



# GUIDELINES FOR IMPLEMENTATION OF “KAYAKALP” INITIATIVE

**MINISTRY OF HEALTH AND FAMILY WELFARE  
GOVERNMENT OF INDIA**



# CONTENTS

<b>Introduction:-</b>	<b>5</b>
<b>A. Improving Hospital/Facility Upkeep</b>	<b>8</b>
Infrastructure Maintenance	8
Hospital/Facility Appearance	11
Maintenance of Open Areas	15
Landscaping and Gardening	15
Pest and Animal Control	18
Illumination and Lighting in Hospital	19
Maintenance of Furniture and Fixtures	23
Removal of Hospital Junks	23
Water Conservation	25
Work Place Management	28
<b>B. Improving Sanitation and Hygiene</b>	<b>23</b>
General Approach to Environmental Cleaning	23
Material and Equipment for Cleaning	41
Standard Method of Cleaning	50
Monitoring of Cleanliness Activities	51
Drainage and Sewage Management	51
<b>C. Improving Waste Management</b>	<b>55</b>
Implementation Of Bio Medical Waste Rules, 2016 & 2018 (Amendment)	55
Storage of Bio Medical Waste	59
Disposal of Bio Medical Waste	60
Handling of Metal Sharps	61
Handling of Glassware	62
Sharp Management	62
Post Exposure Prophylaxis (PEP)	62
Steps for Managing Accidental Exposure	63
Management of Hazardous Waste	67
Solid General Waste Management	71
Liquid Waste Management	73
Equipment and Supplies for BMW Management	77
Statutory Compliances	77
<b>D. Infection Control</b>	<b>80</b>
Standard and Additional Precautions	81
Spill Management	111
Isolation and Barrier Nursing	116

Hospital Infection Control Programme -----	118
Hospital Acquired Infection Surveillance -----	122
Environment Control -----	128
<b>E. Hospital Support Services -----</b>	<b>134</b>
Laundry Services and Linen Management -----	134
Water Sanitation-----	141
Kitchen Services -----	145
Hospital Security Services-----	151
Out-Sourced Services Management -----	152
<b>F. Hygiene Promotion-----</b>	<b>155</b>
Community Monitoring and Patient Participation -----	155
Information, Education and Communication -----	157
Leadership and Teamwork -----	159
Staff Hygiene and Dress Code-----	161
Annexure I: Characteristics of the Main Disinfectant Groups-----	162
Annexure II: Standard Operating Procedures for Cleaning -----	164
Cleaning of Patient Care Area/Room -----	164
Cleaning Operating Rooms -----	166
Cleaning of Sterile Areas -----	170
Cleaning of Labour Rooms -----	170
Cleaning of Toilets -----	172
Cleaning of Isolation Wards -----	173
Cleaning of Equipment -----	175
Cleaning of Ambulance -----	177
Cleaning of Water Coolers:-----	178
Cleaning of Air Conditioners (Ac) -----	178
Annexure III: Sample Checklist -----	179
Annexure IV: Schedule I: BMW Categories and their Segregation, Collection, Treatment, Processing and Disposal Options -----	181
Annexure V: Logo for BMW Containers and Bags -----	186
Annexure VI: Needle Stick Injury Reporting Format -----	187
Annexure VII: Surgical Site Infection Reporting Format -----	189
Annexure VIII: Inspection Checklist (CPWD) -----	190
Annexure IX: IEC for Swachh Bharat Abhiyan and Kayakalp -----	194
Annexure X: Glossary of Terms -----	199
List of Abbreviations -----	206
References -----	208
List of Contributors -----	212

# INTRODUCTION

After the launch of “Swachh Bharat Abhiyan (SBA)” on 2nd October 2014, “Kayakalp” initiative was launched by the Ministry of Health & Family Welfare on 15<sup>th</sup> May 2015 to complement these efforts.

The objectives of the “Kayakalp” Scheme are

- to promote cleanliness, hygiene and infection control practices in public healthcare facilities, through incentivising and recognising such public healthcare facilities that show exemplary performance in adhering to standard protocols of cleanliness and infection control;
- to inculcate a culture of ongoing assessment and peer review of performance related to hygiene, cleanliness and sanitation;
- to create and share sustainable practices related to improved cleanliness in public health facilities linked to positive health outcomes.

All the states have been enthusiastically participating in this scheme since its launch.

As evident, the Scheme promoted cleanliness and hygiene in public health facilities. However, it was observed, through peer review and external assessment process, that awareness levels with regard to the closure of gaps as per the thematic area of the Kayakalp Scheme have been found to be inadequate at the facility level.

“Guidelines for Implementing Kayakalp” have been developed as an implementation tool and enabler document to find solutions to the identified problems, These guidelines are meant for secondary care public hospitals meeting the Indian Public Health Standards (IPHS) guidelines, though with some discretion they may be used for primary healthcare facilities and as well tertiary care hospitals.

These guidelines have been developed after a detailed literature review of the existing best practices in the field of hospital sanitation, housekeeping, infection control, general maintenance, waste management, and support services etc.; and relevant extracts from the same were adapted with suitable changes as per the needs of public health systems. These guidelines are generic in nature and can be adopted by the healthcare facilities judiciously as per their scope of services.

While framing these guidelines actual logistics, staff and other constraints in the public healthcare facilities have also been kept under consideration.

This handbook would serve as a practical guide to follow standard protocols and practices to achieve highest level of standards related to cleanliness, hygiene and infection control at public healthcare facilities.

These guidelines are divided into six thematic areas as per the “Kayakalp” Scheme (Figure-1):

- Hospital Upkeep
- Sanitation and Hygiene
- Waste Management
- Infection Control
- Hospital Support Services
- Hygiene Promotion





**Figure 1: Six thematic areas of “Kayakalp”**

Each thematic area is further detailed as per the criteria and check points included in the guidelines.

These guidelines focus on strengthening and streamlining maintenance of infrastructure, development of suitable policies for housekeeping services, pest control measures, water sanitation, selection & training of manpower, development and implementation of suitable cleaning methods in the form of protocols/ Standard Operating Procedures (SOPs), effective supervision and monitoring by the staff and in-built mechanisms in the contracts coupled with an organisational structure which puts a premium on good housekeeping and sanitation. The guidelines also describe waste management protocols to be followed in hospitals, along with infection control measures and monitoring of infection rates and activities, the function and role of support services and measures which can be undertaken by hospitals for hygiene promotion both within the hospitals and in community as well.



## Purpose

These guidelines have been developed to provide comprehensive information to healthcare workers for implementation of 'Kayakalp' in their facilities.

The specific objectives of these guidelines are to provide directions and information in relation to

- facilities, equipment, and procedures necessary to implement "Swachhata" and standards precautions for control of infections
- development of suitable policies for housekeeping services, training of manpower, development and implementation of suitable cleaning methods in the form of protocols/SOPs, equipment details for manual cleaning, chemicals & cleaning agents to be used, etc
- cleaning, disinfecting and reprocessing of reusable equipment
- waste management practices
- standard precaution and protection of healthcare workers.

## Use of the guidelines

These guidelines are expected to serve the following purpose:

- As an implementation guidebook containing practical guidelines and protocols for attaining high score on "Kayakalp" assessments.
- Reference books for "SBA training" under "Kayakalp".
- Help assessors to get acquaintance with various aspects of "Kayakalp" tools viz. rain water harvesting, 5S, three bucket system, composting, herbal garden, illuminations, etc.
- Support the health facilities in attaining "Kayakalp" awards and NQAS certificates.

## DISCLAIMERS

In addition to the prescribed guidelines, healthcare facilities must comply with any statutory or legal obligations from time to time.

Many photographs in these guidelines have been provided to illustrate best practices. These photographs were shared by States/UTs with National Health Systems Resource Centre (NHSRC), and NHSRC does not authenticate these photographs and name of the facilities. These are given just to illustrate texts in pictorial form.

Recommendations in these guidelines are provided after considering various national and international guidelines (CDC, WHO), constraints of public health facilities in India, best practices observed in the field and views of experts in that domain.

***For ease of service providers, somewhere brand names of products are provided only as an illustrative example. NHSRC does not endorse any commercially available products.***





# IMPROVING HOSPITAL/ FACILITY UPKEEP

Design characteristics of the hospital such as lighting, ventilation, supportive workplaces, proper layout, and maintenance of the exteriors and interiors can help to reduce errors and stress, and improve outcomes. Activities which are directed for proper maintenance of hospital upkeep enable health facilities to carry out the functions in a safe and secure environment.

Under the “Kayakalp” Scheme the key components of hospital upkeep are included under following criteria:

- Infrastructure Maintenance
- Hospital/Facility Appearance
- Pest and Animal Control
- Landscaping & Gardening
- Maintenance of Open Areas
- Maintenance of Furniture and Fixtures
- Illumination and Lighting
- Removal of Junk Material
- Water Conservation
- Work Place Management

## INFRASTRUCTURE MAINTENANCE

All buildings, however well designed and conscientiously built, require maintenance and repair as they get older. Proper maintenance of the infrastructure is required to be carried out to maintain safe environment inside these buildings. This is a continuous process and includes immediate remedial action for any fault besides preventive maintenance.

### MAINTENANCE OF GENERAL PHYSICAL STRUCTURE

Maintenance of general hospital infrastructure includes the following activities:

1. **Day to day repairs:** Day to day repairs should be carried out by hospital authorities through directly employed labour. The work which is to be attended such as removing choked drainage pipes, restoration of water supply, replacement of blown fuses, repair of faulty switches, watering of plants, lawn mowing, hedge cutting, sweeping of leaf falls etc. should be done on day to day basis. This ensures satisfactory continuous functioning of various services in the buildings.





2. **Annual Repairs:** Works of periodical nature like white washing, colour washing, distemping, painting etc. are called annual repair works and these are generally undertaken through a system of contracts. The periodicity of two years for white washing and colour washing and three years for painting has been laid down by the Central Public Works Department (CPWD). However, facility staff is required to take a decision on the basis of directive received from their respective state governments.

Works such as patch repair to plaster, minor repairs to various items of work, replacement of glass panes, replacement of wiring damaged due to accident, replacement of switches, sockets, tiles, gap filling of hedges, replacement/replanting of trees, shrubs, painting of tree guards, and trimming of plants etc., which are not emergent works and are considered to be of routine type, can be done during any particular period of the financial year, depending upon the exigency. Such works can be done under day to day repair also.

3. **Special repairs:** As the building ages, there is deterioration of various parts of the building and services. Major repairs and replacement of elements become inevitable. It becomes necessary to prevent the structure from deterioration and undue wear and tear as well as to restore it back to its original condition to the extent possible.

The following types of works in general are undertaken under special repairs:

- White washing, colour washing, distempers etc. after completely scrapping the existing finish and preparing the surface afresh
- Painting after removing the existing old paint
- Provision of water proofing treatment to the roof. All the existing treatments known are supposed to last satisfactorily only for a period of about ten years
- Repairs of internal roads and pavements
- Repairs/replacement of flooring, skirting, dado and plaster
- Replacement of doors, window frames and shutters. Replacement of door and window fittings
- Replacement of water supply and sanitary installation like water tanks, WC cistern, wash basins, kitchen sinks, pipes etc.
- Re-grassing of lawns/grass plots within 5-10 years
- Renovation of lawn in 5-6 years
- Replanting of hedges in 8-10 years.

The building services fixtures including internal wiring, water supply distribution systems etc. are expected to last for 20-25 years. Thereafter, it may be necessary to replace them after detailed inspection.

The expected economic life of the building under normal occupancy and maintenance conditions is considered to be as below:

- Monumental buildings - 100 years
- RCC framed construction - 75 years
- Load bearing construction - 55 years
- Semi-permanent structures - 30 years
- Purely temporary structures - 5 years

The life of the building mentioned above is only indicative and it depends on other factors like location, utilisation, specifications, maintenance and upkeep and caretaking.



All the three categories i.e. day to day, annual and special repairs/services are interrelated. Neglect of routine maintenance and preventive measures may lead to more extensive periodical maintenance and in the long run major repair or restoration which could have been avoided or postponed. ***Hospital authorities may use Inspection Checklists of CPWD for maintenance, as provided in Annexure VIII***

All three plans are to be carried out under the direct supervision and should ensure following in the health facility:

- There are no cracks, seepage, chipped plasters and broken floors in the HCF
- There are no broken windows and glass panes and all the windows are guarded
- There are no loose and hanging electrical wirings in the facilities
- All the electrical panels are placed inside closed cabinet and there are no broken electrical panels in the facility
- The health facility has an intact boundary wall with an adequate height to prevent unauthorised entry
- The health facility does not have any growth of algae, mosses or any vegetation on the roof and walls
- The health facility including boundary walls are painted in a uniform colour scheme.

The following precautions are needed to be taken while framing, scheduling or performing periodic maintenance of the health facility:

- Maintenance work is needed to be carried out at times which minimise any adverse effect on output or function of hospital
- Programme should be planned in a way to carry out comprehensive work to obviate multiple works at one site at different times
- Maintenance work, completed or being carried out should comply with all statutory and other legal requirements.

All the activities carried out under the periodic maintenance programme need to be recorded and all such records need to be kept by the health facility. These records include details of work done, details of person performing the activities, time frame of the activity and person responsible for validating the satisfactory completion of the work done.

