Concepts of Hospital Infection Control (HIC)

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Intent

- The NABH standards guide the provision of an effective infection control programme in the hospitals.
- It aims at reducing or eliminating infection risks to patients, visitors and providers of care.
- It focuses on measures and action taken to prevent or reduce the risk of Hospital Acquired Infection (HAI).
- It lists action plan to control outbreaks.
- Every hospital should set up a hospital infection control (HIC) committee.

  The members of the HIC committee should aim at developing effective measures to prevent, identify and control infections in a hospital.

NATIONAL INFECTION CONTROL GUIDELINES

Draft version 2017

NATIONAL CENTRE FOR DISEASE CONTROL
Directorate General of Health Services
Ministry of Health & Family Welfare
Government of India

Guiding document

Standard Precautions

The infection prevention practices that apply **to all patients**, regardless of suspected or confirmed infection status, in any setting in which health care is delivered are called standard precautions.

Standard Precautions

- All health care professionals should adopt the following infection prevention practices:
- Hand hygiene.
- Personal protective equipment (PPE):
    - Gown
    - Mask
    - Eye protection or face shield
- Sharps precautions and safe injection practices.
- Clean patient care equipment.
- Environmental cleaning.
- Clean linen and laundry.
- Safe disposal of biomedical waste(BMW).
- Patient placement.

Hand Hygiene

Hand washing:

Using soap and water

Hand rubbing:
Using alcohol-based hand rub

Personal Protective Equipment (PPE)

- All health care professionals should wear specialised clothing or personal protective equipment (PPE) to protect themselves from exposure to blood or body fluid spills.

Types of PPE

Sharps Precaution

- A sharp injury occurs when a health care professional is accidentally struck with a used needle or a sharp instrument. And, this might lead to spread of infection.

- Therefore, all health care professionals should take utmost care while handling, cleaning and disposing used needles and other sharp instruments.

Clean Patient Care Equipment

- All patient care equipment that are soiled with blood or body fluids should be handled in a manner that would prevent the spread of infection.

- Reusable items should be cleaned and sterilised before using it again.

Environmental Cleaning

- All health care professionals should adopt adequate procedures for routine cleaning of the different areas of the hospital and frequently touched surfaces.

Clean Linen and Laundry

- Soiled linen can cause HAI.
- To avoid spread of infection adequate procedures should be established for collecting, transporting, processing and storing linen.

Safe Disposal of Biomedical Waste

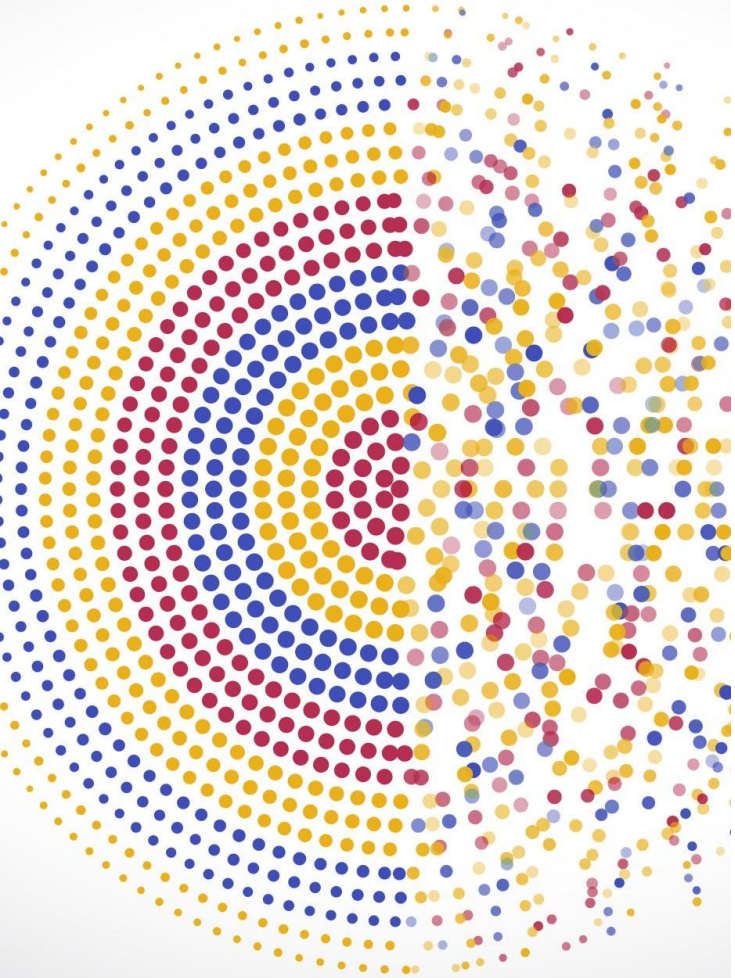
- Biomedical waste can cause health problems to health care professionals who handle it and pollute the environment as well.
- So, all health care professionals should ensure safe disposal of biomedical waste.

