C - If source is unknown but high risk consider it as HBsAg positive

For Persons with Unknown Antibody Status

A - Test exposed person for anti HBs antibody, if responder no treatment is Needed

B - If inadequate give one dose of HBIG and vaccine booster dose

C - If source is negative no treatment is needed

D - When source is unknown or not available for testing check for antibody titers. If responder- no treatment needed but if non-responder a vaccine booster is needed along with rechecking titres 1-2 months later.

Post Exposure Prophylaxis Dose and Schedule

A - The dose of HBIG is 0.06 ml/kg body weight single IM injection

B - Preferably should be given within 24 hours of exposure or at least within 7 days of needlestick injury

C - In cases of sexual contact with HBsAg positive patient HBIG can be given upto 2 weeks from day of exposure

D - Hepatitis B vaccine should be given in schedule of 0,1,4-6 month 3 IM injections.

E - HBIG and Vaccine can be administered simultaneously at different IM sites

Follow Up of HBV Exposed Persons:
A. Perform follow up Anti HBs testing in persons exposed to HBV who received hepatitis B vaccine
B. Test for Anti HBs titer after1-2months of last dose of vaccine
C. Anti HBs response cannot be ascertained if person has received HBIG in within previous 3-4 months
D. If Acute HBV positive work up on the lines of HBV infection

Immunoglobulins are provided from MS office after reporting of the exposure and testing for Anti HbsAg titres.
It is mandatory to report the exposure to either at ART center of KGMU on first floor of Old OPD or at Occupational Hazard OPD at room no. 207 , New OPD

Adult Immunization*

Adult (Health Care Workers) [1]
1. Influenza (Annual)
   (Inactivated)
2. Tdap 0.5 ml Single Dose
3. Td every 10 years after Tdap
4. MMR - 0.5 ml, 0, 28 days
5. Hepatitis B - 0,1,6 Titres- 2 months after last vaccine
6. Varicella 0, 1 month (if no history of infection of chicken pox or vaccination in past)

Special Situations

a) > 65 years or Immuno compromised
   1. Zoster: Single Dose (Currently not available in India)
   2. Pneumococcal: PCV - 13: Single Dose to be given and PPSV23 to be given 1 year after PCV 13

b) Female in reproduction age group
   HPV - 0,1-2, 6 months
c) Asplenia
   1. Pneumococcal
   2. Hib (Homophiles influenza b)
   3. Meningococcal- 2 doses to be given 2 months apart

Important vaccines for Foreign travel
a) Yellow fever Single Dose - at least 10 days prior to travel.
to be repeated after 10 days (done in Community Medicine Department every Thursday)
b) Meningococcal Vaccine - at least 2 months prior to travel.
2 Doses 2 months apart
(Reference: 1. Recommended Adult Immunization Schedule - United States-2016 available at www.cdc.gov/vaccines/schedules/downloads/ adults/ adult schedule pdf Yellow fever vaccination. Available at www.nhs.vk/ conditions/ yellow -fever/ pages/ prevention .aspx. Meningococcal Vaccine Recommendation by age and risk factor for serogroup A,C,W or Y .Available at www. immunize.org/ catg.d/PP208.pdf. Administering vaccines to adults: Dose, route, site and needle size available at www.immunize.org/catg.d/p3084.pdf)

Facilities for Post Exposure Prophylaxis (PEP) are available at following places for emergency

- I.C.T.C., Department of Microbiology, K.G.M.U.
- I.C.U. Department of Medicine, K.G.M.U.
- Labour Room, Queen Marry Hospital, K.G.M.U.
- Trauma Centre, K.G.M.U.(METC)
- PRO Office, K.G.M.U.

Drugs are also available at the ART centre (old OPD block) during OPD hours.

COVID-19 VACCINATION

- Mandatory for all the HCWs
- Kalam Center,KGMU

CHAPTER – 8

SYNDROMIC APPROACH FOR EMPIRICAL THERAPY OF COMMON INFECTIONS

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Introduction:-

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. We believe that by following the guidelines it will be possible to maintain a high standard of patient care, delivered in a consistent way across this University.

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:

1. Send for the appropriate investigations in all infections as recommended. This is the minimum requirement for diagnosis, prognosis and follow up of these infections.
2. **Microbiological samples must always be sent prior to initiating antimicrobial therapy.** Rapid tests, such as Gram stain, can help determine therapeutic choices when empiric therapy is required.
3. Differentiation between contamination, colonization and infection is important to prevent overuse of antibiotics.
4. **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, and 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?

5. 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.

6. 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.

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

8. 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. 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.

10. 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 notMSSA.
c) In case of Pan drug resistant *Pseudomonas* / *Acinetobacter spp.* combination therapy using Colistin along with β lactams should be discussed with microbiologist / physician.

11. 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
ii. β–lactam antibiotic.
iii. β–lactam antibiotic and β–lactamase inhibitor.
iv. β–lactam antibiotic and cell wall inhibitor (Vancomycin)
v. Sulphamethoxazole and Trimethoprim.

12. 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.

13. 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.

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 issue of 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 faint.
- **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.

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.

- 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.

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.	Amoebic dysentery	*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** *** 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 *** Majority of strains are nalidixic acid resistant.	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-trimoxazoleif theprevalence of MDR S.Typhi is very low(<10%).

7.	Cholangitis / Acutecholecystitis*	Enterobacteriaceae Anaerobes	Ertapenem1gm i.v.OD **Alternatives:** Piperacillin+Tazobactam 4.5 gm i.v. 8 Hourly **OR** 3.375gmi.v. 6 hourly	•Duration: 7–10 days •Patients unresponsive to antibiotics may require surgery.
8.	Spontaneous bacterial peritonitis	Enterobacteriaceae (most often E. coli)	Piperacillin+Tazobactam 4.5 gm i.v. 8H **OR** 3.375gm i.v. 6hourly **Alternatives:** Ertapenem1gm i.v. OD	•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)*	*Enterobacteriaceae* *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** 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

* 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.