#### **MAINTENANCE OF HOSPITAL PARKING**

The health facility should ensure that there is provision of sufficient space for parking of vehicles of the staff, patients, visitors and ambulances.

The following aspects are needed to be considered for maintenance of parking spaces of the health facility:

- The porch parking space at the entrance of the hospital should be covered with a shed to protect from all weather conditions
- The porch parking should be designed in a way to enable singular way of movement and enough space for parking of at least two ambulances, for better disaster management
- The parking facilities for ambulances and other vehicles are properly demarcated
- The demarcated parking area for ambulances should be covered with a shed and should be kept free of normal traffic to ease the movement of the ambulance
- Parking for patients, especially those with disabilities should be as close as possible to the entrance of the building
- A reserved parking space for persons with disabilities should be created in public and staff parking
- The directional signage should also be in place for proper identification of the parking spaces



- Parking areas need to be properly illuminated
- Parking space for employees should ideally be located separately.

## **HOSPITAL/FACILITY APPEARANCE**

The appearance of a health facility, if well planned, can be beneficial for patients, visitors and staff of the hospital. It can help reduce patient and staff stress and fatigue leading to increase in effectiveness of delivering care and improve overall healthcare quality. Choosing a soothing colour for exterior and interior paint, display of facility's name and services, proper signage system and Information, Education and Communication (IEC) material are basic considerations to be taken into account while planning the facility appearance.

### **PAINT AND PLASTER**

The hospital should be plastered evenly for smoother surfaces and should be painted both from outside and inside in a uniform colour scheme which reflects a stress free and calm environment.

- The facility should regularly check for any chipping of plaster and fading of paint
- Regular maintenance of plaster and paint needs to be a part of periodic maintenance programme as discussed earlier in these guidelines.
- The colour schemes can be adopted as per state directives or as planned by the hospital management.
- While planning the material for plaster and paint, infection control effectiveness of the materials should be considered.

### **SIGNAGE SYSTEM**

Hospitals being a multi departmental set up and having various services which are available at different locations, need to have a proper signage system in the facility which not only contributes to finding the way in and around the hospital premises but also provides relevant information about the services provided by the health facility.

While planning an effective signage system of the hospital following elements should be considered:

- Sign posts need to be in uniform colour scheme and should provide visual signals
- The signs should be prominently displayed and clearly understood
- Content should be clear and consistent. Text and pictographs should be identical from the starting point to destination
- The font size used for display boards should be clear and visible from a distance
- The signage system of the hospital should be at least bilingual one in English and other in local language or Hindi
- Script, language and lines need to be selected for optimal reading and type style should be legible and compatible with the pictographs and the environment
- The shape of designed boards should essentially be customised according to the location and should not be complex in structure
- Signboards need to be placed closer to one's natural line of vision for enhanced vision
- Signage system should include path of information, links, flow and structure of the health facility and the various activities performed therein.

It is suggested that the displayed content needs to be concise and unambiguous conveying the message clearly. Instructional boards in hospitals should be proactive like "Help us in maintaining silence" instead of being passive like "Keep silence".



## TYPE OF SIGNAGES

Hospitals need to have at least these signages in place at and around the health facilities.

### Regulatory Signages

These signages includes the signage or display which are mandatory under different rules and regulations as per National or State laws. These include, but are not limited to the following:

- Signage under PCPNDT Act
- No Smoking signage
- Signage as per Atomic Energy Regulatory Board (AERB) guidelines for radiation warning
- Signage under Bio Medical Waste (BMW) Rules 2016 with biohazard symbol
- Signage for CCTV surveillance
- Illuminated signage for fire exit and fire exit plans on each floor
- Display of licenses and certifications for various services like pharmacy, license for registration of sonologist and USG machine, license for blood bank, AERB license etc.

### Locational or Departmental Signages

Locational signs are used to identify the location of department/services.

- **External Location Signage**
  - Hospitals need to have one large external location sign with **"Name of Facility"**. This should be displayed at every main entry and exit point of the health facility



Figure 2: External location signage of Civil Hospital, Faridkot, Punjab

- This sign should be positioned high enough to be visible to drivers and people entering the hospital
- External signs need to be artificially illuminated to ensure they are visible in the night also
- **"Emergency Department"** signage board needs to be illuminated in RED and should be prominently visible
- **Hospital layout** with demarcated block wise establishment needs to be displayed at the entrance of the hospital





Figure 3: Layout Plan of Civil Hospital, Phagwara, Punjab

- **Internal Location Signage**

- Hospital needs to develop internal location signage for all departments/areas like OT, surgical ward, pharmacy, OPD, etc.
- Location signs need to be positioned such that they are visible and legible from all directions of approach by all site users.



Figure 4: Internal signage - STNM Hospital, Sikkim

## Directional Signages

To direct people to a destination by means of a text message and an arrow

- **External Directional Signage**
  - Hospital needs to have external directional signage which leads to the hospital from the main approach road
  - Such directional signages need to be placed at different strategic locations like major intersections of the road leading to the hospital, main connecting road and at any round about which may be present on the road leading to the hospital

- **Internal Directional Signage**

These signages need to be placed in the health facility indicating directions to various establishments like OPD block, parking area, emergency department or directions to various departments located on a particular floor.

**Table 1: Do's and don'ts for directional signages**

DO'S AND DON'TS FOR DIRECTIONAL SIGNAGES	
Do's	Don't
Directional signs should have clear direction indicators – usually arrow	Avoid using unclear or misleading arrows which may cause confusion
There should be a directional (or locational) sign at each key decision point	Avoid trying to direct people back to the way they have come. The types of arrow used to convey this message are often difficult to understand
The direction the arrow is indicating should be easy to understand, and easy to relate to the actual environment	Avoid listing too many destinations on one sign
Directional signs should be consistently positioned so people know where to look for information	Avoid leaving too big a gap between the text and arrow

## Directories

- Hospital should have departmental directories at appropriate place in the hospital
- Directories positioned on various floors should include all the services that are available on the particular floor
- Directories can be positioned outside lifts or at building entrances



*Figure 5: Floor directory at PHC in Tamilnadu*



## Other Signages

Besides these, other signages may also be displayed like Citizen Charter including patient rights and responsibilities, display of rate lists, display of important contact numbers like higher referral centres, blood bank, emergency response numbers and complaint redressal procedure, scope of services, services not available, major timings of the hospital and departments, contact numbers of personnel of major functioning departments etc.

## IEC Materials

- Adequate display of IEC posters need to be displayed at appropriate locations of the hospital
- No unwanted/outdated posters should be pasted on the walls of building and boundary of the hospital
- IEC materials should be as per the scope of services provided by the health facility
- IEC materials may include information related to various health programmes, immunisation schedules, educational posters of hand washing, preventive maintenance aspects, posters for MCH, health related information, educational poster on disaster management etc.
- ***Few IEC materials related to “Swachh Bharat Abhiyan” and “Kayakalp” developed for hospitals are provided in Annexure IX of these guidelines.***

## MAINTENANCE OF OPEN AREAS

A well maintained open area of the hospital provides an aesthetic looks to the health facility and is crucial to patients’ physical, psychological and social recuperation and wellness.

Open areas of the hospitals need to be maintained by ensuring following minimum interventions:

- **No Abandoned Buildings:** Any abandoned building in the hospital premises creates a risk of safety by attracting pests. They can be used for unsocial activities. Hospital needs to ensure that any building in the premises in a dilapidated condition is demolished if it cannot be repaired.
- If it is not possible for the health facility to demolish or reallocate the services to the abandoned building then it should be marked as **“ABANDONED”** and should be properly secured.
- **No Encroachments:** Hospital authorities should not allow any unauthorised encroachment inside the premises by authorised vendors/shops and in no circumstances unauthorised vendors should be allowed inside the premises. Hospitals also need to ensure that the access road to the hospital is not occupied or restricted by some vendors or unauthorised shops.
- **No Thoroughfare:** As detailed earlier in these guidelines, hospitals should ensure that boundary walls of the building should be intact to avoid any thoroughfare of general public. The entry and exit points of the hospital need to be guarded to avoid any thoroughfare by general public.
- **No Water Logging:** Hospitals need to ensure that proper sloping of open areas is done in such a way that the runoff water is drained easily. Drainage system needs to be checked ensuring free flow and the drainage should be maintained as per the periodic maintenance programme of the hospital. All the pot holes and bumps in the open areas and in the access roads need to be repaired periodically.
- Health facility should ensure that there are no overgrown shrubs, weeds, grass and wild vegetation in the open areas of the hospital. All overgrown branches of plants/trees should be regularly trimmed depending upon the requirement.

## LANDSCAPING AND GARDENING

Landscaping is used to enhance visible features of open areas of the hospital. Properly planned and maintained landscapes and gardens in the hospital have following benefits for both the staff and patients of the hospital:





- **Physical benefits:** Interaction with the natural environment has a positive effect on patients' feeling of well-being, which in turn has a salutary effect on their physical health
- **Psychological benefits:** Natural scenes draw attention of the patients away from illness and helps in maintaining heart rates and blood pressure
- **Social benefits:** Natural environment in health facilities contributes to social integration by providing spaces for social interaction and support; they may significantly help increase access to social support for patients, families and staff.

While designing or planning a landscape and garden of the hospital following criteria are considered:

- While planning the garden of a healthcare facility, location, accessibility, environment and integration with overall hospital design should be taken into account
- Gardens may be designed and set up attractively; gardens should be easily accessible through entrances and paths
- Design of the garden should take into account patients' psychological as well as physical needs, disabilities and duration of stay. Patients undergoing different kinds of treatment may use these areas for different purposes; for example, orthopaedic patients may need to use walking aids in the gardens; senior citizens may need handrails and more shaded areas; wheelchair bound patients may require a proper path for access
- All green areas of hospital are to be provided with barricades, fence, wire mesh and gates to prevent unauthorised entry and to restrict mishandling of the plants
- Hospital front area is to be maintained with grass beds, trees and garden with an aesthetic appearance
- All the dry leaves and green waste should be removed on daily basis.



*Figure 6: Landscaping and gardening of District Hospital, Himachal Pradesh*

## HERBAL GARDEN

Apart from a garden, hospitals are also encouraged to set up a herbal garden within their premises. The herbal garden can be set up in addition to the normal garden or can be set up in separate plots. Pots can also be used in addition.

Plants in the herbal garden, created by the hospital, should be medicinal plants as available in the territory of the establishment.

Only organic and compost fertilisers but no chemical fertilizers should be used for the plantation of these medicinal plants in this garden.



All the criteria as listed above for landscaping and gardening are to be considered while planning the herbal garden.

A list of common medicinal plants available in India has been provided in Table 2 of these guidelines.



Figure 7: Herbal Garden District Hospital, Haryana

Table 2: List of common medicinal plants for Herbal Garden

List of Common Medicinal Plant			
S. No.	Name of Species	S. No	Name of Species
1	Aloe Vera (Ghritkumari)	26	Jatamansi (Nardostachysjatamansi)
2	Amla (Phyllanthusemblica)	27	Kalihari (Gloriosasuperba)
3	Anantmool (Hemidesmusindicus)	28	Kalmegh (Andrographispaniculata)
4	Arjun (Terminaliaarjuna)	29	Kokum (Garciniaindica)
5	Ashok (Saracaasoca)	30	Konch (Mucunaprurita)
6	Archa/Adapalen ( <i>Rheumemodi</i> )	31	Kuth (Sassureacostus)
7	Ashwagandha (Withaniasomnifera)	32	Kutki (Picrorhizakurrooa)
8	Atees (Aconitum heterophyllum)	33	Makoy (Solanumnigrum)
9	Bach (Acoruscalamus)	34	Mandukparni (Centellaasiatica)
10	Bael (Aeglemarmelos)	35	Mulethi (Glycyrrhizaglabra)
11	Beladona (Atropabelladona)	36	Neem (Azadirachtaindica)
12	Bahera (Terminaliabellirica)	37	Pippali (Piper longum)
13	Bankakri (Podophyllumhexadendrum)	38	Punarnava (Boerhaaviadiffusa)
14	Bhumiamalaki (Phylanthusamarus)	39	Pushkarmool (Inularacemosa)
15	Brahmi (Bacopamonneri)	40	Ratalu (Dioscoreabulbifera)
16	Chirayata (Swertiachiraiyata)	41	SafedMusli (Chlorophytumborivillianum)



17	Coleus (Coleus barbatus Benth)	42	Sarpagandha (Rauwolfia serpentina)
18	Calthararanthus roseus (Sadabahar)	43	Siris (Albizia lebbek)
19	Dalchini (Cinamomum zeylanicum)	44	Sena (Cassia angustifolia)
20	Daruhaldi (Berberis aristata)	45	Shatavar (Asparagus racemosus)
21	Gambhari (Gmelina arborea)	46	Stevia (Stevia rebaudiana)
22	Giloe (Tinospora cordifolia)	47	Sea Buckthorn (Hippophae rhamnoides)
23	Gudmar (Gymnema sylvestre)	48	Tagar (Valeriana wallichii)
24	Guggal (Commiphora wightii)	49	Tulsi (Ocimum sanctum)
25	Harar (Terminalia chebula)	50	Viaavidang (Embellica officinalis)

## PEST AND ANIMAL CONTROL

Pests and animals are attracted to health facilities in search of food, water, shelter and optimal temperatures and pose a number of health threats through spreading of microbial infections and communicable diseases. Therefore having a pest control plan and an animal and pest free environment is of utmost importance for healthcare facilities.