Transmission-based Precautions

Airborne Precaution

Contact Precaution

Droplet Precaution



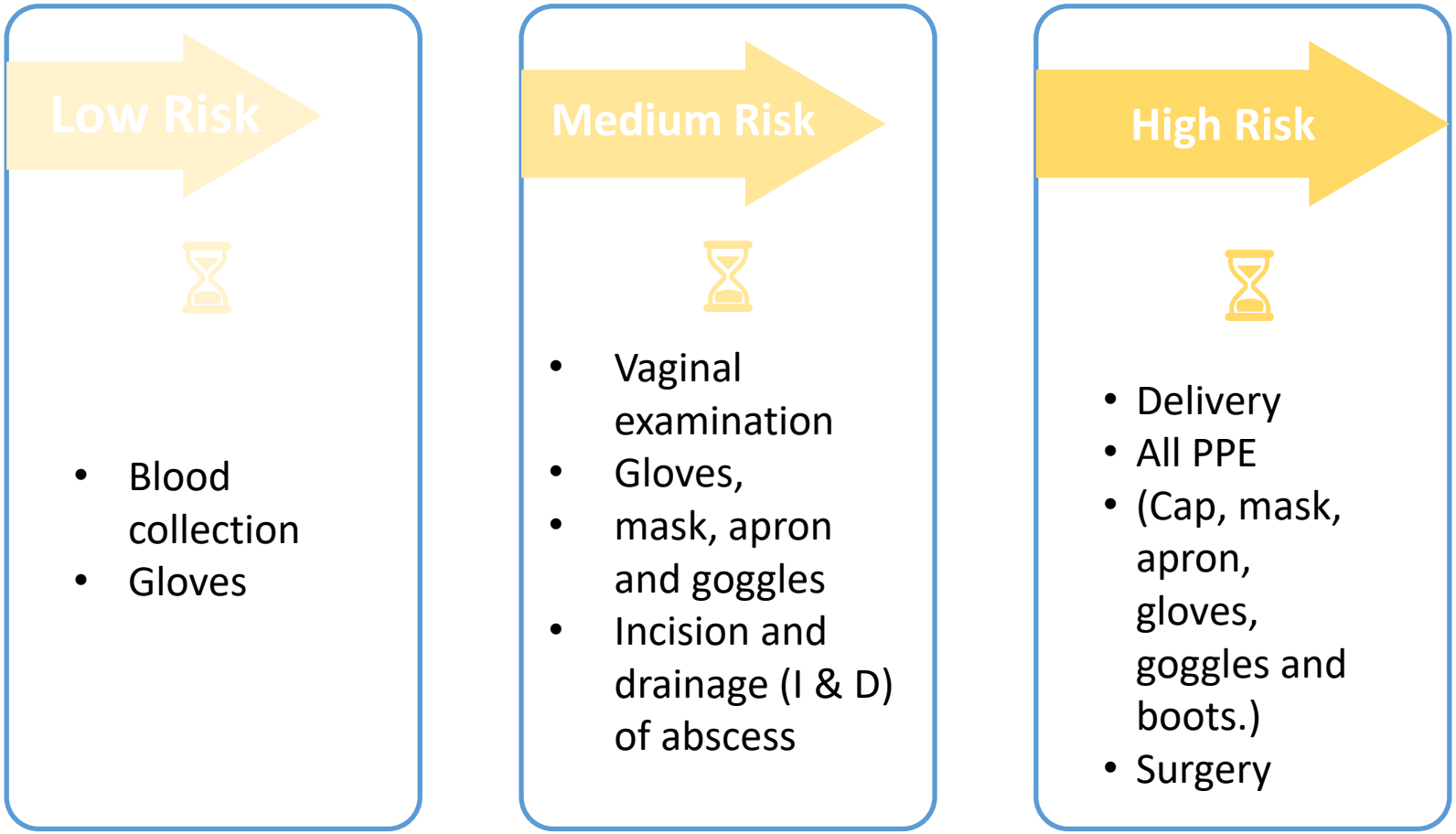
Evidences

- Documentation of standard precaution in the HIC manual.
- Training records.
- Audit reports.
- Staff awareness - interview.

Facilities Available

- Hospitals should ensure that adequate quantities of PPE, soap, alcohol hand rub and disinfectants are available for use by health care professionals.

PPE Usage


Low Risk
Blood collection
Gloves
Medium Risk
Vaginal examination
Gloves,
mask, apron and goggles
Incision and drainage (I & D) of abscess
High Risk
Delivery
All PPE
(Cap, mask, apron, gloves, goggles and boots.)
Surgery

Evidences

- Adequate stock and supply of soap, disinfectants and PPEs.
- Staff training on donning and doffing PPE.
- Audit of PPE usage practices.

- **HAND HYGIENE**

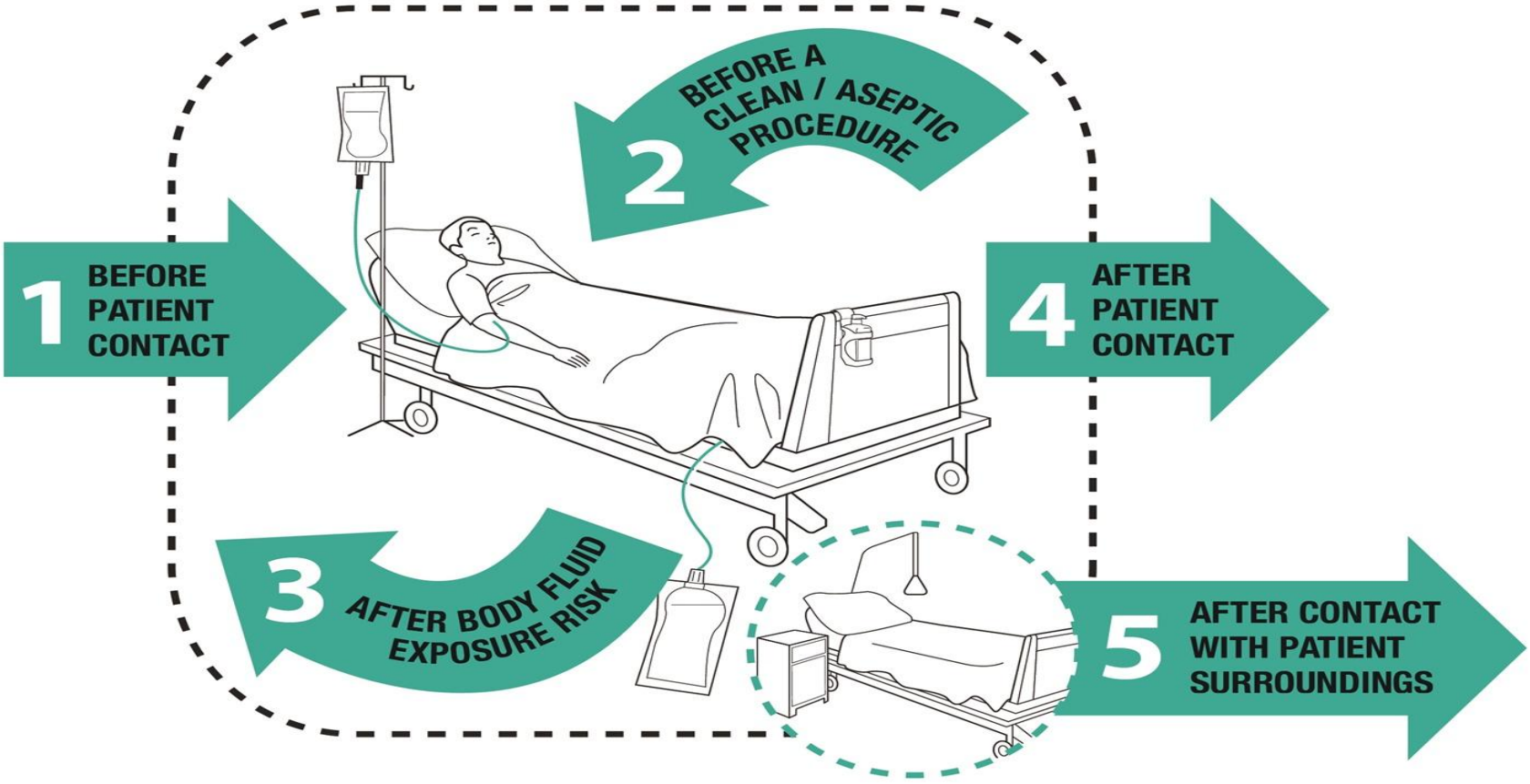
Why is hand hygiene important?

- Thousands of people die every day around the world from infections acquired while receiving health care.
- Hands are the main pathways of germ transmission during health care.
- Hand hygiene is therefore the most important measure to prevent health care-associated infections.
- **You** must perform hand hygiene to **protect the patient** against harmful germs carried on **your** hands or present on his/her own skin and also **protect yourself** and the healthcare environment from harmful germs.

How to perform hand hygiene?

https://www.cdc.gov/oralhealth/infectioncontrol/faq/hand.htm

Five Moments of Hand Hygiene



Facilities Available for Hand Hygiene in Patient Care Areas

- Running water and soap.
- Hand disinfectant at the patient's bedside.
- Hand disinfectant at the entry point of critical area/isolation area.

Techniques of Hand Hygiene

Hand washing – It is done using soap and water when hands are visibly soiled or when there is an exposure to spore forming pathogens such as *Clostridium difficile*

Hand rubbing – It is done using an alcohol-based hand rub. And, is the preferred method of hand hygiene, if hands are not visibly soiled.

How to Handrub?

RUB HANDS FOR HAND HYGIENE! WASH HANDS WHEN VISIBLY SOILED

Duration of the entire procedure: 20-30 seconds

1a 1b

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

2

Rub hands palm to palm;

3

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

4

Palm to palm with fingers interlaced;

5

Backs of fingers to opposing palms with fingers interlocked;

6

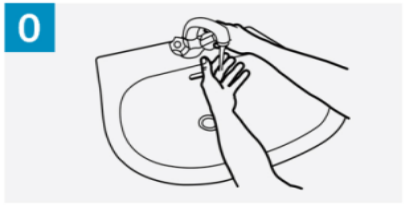
Rotational rubbing of left thumb clasped in right palm and vice versa;

7

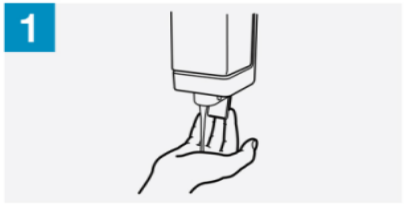
Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

8

Once dry, your hands are safe.