**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. viridans*with 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 :** **1.** Cloxacillin 500-1000 mg p.o. Q6H × 7-10 days **2.** Cephalexin 500 mg p.o. Q6H×	

2.	Furunculosis	*S. aureus*	**1.** Cloxacillin 500-1000 mg p.o. Q6H × 7-10 days **2.** Cephalexin 500 mg p.o. Q6H× 7- 10 days	
.	Diabetic foot– mild (localized cellulitis, no systemic symptoms)	*S. aureus*	**1.** Cloxacillin 500-1000 mg p.o. Q6H × 7-10 days **2.** Cefazolin 1 gm i.v. Q8H / Cephalexin 500 mg p.o. Q6H × 7-10 days	
	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
	Necrotizing fasciitis	*S. pyogenes*	CP 20 L Units i.v. Q4H+ Clindamycin 600 mg i.v. Q6H	Surgical debridement.
	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.	
.	**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	

.	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). <u>Bone & Joint Infections:</u>

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
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×	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.	.
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; Severepneumonia=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). <u>Parasitic Infections:</u>

S.No.	Condition	Etiology	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.	
		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

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	
4.	Helminthiasis	Ascaris, Enterobius, Hookworm	Albendazole 400 mg p.o. x 1 dose Repeat dose after 2 weeks for Enterobius	

h). <u>Acute Undifferentiated Febrile Illnesses:</u>

S.No.	Condition	Etiology (Likely	Antibiotics	Comments
1.	Leptospirosis	*Leptospia interrogas*	Crystalline penicillin10 L unitsi.v. Q4H **Alternative regimen**: 1.Ceftriaxone 1 gm i.v. OD	
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^{0}F) or temperature of>38.0^{o}C (100.4^{0}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 unstablepatient (Hypotension).

4. ***Initial antibiotic therapy:***

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

b) Monotherapy when Vancomycin not indicated: cefepime 2gmi.v.BDorCeftazidime 2 gm i.v. Q8H

c) Two drugs without Vancomycin:
Amikacin (15 mg/kgi.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	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

subsequent complication–continue use of same i.v. drugs	
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.	**2. 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 (CAI) Community Acquired Infection	PATIENT TYPE 2 (HAI) Hospital and Healthcare Associated Infections
• 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, Klebsiella sp, 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 intraabdominal 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
   i. New or progressive radiographic in filtrate,
   ii. New onset of fever,
   iii. Purulent sputum,
   iv. leukocytosis,
   v. 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 Antibioticsas 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 bloodstream 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 erythemaor 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 is 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 Cardiac Surgery:
a) Injection Cefaperazone 1 gm IV twice daily for 3 days
Followed by Inj. Co-Amoxyclav 1.2 gm IV twice daily for 2 days
Followed by oral antibiotics
b) For cases transferred from other ICUs, on ventilators, with high WBC counts or with febrile illness → Inj Teicoplanin 400 mg IV stat will be given at the time of induction.

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 immunocompetent cases*:**Ceftriaxone
5. ***Elderly group and immunocompromised 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 hrly Inj Metrogyl 500 mg IV 8th hrly 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 (whicheveris 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. Followup 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
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 hrly 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 Continous 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)

3rd line therapy: For multidrug resistant organism

- For Gram Negative: Injection Colistin, Inj. Tigecycline

- Tigecycline used as monotherapy 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 defense mechanisms	
• Advanced age • Anatomic anomalies of the urinary tract • Poor nutritional status • Smoking • Chronic corticosteroid use • Immunodeficiency	↓ natural defense 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	Prophyla xis Indicated	Antimicrobial (s) of Choice 2	Alternative Antimicrobial (s) 2
Shock-wave lithotripsy (GU tract)	If risk factors	Fluoroquinolone, trimethoprim-sulfamethoxazole 3rd gen cephalosporin	Aminoglycoside ± Ampicillin 1st/2nd gen. Cephalosporin Amoxicillin/Clavulanate
Percutaneous renal surgery (GU tract and skin)	All patients	1st/2nd gen. Cephalosporin, Aminoglycoside + Metronidazole or Clindamycin 3rd gen cephalosporin	Aminoglycoside/ Sulbactam Fluoroquinolone
Ureteroscopy (GU tract)	All patients	Fluoroquinolone, trimethoprim-sulfamethoxazole 3rd gen cephalosporin	Aminoglycoside ± Ampicillin 1st/2nd gen. Cephalosporin Amoxicillin/Clavulanate

Key: gen., generation; GU, genitourinary.

1) Organisms common to the GU tract – *E. coli, Proteus sp., Klebsiella spp.,Enterococcus;* Skin – *S. aureus*, coagulase negative *Staphylococcus spp*., Group A *Streptococcus spp*.

Prophylaxis for Upper Tract Instrumentation:

Procedure (organisms)1	Prophylaxis Indicated	Antimicrobial (s) of Choice 2	Alternative Antimicrobial (s) 2
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 intestine4 (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 [q12h]
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 [q6h] Cephradine: 500 mg PO [q6h] Cefadroxil: 500 mg PO [q12h] Cefazolin: 1 g IV [q8h]
2nd Generation cephalosporins	Cefaclor: 500 mg PO [q8h] Cefprozil: 500 mg PO [q12h] Cefuroxime: 500 mg PO [q12h] Cefoxitin: 1 - 2 g IV [q8h]
3rd Generation cephalosporins (oral agents not listed)	Ceftizoxime: 1 g IV [q8h] Ceftazidime: 1 g IV [q12h] Ceftriaxone: 1 - 2 IV single dose Cefotaxime: 1 g IV [q8h]
Others	Amoxicillin/clavulanate: 875 mg PO [q12h] Ampicillin: 1 - 2 g IV [q6h] Ampicillin/sulbactam: 1.5 - 3 g IV [q6h] Aztreonam 1 - 2 g IV [q8h] Clindamycin: 600 mg IV [q8h] Erythromycin base (for bowel preparation): 1 - 2 g PO [variable] Metronidazole: 1 g IV [q12h]; (for bowel preparation) 1 - 2 g PO [variable] Neomycin(for bowel preparation): 1 - 2 g PO [variable] Pipercillin/tazobactam: 3.375 g IV [q6h] Ticarcillin/clavulanate: 3.1 g IV [q6h] Trimethoprim-sulfamethoxazole: 1 double-strength tablet PO[q12h] Vancomycin: 1 g IV [q12h]

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

Criteria for antimicrobial prophylaxis for patients with orthopedic 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 Optimizing 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 ITU) when the recommended dose is 400mg 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 at Aayush Hospitals.
- 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. Q6H
Meropenem: 1gm i.v.Q8H
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 surgeryetc).
- 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

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 realted 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:
f) (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 Amp C and porin loss: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