### MINIMUM REQUIREMENT FOR PEST AND ANIMAL CONTROL

To ensure a pest and animal free environment, health facilities can undertake various activities which in general may include proper infrastructure maintenance, provisions of physical barriers, having a pest control plan and engagement of pest control agency. Health facility should ensure that the following requirements are met for pest and animal control:

- Hospital should engage a pest control agency for carrying out pest control activities including anti-termite treatment for wooden furniture and fixtures. The records of engaging such agency and pest control activities need to be maintained
- Hospital boundary wall should be intact (at least 2.5 metres) and cattle traps installed at all entrances and exits of the hospital to restrict entry of stray animals
- Facility windows and doors should be designed in a way to reduce or prevent entry of flying pests
- Hospital staff should follow and comply with best practices of housekeeping, cleaning and disinfection
- Hospital staff should follow and comply with the best practices of waste management
- Periodic maintenance plan needs to be complied with for maintenance of cracks and holes in infrastructure and for any plumbing faults in utilities and pipes, fixing of clogs, fastening of floor drains
- Regular trimming of landscapes, plants, shrubs and trees also to prevent rodents from having easy access to upper levels, windows and the roof
- Regularly cleaning of drains and check for any drain clogs
- Good storage practices for materials especially food item storage in kitchens and cafeterias
- Coordinate with local authorities to prevent accumulation of waste around the premises of the hospital as it leads to pest infestation in and around the premises

### MEASURES FOR MOSQUITO FREE ENVIRONMENT

As mosquitos pose a major problem in India, the healthcare establishment should take some extra measures to ensure that it has a mosquito free environment. The health facility should ensure that the hospital environment is clean and all the water tanks and containers are covered.

In addition to these basic measures, the following additional measures need to be taken by the hospital to



provide mosquito free environment and for patient safety:

- Eliminate standing water in and around the hospital
- All the containers like coolers, buckets, planters, flower pots, trash containers should be checked for water storage and should be cleaned on weekly basis
- Hospitals can use good quality insect repellents
- Tightly cover water storage containers (buckets, cisterns, rain barrels)
- For containers without lids, use fine wire mesh
- All the septic tanks should be checked for cracks or gaps and open vent should be covered with fine wire mesh
- Hospitals may use screens on windows and doors
- Health facilities may also use mosquito nets for patient safety.



*Figure 8: Use of mosquito net at District Hospital, Maharashtra*

## PEST CONTROL PLAN

- Health facility needs to have an effective pest control plan for ensuring a pest and animal free environment in the facility. The salient features of pest control plan are :
  - Engaging a pest control agency for carrying out pest control activities in the facility
  - Pest control activities should also include anti termite treatment for furniture and fixtures
  - Pest control plan includes the frequency of carrying out the activities related to the pest control
  - Besides normal frequency of carrying out these activities, such plan should also include other indications for carrying out the activities of pest control for example on incidence of pest presence (e.g., pest sightings, droppings or pest catches in monitoring traps) and when non-chemical approaches such as vacuuming, trapping and exclusion (i.e., physically blocking pests' entrance) has been unsuccessful or is inappropriate
  - Pest control plan should also include routine inspection and monitoring for pest presence
  - Pest control plan should also include storage conditions and methods of different materials especially for food items

## ILLUMINATION AND LIGHTING IN HOSPITAL

Every modern hospital consists of many components serving diverse functions. They may be non-medical areas, such as offices, kitchens, laundries and libraries and may be lighted in the same way as those found in industry or commerce. There are also many specialised interiors, such as operation theatres, clinics,



treatment rooms and wards, where special lighting techniques and fittings will be required to achieve the desired standard of lighting, hygiene, electrical safety, reliability and ease of maintenance.

Complex structures of hospitals by the nature of their construction require special lighting and illumination requirements. Thus, different type of services in the hospital need to have specific illumination and lighting in different areas as per requirements of the services that are being rendered.

These guidelines for lighting and illumination requirement for hospitals are intended towards satisfactory lighting of those interior areas which are peculiar to hospital buildings.

Hospitals need to ensure that there is adequate lighting and illumination in the circulation area, indoor areas, and procedure rooms and in front of the facility and on the access road of the hospital. The hospital also needs to ensure that it uses energy efficient measures like use of natural light and energy efficient bulbs.

### **LIGHTING OF THE PATIENTS' ROOMS OR WARDS**

The patients' rooms in a hospital often account for more than half of the useful floor space. The lighting of patients' rooms is of great importance and has to satisfy the needs of the patients as well as those of the medical and nursing staff. Moreover, the total lighting effect should be such as to contribute to the general decor and should be free of glare to the recumbent patient.

#### **Lighting for Medical and Nursing Staff**

This lighting should be adequate to enable them to carry out their routine tasks. Lighting should enable the staff to carry out such tasks as reading thermometer or making charts at the bedside or elsewhere.

It is recommended that the **nursing stations** are to be illuminated with at least 150-300 lux level of lighting.

#### **Lighting for the Patients**

For the patients in the wards, lighting should create a cosy and pleasant atmosphere. Lighting in the wards should be planned in such a way that meets the specific requirements of the patients in a ward, for example, some of the patients may like to sleep before the scheduled time of 'lights out' so a high level of illumination will be a nuisance to those patients.

Considering all these requirements the level of illumination of 100 lux is acceptable for general lighting of wards which will also meet the needs of the nursing staff.

Apart from general lighting, individual patients can be provided with additional lights in the form of bed head lights which can be switched 'on' or 'off' by patients themselves. These lights also contribute to the general appearance of the wards by breaking the monotonous uniformity that will result from general lighting.

#### **Examination Lighting**

In certain emergencies it is required to examine the patient in the ward itself for which an examination light capable of providing 1000 lux will be required. For such situations a mobile examination lamp which can be attached to a wall socket by the bedside may be used as providing a separate examination lamp by the bed side may not be good idea as its use may not be that frequent.

#### **Night Lighting**

At night after 'lights out' the wards cannot be left in complete darkness. The nursing station should be able to take in the ward at a glance to make sure that everything is alright. Those patients who can move should also be able to make their way to the lavatory, etc. At night lighting system should give enough illumination (about 1 lux) for this purpose.

The lighting installation in a ward therefore is recommended as follows:





**Table 3- Lighting requirements in wards**

General Lighting	100 lux
Nursing Stations	150-300 lux
Night Lighting	1 lux
Examination Lighting	1000 lux

### **LIGHTING REQUIREMENTS OF CORRIDORS**

Corridors in a hospital serve a more important function than in many other buildings because they act as transitional areas between wards and service rooms and between naturally lit and artificially lit rooms.

Doctors discuss their work with their colleagues and make notes. Thus the corridors, in a sense, act as a working area. Moreover, corridors also fall within the visual range of the patients in the wards and therefore require special attention. The artificial lighting to be provided in the corridors will depend on the architectural layout adopted for the building.

#### **Single Corridor Layout**

In the 'single corridor' layout the wards and the service rooms are on the two sides of the corridor. In such layout the corridor itself will have enough day lighting. In the evening the corridors need to have an illumination of about 100 lux. But after 'lights out' the corridors need to be provided with similar night lighting arrangement as for the wards, that is minimum of 1 lux lighting arrangement.

#### **Double Corridor Layout**

In the 'double corridor' or 'race track' plan the wards are placed around the outside of the building and are normally day lighted. In the centre of the building are the service rooms which will have no access to daylight and will require artificial lighting at all times. During the day the staff will move between the wards receiving daylight to the internal rooms which are artificially lit to a level. The corridor should bridge these two levels and an illumination of 150 lux is to be provided in the corridors during the daytime. In the evenings the corridors need to have 100 lux of illumination level as the ward illumination level is of 100 lux.

### **LIGHTING OF SURGICAL AREAS**

#### **Lighting of Operating Theatres and Labour Room**

The general lighting of procedure rooms should be at least 300 lux. This level of illumination is adequate for the technical staff to operate the ancillary equipment in the operation theatres.

The visual requirement in the theatre is the detailed examination of tissue, organs and instruments at the site of the operation. The size of critical detail is very small with a very low contrast. It is recommended that the illumination level for lighting on the operating tables should be between 2000 and 10000 lux. Lower levels than this may be more comfortable for the surgeon where fine detail does not have to be discriminated like in labor rooms.

#### **Light Sources**

In general, the operating table light fittings employ tungsten lamps and produce a very high level of illumination, with very good colour rendering properties but it is not advisable to use filament lighting for general lighting of the theatre because of the additional heat output that would be produced by this form of lighting. It is more practical to use fluorescent light sources which inherently have low heat output and have added advantage of producing good colour of lighting which is needed for rendering medical purposes.



## Anaesthetic Room

In view of the close association of this room with the theatre proper a general illumination of 300 lux is recommended with provision for a spotlight (which can be either fixed or portable).

## Recovery Room and Intensive Care Units

General lighting may be installed as in a normal ward with a separate system to raise the illumination level up to 300 lux for each bed independently. The fitting designs should be such as to limit the spread of lighting onto the adjacent beds. Dimming of the individual bed lights should be provided for.

## RECOMMENDED ILLUMINATION VALUES AND GLARE INDEX

The levels of illumination and glare index recommended for different areas in a hospital are listed as follows:

**Table 4: Illumination and glare index for different areas of hospital**

S.No.	Classification	Illumination Lux	Limiting Glare Index
1.	Reception and Waiting Room	150	16
2.	Wards <ul style="list-style-type: none"><li>• General</li><li>• Beds</li></ul>	100 150	13 --
3.	Operation Theatre <ul style="list-style-type: none"><li>• General</li><li>• Operation Table</li></ul>	300 2000-10000	10 --
4.	Laboratories	300	19
5.	Radiology Area	100	--
6.	Casualty and OPD Department	150	16
7.	Stairs and Corridors	100	--
8.	Dispensaries	300	19

## ILLUMINATION IN FRONT AND ON ACCESS ROAD

Hospital needs to ensure that the front of the hospital and access road to the hospital is well illuminated with use of street lamps. The lamps should be installed in a way that no dark areas are there on the access road. In addition to these, display boards used for the name of the hospital and emergency department should be well illuminated.

## ENERGY EFFICIENT MEASURES

Hospital needs to ensure that it follows energy efficient measures while planning for lighting requirements of the hospital. Energy efficiency measures that can be adopted by the hospital includes following measures:

- Adequate use of natural lights/day light
- Use of energy efficient bulbs like CFL or LED
- Limited use of artificial lights
  - Switching off of lights when not needed
  - Defining and following “lights out” hours for hospital for different area
  - Labelling of switches to enable staff to select only those lights which are needed, etc.



## MAINTENANCE OF FURNITURE AND FIXTURES

Hospitals need to ensure that all the furniture and fixtures installed in the hospital are well maintained to provide safe environment in the hospital. These minimum requirements need to be met by the hospital for maintenance of furniture and fixtures.

- All the doors are needed to be intact and are painted and varnished
- All the window panes need to be intact and should be provided with safeguard grill and meshes
- All the patient beds are well maintained with no broken parts and no temporary arrangements made for maintaining stability of the beds
- All the patient beds should be checked for deposition of rust and should be painted on regular basis
- All trolleys, stretchers, wheel chairs etc. are provided with safety belts
- All trolleys, stretchers and wheel chairs should be intact, painted and cleaned on regular basis
- Wheels of stretchers, wheel chairs and trolleys need to be properly aligned and well lubricated
- All furniture installed in the hospital needs to be checked for any broken parts, withered paint etc. and should be repaired accordingly
- Preventive maintenance programme of the hospital should also include preventive maintenance of furniture and fixtures
- The facility should ensure that it carries out anti-termite treatment for all the furniture and fixtures at least once in a year as described in the pest and animal control section above.

## REMOVAL OF HOSPITAL JUNKS

It is observed that in public health facilities there are various junk articles in the form of unserviceable medical equipment, furniture and electrical equipment etc. which often lie unattended and are stored in various unoccupied areas of the premises. All junk material stored in the hospital poses a potential fire risk and can lead to accumulation of pests in these areas.

Junk material accumulated in the healthcare settings includes following type of items:

- **Surplus Items:** Items that are in working order but are not required for use in a particular section. Such items also includes stock in the stores of the hospital which has not been used for some time.
- **Obsolete Items:** Items that are in working order but cannot be put to use effectively because of change in technology/design
- **Unserviceable Items:** Equipment that are not in working order, have outlived their span of life and are beyond economic repair
- **Scrap:** Process waste, broken and any other item not covered above but has got resale value
- **Empties:** Empty containers, crates, bottles, plastic jars, drums etc.

For timely removal of junk from the hospital and to avoid unnecessary accumulation, hospital needs to ensure that it has a documented condemnation policy which is followed and implemented as listed.