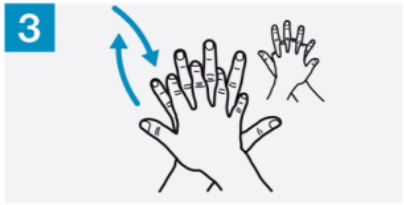


Wet hands with water;

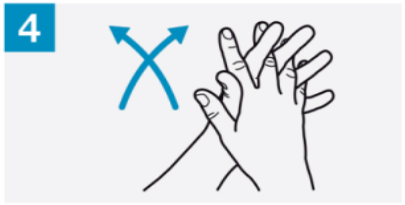


Apply enough soap to cover all hand surfaces;

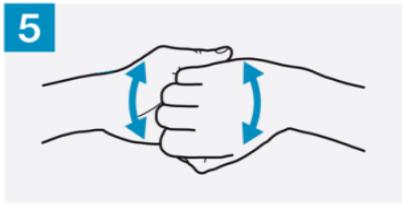
Rub hands palm to palm;



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

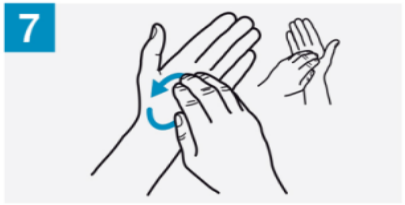


Palm to palm with fingers interlaced;

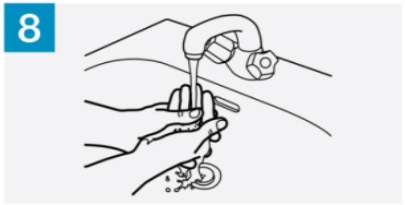


Backs of fingers to opposing palms with fingers interlocked;

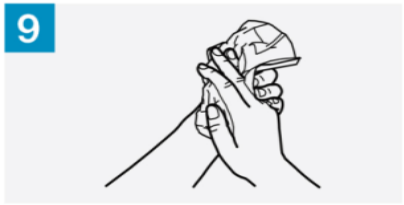
Rotational rubbing of left thumb clasped in right palm and vice versa;



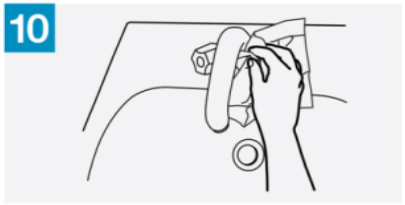
Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



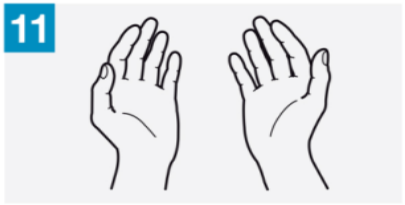
Rinse hands with water;



Dry hands thoroughly with a single use towel;



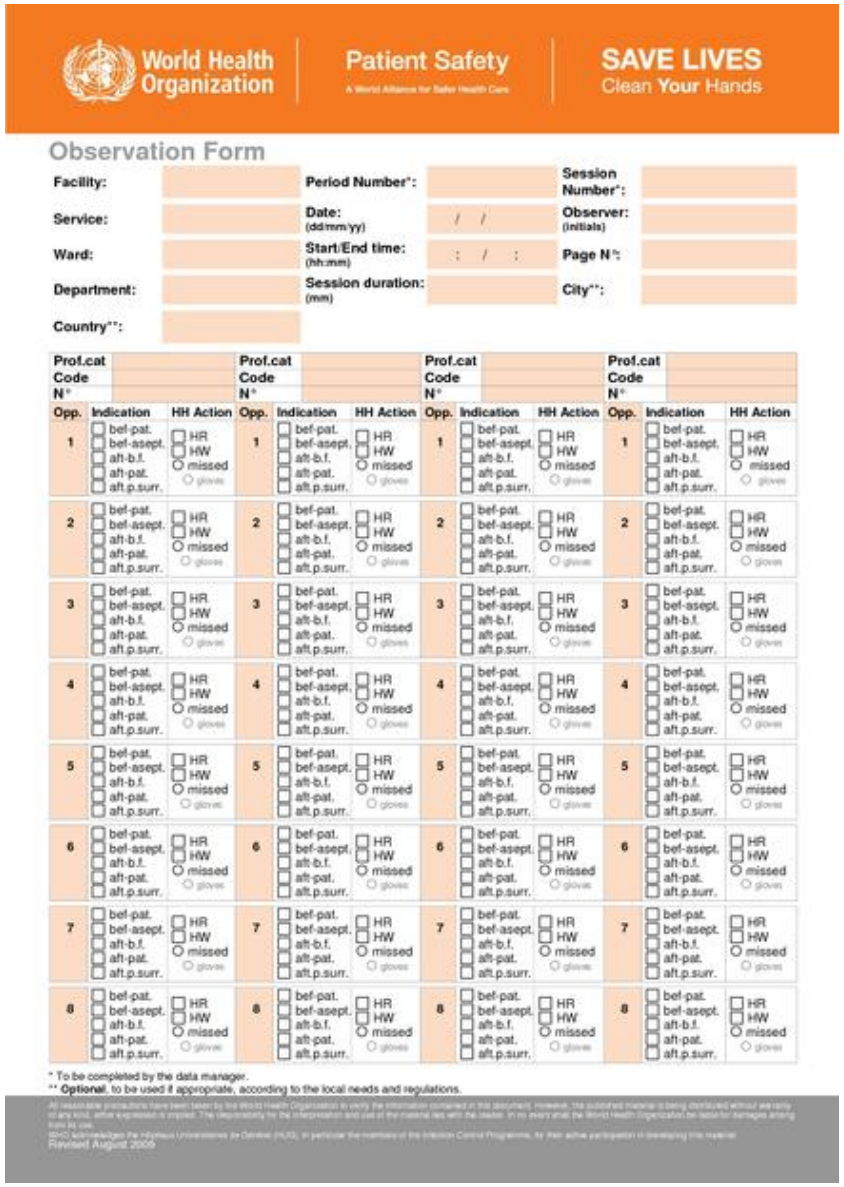
Use towel to turn off faucet;



Your hands are now safe.

Surgical hand antisepsis (2 - 5 mins)

Monitoring Hand Hygiene Practices



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

Observation Form

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

Prof.cat Code N°			Prof.cat Code N°			Prof.cat Code N°			Prof.cat Code N°		
Opp.	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**
1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
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* To be completed by the data manager.
** **Optional**, to be used if appropriate, according to the local needs and regulations.

Revised August 2009

Hand Hygiene Audit

Appendix E: Handwashing competence checklist

South Staffordshire NHS
Primary Care Trust

Hand Washing Competence Checklist

NAME:

All stages must be carried out to be assessed as competent

		Tick
No wristwatches or, jewellery are worn. A plain band ring is acceptable but no stoned rings. Nails should be short, no polish or fake nails to be worn.		
Wet hand under running water before applying soap.		
Apply enough soap to cover all hand surfaces		
1 Palm to palm		
2 Right palm over left dorsum and left pam over right.		
3 Palm to palm finers interlaced		
4 Backs of fingers to opposing palms with fingers interlocked		
5 Rotational rubbing of thumbs		
6 Rotational rubbing backwards and forwards with clasped fingers		
7 Rub each wrist with opposite hand		
Rinse hands thoroughly under running water		
Turn taps off with elbows		
Dry thoroughly using paper towels		
Using foot pedal to open bin, dispose of paper towels		

Competent: YES/NO

Comments:

Signed: **Date:**

Print name:

Hand Washing Competence Checklist

Hand Washing Competence Checklist

Evidences

- Adequate hand hygiene facilities.
- Hand hygiene training records of all health care workers (HCWs).
- Availability of hand hygiene posters.
- Hand hygiene – audit.