Antibiotic Schedule for Sensitivity testing		
For Urine Specimen (Gram negative)		
	Entrobacteriaceae members	**Non- Fermentars**
Ist Line Primary drugs	Ampicillin	Ampicillin
	Cefazolin	Carbenicillin
	Gentamicin	Gentamicin
	Tobramycin	Tobramycin
	Norfloxacin	Norfloxacin
	Nitrofurantoin	Ofloxacin
	Co-trimoxazole	
	Fosfomycin	
IInd Line Primary drugs (Use Selectively)	Cefuroxime	Amikacin
	Amoxycillin + Clavulanic acid	Aztreonam
	Amikacin	Cefepime
	Cefotaxime	Cefpirome
	Ceftriaxone	Ciprofloxacin
	Ciprofloxacin	Levofloxacin
	Levofloxacin	Piperacillin + Tazobactam
	Cefepime	Cefoperazone + Sulbactam
	Cefpirome	Imipenem
	Carbenicillin	Meropenem
	Imipenem	
	Meropenem	
Supplemtal Drugs (Report Selectively)	Chloramphenicol	Chloramphenicol
	Aztreonam	Polymyxin-B
	Ceftazidime	Colistin
	Tetracycline	Doxycycline
	Doxycycline	
	Polymyxin-B	
	Colistin	
	Cefoperazone + Sulbactam	
	Piperacillin + Tazobactam	
	Netilmicin	

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

Antibiotic Schedule for Sensitivity testing		
For Urine Specimen (Gram Positive)		
	Staphylococcus species	**Entrococcus species**
Ist Line Primary drugs	Penicillin	Ampicillin
	Ampicillin	Penicillin
	Norfloxacin	Norfloxacin
	Nitrofurantoin	Levofloxacin
	Co-trimoxazole	Ciprofloxacin
	Oxacillin / Cefoxitin	Nitrofurantoin
	Clindamycin	Tetracycline
IInd Line Primary drugs (Use Selectively)	Doxycycline	Doxycycline
	Tetracycline	Vancomycin
	Vancomycin	Linezolid
	Linezolid	Teicoplanin
	Teicoplanin	
	Ciprofloxacin	
	Levofloxacin	
	Amoxycillin + Clavulanic acid	
Supplemtal Drugs (Report Selectively)	Ofloxacin	Ofloxacin
	Moxifloxacin	Moxifloxacin
	Chloramphenicol	Gentamicin (HLG)
	Gentamicin	Chloramphenicol

Antibiotic Schedule for Sensitivity testing		
For samples other than Urine (Gram Positive)		
	Staphylococcus species	**Entrococcus species**
Ist Line Primary drugs	Penicillin	Penicillin
	Ampicillin	Ampicillin
	Oxacillin / Cefoxitin	Co-trimoxazole
	Erythromycin	
	Co-trimoxazole	
IInd Line Primary drugs (Use Selectively)	Doxycycline	Linezolid
	Tetracycline	Vancomycin
	Vancomycin	Teicoplanin
	Linezolid	Clindamycin

	Teicoplanin	Tetracycline
	Clindamycin	
	Amoxycillin + Clavulanic acid	
Supplemtal Drugs (Report Selectively)	Chloramphenicol	Ciprofloxacin
	Ciprofloxacin	Levofloxacin
	Levofloxacin	Chloramphenicol
	Ofloxacin	Gentamicin (HLG)
	Moxifloxacin	
	Gentamicin	
	Amikacin	

Antibiotic Schedule for Sensitivity testing		
For samples other than Urine (Gram Negative)		
	Entrobacteriaceae members	**Non- Fermentars**
Ist Line Primary drugs	Ampicillin /Amoxycillin	Ampicillin
	Cephalothin / Cephalexin	Gentamicin
	Gentamicin	Tobramycin
	Tobramycin	Piperacillin
	Co-trimoxazole	Ceftazidime
		Doxycycline
		Tetracycline
IInd Line Primary drugs (Use Selectively)	Amoxycillin + Clavulanic acid	Cefoperazone + Sulbactam
	Cefoperazone + Sulbactam	Piperacillin + Tazobactam
	Piperacillin + Tazobactam	Aztreonam
	Cefuroxime	Ceftriaxone / Cefotaxime
	Amikacin	Cefepime
	Cefotaxime	Cefpirome
	Ceftriaxone	Amikacin
	Ciprofloxacin	Imipenem
	Levofloxacin	Meropenem
	Imipenem	Ciprofloxacin
	Meropenem	Levofloxacin
Supplemtal Drugs (Report Selectively)	Netilmicin	Netilmicin
	Doxycycline	Polymyxin-B
	Tetracycline	Colistin
	Chloramphenicol	Ofloxacin
	Aztreonam	
	Ceftazidime	
	Polymyxin-B	
	Colistin	

CHAPTER - 9

BIO MEDICAL WASTE PROTOCOL

Prepared by: Members of University Environment Department

Part 1: Bio Medical Waste Management Practices at work stations

1.1. Segregation of Waste

1.1.1.General waste- black bin
1.1.2.Non Plastic waste-yellow bin
1.1.3.Plastic waste- red bin
Metallic sharps- puncture proof white bin
1.1.4.Intact glass-blue bin
1.1.5.Liquid Waste-white bin
1.1.6.Paper waste

1.2. Waste recording

1.2.1.Waste recording
1.2.2.Waste tracking system

1.3. Maintenance, cleaning, IEC material

1.3.1.Cleaning of bins at workstation
1.3.2.Waste collection trolley cleaning
1.3.3.Hub cutter maintenance
1.3.4.IEC Materials (Information Education Communication)

Part 2: *Waste Collection*
Part 3: *Terminal Disposal*
Part 4: *Misc*

(Spill Management)

4.1. Mercury spill
4.2. Blood spill

(Occupational safety)

4.3. Needle Prick Injury Reporting
4.4. PEP

Part 5: *Training, Monitoring and meeting Schedules*

Part 6: *Handling Special category of waste*

6.1. Chemotherapy Waste
6.2. Radioactive waste

6.3. Pharmaceutical waste
6.4. Liquid Waste
6.5. Plaster cast
6.6. E-Waste
6.7. Hospital Bedding
6.8. Blood bags
6.9. Mortuary clothes