## CONDEMNATION POLICY

All health facilities need to have a condemnation policy framed in the hospital and it has to be implemented and followed. The condemnation policy at the health facility should align with the state level condemnation policy framed at the state (if any)

The policy framed in the hospital should be directed to ensure the following:

- The hospital has a Condemnation Committee in the hospital for carrying out the activities of condemnation of junk materials



- No junk material is stored in patient care areas, open areas and corridors or in critical service areas of the hospital
- There is a provision of having a demarcated and secure space in the hospital for storage of junk material before its disposal

***The condemnation options to be followed by the facility for disposal of various junk items from the hospital should be as per the state government's directives.***

### CONDEMNATION COMMITTEE

Hospitals need to form a Condemnation Committee for carrying out the activities of condemnation of junk from the health facility. The Condemnation Committee needs to have a representation from different categories of staff, as prescribed in the state level condemnation policy.

The suggested membership of the Condemnation Committee to be formed at the hospital is as follows:

- Hospital Superintendent/Chief Medical Officer of the institution
- Hospital Manager
- Senior Medical Officer
- Nursing Superintendent/senior most nursing staff of the institution
- Technical professional concerned with the machinery/accessories etc., i.e., Bio Medical Engineers// Head of the Department (HoD)//suppliers//service agency etc.
- Representative of the accounts department, if available.
- Store in charge//Storekeeper

The constitution of the committee may vary from institution to institution depending on the availability of the mentioned posts; the changes may be made by the Head of the institution.

### Meeting Schedule

The Condemnation Committee formed at the hospital needs to meet at least once in six months or when required.

### Responsibilities of Condemnation Committee

The major responsibility of the Condemnation Committee formed at the facility may include following:

- To frame/follow the condemnation policy at the hospital
- To inspect all the areas of the hospital for any junk material present/accumulated in various areas of the hospital
- To decide the minimum upset price for which tendering is required and minimum upset price for which public auctions can be made.
- To gather and maintain information or list of items from different areas of the hospital that need to be condemned or are beyond use.
- To maintain a list of items that are stored in the hospital for condemnation
- To inform all concerned regarding the condemnation activity to be undertaken by the facility
- To approve the condemnation of junk and other materials
- To demarcate and allocate space within the hospital for storage of junk material before its disposal
- To maintain records of the items that are condemned by the health facility
- To follow relevant rules while disposing of the condemned articles e.g. E-waste management rules, BMW management rules etc.





## SPACE FOR JUNK MATERIAL

Hospitals need to ensure that they have a demarcated and secure area for storage of junk materials in the hospital before final disposal. All junk material/items should be stored in this area only and should not be stored in patient care areas, open areas or critical service area.

This area needs to be secured under lock and key and should be equipped with fire safety measures like installation of fire extinguishers, smoke detectors, fire alarm etc.



Figure 9: Junk room for keeping junk articles - CHC Tibba

## CONDEMNATION OPTIONS

The Condemnation Committee formed at the hospital may follow the condemnation options as framed by the State Government or may undertake the following steps for condemnation of junk in the hospital:

- To offer the equipment to authorised vendors under the buyback option
- To sell the junk through public auctions as per for the items having a minimum upset price as decided by the hospital
- To dispose of the junk through tender process for the items having a minimum upset price as decided by the hospital.

## WATER CONSERVATION

Water conservation simply refers to reducing the usage of water and recycling waste (used) water. Any beneficial reduction in water loss, water use and water waste can be classed as water conservation. An important component of water conservation involves minimising water losses, prevention of water wastage and increasing efficiency in water use.

Water conservation includes all the policies, strategies and activities undertaken by the hospital to sustainably manage water; to protect the environment and to meet the current and future demands of the hospital. Factors like bed occupancy, size of the hospital, functional departments affect water conservation measures taken by the hospital.



As per “Kayakalp” Scheme the minimum approach that a hospital can adopt for water conservation is as follows:

### ENSURING ADEQUATE QUALITY & QUANTITY OF WATER

- Hospitals need to ensure that the water supply is adequate as per the requirement of the hospital. For the health facilities having beds less than 100, the water requirement is around 350 litres per bed per day and for hospitals having more than 100 beds the requirement escalates to around 400 litres per bed per day
- Hospitals should calculate the requirements of the facility and should ensure that they have enough provisions for storage of water as per calculated requirement
- Hospitals should take appropriate measures for ensuring the quality of water supplied by the hospital. The basic measures that can be undertaken by the hospital are:
  - Regular cleaning of water tanks and reservoirs
  - Regular maintenance of RO plants and water dispensing machines
  - Regular water testing for any growth of micro-organisms
  - Chlorination of water
  - The records for water testing and cleaning of tanks and dispensing system should be retained by the hospitals.

### Maintenance of Water Supply System

- Hospitals need to ensure that they undertake regular maintenance of water supply system as per the periodic maintenance plan of the hospital.

### Inspection for Water Wastage

- Hospitals need to periodically check for any leaking taps, pipes, overflowing tanks, dysfunctional cisterns etc. It should be ensured that designated staff is responsible for carrying out these activities in the health facility. Immediate corrective actions need to be undertaken by the health facility for any fault noticed during the inspection for water wastage.

### Promotion of Water Conservation

- Hospitals should ensure that they promote water conservation in the health facility by use of IEC materials and also by periodic sensitisation of the staff for water conservation.



Figure 10: IEC regarding save water, DH Fazilka



*\*The details of water requirements, storage and quality testing have been provided in the “Water Sanitation” section of these guidelines.*

### RAIN WATER HARVESTING

- Rainwater harvesting is the technique of collection and storage of rainwater at the surface or in sub-surface aquifers, before it is lost as surface runoff.
- Ground water augmentation through diversion of rainfall to sub-surface reservoirs by various artificial recharge techniques can be adopted by the hospital
- Hospitals can also adopt a twin strategy of simple artificial recharge techniques in rural areas like Percolation Tanks, Check Dams, Recharge Shafts, Dug Well Recharge and Sub-surface Dykes and adopting Roof top rainwater harvesting in urban areas.



Figure 11: Rain water harvesting - SDH Jagraon

### ROOF TOP HARVESTING

#### What is Rooftop Rain Water Harvesting?

Rooftop rain water harvesting is the technique through which rain water is captured from the roof catchments and stored in reservoirs. Harvested rain water can be stored in sub-surface ground water reservoirs by adopting artificial recharge techniques to meet household needs through storage in tanks. The main objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain water for use is particularly important in dryland, hilly, urban and coastal areas.

#### Need for Rooftop Rain Water Harvesting

- To meet the ever increasing demand for water
- To reduce the runoff which chokes storm drains
- To avoid flooding of roads
- To augment ground water storage and control decline of water levels
- To reduce soil erosion
- To supplement domestic water requirement during summer, drought etc.

#### Safety Consideration Storage in Ground Water Reservoir

- For rooftop rain water harvesting through existing tube wells and hand pumps, filter or desilting pit should be provided so that the wells are not silted



- Such tube wells if pumped intermittently increase the efficiency of recharge
- If the ground water reservoir is recharged through shaft, dug well etc., inverted filter may be provided.

### Storage in Tanks

- A storage tank should not be located close to a source of contamination, such as a septic tank etc.
- A storage tank should be located on a lower level than the roof to ensure that it fills completely
- A rainwater system should include installation of an overflow pipe which empties into a non-flooding area. Excess water may also be used for recharging the aquifer through dug well or abandoned hand pump or tube well etc.
- A speed breaker plate should be provided below inlet pipe in the filter so as not to disturb the filtering material
- Storage tanks should be accessible for cleaning
- The inlet into the storage tank should be screened in such a way that it can be cleaned regularly
- Water may be disinfected regularly before using for drinking purpose by chlorination or boiling etc.

## WORK PLACE MANAGEMENT

Proper work place management optimises the use of work place resources, minimises risks, and increases productivity of employees as per service requirements.

Work place management includes:

- Sorting of useful and unnecessary articles from the work station
- Arrangement of useful articles and records in a systematic manner
- Labelling of the articles
- Cleaning of work stations

Various techniques can be used by hospitals for work place management. One of the management techniques that can be used by hospitals is of 5S which can be used to improve the hospital environment especially workplace environment. The details of the 5S technique is described in detail as follows:

### 5S

Five S (5S) is a tool to improve work environment and is derived from the Japanese words Seiri, Seiton, Seiso, Seiketsu, and Shitsuke. In English, the 5S means **Sort, Set, Shine, Standardise, and Sustain**.

- **Sort:** Identify and remove unwanted/unused items from the workplace and reduce clutter (Removal//organisation)
- **Set:** Organise everything needed in proper order for easy operation (Orderliness)
- **Shine:** Maintain high standard of cleanliness (Cleanliness)
- **Standardise:** Set up the above 3S as norms in every section of the workplace (Standardise)
- **Sustain:** Train and maintain discipline of the personnel engaged (Self-discipline)

### IMPLEMENTATION OF 5S

The implementation of 5S simplifies activities through reduction of waste and unproductive/unnecessary activities. It is also helpful in improving quality, efficiency and safety. These are the steps for implementing 5S in hospital setting.



## SORT

Sort means separation (sorting) and removing/discarding unwanted and unnecessary items from the workplace. Without “Sorting,” it is not possible to have the next step of putting things in an appropriate order (Setting) in the workplace.

### Steps to Implement Sorting:

- **Identification and Segregation of Unwanted Items**

The “Sort” activity starts with identification of unwanted items in the workplace. If any unwanted items are identified in the workplace which cannot simply be discarded/destroyed, such items are required to be placed in a secured and demarcated space before the Condemnation Committee decides their disposal.

- **Initiation of Sorting**

Sorting may start from any part of the hospital. It may be good to start sorting from inside the hospital building. It should then be extended to the outer space (hospital premises) of the hospital building.

- The indoor space, frontline (OPD, emergency, lab, pharmacy etc.) and backyard (kitchen, laundry services etc.) service sections are the primary targets of this activity at the beginning. No part of the hospital should be excluded from this activity. However, hospital management may prioritise the sections based on criticality of organisation, visibility and urgent needs
- During the activity, decisions may need to be taken to modify the physical structure of the room, wall, door etc. This activity would require some funds, which the top management should support
- It is recommended that the staff should identify unwanted items at their work stations and should remove these unwanted items frequently.

## SET

“Set” is the second step of 5S and is mainly a process to put orderliness in every workplace for better work efficiency. The process is started once all the clutters and unnecessary items are removed from the workplace during the sorting stage. All the items needed at the workplace should be arranged in order based on the objective-oriented way of thinking. For instance, items may be arranged according to alphabetical order or numerical order. All the items should be kept in a specific place following a system, so that anybody in need of these items can find them easily.

Following activities can be done:

- Posters and notices on the notice board, for instance, should be arranged in a manner to avoid messy situation. Old posters can be removed from the workplaces. All necessary work instructions and notices can be pasted at identified places in a systematic manner
- Colour codes (different colours for different purpose, meaning etc.) can be one of the effective visual tools for 5S. This is helpful for easy identification of items and preventing mistakes
- Arranging necessary items at appropriate place with proper numbering, labelling and colour code makes it easy to find quickly
- Arranging the items at correct alignments at appropriate place will give aesthetic appearance, for example, aligning the beds in a systematic manner as per bed spacing norms will give a spacious and aesthetic appearance to the wards





- Simply numbering of items will ease the workplace. For example, in switches of switch board, numbering can be used for identification of fan or light switch. Numbering can also be done for all registers, beds, room numbers and inventories of the hospital.



Figure 12: Set in order, SDH Tirora



Figure 13: Labelling of articles, SDH Tirora

- Name tag, board and symbols development and installation are the activities of the “Set” process. A proper and uniform signage system with pictorial presentations will provide guidance to the staff, patients and visitors
- Instruments and devices should be reviewed during the “Set” period. Tagging and labelling of all instruments and devices identifiable to specific locations should be followed for the items, instrument sets. It should be ensured that all items are kept near the point of use in arranged manner and places are demarcated at work stations and at areas for storage of different items and articles.

## SHINE

“Shine” is the participatory activity for maintaining cleanliness at every workplace regardless of the category and location. Following activities are needed to be undertaken by the hospital:

- All staff in the hospital should be allocated a specific territory for this activity that should include his/her working area. Regardless of the category, rank and gender of the staff, everyone is expected to join in the “Shine” activity and control the work environment on cleanliness
- All the staff need to ensure that the work stations are clean and free of dust and dirt
- Periodical implementation of “Shine” is important. Daily, weekly, monthly and quarterly “Shine” time schedule can be set by the hospital for promoting a cleaner hospital. Daily morning “Shine” practice before starting routine work can be an example. A cleaning checklist should be systematically used in every work area. Regular supervision of the cleaning activity is required to be undertaken by the hospital
- All the equipment should be protected from dust and dirt by periodical and timely cleaning. They should be appropriately covered during resting time
- “Shine” should also be applied at waste segregation, collection, storage, transport and final disposal system.

## STANDARDISE

The “Standardise” stage of 5S is for development of standards for the initial 3S activities, i.e., sort, set and shine. The other objective of this step is to make “Sort”, “Set”, and “Shine” as part of all staff’s routine work in all the sections of the hospital. Once standards are set, those should be disseminated to all the staff through visualisation and sensitisation activities. Following activities can be undertaken by the hospital:

- IEC materials (posters, leaflets, stickers etc.) should be developed to disseminate information related to 5S. The materials need to be eye-catching with highlighting slogans on key messages and should be displayed at locations which are prominently visible to the staff and visitors
- Hospitals may adopt a standard colour coding system throughout the hospital
- Monitoring and Evaluation (M&E) of the various activities undertaken for workplace management through regular supervisory visits are essential for ensuring proper workplace management. M & E activities can be undertaken on a defined schedule or can also be undertaken as a surprise activity.