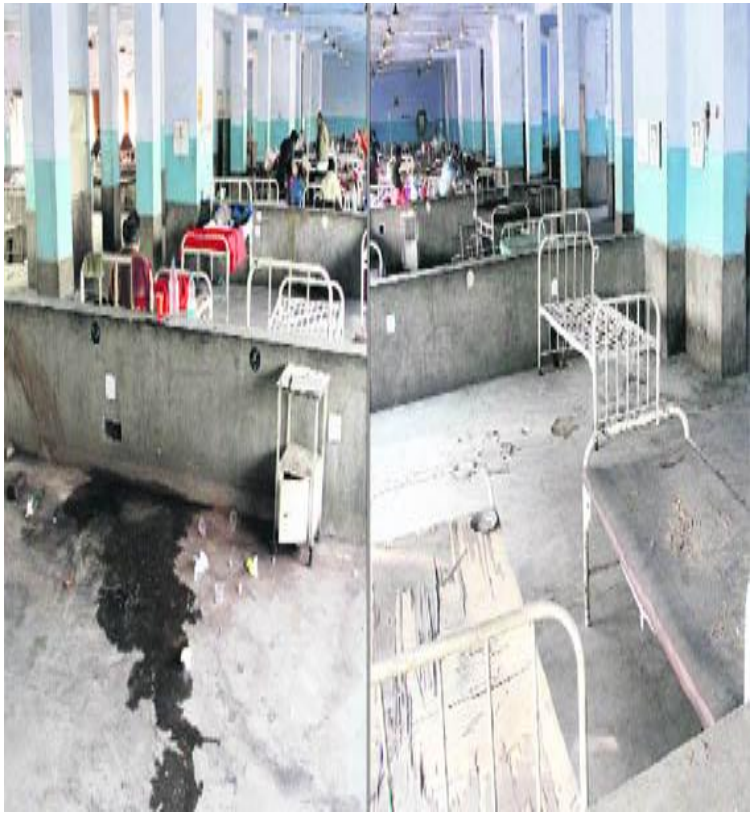
Challenges in Vaccination

- Do you know what are the vaccines available in the heath care facility? And, who pays for the vaccine- Is it the management or the employee?
- Do you know the conditions that require post exposure prophylaxis?

Evidences

- Vaccination policy of the health care facility
- Vaccination records of HCWs
    - HBV +/- (anti HBsAg titres)
    - TT
    - Typhoid vaccine for food handlers
    - Varicella Zoster *
    - Flu vaccine *
- Records of post exposure prophylaxis
    - HIV
    - HBV
    - Others (For example: Cholera- Doxycycline)

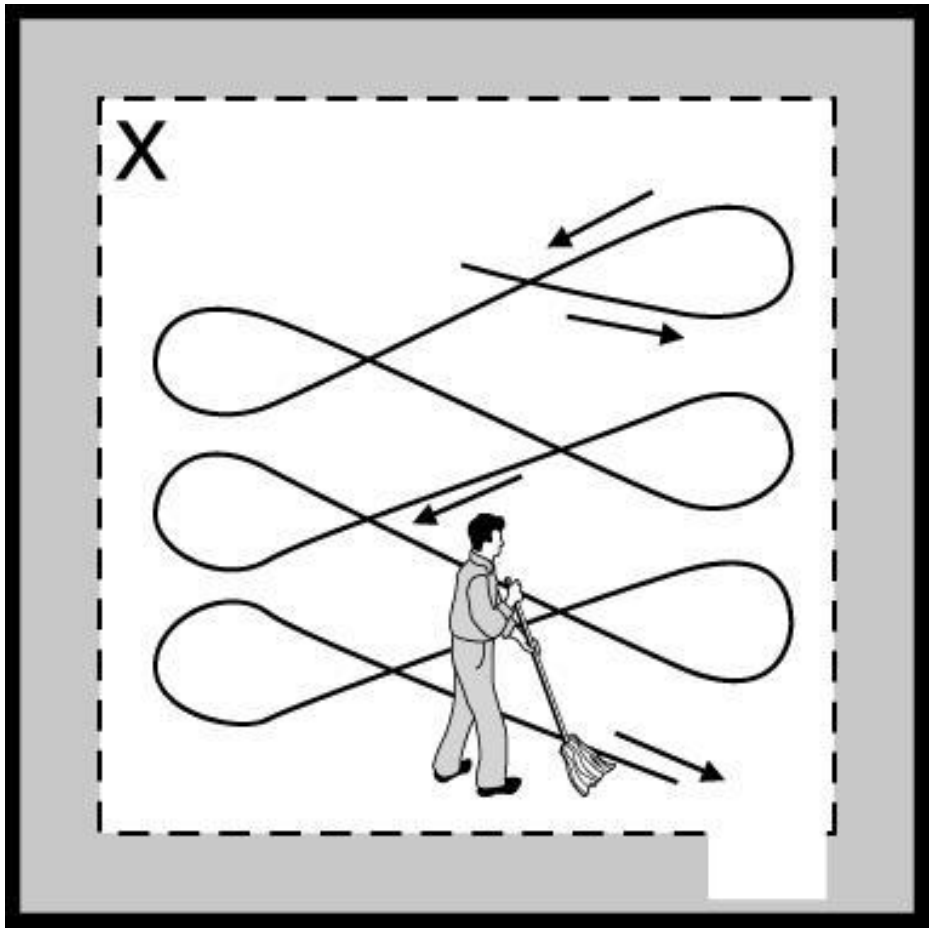
Bad Housekeeping



Good Housekeeping

Method of Cleaning

Figure of 8 Stroke Technique for Mopping



Safety Measures

- Appropriate warning signs such as **“Caution: Wet floor”** should be placed to notify people walking in the area that the area might be slippery. The warning sign should remain on the surface until the surface is dry.

- All housekeeping staff should wear appropriate PPE while performing house keeping activities.

Rodents and Pest Control

- Hospital should adhere to rodents and pest control standards in both clinical and non-clinical areas of the hospital.

- Hospital should ensure that appropriate pest control contract is in operation and that the designated person must be informed about sightings of rodents and/or other pests.

Evidences

- Documentation of house keeping practices in the HIC manual.
- Daily cleaning records.
- Training records of house keeping staff.
- Audit reports on house keeping practices.
- Safety data sheet (SDS) of the cleaning materials used.
- House keeping staff awareness - interview.

Frequency of Cleaning

- Routine cleaning is done based on the following criterion:
  - Type of surface:
    - High touch surface.
    - Low touch surface.
  - Risk of infection associated with the area.
  - Patient's vulnerability.

Cleaning High Touch Surface

- High touch surfaces in a hospital are surfaces that are in frequent contact with the hands.
- These surfaces should be cleaned and disinfected daily.
- For example: Doorknobs, bedrails and elevator buttons.

Cleaning Low Touch Surface

- Low touch surfaces in a hospital are surfaces that are in minimal hand contact.
- These surfaces should be cleaned regularly(but not necessarily daily)and when a patient gets discharged.
- For example: Floors and walls.

Cleaning Patient Care Equipment

- All patient care equipment should be cleaned and then based on the degree of risk involved, each equipment should be either disinfected/ sterilised before reuse.

Disinfection

- Disinfection is a process where most microbes except bacterial endospores are removed from a defined object or surface.

- Based on its utility, the type of disinfectant solution, its concentration and frequency of use for different environmental areas and instruments or materials should be determined.

How to select a disinfection agent?

- A disinfection agent should be selected based on the following criterion:
  - Intended use and appropriateness.
  - Degree of disinfection required.
  - Spaulding's classification.
  - Safety.
  - Turn-around-time (TAT).

Evidences

- Documentation of cleaning and disinfection practices in the HIC manual.
- Daily cleaning records.
- Staff training records.
- MSDS for all chemicals used.