1. Bio-medical Waste Management Practices at all work station:-

1.1. Segregation of waste:

SOP: 1.1.1

Subject		Segregation of waste at the point of generation	
Purpose		To ensure proper segregation of biomedical waste so as to minimize generation of incinerable waste	
Departments to follow		All departments	
Who is responsible		All doctors, nursing staff and housekeeping staff	
Who is accountable		All persons are individually accountable.	
Who will monitor		Nodal officers/UEC Members.	
Who will train		Respective Nodal officers/UEC members	
Procedure:			
Sn	**Category**	**Items**	**Color coding**
1.	**General waste**	Paper, Wrappers, Peels of fruits & vegetables, Remains of food & edibles etc.	**Black**
2.	**Non-plastic infectious incinerable waste (Non-recyclable)**	Human and Animal Anatomical Waste, waste contaminated with blood, and with body fluids including cotton, dressing, soiled plaster cast, linen, bedding and other such material	**Yellow**
3.	**Plastic infectious waste (Recyclable)**	Disposable items such as glucose bottle, hub removed syringe, tubing, catheter, intravenous set, glove etc.	**Red**
4.	**Sharp waste**	Needle, scalpel, blade, etc. that may cause puncture and cuts. This includes both used and unused sharps etc	**Puncture proof Container**
5.	**Glass waste**	Glass material like bottles, ampoules, slides, tubes etc	**Blue**
6.	**Liquid waste**	Waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities, chemicals used in production of biological, chemicals used in disinfection, as insecticides etc.	**White**
7.	**Paper Waste**		**Perforated Bin**

SOP: 1.1.2

SOP	Yellow bin
Procedure	For storage of non plastic, infectious, incinerable waste such as anatomical waste (human and animal), waste contaminated with blood and body fluid including cotton, dressing, soiled plaster cast, linen, bedding etc.

Placement of bin	Bins to be placed beyond the reach of the public/attendants under the supervision of staff nurse.
Terminal Disposal	Incineration at authorized Common Bio-medical Waste Treatment Facility (CBWTF).

SOP: 1.1.3

SOP	Red Bin
Procedure	• For storage of all recyclable, infectious, plastic waste such as glucose bottles, hub removed syringes, tubings, catheters, intravenous sets, gloves etc. Cotton and bandage if yellow bin is not available. • Glucose bottles should be collected in separate red coloured bin with liner and is labelled as "Plastic glucose bottle only"
Placement of bin	Bins to be placed beyond the reach of the public/attendants under the supervision of staff nurse.
Terminal Disposal	• Disinfected by autoclave / microwave, shredded and sold to authorize recyclers. • Waste is treated with 10% Hypo solution for half an hour and then shredded into small pieces and sold to authorize recyclers.

SOP: 1.1.4

SOP	Black bin
Procedure	Use of black bin exclusively for storage of general waste which comprises of Wrappers, Peels of fruits, vegetables, remains of food & edibles etc
Placement of bin	Black bins are placed in the corridors, near the toilets and small black bins at bedsides. Bins are at easy access to the general public and are in sufficient number and of adequate size Bins are not tagged with Biohazard symbols
Terminal Disposal	All non-infectious waste is sent to the Nagar Nigam for land filling. Non plastic general waste is utilized for preparing manure by vermi-composting.
SOP	Puncture proof bin
Procedure	For storage of sharps such as needles, blades, scalpels, ampoules, broken glass, broken test tubes etc. Hub of injection unit should be securely mutilated with hub cutter and then disposed of at the point of generation, needles not to be recapped or bent. Sharps should be handled carefully. Needles / all metallic sharp to be collected separately in the hub cutter box which is capped and transferred to CCTS with least handling.
Placement of bin	White transparent box liner should be placed near the workstations under the supervision of staff nurse.
Terminal Disposal	Autoclaved----------→ Smelting

SOP: 1.1.5

SOP	Blue bin
PROCEDURE	For storage of all glass waste such as ampoules, glass bottles, glass vials etc

PLACEMENT OF BIN	Bins to be placed beyond the reach of the public/attendants under the supervision of staff nurse.
TERMINAL DISPOSAL	Treated with 10% Hypochlorite solution for minimum half an hour and then sold to authorized recyclers.

SOP: 1.1.6

SOP	White bin(for liquid waste)
Procedure	Waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities, chemicals used in production of biological, chemicals used in disinfection, as insecticides etc.
Placement of bin	Bin should be placed near the workstation under the supervision of sister incharge
Terminal Disposal	Treated with 10% Hypochlorite solution for minimum half an hour then drained.

SOP: 1.1.7

SOP	Paper waste
Procedure	Perforated plastic bucket of any colour labelled as "paper waste only" is to be used exclusively for papers waste (non confidential). For confidential paper waste such as case sheets examination papers or copies (after a recommended period of storage) should be sent to the CCTS along with a person from the department to get the waste shredded in front of him.
Placement of bin	Bins to be placed mostly in the offices, corridors near consultants rooms etc
Terminal disposal	Paper is shredded into small pieces (with paper shredder) and sold to authorized recycler for recycling. Confidential papers should be shredded in front of concern person.

1.2. Waste Recording

SOP: 1.2.1

SOP	Waste recording
Procedure	All the bags to be tagged and weighed using spring balance under supervision. Data to be recorded by the staff locally posted. Weighing to be done by the collection staff from UED. Biohazard symbol to be present on the yellow and red bags. Data to be entered in the record book provided by the UED. Monthly record sheet to be signed by the Nodal officer and sent to UEC latest by 7th of every month

SOP: 1.2.2

SOP	Computerized waste tracking
PROCEDURE	Bags to be bar coded at every work station by the staff from UED.

1.3. Maintenance, Cleaning & IEC Material

SOP: 1.3.1

SOP	Cleaning of bins at workstation
DEPARTMENT	All departments to follow
PURPOSE	To ensure regular and proper cleaning of ward bins
RESPONSIBILITY	Ward sweepers
ACCOUNTABILITY	Nodal Officers and Sister In-charges

PROCEDURE	All ward bins to be cleaned with disinfectant minimum once in a day
MONITORING:	Nodal officers, UED members

SOP: 1.3.2

SOP	Waste collection trolley cleaning
PURPOSE	To ensure regular and proper cleaning of waste collection trolleys
RESPONSIBILITY	Contractor and sweepers of UED involved in collection process
ACCOUNTABILITY	The Supervisory staff of UED
PROCEDURE	Trolleys to be cleaned with disinfectant after each shift
MONITORING:	UED members along with UED staff

SOP1.3.3

SOP	Hub cutter maintenance
SUBJECT	Cleaning & maintenance of hub cutters
DEPARTMENT	All departments to follow
PURPOSE	To ensure regular and proper cleaning of hub cutters
RESPONSIBILITY	Track in-charges of UED involved in collection process are responsible to implement this SOP strictly in their respective workstation
ACCOUNTABILITY	Staff nurses of all workstations are accountable for their respective workstation
PROCEDURE	Cleaning & oiling of hub cutter should be done daily.
MONITORING:	UED Members.