## SUSTAIN

It has to be ensured by the hospital that all activities undertaken by the staff for workplace management are sustained and adopted by the staff in their daily routine. All the staff should be trained through formal training sessions and through hands-on training for managing the work stations.



## 5S METHODOLOGIES

There are five 5S phases: They can be translated from the Japanese as “sort”, “straighten”, “shine”, “standardise”, and “sustain”.

### **Seiri (Sort)**

- Remove unnecessary items and dispose them properly
- Make work easier by eliminating obstacles
- Reduce chance of being disturbed with unnecessary items
- Prevent accumulation of unnecessary items
- Evaluate necessary items with regard to cost or other factors
- Remove all parts not in use
- Segregate unwanted material from the workplace
- Need fully skilled supervisor for checking on regular basis

### **Seiton (Systematic Arrangement)**

- Can also be translated as “set in order”, “straighten” or “streamline”
- Arrange all necessary items so they can be easily selected for use
- Prevent loss and waste of time
- Make it easy to find and pick up necessary items
- Ensure ‘first-come-first-served’ basis
- Make workflow smooth and easy
- All above work should be on regular basis

### **Seiso (Shine)**

- Can also be translated as “sweep”, “sanitise”, “shine”, or “scrub”
- Clean your workplace completely
- Use cleaning as inspection
- Prevent machinery and equipment deterioration
- Keep workplace safe and easy to work
- Keep work place clean

### **Seiketsu (Standardise)**

- Standardise best practices in the work area
- Maintain high standards of housekeeping and workplace organisation at all times
- Maintain orderliness. Maintain everything in order and according to its standard
- Everything in its right place (Chilled totes in chilled area, Dry totes in dry area)
- Every process has a standard

### **Shitsuke (Sustain)**

- To keep in working order
- Also translates as “do without being told” (though this doesn’t begin with S)
- Perform regular audits
- Training and discipline
- Training is a goal oriented process. Feedback on the impact of training is necessary monthly.

Figure 15: 5S Methodologies





# IMPROVING SANITATION AND HYGIENE

B



The hospital environment is a complex one and contains a large variety of microbial flora. Various parts of the hospital environment can harbour reservoir(s) of microbes many of which can constitute an infection risk to patients as well as visitors and healthcare workers. Transmission of microbes from the environment to the patients and healthcare workers through direct and indirect contact with the environment has been well documented. Surfaces with higher frequency of hand contact are more likely to be a source of infection than surfaces with low degree of contact. Thus high touch surfaces (e.g., handles, bedside tables, etc.) in the patient care area are a more significant source of infection than low touch surfaces such as walls and floors.

Patients undergoing invasive procedures such as surgery, other invasive procedures and those with immunity lowering conditions are at greater risk of infection compared to those without such procedures/conditions. Thus proper sanitation and maintenance of hygiene through proper cleaning and disinfection of hospital circulation areas, environmental surfaces and patient care items assume significant importance in any healthcare setting.

Under the “Kayakalp” Scheme for maintaining proper sanitation and hygiene in the hospital the following criteria are established which are to be followed and implemented by the hospital:

- Cleanliness of Circulation Area
- Cleanliness of Wards
- Cleanliness of Procedure Areas
- Cleanliness of Ambulatory Areas (OPD, Emergency, Lab)
- Cleanliness of Auxiliary Areas
- Cleanliness of Toilets
- Use of Standard Materials and Equipment for Cleaning
- Use of Standard Methods of Cleaning
- Monitoring of Cleanliness Activities
- Drainage and Sewage Management

## GENERAL APPROACH TO ENVIRONMENTAL CLEANING

Environmental cleaning and disinfection of the hospital is mainly aimed at eliminating//reducing//controlling//isolating the reservoirs of organisms in the environment.

Different areas in the hospital can be broadly categorised into:



**General Areas:** Such areas in the hospital where only general traffic is present; admitted patients are not present; patient care activities and procedures are not performed; street clothes and footwear are worn. Such areas are circulation areas like corridors, open areas like parking spaces, registration area etc.

**Patient Care Areas:** All areas in the hospital where patients are admitted and patient care activities and procedures are performed. These areas include wards, Operation Theatres (OTs), laboratory etc.

Sanitation and hygiene activities need to be carried out in the hospital based on the type of area.

## FACTORS INFLUENCING THE CLEANING FREQUENCY AND LEVEL OF DISINFECTION

In order to maintain overall hygiene and sanitation of the hospital, the following factors need to be considered while carrying out the cleaning and disinfection activities in the hospital:

### A. Potential for Direct Patient Contact

Environmental surfaces serve as reservoirs of the pathogens and microbiologically contaminated environmental surfaces can be associated with transmission of infections to both staff and patients. All surfaces in the hospital which can be under direct contact with patients should be more frequently cleaned with high/low level disinfectants as appropriate for the type of area. Cleaning and disinfecting such environmental surfaces is fundamental in reducing their potential contribution to the incidence of hospital acquired infections (eliminating the reservoirs in the chain of infection).

### B. Type of Surface and Orientation (vertical//horizontal)

Dry conditions favour the persistence of gram-positive cocci (e.g., coagulase-negative *Staphylococcus* spp.) in dust and on surfaces, whereas moist, soiled environments additionally favour the growth and persistence of gram-negative bacilli and fungi. Horizontal surfaces catch more dust and microbes and therefore may require more frequent cleaning.

### C. Degree and Frequency of Hand Contact

- **High Touch Surfaces** are those that have frequent contact with hands. Examples include doorknobs, elevator buttons, telephones, bedrails, light switches, computer keyboards, monitoring equipment, haemodialysis machines, wall areas around the toilet and edges of curtains in the patient area. Transmission of microbes from these surfaces to the patient directly or indirectly is more likely. Such surfaces require more frequent cleaning.
- **Low Touch Surfaces** are those that have minimal contact with hands. Examples include floors, walls, ceilings, mirrors and window sills. Potential for infection transmission from these surfaces is low and they require less frequent cleaning. However, they should be cleaned as soon as possible when visibly soiled.

### D. Potential for Contamination with Pathogens

Probability of contamination of a surface depends upon the nature of activity, pathogens involved and the microbial load. Contamination with blood//body fluids is taken as a measure of this. Based on this, hospital area//surfaces can have:

- **Heavy Contamination:** Surfaces and/or equipment are exposed to copious amounts of blood or other body fluids (e.g., OTs, labour room, autopsy room, cardiac catheterisation laboratory, burn unit, haemodialysis unit, Casualty Department, bathroom if the patient has diarrhoea or is incontinent).
- **Moderate Contamination:** Surfaces and/or equipment are contaminated with blood or other body fluids as part of routine activity (e.g., patient room, bathroom if patient is incontinent) and the contaminated substances are contained or removed (e.g., soiled bed sheets). All patient rooms and bathrooms should be considered to be, as a minimum, moderately contaminated.
- **Light Contamination:** An area is considered to be lightly contaminated or not contaminated if



surfaces are not exposed to blood, other body fluids or items that have come into contact with blood or body fluids (e.g., lounges, libraries, offices, general traffic areas).

#### **E. Nature of Activity (critical care, meetings etc.)**

The nature of activity generally influences the exposure of surfaces/equipment to blood and body fluids e.g., critical care area versus meeting rooms.

#### **F. Vulnerability of Persons Present in the Area**

Susceptibility to infection varies among different types of patients.

- **More Susceptible:** These are patients who are more susceptible to infection due to their medical condition or lack of immunity. These include those who are immune-compromised neonates; those who have severe burns; and those undergoing invasive or operative procedures (e.g., haemodialysis). Patients with sterile tissues exposed/sterile devices inserted in major blood vessels or body tracts e.g., central lines, endotracheal tubes for more than 24 hours are also more susceptible to infection. Patients with peripheral IV cannulation, urinary catheter insertion and intramuscular injections are excluded from this category unless they have some medical condition causing lack of immunity.
- **Less Susceptible:** For the purpose of risk stratification for cleaning, all other individuals are classified as less susceptible.

### **CLASSIFICATION OF HOSPITAL AREAS INTO RISK CATEGORIES**

All healthcare environments should pose minimal risk to patients, staff and visitors. However, different functional areas represent different degrees of risk and, therefore, require different cleaning frequencies, and levels of monitoring and evaluation.

A functional area refers to any area in a healthcare facility that requires cleaning. Consequently, all functional areas should be assigned in one of the following three categories:

- High risk areas
- Moderate risk areas
- Low risk areas.

Regular monitoring should take place in areas where standards are considered poor or where routine monitoring reveals consistent weaknesses. These functional area risk categories are explained below.

- **High risk areas:**
  - Consistently high cleaning standards must be maintained in these areas. These areas require intensive and frequent cleaning with high-level disinfectant (HLD) (Aldehyde based)
  - Patient care areas and other facilities designated as high risk category should be routinely monitored by the Hospital Administrator, housekeeping supervisor and in-charge nursing staff
  - High risk functional areas typically include OTs, Intensive Care Units (ICUs), High Dependency Units (HDUs), Emergency department, post-operative units, surgical ward, labour room, haemodialysis unit, Central Sterile Supply Department (CSSD)/Theatre Sterile Supply Unit (TSSU) and other facilities where invasive procedures are performed
  - Bathrooms, toilets, staff lounges, offices and other areas adjoining high risk functional areas should be treated as having the same risk category, and receive the same intensive levels of cleaning.
- **Moderate risk areas:**
  - These areas should be maintained by regular and frequent cleaning with 'spot cleaning' in between with HLD
  - These areas require weekly monitoring by the Hospital Administrator and daily monitoring by house-keeping supervisor and in-charge nursing staff



- Moderate risk areas may include medical wards, laboratory areas, blood bank, pharmacies, dietary services, laundry services, mortuary, nurses/doctors rest rooms etc.
- Bathrooms, toilets, staff lounges, offices and other areas adjoining high risk functional areas should be treated as having the same risk category and receive the same regular levels of cleaning.
- **Low risk areas:**
  - In these areas, high standards are required for aesthetic and to a lesser extent, hygiene reasons. These can be maintained by regular and frequent cleaning with 'spot cleaning' in between with moderate to low level disinfectants
  - These areas require fortnightly monitoring by the Hospital Administrator and daily by housekeeping supervisors and in-charge staff/nursing staff
  - Low risk functional areas may include administrative areas, offices, seminar rooms, stores, staff rooms, non-sterile supply areas, record room etc.
  - Additional internal areas like bathrooms, staff lounges, offices and other areas adjoining low risk functional areas should be treated as having the same risk category and receive the same level of cleaning.

Cleaning and disinfection is dynamic in the sense that the practices in a given location may change with the nature of patients admitted. For example, a ward may be an area of low risk most times but in case of a diarrheal disease/swine flu outbreak the same ward will now be a medium risk area due to the presence of these patients. The environmental cleaning and disinfection protocols should be changed accordingly.

Hence the classification of a patient care area should be reviewed in such situations.

## CLEANING AND DISINFECTION FOR HOSPITAL ENVIRONMENT

The hospital environment is a complex one and contains a large variety of microbial flora. The presence and movement of humans, equipment and air continuously adds and detracts from this microbial population making its composition very dynamic. Various parts of the environment can harbour reservoir(s) of microbes many of which can constitute an infection risk to patients as well as visitors and healthcare workers. Transmission of infections within hospital settings is different from transmission in the community and the consequences can be more severe. Transmission of microbes from the environment to the patients and healthcare workers through direct and indirect contact with the environment has been well documented. Surfaces with higher frequency of hand contact are more likely to be a source of infection than surfaces with low degree of contact. Thus high touch surfaces (e.g., handles, bedside tables, etc.) in the patient care area are a more significant source of infection than low touch surfaces such as walls and floors.

Patients undergoing invasive procedures such as surgery, other invasive procedures and those with immunity lowering conditions are at a greater risk of infection compared to those without such procedures/conditions. Thus cleaning and disinfection of environmental surfaces and patient care items assume significant importance in any healthcare setting.



For any infection to occur, the Chain of Infection shown below needs to be completed.

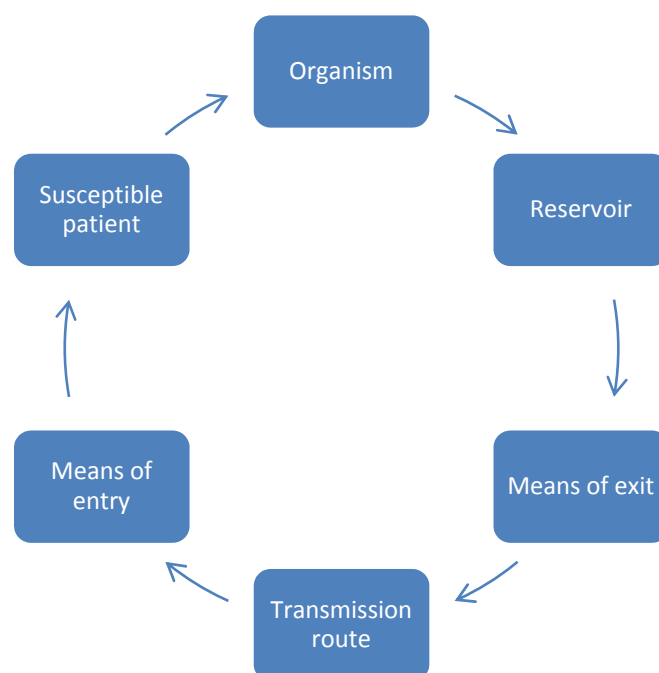


Figure 16: Chain of Infection

**Note:**

***Environmental cleaning and disinfection of the hospital is mainly aimed at eliminating/reducing/controlling/isolating the reservoirs of organisms in the environment.***

**Levels of disinfection**

Microbes have an innate resistance to killing by disinfectants.