DISINFECTION AND STERILISATION PRACTICES

Note: Proper cleaning is essential before any disinfection or sterilisation process.

Disinfection is a process where most microbes except bacterial endospores are removed from a defined object or surface.

Sterilisation is a process by which an article, surface or medium is made free from all micro-organisms **including spores.**

Spaulding's Classification

- Spaulding outlined three categories of risk from medical instruments based on its potential to transmit infection if the instrument is microbiologically contaminated.

Non-critical

- Devices that are in contact with normal and intact skin of a patient. These devices require low level or intermediate level disinfection before reuse.
- For example: BP apparatus, stethoscope.

Semi Critical

- Devices that come in contact with intact mucous membranes or non-intact skin. These devices require high level disinfection before reuse.
- For example: Vaginal speculum and endoscope.

Critical

- Devices that come in contact with sterile areas of the body including blood contact. These devices should be sterilised before reuse.
- For example: All surgical instruments.

Types of Disinfectants

- **High level disinfectants (HLD)**
- Glutaraldehyde (2.45%) (> 20 mins)
- Ortho-phthalaldehyde (OPA) (0.55%)
- Peracetic Acid (0.2%)
- Hydrogen Peroxide(7.35%)/ Peracetic Acid (0.23%)
- **Intermediate level disinfectants (ILD)**
- Sodium Hypochlorite
- Povidone Iodine
- Chlorhexidine
- Phenols
- Glutaraldehyde (Short Exposure Time)
- **Low level disinfectants (LLD)**
- Alcohols
- Benzalkonium chloride
- Soaps

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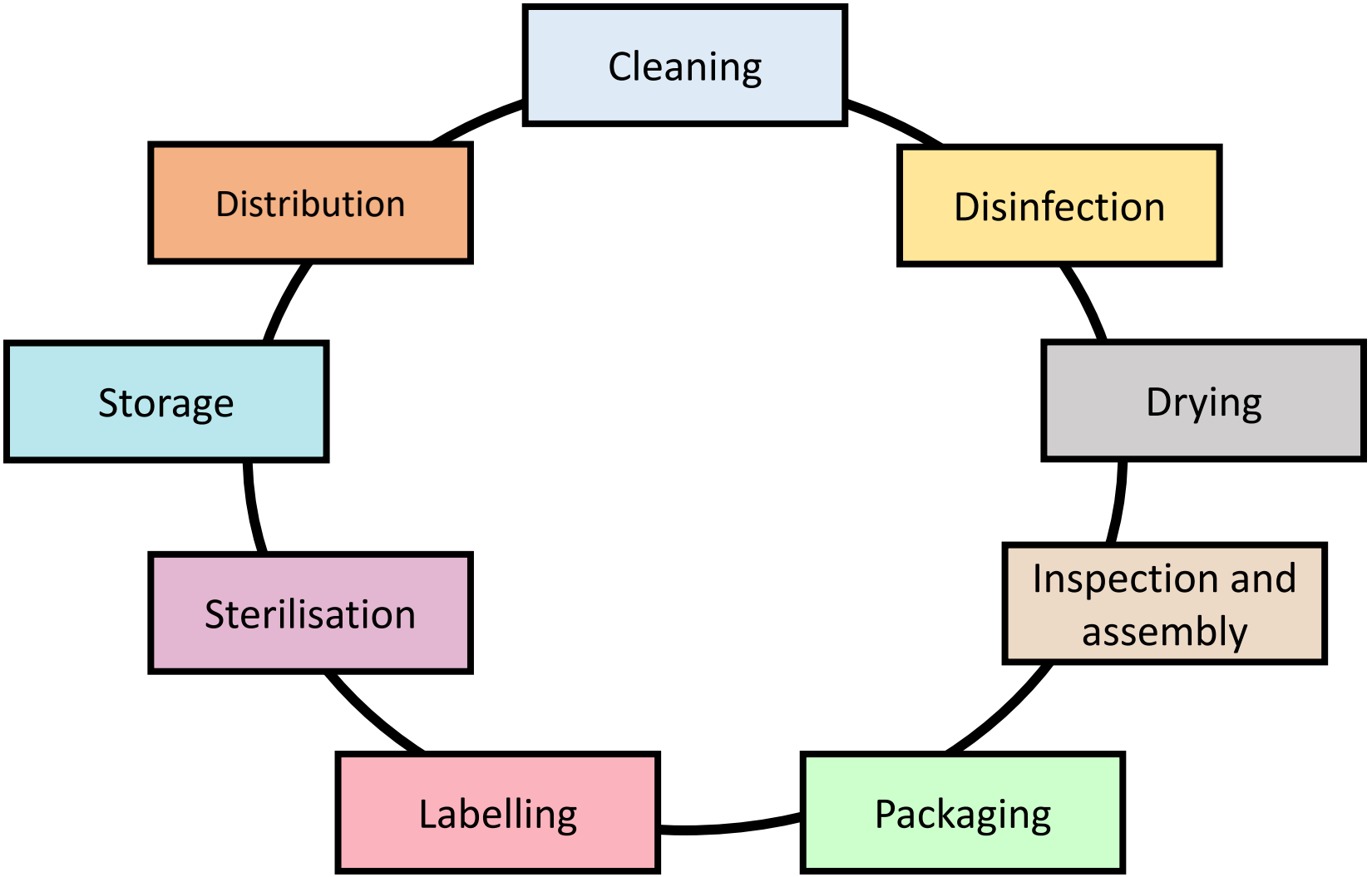
  - Spaulding's classification.
  - Safety.
  - Turn-around-time (TAT).

Central Sterile Supply Department

- The CSSD is the service within the hospital, catering for the sterile supplies to all departments such as specialised units as well as general wards and OPDs.

- It was previously known as:
  - **TSSU** : Theatre Sterile Supply Unit (+)
  - **HSSU** : Hospital Sterile Supply Unit

Functions of the CSSD



CSSD Essentials

- Zoning : Soiled area, Clean/disinfected. area and sterile storage area.
- Uninterrupted power supply.
- Compressed air.
- Water with low TDS. (RO water is preferred for final rinse)
- Environmental controls:
  - Temp – 18 - 25 ^{0} C.
  - Humidity – 40-60 %.
  - Pressure – Cleaning and Decontamination area - Negative. Storage area – Positive.

Storage

- The sterilised packages must be stored only on stainless steel racks. They should never be stored on wooden racks.
- The stainless-steel racks should be placed at a distance of:
  - 45cms from the roof.
  - 20-25cms from the floor.
  - 5cms from the wall.

Types of Sterilisation Process Monitors

- There are three types of sterilisation process monitors that help in identifying possible errors.