SOP: 1.3.4

SOP	IEC Materials (Information Education Communication)
SUBJECT	Use of IEC materials
DEPARTMENT	All departments to follow
PURPOSE	To provide knowledge for the use of infrastructure provided for waste collection and storage.
RESPONSIBILITY	Supervisory staff of UED
ACCOUNTABILITY	Nodal Officers and Sister In-charges of the work stations
PROCEDURE	• Different materials to be used to educate and spread awareness regarding segregation amongst hospital employees, patients and attendants • **Posters:** An appropriately sized poster with pictorial depiction of waste material to be disposed in the bin at an appropriate area near the bin. The poster should be in the local language. • **Hoarding**: should be in the local language indicating different category of waste along with the color coding. To be placed at prominent places in the campus • **Annual Newsletter** • **Pamphlets:** to be distributed at the time of patient admission. • **Patient attendant card:** to be provided in the wards at the time of admission and taken back at the time of discharge. **Note:** All the IEC material to be renewed time to time.
MONITORING:	Nodal officers and UED team.

Part 2: Waste Collection











Small bins at bed side or on trollys

Big bin at collection point

Ward collection Trolley no-2 for transport of bags

Small Bin:

- To be placed at the site of waste generation
- No liner to be placed
- Will be cleaned by local cleaning Staff daily

Big Bin:

- Placed at specified places in the wards
- Liner to be placed
- Collection when 3/4th full or daily
- Bin to be cleaned by local cleaning staff

Collection of Bag:

- All bags to be bar coded along with zip lock
- To be collected by staff from UEC. Weighing & recording of weight to be done under supervision of local staff (nurse/ ward boy) posted at the work station.
- Appropriate signage to be put in case of special category waste
- Biohazard symbol to be present on the bags in case of infectious waste (Red and Yellow bags)

SOP: 2

SOP	Waste Collection Process
SUBJECT	Collection of bags from work stations
PURPOSE	To ensure proper collection.
RESPONSIBILITY	Supervisory staff from UEC.
ACCOUNTABILITY	I/C work station.
PROCEDURE	• All the waste collected in small bins to be emptied into the big bins placed at collection points at frequent intervals when the bin is 3/4th full

	• Waste bins kept at collection points to be emptied when 3/4th full or minimum once a day. • Segregation of infectious and non-infectious waste to be maintained at all levels. • In no situation waste should be stored for more than 48 hours
MONITORING:	UEC members.

Part 3: Terminal Disposal ……..

SN	Colour	Waste	Disposal
1	**Yellow**		Incineration
2	**Red**		Autoclave / microwave
3	**Puncture proof container**		Autoclave- burial / smelting
4	**Liquid waste**		Treatment with hypo soln / ETP
5	**Paper waste**		Shredding- recycling
6	**General waste**	Biodegradable	Vermicomposting
		Non-biodegradable	recycling

Part 4: Misc

SOP: 4.1(Spill Management)

SOP	Mercury spill Management
SUBJECT	Handling of mercury
DEPARTMENT	All departments to follow
PURPOSE	To ensure safe management of mercury spillage
RESPONSIBILITY	All Healthcare worker are responsible to implement this SOP strictly in their respective workstation
ACCOUNTABILITY	Nodal Officers
BACKGROUND	Accidentally swallowed elemental mercury is assimilated very slowly, and it is possible for the mercury to pass through the digestive system without causing damage. Long-term inhalation of elemental mercury vapour can cause tremors, gingivitis, and easy excitability, similar to the symptoms of methyl mercury poisoning.
PROCEDURE	Mercury spill management kit to be provided to all workstations. During incident of mercury spillage following steps to be followed: • Open all windows and turn off heaters and air conditioners to minimise vaporisation. • Waste handler to remove all jewellery and watches • Wear gloves, mask, and eye shield. • Collect mercury using cardboard sheets/ X-ray plates and suck it with an eyedropper or a syringe. Empty it in a container which has water. • Pick up the remaining beads of mercury with a sticky tape in a plastic bag along with the eyedropper, cardboard and gloves. • Place this bag and the sealed container in the second bag. Label it as mercury waste.
MONITORING:	UED Members
TRAINING:	All nursing staff and sweepers to be trained by nodal officer

SOP: 4.2

SOP	Body fluid spill Management
SUBJECT	Handling Body fluid spillage
DEPARTMENT	All departments to follow
PURPOSE	To ensure safe and proper handling of Body fluid spill
RESPONSIBILITY	All nursing staff and sweepers
ACCOUNTABILITY	Nodal Officers and Sister In-charge
BACKGROUND	Body fluid if not cleaned properly can spread infection.
PROCEDURE	During cleaning of body fluid spill following steps to follow: • Cover the spill with absorbent cotton or a cloth. • Discard this cloth in the yellow/red bin. • Disinfect the surface with 10% bleach for 10-15 minutes or use phenolic disinfectants. • Now use cloth or cotton to absorb the spill and discard it in the yellow/ red bag. • Finally use the normal mop.
MONITORING:	Nodal officers, UED staff, members
TRAINING:	Nodal officer

Occupational Safety

SOP 4.3

SOP	Needle Prick Injury Reporting
SUBJECT	Occupational safety of Healthcare worker
DEPARTMENT	All departments
PURPOSE	To ensure the safety of Healthcare worker
RESPONSIBILITY	Health care workers and Nodal Officers of respective departments
ACCOUNTABILITY	UEC members

PROCEDURE	• Do not panic. Do not squeeze the finger to draw blood. Place the finger in running water for few minutes. Wash it gently with plain soap and water. And report to the nodal officer of your concerned department. • Nodal officer may refer you to the occupational hazard unit of KGMU. FOR PERSONS WHO ARE UNVACCINATED • If source is HBsAg positive give single dose of Hepatitis B Immunoglobulin (HBIG) and start vaccine series. • If source is HBsAg negative no HBIG to be given start vaccine series • If source is unknown or not available for testing start vaccine series without giving HBIG FOR PERSONS WHO ARE VACCINATED • If the person exposed is a known responder no treatment required irrespective of the status of the patient (positive, negative,unknown) • If the person is a known non responder- give one dose of HBIG and initiate revaccination if source is HBsAg positive, no trearment if source is negative, • If source is unknown but high risk consider it as HBsAg positive