**Table 5: Innate resistance of various types of microbes to killing by disinfectants and antiseptic chemicals**

Resistant	
	Prions (e.g., Creutzfeldt-Jakob Disease)
	Bacterial spores ( <i>Bacillus subtilis</i> )
	Coccidia ( <i>Cryptosporidium</i> ) Mycobacteria ( <i>M. tuberculosis</i> , <i>M. terrae</i> )
	Nonlipid or small viruses (polio, coxsackie)
	Fungi (e.g., <i>Aspergillus</i> , <i>Candida</i> ) Vegetative bacteria ( <i>S. aureus</i> , <i>P. aeruginosa</i> )
	Lipid or medium-sized viruses (HIV, herpes, hepatitis B)
Susceptible	



**Table 6: Level of disinfection by type of organism**

	Bacteria			Fungi	Viruses	
Disinfection level	Vegetative forms	Tubercle bacillus	Bacterial spores		Lipid and medium size	Non-lipid and small size
High	+	+	+ *	+	+	+
Intermediate	+	+	-**	+	+	+/-**
Low	+	-	-	+/-	+	+/-

\* Only with extended exposure times are HLDs capable of killing high numbers of bacterial spores in laboratory tests; they are, however, capable of sporicidal activity.

\*\* Some intermediate-level disinfectants (e.g., hypochlorites) can exhibit some sporicidal activity; others (e.g., alcohols and phenolics) have no demonstrable sporicidal activity.

\*\* Some intermediate-level disinfectants, although tuberculocidal, may have limited virucidal activity

As the level of disinfection increases from low to high, the range of organisms killed also increases. The kill spectrum of disinfectants varies among various chemical types. **Therefore the level of disinfection required influences the choice of the chemical to be used for environmental disinfection in a given area.**

The following cleaning frequency and disinfection levels should be used for various areas in the hospital based on the risk classification:

**Table 7: Cleaning and disinfection frequency and level be followed in various area of the hospital**

Location	Risk classification	Routine cleaning frequency	Additional cleaning	Disinfection level required	Reagents to use
All ICUs	High risk	At least thrice a day at fixed times	Yes	High	Aldehyde based
Burn ward	Medium risk	At least twice a day at fixed times	As required	High	Aldehyde based
Casualty treatment area	High risk	At least twice a day at fixed times	Yes	High	Aldehyde based
CSSD	Medium risk	At least twice a day at fixed times	As required	High	Aldehyde based
Echocardiography (No patients with respiratory infection)	Low risk	At least twice a day at fixed times	As required	Only cleaning/ low level disinfection	Only soap/ QUAT
General public areas	Low risk	At least twice a day at fixed times	As required	Only cleaning/ low level disinfection	Only soap/ QUAT
Haemodialysis unit	High risk	At least twice a day at fixed times	Yes	High	Aldehyde based
Labour room	High risk	At least twice a day at fixed times	Yes	High	Aldehyde based
Laboratory	Medium risk	At least twice a day at fixed times	As required	High	Aldehyde based
Offices	Low risk	At least twice a day at fixed times	As required	Only cleaning/ low level disinfection	Only soap/ QUAT



Location	Risk classification	Routine cleaning frequency	Additional cleaning	Disinfection level required	Reagents to use
Operation theatre	High risk	- Start of the day - between cases - end of the list - detailed wash-down	Yes	High	Aldehyde based
General ward	Medium risk	At least twice a day at fixed times	As required	High	Aldehyde based
Patient rooms (Patient not on isolation precautions)	Low risk	At least twice a day at fixed times	As required	Low	QUAT
Patient rooms (Patient on isolation precautions)	Medium risk	At least twice a day at fixed times	Yes	High	Aldehyde based
Pharmacy	Low risk	At least twice a day at fixed times	As required	Low	QUAT
Physiotherapy	Low risk	At least twice a day at fixed times	As required	Low	QUAT
Procedure rooms	High risk	At least twice a day at fixed times	Yes	High	Aldehyde based
Radiology	Low risk	At least twice a day at fixed times	As required	Only cleaning/ low level disinfection	Only soap/ QUAT
Reception area	Low risk	At least twice a day at fixed times	As required	Only cleaning/ low level disinfection	Only soap/ QUAT
Respiratory therapy room/area	High risk	At least twice a day at fixed times	Yes	High	Aldehyde based
Soiled linen collection area	Medium risk	At least twice a day at fixed times	As required	High	Aldehyde based

## GENERAL CLEANLINESS REQUIREMENTS

The cleanliness activities taken up by the hospital need to ensure minimum following:

- There is no visible dirt/grease/stains in any area of the hospital including roof top, floors and walls
- There are no cobwebs/bird nests and other incubations due to pests and animals
- There is no seepage on the roofs and walls of the hospital
- Patients mattresses, furniture, fixtures are without grease and dust
- There is no foul smell in any area of the hospital
- The floors of the different areas of the hospital are kept dry. When wet mopping is used, appropriate safety measures need to be adopted by the hospital like use of signage (Wet Floor)
- There is availability of appropriate cleaning and disinfection materials and equipment needed for different areas





- The hospital uses standard methods of cleaning for different areas
- The hospital ensures that monitoring of cleanliness activities is done at pre-defined intervals and corrective actions are taken when needed
- The drainage and sewage is well maintained to avoid any leakage, blockage and easy flow through the drain.

## GENERAL CLEANING PRACTICES FOR ALL HEALTHCARE SETTINGS

### *Before Cleaning*

- Check for additional (isolation) precautions signs
- Follow precautions as indicated
- Remove clutter before cleaning
- Follow the manufacturer's instructions for proper dilution and contact time for cleaning and disinfecting solutions
- Gather materials required for cleaning before entering the room
- Visibly check and ensure all cleaning equipment itself is clean
- Clean hands before entering the room
- Prepare chemical dilutions and put on gloves before beginning cleaning.

### *During Cleaning*

- Progress from the least soiled areas to the most soiled areas and from high surfaces to low surfaces
- Remove gross soil (visible to naked eye) prior to cleaning and disinfection
- Minimise turbulence to prevent the dispersion of dust that may contain micro-organisms
- Never shake mops
- Use dust control mop prior to wet/damp mop. **Do not use brooms**
- Wash the mop under running water before doing wet mopping
- Do not '**double-dip**' mops (dip the mop only once in the cleaning solution, as dipping it multiple times may re contaminate it)
- An area of 120 square feet to be mopped before re-dipping the mop in the solution
- Cleaning solution to be changed after cleaning an area of 240 square feet (This does not apply to critical areas like OT and ICU)
- Change more frequently in heavily contaminated areas, when visibly soiled and immediately after cleaning blood and body fluid spills
- Be alert for needles and other sharp objects. Safely handle and dispose sharps into puncture proof container. Report incident to supervisor
- Collect waste, handle plastic bags from the top (do not compress bags with hands)
- Clean hands on leaving the room.

### *After Cleaning*

- Do not overstock rooms
- Tools used for cleaning and disinfecting should be cleaned and dried between uses
- Launder mop heads daily
- All washed mop heads should be dried thoroughly before re-use
- Clean sanitation cart and carts used to transport biomedical waste daily.





**Note: Kindly Refer to Annexure II: “Standard Operating Procedures for Cleaning”, for cleaning methods of different areas of hospital**

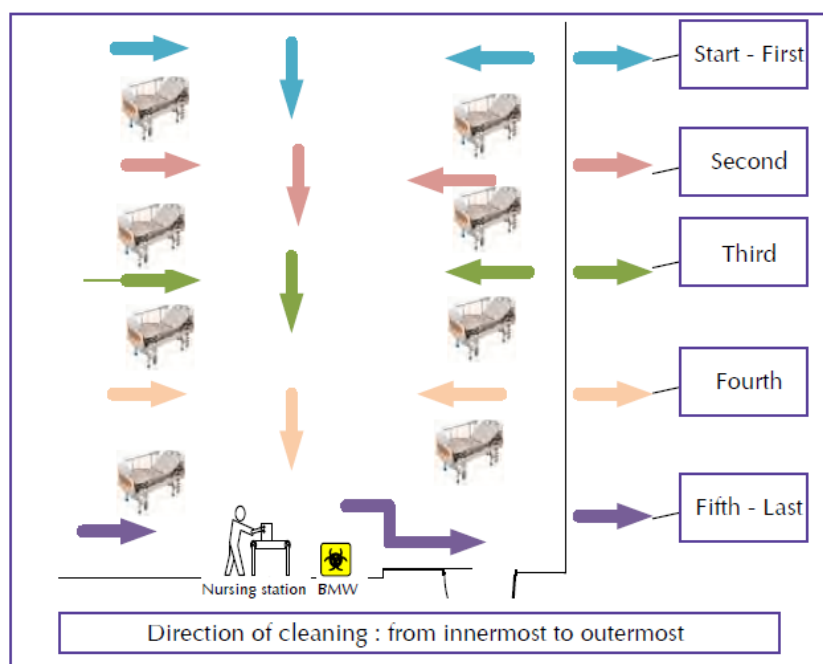


Figure 17: Direction for cleaning

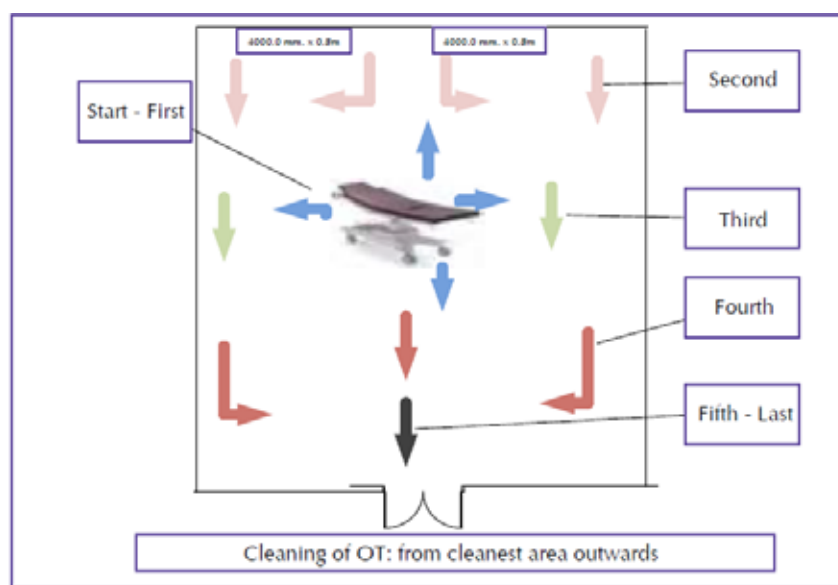


Figure 18: Direction for OT cleaning

## MATERIAL AND EQUIPMENT FOR CLEANING

Hospitals need to ensure that it has regular availability of all disinfectants, cleaning materials and equipment for meeting the cleaning requirements of the hospital.

### GENERAL REQUIREMENT

- The hospital should maintain a list of standard cleaning and disinfecting materials
- Efficacy of these materials should be checked for meeting the requirements of disinfection for



specified areas in the hospital or as per specific use like disinfection of the surface areas and for cleaning and disinfection of equipment

- The hospital should try to ensure that all the disinfectants and cleaning materials are approved through an appropriate authority for ensuring the efficacy of these agents and materials
- **The hospital must ensure that all staff uses correct concentration of cleaning solution; for this purpose housekeeping staff should be trained in the preparation of solution of cleaning and records of the same need to be kept**
- **A chart showing the name of the chemicals, dilutions to be used, areas where it is permitted for use and the intended application (for what to use - floor/equipment/blood spill cleaning etc.) should be prepared and placed in all areas of the hospital**
- The hospital should ensure that it has adequate number of buckets, carts and cleaning equipment for meeting the cleaning requirements of the hospital
- It is to be ensured by the hospital that separate equipment is used for cleaning of general and critical areas
- It is recommended that the hospitals having a bed capacity of over 300 beds needs to have a mechanised mopping machine for cleaning of premises.

### SELECTION OF DISINFECTANTS

There is no ideal disinfectant, and the best option should be chosen according to the situation. A disinfectant solution is considered appropriate when the balance between the antimicrobial activity, required disinfection level, toxicity of the product, ease of use and cost is satisfactory for the given application.