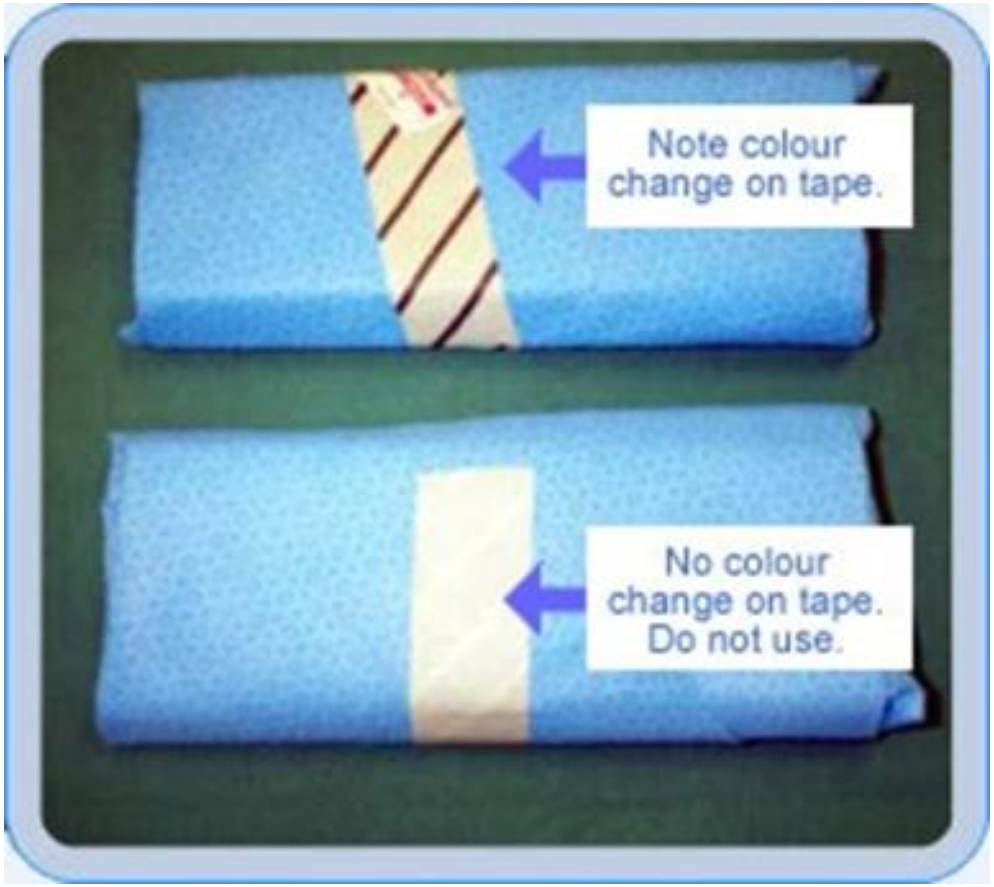
- They are:
    - Physical indicators.
    - Chemical indicators.
    - Biological indicators.

Principles of Reprocessing Reusable Devices

- Identification of reprocessing times of SUD.
- Labelling of SUD with the name of the device, size specifications, original manufacturer, number of times the device has been used, date of last use and date of reprocessing.
- Allocation of a non-repeatable batch number to the device in order to facilitate recall of the device.
- Not reusing original packaging materials from the manufacturer.
- Obtaining consent for use on patients.
- Documentation.

Sterilisation Failure - Recall

- Conditions when instruments or equipment are returned to CSSD:
  - When the biological indicator shows bacterial growth.
  - When it is wet inside the sterilised package.
  - When there is no colour change in the chemical indicator.
  - If the SUD is found unsafe to use due to repetitive incidents or due to a report by Microbiology department or from its manufacturer.



LINEN MANAGEMENT

- Linen management is an organised systematic approach to managing the laundry/ linen system in an efficient, safe and cost-effective manner.

The functions of the laundry department are:	Collecting soiled linen.
	Sorting the linen and processing it.
	Inspecting, repairing or replacing damaged material.
	Distributing clean linen to the respective user departments.
	Maintaining registers.

Outsourcing Laundry

If the laundry is outsourced, then there should be an established system for contract management and periodic review of quality of service.

KITCHEN SANITATION AND FOOD HANDLING

Personal Hygiene – Dietary Staff

- The dietary staff should :
  - Perform hand hygiene before starting work and should repeat it at several instances such as after using the toilet, after touching unclean equipment and after handling raw food.
  - Wear clean clothes.
  - Use hair nets while on duty.
  - Wear gloves.
  - Use clean equipment for preparing or storing food.

Surveillance

- Environmental surveillance: Whenever an outbreak is suspected.
- Water analysis: Once a month.
- Screening food handlers for carrier state of enteric pathogens: Bi-annually.

Vaccination

- All dietary staff should be given the following vaccinations:
  - Typhoid vaccine.
  - Hepatitis A Vaccine*(Best practice).

ENGINEERING CONTROLS TO PREVENT INFECTIONS

Engineering controls

- Engineering controls are important for preventing infections in hospitals. The role of the engineering team is crucial in the maintenance of the HVAC, water supply, building and the supply lines.

Basic Requirements for Environmental Controls

- Basic requirements of environmental controls include:
    - Water management.
    - Theatre environment.
    - Protective environment rooms.
    - Facility management.

Water Management

- General requirements for pipelines are:
    - Proper colour coding of different pipelines like drinking water, RO lines, fire pipelines and sewage water lines.
    - Up-to-date drawings of pipelines.

Water Management

- General requirements for water tanks are:
  - Cleaning schedule.
  - Records of date of cleaning, disinfectant used, name of person who cleaned the tank.
  - Tanks:
    - Should be kept closed.
    - Should be marked with details regarding type of water, tank's capacity, last cleaning date and due date.
    - Should have water level indicator.
    - Should have safe access with ladder.

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Testing Sewage Treatment

- Sewage treatment (Limits as per PCB):
    - Physical quality: Daily.
    - Chemical quality: Once in 6 months.
    - Biological quality: Monthly.

Water Analysis

- For an entry level, the best practice for analysing drinking water is once in a month.
- Checking the residual chlorine levels of the RO water for dialysis should be done after the weekly cleaning at the terminal ends before connecting to the machine.
- Endotoxin levels for the RO water for dialysis should be done once in a month.
- Scrub water should be checked once a week.

Theatre Environment

- Theatre environment should have the zoning done appropriately.
- Entry should be restricted.
- Patients should not be brought beyond the red line in theatre. And, transfer trolleys should be used.
- Theatre staff should wear proper attire.
- Operation theatre (OT) walls and floor should be free of crevices and cracks.
- The floor should be seamless with curved edges. This would prevent accumulation of dirt and micro-organism and would be easy to clean.
- Cleaning records should be maintained.

AC in Theatre

- It is mandatory for full NABH accreditation to have the following in each OT:

- *Individual air handling unit (AHU) for each theatre.*
- *Laminar flow and high efficiency particulate air (HEPA) filters in case of ultra clean theatres.*
- *Air changes, positive pressure, relative humidity and temperature should be monitored and documented daily.*

- The air-conditioning system should not be switched off and should be maintained with a variable frequency devices (VFD) and a blower to prevent spore formation in the ducts.

Filter Cleaning

- The integrity of the filters and the system should be checked every six months.
- HEPA should be changed if the particle count is high.
- The pre-filters at the AHU should be washed every week and maintained appropriately.
- Records of checking should be maintained.

Note: For entry level certification, split AC system and window AC are permitted in theatres. The filters of the window AC should be cleaned weekly and unit should be maintained weekly. And, the process should be documented.

Protective Environment Rooms

- Protective environment rooms like burns unit, transplant units and isolation units should be planned and constructed as per the norms

- Air-conditioning requirements like positive pressure in case of transplant or burns unit and negative pressure in case of isolation units should be provided.

Isolation Requirements

- If isolation units are not available in the hospital and patients with air-borne infections are admitted, then to prevent the spread of infections:
  - Each patient should be placed in single/private rooms with closed doors.
  - Patients with same illness can be placed in same room.
  - There should be no central AC supply in any rooms.
  - Each room should have separate AC unit (window/split/non-AC room).

Isolation Requirements in a Block with Central AC

- The door should be kept shut.
- Windows should be open.
- Inlet and outlet AC duct should be blocked.
- Powerful exhaust for airflow (from outside to inside the room, in and out through window and when the door is opened) should be available.