	FOR PERSONS WITH UNKNOWN ANTIBODY STATUS • Test exposed person for anti HBs antibody, if responder no treatment is needed • If inadequate give one dose of HBIG and vaccine booster dose • If source is negative no treatment is needed • When source is unknown or not available for testing cheque for antibody titres. If responder- no treatment needed but if non-responder a vaccine booster is needed along with rechecking titres 1-2 months later. POST POSTEXPOSURE PROPHYLAXIS DOSE AND SCHEDULE • The dose of HBIG is 0.06 ml/kg body weight single IM injection • Preferably should be given within 24 hours of exposure or at least within 7 days of needle stick injury • In cases of sexual contact with HBsAg positive patient HBIG can be given up to 2 weeks from day of exposure • Hepatitis B vaccine should be given in schedule of 0,1,4-6 month 3 IM injections. • HBIG and Vaccine can be administered simultaneously at different IM sites FOLLOW UP OF HBV EXPOSED PERSONS • Perform follow up Anti HBs testing in persons exposed to HBV who received hepatitis B vaccine • Test for Anti HBs titer after1-2months of last dose of vaccine • Anti HBs response can not be ascertained if person has received HBIG in within previous 3-4 months • If Acute HBV positive work up on the lines of HBV infection
MONITORING:	Nodal officers & UED members

SOP 4.4

SOP	PEP/HIV
SUBJECT	Occupational safety of Healthcare worker
DEPARTMENT	All departments
PURPOSE	To ensure the safety of Healthcare worker
RESPONSIBILITY	Health care workers and Nodal Officers of respective departments
ACCOUNTABILITY	UED members
PROCEDURE	PEP will be given at the ART centre KGMU. Contact Person: Dr. D Himanshu Reddy, Prof. Department of Medicine, KGMU
MONITORING:	Nodal officers & UED members

Part 5: *Training, Monitoring and meeting Schedules*

SOP 5.1

SOP	Training Programme
SUBJECT	Training Programme for all the healthcare personnel
DEPARTMENT	All departments to follow
PURPOSE	To ensure training of each and every person of the Institution employed for providing healthcare, immediately after his/ her joining.
RESPONSIBILITY	Nodal Officers, UED staff and UED members
ACCOUNTABILITY	Nodal Officers, UED staff and UED members

PROCEDURE	• It is mandatory for all new entries to attend a one hour training session at UED and give a MCQ test and obtain a certificate of training from UED. • As per training schedule: (annexure: I) a) Departmental Training by Nodal Officers in the department b) New Entry Training by Nodal Officers/ UEC members at UEC c) On Demand Training
MONITORING:	UED members
TRAINING:	Nodal Officers and UED members

SOP 5.2

SOP	Monitoring Schedule
SUBJECT	Monitoring Schedule
DEPARTMENT	UED
PURPOSE	To ensure proper segregation
RESPONSIBILITY	UED
ACCOUNTABILITY	UED
PROCEDURE	Monitoring schedule (Annexure: I) A team of nodal officers along with the Sanitary Inspectors, Matron and UED Staff A format for reporting to be provided (Annexure: II) A final report of the round to be sent to the respective Nodal officer through HOD Report to be stored in the monitoring file at UED
MONITORING:	Head UED

SOP 5.3

SOP	Meeting
SUBJECT	Meeting Schedule: Meetings of all Nodal Officers: quarterly Meeting of Waste Management Committee: six monthly
MONITORING:	Head, UED

Part 6: *Handling Special Category of Waste*

SOP 6.1

SOP	**Chemotherapy waste**
SUBJECT	Chemotherapy waste
DEPARTMENT	All work stations dealing with Chemotherapy administration
PURPOSE	To ensure proper disposal
RESPONSIBILITY	Staff posted at the work station
ACCOUNTABILITY	Nodal Officer, Sister In-charge
PROCEDURE	All the plastic waste to be neutralized by 10% hypo solution at UED Red Bags from these work stations to be neutralized by 10% hypo solution after autoclaving. Residual chemotherapy drug to be disposed off in yellow bin for incineration
MONITORING:	Head, UED / UED members

SOP 6.2

SOP	**Radioactive waste**
SUBJECT	Radioactive waste
DEPARTMENT	All workstations dealing with radioactive waste
PURPOSE	To ensure proper disposal
RESPONSIBILITY	Staff posted at the work station
ACCOUNTABILITY	Nodal officers, sister in charge
PROCEDURE	**Radioactive material with short half life**: All the radioactive material with short half life to be stored till 10 half lifes and then discharged into the drain after dilution. **Radioactive material with long half life**: To be sent to AERB for proper disposal / adopt policy to replace old source with new one and take back the old source for disposal by vendors
MONITORING:	Head UED / UED members

SOP 6.3

SOP	Pharmaceutical waste
SUBJECT	Pharmaceutical waste
DEPARTMENT	All departments to follow
PURPOSE	To ensure safe and proper disposal of expired /unused pharmaceutical waste
RESPONSIBILITY	All doctors, residents, pharmacy, drug store staff, nurses
ACCOUNTABILITY	Nodal Officers, pharmacist incharge
BACKGROUND	All pharmaceutical waste needs proper disposal as per the guidelines.
PROCEDURE	Either of the following to be followed: ✓ Return of expired pharmaceuticals to the donor or manufacturer ✓ Incineration ✓ Encapsulation and burial in a sanitary landfill *Note: Antibiotics or cytotoxic drugs should not be discharged into municipal sewers or watercourses*
MONITORING:	Nodal officers, UED staff, members

SOP 6.4

SOP	Liquid waste
SUBJECT	Liquid waste
DEPARTMENT	All departments to follow
PURPOSE	To ensure safe and proper disposal of liquid waste generated by providing patient care, diagnostic work and cleaning activities
RESPONSIBILITY	All doctors, residents and staff nurses
ACCOUNTABILITY	Nodal Officers
BACKGROUND	All liquid waste [waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities, aspirations from

	body cavities, sputum etc] needs proper disposal as per the guidelines. Effluent treatment plant is difficult to install because of multiple outlets at KGMU. Work is in process.
PROCEDURE	In view of non availability of ETP we recommend using 10% hyposolution for treating liquid waste for half an hour before discharging into the drainage.
MONITORING:	Nodal officers, UED staff, members

SOP 6.5

SUBJECT	Plaster Cast
DEPARTMENT	Department of Orthopaedics to follow
PURPOSE	To ensure safe and proper disposal of Plaster cast infected and non-infected both.
RESPONSIBILITY	All doctors, residents and staff nurses
ACCOUNTABILITY	Nodal Officer, I/C Plaster room
BACKGROUND	As per the guidelines Gazettee 1998 soiled Plaster cast to be disposed by incineration
PROCEDURE	Infected / soiled plaster to be disposed in yellow bags for incineration Noninfected cast to be disposed off in black bags with proper labelling for further autoclaving and mutilation.
MONITORING:	Nodal officers, UED staff, members