#### General Principles while Using a Hospital Disinfectant

- It is most important that an item or surface be free from visible soil and other items that might interfere with the action of the disinfectant, such as adhesive products, before a disinfectant is applied, or the disinfectant will not work
- A hospital approved disinfectant may be used for equipment that only touches intact skin
- It is important that the disinfectant be used according to the manufacturer's instructions for dilution and contact time
- Minimise the contamination levels of the disinfectant solution and equipment used for cleaning. This can be achieved by ensuring proper dilution of the disinfectant, preparing the disinfectant fresh before use, frequently changing the disinfectant solution and by not dipping a soiled cloth into the disinfectant solution (i.e., no 'double-dipping')
- Personal protective equipment should be worn appropriate to the product(s) used
- There should be a quality monitoring system in place to ensure the efficacy of the disinfectant over time (Vendors may also be asked to provide a quality test certificate for each batch for hospital records)

***Important: The physical characteristics of the chemical should be considered before choosing a chemical. For example, even though alcohol is a rapid acting intermediate to HLD it is not suitable for disinfection of large surface areas due to rapid evaporation and flammability. Although chlorine is low cost HLD, it is highly corrosive to metals in concentration required for HLD. If disinfectants mentioned in this document are to be used for purposes other than those mentioned, guidance regarding the same should be taken before making a decision.***



**Table 8: Dilution of cleaners and disinfectants to prepare working solution**

Reagent	Dilution	Application
<p>HLD – aldehyde based (product preferably should not release formaldehyde gas – so plain formalin solution should not be used)</p> <p>Example product - Bacillocid</p>	<p>Daily use (OT and other critical areas): Add 7 ml of the concentrate per litre of water.*</p> <p>Used once a week (OT only): Add 20 ml per litre of water.</p> <p>Used 2-3 times a week (OT only): Add 10ml per litre of water.*</p> <p>For disinfection of blood body spills: Add 10ml per litre of water (1%)*.</p> <p><b><i>*Kindly refer to manufacturer instructions also before use</i></b></p>	<p>For high-level disinfection of surfaces in critical areas. Can also be used for disinfection of blood and body fluid spills on metallic &amp; non-metallic surfaces.</p>
<p>Low level disinfectant (any product with 4<sup>th</sup> or 5<sup>th</sup> generation Quaternary ammonium compound with demonstrated resistance to inactivation by hard water) – product to be finalised</p>	<p>As per manufacturer</p>	<p>For cleaning and disinfection in semi-critical areas. Can also be used in general areas.</p>
<p>Chlorine</p> <p>(Chlorine releasing granules containing chlorine dioxide/ Sodium dichloroisocyanurate (NaDCC) preferable).</p> <p>Example product – Isochlor granules.</p> <p>If this is not possible, Sodium hypochlorite solution with a minimum basic concentration of 5.25 to 6.15% can be used)</p> <p>Note: Bleaching powder should be avoided as it leaves powder residues on the surfaces.</p>	<p>Important: Irrespective of the chlorine formulation used, the final concentration mentioned in parts per million (ppm) of chlorine should be adhered to.</p> <p>Granules: as per manufacturer recommendation (add the number of grams of granules to measured quantity of water).</p> <p>Sodium hypochlorite:</p> <p>For small blood - body fluid spills (less than 10ml) – use a 1:100 (1%) dilution (500 ppm free chlorine).</p> <p>For large blood – body fluid spills (more than 10ml) – use a 1:10 (10%) dilution (5000 ppm free chlorine).</p> <p>For linen disinfection: Use a 1:100 (1%) dilution (500 ppm free chlorine) with immersion for 5 minutes. Rinse with plain water immediately.</p>	<p>For disinfection of soiled linen, liquid biomedical waste. Can also be used for disinfection of blood and body fluid spills on non-metallic surfaces.</p> <p>For disinfection and odor minimisation of toilets.</p> <p>For disinfection of selected patient care equipment (non-metallic) such as oxygen humidifier bottles, bedpans, urine pots.</p>



Reagent	Dilution	Application
Any good quality liquid soap	Add enough soap to water to give a soapy feel. Avoid too much foaming or prepare as per manufacturer recommendation.	For general cleaning and removal of dust and organic matter on environmental surfaces and equipment.

**Table 9: Dilution chart for liquid sodium hypochlorite (Minimum 5% concentration available in original solution)**

Original concentration	Dilution (prepared v/v)	Chlorine in ppm	Recommended use
Minimum 5%	None	50,000 ppm	
	1:10 (10%)	5000	Disinfection of large blood/body fluid spills
	1:100 (1%)	500	Wiping metallic surfaces on a regular basis, wiping after cleaning a small blood spill.
	1:200 (0.5%)	250	Cleaning equipment disinfection

**Important:** The original bleach/hypochlorite solution should contain minimum 5% sodium hypochlorite, or 50,000 ppm available chlorine for the diluted solution to contain the ppm mentioned in the chart. Hypochlorite solutions are unstable and tend to lose 40-50% of free available chlorine over one month even when stored in an opaque plastic container. Hence the expiry dates mentioned by the manufacturer should be strictly followed.

#### CLEANERS AND DISINFECTANTS FOR USE IN ALL HEALTHCARE SETTINGS

The following cleaning and disinfecting materials are commonly used in healthcare settings:

- Soap
- Alcohols 60-90% ethyl or isopropyl alcohol/denatured ethyl alcohol
- Iodophors
- Quaternary Ammonium Compounds ('QUATs')
- Chlorine and Chlorine Compounds:- (in order of preference)
- NaDCC (Sodium dichloroisocyanurate)
- Calcium Hypochlorite
- Sodium Hypochlorite ('bleach')
- Phenolic
- Aldehydes (to be used only for environmental and/or equipment disinfection as per product contents)
- Hydrogen Peroxide (to be used only as an antiseptic)

#### Soap

Soaps are generally alkaline compounds used to remove dirt and organic matter from surfaces. They act mainly by loosening the dirt and organic matter from the surface. Hence, the mechanical action of scrubbing/brushing followed by a water rinse is important when using soap for cleaning any surface. Soap has little or no antimicrobial activity. Soap solutions can allow growth of bacteria when used for environmental cleaning, they should be prepared just before use; used immediately and the leftover discarded. Soap can be used to clean large environmental surfaces to remove dirt, organic matter, grime,



oils, and residues of disinfectants. It is cheap, easily available and along with proper mechanical scrubbing/brushing can remove almost 80-90% of microbes on a surface. The surfaces should be adequately rinsed to remove all soap residues. This increases the effectiveness of subsequently used disinfectants.

### **Alcohols**

In healthcare settings, “Alcohol” generally refers to two water-soluble chemical compounds – ethyl alcohol and isopropyl alcohol. Alcohols are rapidly bactericidal rather than bacteriostatic against vegetative forms of bacteria; they also are tuberculocidal, fungicidal, and virucidal but do not destroy bacterial spores. Optimum bactericidal concentration is 60%–90% solutions in water (volume/volume). The most feasible explanation for the antimicrobial action of alcohol is denaturation of proteins.

Alcohols can be used for disinfecting small surface items such as thermometers, stethoscopes, equipment buttons, rubber stoppers of medication vials etc. The main use of alcohol in healthcare settings is as an antiseptic and for disinfection of small items/surfaces.

Alcohols are not recommended for sterilising medical and surgical materials principally because they lack sporicidal action and they cannot penetrate protein-rich materials. They should not be used to clean/disinfect large surfaces as they evaporate quickly leading to unreliable disinfection. They can also denature and fix proteins to the surface. Alcohols are highly flammable – they should be stored in a cool ventilated area and should not be used near open flame. They damage the shellac mountings of lensed instruments, tend to swell and harden rubber and certain plastic tubing after prolonged and repeated use, bleach rubber and plastic tiles and damage tonometer tips.

### **Iodophors**

An iodophor is a combination of iodine and a solubilising agent or carrier; the resulting complex provides a sustained-release reservoir of iodine and releases small amounts of free iodine in aqueous solution. The free iodine is responsible for the antimicrobial action. The best-known and most widely used iodophor is povidone-iodine.

Iodophors are bactericidal, mycobactericidal, and virucidal but require prolonged contact times to kill certain fungi and bacterial spores (weak sporicidal activity). In a hospital, they are often used for “Part Preparation” prior to surgery or any invasive procedure.

Antiseptic preparations of iodophors should not be used as environmental or equipment disinfectants because of concentration differences and surface staining.

### **Quaternary Ammonium Compounds (QUATs/QACs)**

Chemically, the quaternaries are organically substituted ammonium compounds. Examples of the chemical names of quaternary ammonium compounds are Benzalkonium Chloride, Benzethonium Chloride, Cetrimide etc.

The quaternaries can be used in ordinary environmental sanitation of noncritical surfaces (e.g., floors, furniture, and walls), and for disinfecting medical equipment that contacts intact skin (e.g., blood pressure cuffs).

Although QUATs are widely used as disinfectants, they should not be used to disinfect patient care items such as catheters, cystoscopes etc. as infections have been reported from such use. The quaternaries are good cleaning agents, but high water hardness and materials such as cotton and gauze pads can make them less microbicidal because of insoluble precipitates or cotton and gauze pads absorb the active ingredients, respectively.

As with several other disinfectants (e.g., phenolics, iodophors) gram-negative bacteria can survive or





grow in them. Therefore, cleanliness in preparation and immediate use are important practices to be followed in their use. Prepared solutions should not be stored for extended periods of time.

### **Chlorine and Chlorine Compounds**

Chlorine products are available as liquids or solid powders. The strength of a chlorine solution is expressed in ppm of free chlorine. They have a broad spectrum of antimicrobial activity, do not leave toxic residues, are unaffected by water hardness, are inexpensive and fast acting, remove dried or fixed organisms and biofilms from surfaces, and have a low incidence of serious toxicity.

**NaDCC (Sodium dichloroisocyanurate) should be the preferred one. Use of powder/granules should be more than liquid preparations in view of significant differences in storage requirements, shelf life and potency.**

**Sodium hypochlorite ('bleach') should be the last choice, if other chemicals are not available. Hypo is unstable and the disinfection efficacy of the final prepared solution varies widely. If used, it should be procured within one month of the manufacture and used as soon as possible. The can label should mention manufacture and expiry dates, batch number and concentration (minimum 5%).**

Disadvantages of hypochlorite include corrosiveness to metals in high concentrations (>500 ppm), inactivation by organic matter, discolouring or "bleaching" of fabrics, release of toxic chlorine gas when mixed with ammonia or acid (e.g., household cleaning agents, urine), and relative stability.

In general solid powders with these contents should be preferred over liquid hypochlorite.

### **Phenolic**

These groups of disinfectant chemicals have carbolic acid base, derived from coal tar. Chlorinated fraction and petroleum residues are added to improve their cleansing and physical properties. Usually they are black or white fluids.

Phenolics are mostly used for floor and wall cleaning and can also be used for hard surfaces and equipment that do not touch mucus membrane (e.g. IV stands, wheel chairs, beds etc.)

They are more potent than iodophors. They are irritant to skin and mucosa and corrosive to metal surface. White fluids are emulsified suspension and precipitate on surface and make subsequent cleaning difficult.

Phenolics are not recommended for use in nurseries and food contact surfaces.

Although this is a traditional disinfectant, it is damaging to the environment. It is recommended that this chemical should be phased out as soon as possible.

### **Aldehydes**

The biocidal activity of aldehydes results from alkylation of sulfhydryl, hydroxyl, carboxyl, and amino groups of micro-organisms, which alters RNA, DNA, and protein synthesis.

They have very good bactericidal, virucidal, fungicidal and sporicidal activity and are often used as HLDs.

Aldehydes are generally non-corrosive to metal and do not damage lensed instruments, rubber or plastics.

### **Hydrogen Peroxide:**

Hydrogen Peroxide is popularly used in disinfecting equipment and environmental surfaces. It is effective against virus.

Using this to clean blood from surfaces and linen is not recommended as it is very costly and corrosive.



Can be used for cold sterilisation of heat sensitive critical items.

Requires 30 minutes at 20°C

They are having rapid action and non-toxic.

***Kindly Refer to Annexure I: Characteristics of the main disinfectant groups***

#### **PREPARATION OF WORKING SOLUTIONS OF CLEANERS AND DISINFECTANTS**

- Prepare dilutions in a well-ventilated area. The smell of the concentrated solution should not remain in the area
- Wear utility gloves when handling the chemicals
- Ensure that the bottle/bucket in which the solution will be prepared and the measuring cup/syringe/tumbler etc. are clean
- Prepare working solutions just before use
- Prepare only the required quantity
- All dilutions should be prepared by measurement. Mark the container/bottle with insulation tape
- Use a syringe/suitable measuring apparatus to measure the reagent to be diluted
- Chlorine solutions should be prepared in an opaque container with a tight cap and kept away from direct sunlight and heat
- Prepare disinfectant solutions (except chlorine) in a transparent bottle – a mineral water bottle can be used. Other types of plastic bottles can also be used if cost is not an issue
- While preparing the working solution first fill the bottle with water and then add the chemical/soap. Keep the cap tightly closed during transport.
- **All the prepared solutions should be clearly labelled with date and time of preparation and name of solution**
- Do not puncture the cap. To sprinkle/pour, loosen the cap by a couple of turns
- During use, the bottles/containers with the chemical should always be placed on the floor and never on any table/trolley/chair etc.
- All bottles/cans of chemicals should be capped tightly when not in use
- At the end of 12 hours or when the bottle is empty, wash all bottles/containers and caps with soap and water; rinse well with water and allow to dry before reusing them
- Change the bottles weekly and whenever they appear soiled/dirty.