INFECTION CONTROL GUIDELINES FOR THE MORTUARY

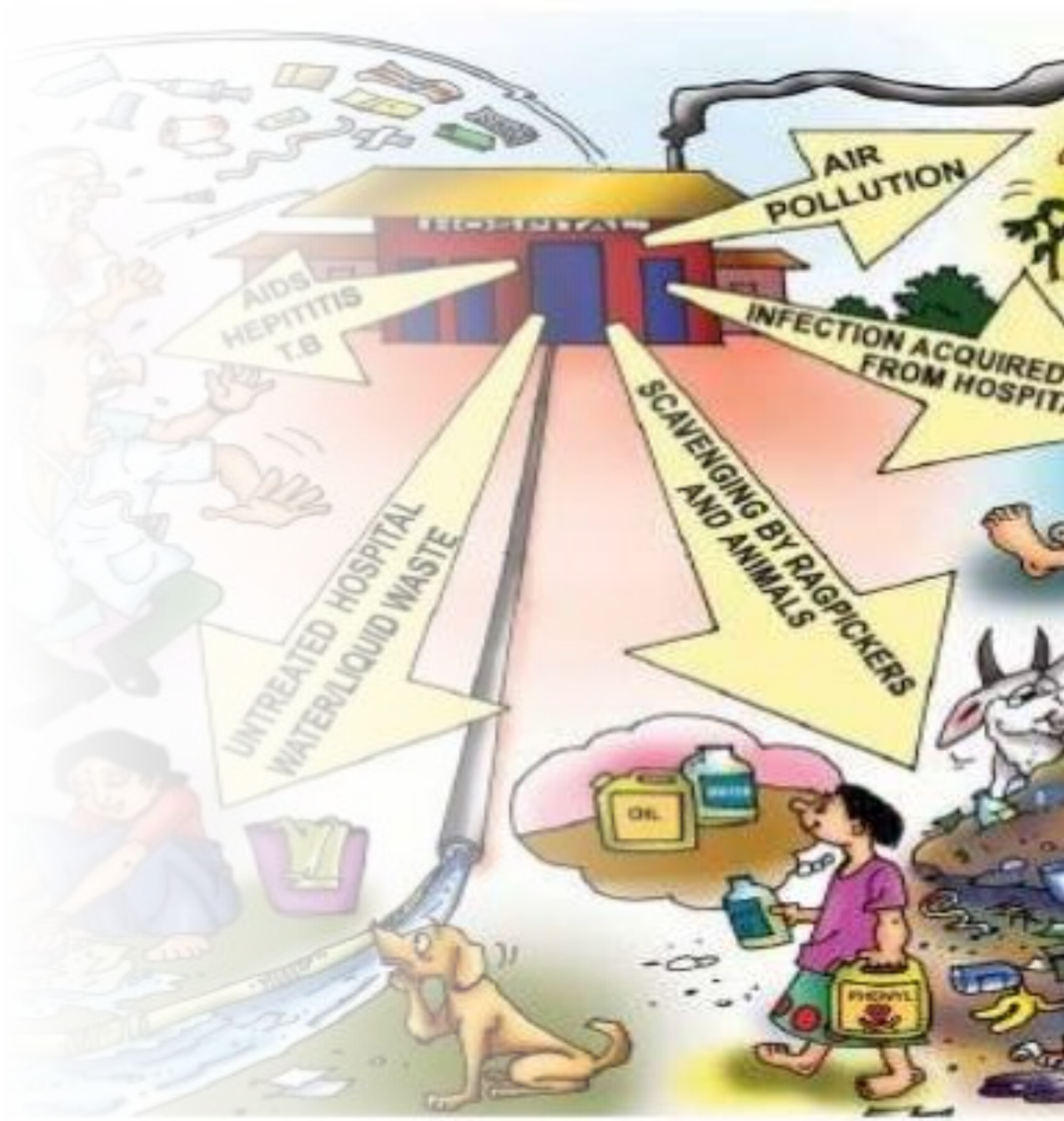
Requirements

- A separate area should be designated as mortuary and should be under lock and key with strict access control.
- The facility should be clean.
- It should have a cold storage with temperature monitoring and power back up.

- The mortuary staff should perform hand hygiene and wear adequate PPE.
- The biomedical waste should be safely segregated and disposed.
- The mortuary should be free of pests and rodents.
- The entire process should be documented.

BMW MANAGEMENT

- Any waste that is generated during diagnosis, treatment or immunisation in hospitals, laboratories and blood bank is called a biomedical waste.



Importance of Safe Segregation and Disposal of BMW

- Biomedical waste can cause health problems to health care professionals who handle it and pollute the environment as well. So, proper collection, segregation, storage and disposal of biomedical waste is important to control or minimise the risk of infections, injury and toxic effects.

3R Approach to BMW Management

- **Reduce:** Prevent wastage of products.
- **Reuse:** Reuse single use items after proper sterilisation.
- **Recycle:** Send non-hazardous items for recycling.

BMW Rules

- Remember that the BMW rules of 2016 do not apply to:
    - Radioactive Wastes, Atomic Energy Act, 1987
    - Hazardous Chemicals Rules, 1989
    - Solid Wastes covered under MSW, Rules, 2000
    - Lead acid batteries, Batteries Rules, 2001
    - Hazardous Waste management Handling & Transboundary Movement Rules, 2008
    - E-waste, E-waste Rules, 2011
    - Hazardous microorganisms Rules, 1989

Examples of Biomedical Waste

- Infectious waste.
- Chemical waste.
- Sharps waste.
- Cytotoxic waste.
- Infected waste.

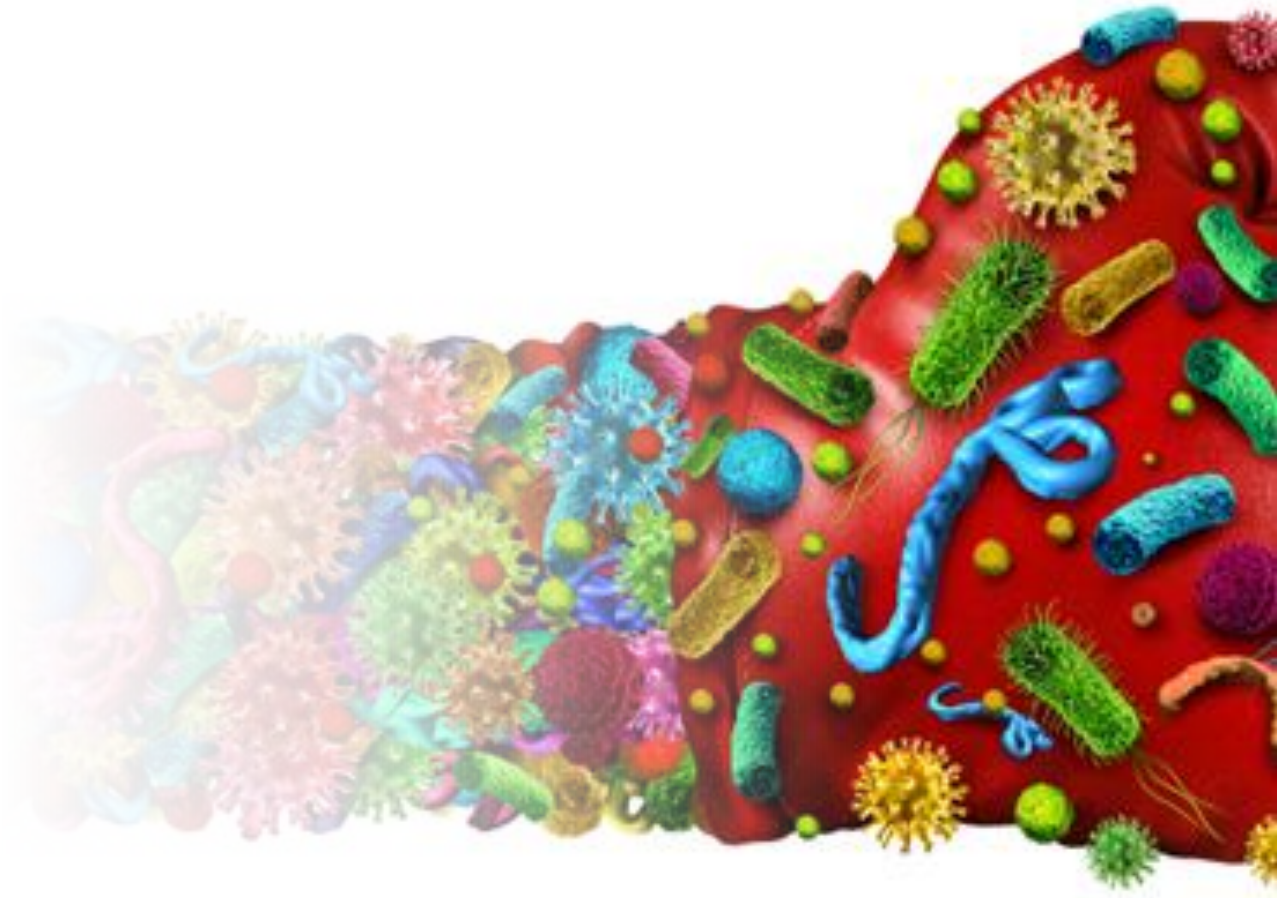
Signs and Signages

Handling Biomedical Wastes

All health care professionals handling biomedical wastes should wear personal protective equipment (PPE) such as cap, goggles, mask, apron, rubber gloves and boots.