SOP 6.6

SUBJECT	Electronic waste
DEPARTMENT	All Departments to follow
PURPOSE	To ensure safe and proper disposal of Electronic waste
RESPONSIBILITY	All doctors, residents and staff nurses
ACCOUNTABILITY	Nodal Officer
BACKGROUND	E- waste [mobile phones, batteries, UPS, etc] being generated any where needs proper disposal
PROCEDURE	All E- waste generated in the department to be handed over to UED for further proper disposal All waste thus collected will be sent to the authorized dealers for further proper handling and disposal
MONITORING:	Nodal officers, UED staff, members

SOP 6.7

SUBJECT	Hospital Bedding waste
DEPARTMENT	All Departments to follow
PURPOSE	To ensure safe and proper disposal of Bedding waste
RESPONSIBILITY	Head Nurse of the concerned ward

ACCOUNTABILITY	Nodal officer
BACKGROUND	Blood and body fluid contaminated linen and pillow/ pillow covers
PROCEDURE	1. Housekeeping and laundry personnel should wear gloves and other PPE as indicated when collecting, handling, transporting, sorting, and washing soiled linen 2. 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. 3. In the laundry Step 1: Wash heavily soiled linen separately from non-soiled linen. Step 2: Wash the entire item in water with liquid soap to remove all soilage, even if not visible 4. For heavily soiled linen: Pre-soak in soap, water and bleach ONLY if linen is heavily soiled. • Use warm water if available. • 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. Step 3: Check the item for cleanliness. Rewash if dirty or stained. Step 4: Rinse the item with clean water. 5. If machine wash: wash soiled and non-soiled linen separately in hot water (80-90^{o} C)
MONITORING:	Nodal officers, UED staff, members

SOP 6.8

SUBJECT	Blood Bag
DEPARTMENT	All Departments to follow
PURPOSE	To ensure safe and proper disposal of Discarded Blood Bag
RESPONSIBILITY	Concerned Technicians
ACCOUNTABILITY	Nodal officer/Head of the department
BACKGROUND	Blood bags, syringe, needles, i.v lines used during collection of blood and blood samples must be disposed properly as they may be the potential source of infectious microorganisms.
PROCEDURE	Needles must be disposed of in a container designed to prevent accidental puncturing of personnel, such as a sharps container. All blood contaminated waste must be disposed in red bags.
MONITORING:	Nodal officers, UED staff, members

SOP 6.9

SUBJECT	Mortuary clothes
DEPARTMENT	All Departments to follow
PURPOSE	To ensure safe and proper disposal of Discarded Blood Bag
RESPONSIBILITY	Ward boy
ACCOUNTABILITY	Nodal officer
BACKGROUND	Both soiled and non-soiled linen has to be collected in plastic/sealed containers and have to be sent to the laundry. Infection control practices needs to be strictly followed at mortuary too.
PROCEDURE	Housekeeping and laundry personnel should wear gloves and other PPE as indicated when collecting, handling, transporting, sorting, and washing soiled linen Contaminated linen must be processed as mentioned above in SOP 6.7
MONITORING:	Nodal officers, UED staff, members

CHAPTER – 10

HOSPITAL INFECTION SURVEILLANCE

Prof. Amita Jain, Dr. Sheetal Verma, Dr. D. Himanshu, Dr. Nitin

Objectives:

1. Reducing HAI rates in the hospital.
2. Establishing existing HAI rates.
3. Analyzing infection rates in terms of wards / department.
4. Evaluation of prevention and control measures taken to control HAI.
5. To find out if there is any change in the pattern of disease providing an alert of the existence of an outbreak or spread of a virulent organism.
6. To evaluate the efficacy of measures taken to control the outbreak of infection.

Definitions:-

It is ongoing systematic collection and analysis of data about a disease or organism that helps in taking the actions to control or prevent the disease.

The surveillance for infection acquired in the hospital may be passive or active:

a). *Passive surveillance* consists of the reporting of any occurrence of suspected HAI by clinicians. This is poor and not an efficient method to track HAIs.

b). Active surveillance is the systematic collection of data by a designated surveillance team. This is the method recommended by CDC.
Active Surveillance includes:

i) **Prevalence study (cross-sectional/transverse)**: HAI in all patients who are present as inpatients in entire hospital at a given point in time.

ii) For this procedure a team of trained Infection Control Nurses visit every patient of the hospital on a single day, reviewing medical and nursing charts, interviewing the clinical staff to identify infected patients, and collecting the data.

iii) **Incidence study (continuous/longitudinal):** Prospective identification of new infections (incidence surveillance) requires monitoring of all patients within a defined population for a specified time period. Patients are followed throughout their stay, andsometimes after discharge (e.g.post-discharge surveillance for surgical site infections).

***Scope*:**

The scope of this policy will be hospital wide. It will be applicable to all clinical areas.

Responsibility:-

Following staff will be responsible to support the execution of this policy:

- All clinicians of ward / department
- Complete nursing staff of the ward/ department
- The data on HAI will be collected by ICNs

- Link Nurses for Infection Control from the wards will support ICNs in their activities. They will ensure that the HAI form for the ward is filled up and date of device insertion / removal is mentioned.
- The analysis of the data will be done by Quality Officer under supervision HOD,Hospital Administration.
- All departments will detail one nodal officer for control of HAI who will facilitate and support the surveillance activities in his area. Nodal Officer and the Nursing I/C of the ward will ensure that Case Files of the patients are available in the ward.

Details of the policy:

Selection of ICNs: Staff Nurses to perform the task of Infection Control Nurses will be identified, interviewed and selected by HOD, Hospital administration for this role. Subsequently, their training will be done by Dept of Hospital Administration in surveillance procedures and in other Infection Control activities.

HAI Surveillance Format in the wards /departments

Only active method of surveillance will be followed as recommended by CDC. For this purpose, all the patients in specified area will be visited by ICNs daily and will be followed till the time they are admitted. Thus both prevalence as well as incidence methodology will be adopted. The data will be collected manually.
A format for collection of HAI data will be designed and customized for our need by Dept of Hospital Administration based on the guidelines provided by CDC / NHSN. The same is attached as Appendix to this policy. ICNs will be given a short training on collection of data with the help of this format. A similar form for data collection will be designed for the wards and departments. A copy of the same is enclosed with this policy.