After handling biomedical wastes, a health care professional should perform hand hygiene without fail.

ANTIBIOTIC POLICY



Antimicrobial Resistance

- Globally, there is a rise in the infections that are caused due to multidrug resistant organisms(MDROs).

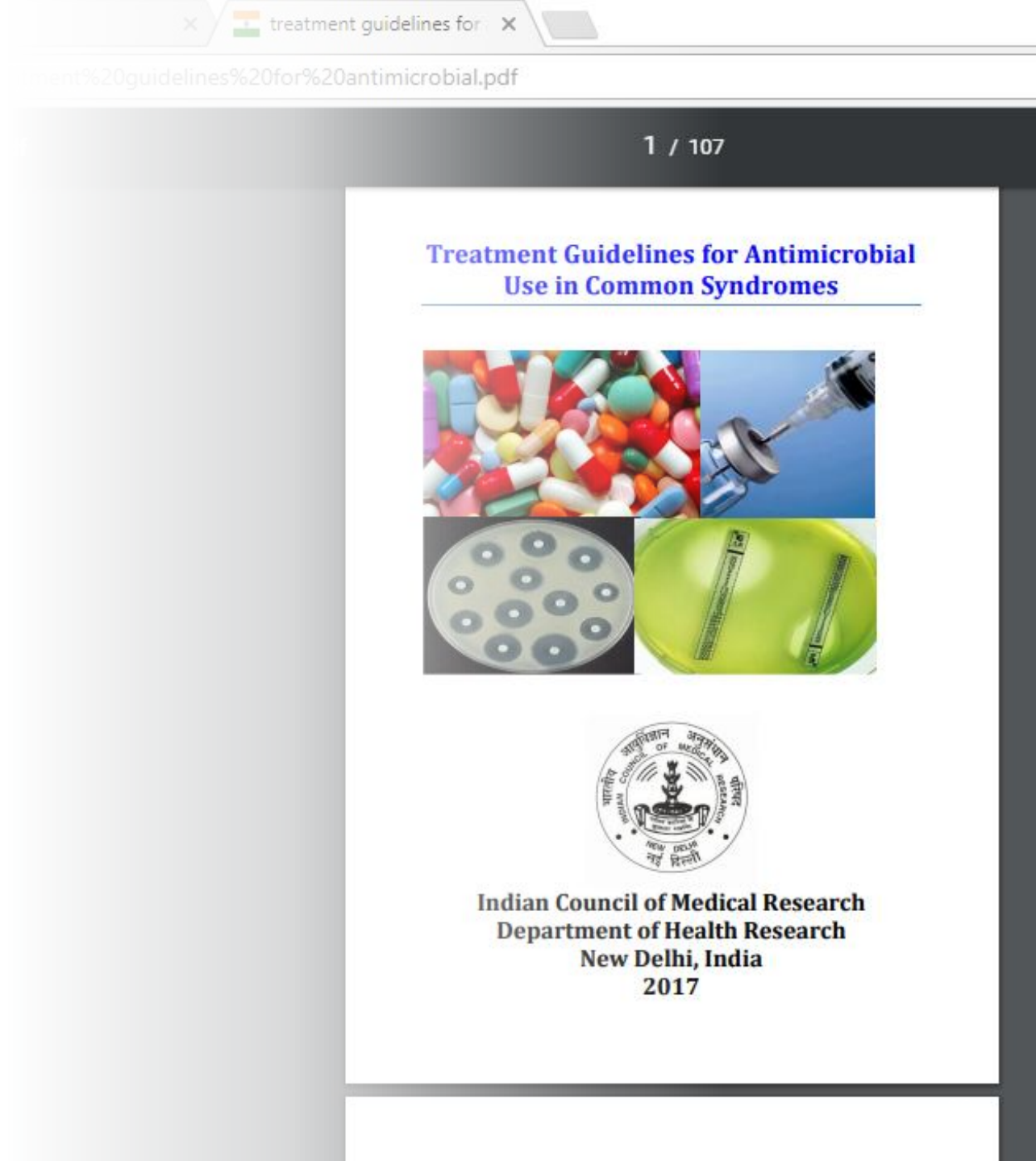
- Most of the current antibiotics in the clinical pipeline are slight modifications of the existing drugs. And, there is a lack of new antibiotics to fight against MDROs.

- So, how can healthcare sector combat the threat of antimicrobial resistance?

- Minimising the emergence and spread of MDROs helps in preserving the effectiveness of existing antibiotics.

Guidelines

- Every hospital should have its own antibiotic policy.
- The antibiotic policy is essentially for prophylaxis, empirical and definitive therapy.
- There should be a periodic review and timely updation of the antibiotic policy.
- The “Treatment Guidelines for Antimicrobial Use in Common Syndromes” can be used as the guiding document.



Aims of the Antibiotic Policy

The primary aims of the hospital antimicrobial policy should be:

- Minimising mortality due to antimicrobial resistant infection.
- Preserving the effectiveness of antimicrobial agents.

This can be achieved by:

- Selecting patients who need to be treated.
- Having all antibiotics available.
- Avoiding unnecessary antibiotic use.

"The RIGHT drug for the RIGHT bug"

OUTBREAK MANAGEMENT

An outbreak may be defined as the occurrence of infections at a rate greater than that expected within a specific geographical area and over a period.

How to detect an outbreak?

- An outbreak can be detected using different surveillance techniques such as:
    - Passive surveillance: Monitoring routinely collected health data.
    - Active surveillance: Actively obtaining health data.
    - Sentinel surveillance: Selected groups provided health care data.
    - Syndromic surveillance: Monitoring health syndromes.
    - Others: Collecting information through newspaper and social media.

Outbreak Preparedness

- After obtaining information regarding an outbreak, a hospital should do the following:

  - Form and train Rapid Response Team (RRT).
  - Conduct periodic review of data.
  - Update the plan.
  - Identify outbreak season/region.
  - Arrange necessary drugs and materials.
  - Strengthen diagnostics.
  - Strengthen liaison with other health-care system and public health authorities.

Confirm

- The first step of outbreak investigation is confirming that there is an outbreak.

- Comparing the current data with the baseline level of disease in a population provides information on increase in number of people falling sick.

Determine Cause (Hypothesis)

- After describing an outbreak, investigators should determine the likely **cause of an outbreak** also called as the **hypothesis**. If the pathogen that cause the infection is already known, then it is easy to find the source of infection and mode of transmission.
    - For example: If the outbreak is cholera then the source of contamination is contaminated water. Salmonella outbreak is due to contaminated eggs or meat.
- If the pathogen is unknown, then the investigators should test and confirm the likely cause of outbreak. This can be done using analytical epidemiological study such as cohort study and case-control study.

THANK YOU