Distribution of ICNs to various wards

Each ICN will be given the responsibility to collect the data out of 250 beds. CMS/MS / Matron will ensure that required No of ICNs are posted with Dept of Hospital Administration. HOD, Hospital Administration will distribute the ICNs to various ward for collection of data.

Data collection and recording of Procedure in the wards

Matron / Nursing I/C wards will ensure that each ward has a nominated Link Nurse for Infection Control in each shift. She will be made responsible for all Infection Control activities of the ward during her shift. She will also facilitate the activities of ICNs inside the ward. Whenever, a patient is put on urinary catheter / central line / ventilator, the link Nurse will fill up the HAI Surveillance form and insert the same the particular case file. During the visit of an assigned ward, ICN will contact with Link Nurse and collect the data in her register. Subsequently, every day the ICN will monitor the signs and symptoms pertaining to a particular HAI in the patient who have undergone the device insertion.
In case a patient develops signs and symptoms within 48 hours of device insertion, the case will not be included as HAI. However, if the patient develops signs and symptoms after 48 hours of device insertion, ICNs will interact with the treating team for the clinical diagnosis, look for the culture and sensitivity report and record the entire data in their register. ICNs will also visit the department of Microbiology to find out the culture and sensitivity report of the patients, if the same is not available in the ward.
In case the culture and sensitivity of any sample sent turns out to be positive, the ICNs will also record the details of organism and the antibiotics. If clinical diagnosis of any HAI is confirmed but the culture of concerned sample is negative still the case record will be taken. The data collected by the ICNs will be analyzed by Quality Officer under guidance HOD, Hospital Administration who will decide the final list of cases to be considered as HAI.

Surveillance of OT:-

Air sampling / Swab culture of OT Surfaces

The consonance amongst various authorities does not exist on routine air sampling and swab cultures. However, since the standard of general hygiene in our OTs is not very satisfying, this may be carried out once a month for all OTs. In addition, this may be carried out in following situations or on suggestion of concerned clinician:

a) On suspicion of an outbreak.
b) Whenever, SSI cases are detected more in number in the patients operated in a particular OT.
c) In case any potentially hazardous surface is identified in OT due to any reason.
d) For validation of OT sterilization techniques.

For monitoring the bacterial load on surfaces, the sterile swabs soaked in sterile normal saline will be collected from following sites:

a) OR table
b) Anesthesia equipment and table
c) Instrument trolley
d) Floor near OR table
e) Window projection if any

The swabs will be processed for both aerobic as well anaerobic cultures.

Surveillance of other high-risk areas like ICUs / labour room/ NICU/PICU/Dialysis center

The routine surveillance of these areas will not be done. It will be carried out on following occasions or suggestion of concerned clinician:

a) On suspicion of an outbreak
b) Whenever, HAI cases are detected more in number in the patients admitted in these facilities.
c) In case any potentially hazardous surface is identified in any area.
d) For validation of sterilization techniques.

Availability of Case Records in the wards :

It will be ensured by CMS / MS / HODs of respective wards /Nodal officer for Infection Control/ Nursing I/C of a ward that the case records are available so that the ICNs can note down the details including the culture and sensitivity report.

Availability of HAI Surveillance Form in the wards /departments

CMS /MS will ensure that HAI Surveillance format is printed and sufficient quantity is kept in the Central Store. The Nursing I/C wards will indent the format from Central Store.

Determination of rates / trends of HAI:

The rates / tends of HAI will be determined by the Quality Officer, Hospital Administration, monthly. The data so collected will be presented by HOD, Hospital Administration in the meetings of HICC.

SURVEILLANCE OF DATA FOR INFECTION CONTROL		
DEVICE NAME	**DATE OF INSERTION**	**DATE OF REMOVAL**
FOLEYS CATHETER		
VENTILATOR WITH ET TUBE/TRACHEOSTOMY TUBE		
CENTRAL LINE		

INVESTIGATION	**TYPE OF SPECIMEN**	**DATE**	**REPORT**		
			CULTURE	**ORGANISM GROWN**	**SENSITIVE TO**
C/S	URINE SPECIMEN FROM PORT OF FOLEY'S CATHETER		**(+) / (-)**	**1**	
				2	
				3	
	BLOOD WHEN PATIENT IS ON CENTRAL LINE		**(+) / (-)**	**1**	
				2	
				3	
	TRACHEAL /BRONCHIAL ASPIRATES OF THE PATIENT ON VENTILATOR		**(+) / (-)**	**1**	
				2	
				3	
	PUS SWAB FROM THE SURGICAL SITE		**(+) / (-)**	**1**	
				2	
				3	

CHAPTER – 11

TEACHING TRAINING PROGRAM FOR HEALTH CARE WORKERS

Prof. Amita Jain, Prof. Kirti, Dr. D. Himanshu Reddy, Dr. Sheetal Verma, Dr. Nitin

Team Member: HICT committee

Objective: To trained faculty staff of KGMU in Infection Control.

Scope: The scope of this policy is hospital wide.

Responsibility: The training in Infection Control will be compulsory for all residents / Non-PG residents / Nursing staff, technicians and housekeeping staff. The responsibility to ensure that the training is attended by various category of staff as per schedule will be of CMS/MS/respective HODs and Matron.

Procedure for training

The training will be conducted in the form of "Infection Control Workshop" which will be completed in one working day from 9 am to 5 pm. The registration for attending the workshop will be done every month by the department of Hospital Administration. Maximum 50 candidates will be registered on first come first basis. Once this number is complete, the date of workshop will be intimated 7 days prior to the workshop. The workshop will be followed by a test. On successful completion of the workshop, a certificate will be issued. The staff as enumerated above will complete the workshop within six months. The candidates who are not able to complete the workshop within six months, their salary will be linked to completion of workshop.

Contents:

The curriculum of trainings will include the topics as per details given in the Appendix to this policy.

Serial No	Training Topics	Attended by	
		Residents /Nursing Staff/concerned Technicians	Class IV housekeeping staff
1	Surveillance Procedure	Yes	-
2	Preventive Care Bundles	Yes	-
3	Safe Injection Practices	Yes	-
4	Safe Infusion Practices	Yes	-
5	Standard Precautions &Hand Hygiene	Yes	Yes
6	Sampling Procedures	Yes	
7	Disinfection, Sterilisation and Cleaning	Yes	Yes
8	Isolation & Barrier Nursing	Yes	Yes
9	Bio-medical Waste Management &Spill Management	Yes	Yes
10	Healthcare worker Safety	Yes	Yes
11	Sample collection	Yes	-

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