#### **STORAGE OF CLEANERS AND DISINFECTANT CHEMICALS**

- All the cleaners and disinfectants, prepared solutions should be clearly labelled
- All cleaners and disinfectant chemicals should be stored in a designated location
- All the inflammables should be stored on lower shelves
- The storage should be out of reach to children e.g. at or above adult shoulder height
- Preferably, use a closed cupboard with a lock, in a cool place away from direct sunlight and heat sources
- If more than one container of the same chemical is stored, use the one with the earliest expiry first (first-in-first-out principle)
- There should be a biohazard label on the cupboard and on the chemical containers



- Keep bottles and cans tightly closed when not in use
- Discarded chemicals should be disposed of as per the manufacturer's instructions.

### EQUIPMENT FOR CLEANING

- **Cleaning trolley/bucket** – It is preferable to have three bucket trolleys with a wringing mechanism. Prefer a light coloured bucket to enable earlier detection of soiling of the water. The trolley should have provision to store bottles of disinfectant, the hand mops and stick mops on the trolley. A separate storage space for used hand mops should be available on the trolley. Ensure the trolley/bucket is clean before using it for cleaning work. The **Three bucket system** should be ideally practiced. The first bucket should contain water with detergent used in the beginning. The mop is then rinsed in the second bucket and dipped in the third bucket which can also contain a disinfectant and the mopping done again.



**Figure 19: Three bucket system of cleaning**

- **Wet mops** (*microfiber mops preferable. If other types are used, use non-lining material*). Mops used in critical, semi critical and general areas should be separate. Colour coding can be used to help staff differentiate easily.
- **Dry (dust) mops** to remove gross debris; brooms are not allowed in patient care areas. Mops used in critical, semi critical and general areas should be separate. Colour coding should be used to help staff differentiate easily.
- **Long handled dust mops** should be available for cleaning cobwebs and lint from the ceiling. These can be prepared by using any long wooden stick and tying a mop to one end. The mop should be tied in a way that allows wiping with pressure.
- **Rubber floor wipers** for toilet floor cleaning. Hand held rubber wipers for cleaning kitchen countertops and another set for toilet wall cleaning.
- **Hand mops** to clean equipment: (*microfiber mops preferable. If other types are used, use non-linting*)



*material*). The size should be large enough to make a palm sized mop when folded twice. Mops used in critical, semi critical and general areas should be separate. Colour coding should be used to help staff differentiate easily.

- **Dust pans** to gather the particulate waste. The waste should be pushed into the pan using a stiff cardboard/plastic.
- **Rubber gloves/utility gloves** with long and short arms. These should be size fitted.
- **Water:** Drinking quality water should preferably be used for preparing all cleaning solutions and rinsing of mops. Aquaguard water can be used. If source water is not clear, filter it using cotton mop/ sheet folded twice and disinfect the filtrate with chlorine before use.

**Brooms should never be used in patient care areas.**

#### **Note on microfiber mops**

Microfiber mops are more efficient at cleaning, use less water and chemicals. Although they are costly, they should be preferred whenever possible. If used, it should be remembered that the cleaning and disinfection of these mops is different from cotton mops and should be set up accordingly. Otherwise the benefit of microfiber cleaning will be lost. Properly used and maintained mops have been shown to reduce cleaning costs in the long term.

#### **CARE AND STORAGE OF CLEANING EQUIPMENT**

An important part of the cleaning strategy is to control the contamination of cleaning solutions and cleaning equipment. Mops, solutions and buckets become contaminated during use and can themselves spread microbes to the surfaces being cleaned. Hence cleaning equipment should be washed and disinfected on a regular basis.

#### **CLEANING AND DISINFECTION OF CLEANING EQUIPMENT**

##### **Cleaning and Disinfection of Mops, Buckets and Trolleys**

- All used wet mops, buckets and trolleys should be washed with soap and water at least once at the end of the day
- Mops should be laundered in hot water (70-80°C) or soaked in clean water with bleaching powder 0.5% for 30 minutes. Wash with detergent and water to remove the bleach
- If the mop/bucket/trolley is used for multiple cleaning sessions during the day, it should be washed and disinfected before each cleaning session is begun e.g. morning, afternoon, evening session
- There is no need to disinfect the bucket/trolley when changing the water in the same cleaning session unless the water has been contaminated with blood/body fluids
- Wear utility gloves when performing this cleaning and disinfection
- Ensure all visible dirt is removed
- Dry mops, buckets and cleaning trolley in a ventilated area before next use
- Shake the dust mops thoroughly to remove all dust before using them.

##### **Cleaning and Disinfection of Utility/Rubber Gloves:**

- Utility gloves should be washed with soap and water after every cleaning session
- Wash the gloves with soap and water before removing them. Rinse to remove soap. Remove gloves and hang to dry



- At the end of the day, wash with soap and water and disinfect by immersion in 0.5% hypochlorite/ chlorine powder solution (dilution as per manufacturer) for one minute. Rinse with plain water and hang to dry overnight.

### **Cleaning and Disinfection Methods for Wet Mops, Buckets and Cleaning Trolleys**

**Table 10: Cleaning and disinfection methods for wet mops, buckets and trolleys**

	Mops (both stick and handheld)	Buckets (individual)	Cleaning trolley
<b>Cleaning</b>	Wash wet cleaning floor and hand held cotton mops with soap and water. Rinse to remove all soap.	Wash with soap and water using a brush. Rinse to remove all soap.	Wash the trolley bucket with soap and water using a brush. Rinse to remove all soap.
	Dry cleaning floor mops should not be washed. They should be taken to an open area and cleaned with a hand held brush.		Wipe down the trolley body with soap and water; rinse wipe with water.
<b>Disinfection</b>	Immerse in 0.5% hypochlorite* solution/chlorine powder solution for 30 minutes. Rinse with plain water immediately to remove all residual chlorine.	Rinse with 0.5% hypochlorite solution/ chlorine powder solution for one minute. Rinse with plain water to remove all residual chlorine.	Rinse bucket with 0.5% hypochlorite solution/ chlorine powder solution for one minute.
	Microfiber mops should be washed with mild soap and disinfected with hot water (70-80°C for two minutes). Do not use a brush to clean the mops.		Wipe down the trolley body with 0.5% hypochlorite solution. Rinse with plain water to remove all residual chlorine.

***\*Do not use hypochlorite solution/strong soap on microfiber mops.***

### **Storage of Cleaning Equipment**

- Always store cleaning equipment in the dirty utility area of the hospital
- Ensure the dirty utility room is clean and well ventilated
- Where, a dirty utility room is not available, provision should be made to modify an existing area for the purpose of dirty utility. Such area should be planned away from the patient care areas
- Cleaning equipment should never be stored in the patient care area, placed on tables, behind doors, on windows and toilets.

### **STANDARD METHOD OF CLEANING**

Hospitals need to ensure that they follow standard methods of cleaning for different areas of the hospital.

Minimum interventions that are needed to be taken up by the hospital include:

- Use of three bucket system of cleaning
- Use of outward mopping: the direction of cleaning in health facilities should be from clean to the dirty area. In closed spaces like a ward the direction should be from within outwards





- Use of brooms in the patient care area should be avoided
- There should be separate mops for critical and general areas. The mops should not be shared between the critical and general areas
- Disinfection and washing of mops is carried out after each cleaning cycle.

***Please refer to Annexure II: “Standard Operating Procedures for Cleaning” for standard methods of cleaning for various areas of hospital***

## **MONITORING OF CLEANLINESS ACTIVITIES**

Hospitals need to ensure that they carry out the monitoring of cleanliness activities at regular intervals, preferably after each cleaning cycle to ensure that the activities are carried out as per standard procedures of the health facility.

Hospitals need to comply with these minimum requirements for monitoring of cleanliness activity:

**Designated Personnel for Monitoring:** Hospitals need to designate a personnel from the Infection Control Committee, to carry out the activities of monitoring of cleanliness. The person designated for monitoring will take daily rounds after each cleaning cycle and will also carry out surprise rounds of the hospital to ensure proper cleanliness and identify any areas for improvement in the current practices. He/She will also be responsible for supervision of housekeeping activities by counter signing the check lists used for monitoring.

**Use of Checklists:** Hospitals need to follow an evidence based structure for monitoring of the cleanliness activities. Hospitals need to follow checklists, detailing the activities carried out during cleaning of that particular area, as a standard protocol.

The housekeeping personnel after completing the activity, as listed in checklist, need to sign or mark the activity which is then monitored by the monitoring personal and is countersigned if found satisfactory.

All the checklists should be displayed at relevant areas and should be customised to the particular area.

***Please refer to Annexure III: “Sample Checklist” for monitoring of the cleanliness activity in different areas of hospital.***

**Monitoring of Quality of Cleaning Material:** Hospitals need to ensure that the cleaning materials are prepared as per the manufacturers recommendations and standard apparatus or methods are used for measuring the appropriate quantity of solutions, to meet the desired concentration for efficient cleaning. Suggestions/feedback needs to be taken from the housekeeping staff, for efficiency of the cleanliness agents.

Monitoring of the cleaning material can also be carried out by doing the surveillance activity of cleaning effectiveness through microbiological testing.

Routine swabbing of environmental surfaces other than in the OT should not be done.

## **DRAINAGE AND SEWAGE MANAGEMENT**

Poor sanitation is known to increase the risk of morbidity and mortality. One of the most important components of sanitation is excreta and waste water disposal. Improper disposal of biodegradable waste can spread diseases and pollute the environment. Hospitals should plan for drainage and sewage system for safe disposal of sewage and avoid any stagnancy of water.



## GENERAL GUIDELINES FOR DRAINAGE AND SEWAGE SYSTEM

- Drainage system should be closed i.e. no open drains in the hospital premises
- All the open drains should be properly covered
- Gradients of the drainage system should be conducive for maintaining the flow of water
- All the drains should be periodically checked for any blockage
- Regular cleaning (preferably once in week) of the drains needs to be carried out, as per cleaning schedule of the hospital
- The drainage and sewage system of the hospital should be connected with municipal sewage and drainage system
- In the absence of connectivity with municipal drainage and sewage system, hospitals need to have their own sewage management system in place within the premises.

## GUIDELINES FOR CONSTRUCTION OF SEPTIC TANKS (ON SITE SEWAGE MANAGEMENT)

Septic tank offers a preliminary treatment of sewage prior to final disposal. Sewage is held in these tanks for some prescribed period during which time the suspended solids present in the storage settle down. The settled sludge and the supernatant liquor undergo anaerobic digestion. The digestion results in appreciable reduction in the volume of sludge and reduction in organic matter in the liquid.

Unsatisfactory design, construction and maintenance of septic tanks constitute a health hazard. It is, therefore, considered essential to have planned septic tanks or onsite sewage system in place.

Normally, septic tanks are designed for foul sewage (faecal matter and urine). Sullage wastes may be distributed crudely by throwing on the gardens or grassed areas and so dispersed and absorbed, or may be drained to a seepage pit or dispersion trench from which it overflows into or is absorbed by the surrounding soil. However it is to be ensured that under no circumstances should effluent from a septic tank be allowed into an open channel drain or body of water without adequate treatment\*.

***\*Management of sullage has been covered separately in “Liquid Waste Management” section of these guidelines***

### Location of Septic Tank

Septic tank should be located at a place open to sky, as far away as possible from the exterior of the wall of building and should not be located in swampy areas or areas prone to flooding. It should also be accessible for cleaning.

### Layout and Construction Considerations

- The layout should be as simple and direct as practicable
- The pipes should be laid, as far as possible, in straight lines in both vertical and horizontal planes; however, where bends are unavoidable, they should be long radius bends with cleaning eyes
- Anything that is likely to cause irregularity of flow should be avoided
- At junctions of pipes in manholes, direction of flow from a branch connection should not make an angle exceeding 45 degree with the direction of flow in the main pipe
- The floor of the tank needs to be water tight and of adequate strength to resist earth movement and to support the weight of the tank, walls and contents. The floor should be provided with a minimum slope of 1: 10, towards the sludge outlet to facilitate desludging



- The walls should be of such thickness as to provide adequate strength and water tightness. Walls built out of brick should not be less than 200 mm thick and should be plastered to a minimum thickness of 12 mm inside and outside with cement mortar. They should have a minimum thickness of 370 mm.

**Note:** For detailed design parameters of the septic tanks please refer to “Indian Standard Code of Practice for Installation of Septic Tanks Part i Design Criteria and Construction (Second Revision)”

### Commissioning of Septic Tank

- The sewerage system should be complete and ready for operation before connection is made to the building
- The tank should be filled with water to its outlet level before the sewerage is let into the tank. It should, preferably, be seeded with small quantities of well digested sludge obtained from septic tanks or sludge digestion tanks
- In the absence of digested sludge a small quantity of decaying organic matter, such as digested cow dung may be introduced.

### Sludge Withdrawal

- Half yearly or yearly desludging of septic tank is desirable
- Normally, the tanks need to be cleaned when the sum of the depth of the scum and the sludge is observed to exceed half the depth of the tank
- A portion of sludge not less than 25 mm in depth should be left behind in the tank bottom which acts as the seeding material for the fresh deposits
- Manual handling of sludge should be avoided
- Spreading of sludge on the ground in the vicinity should not be allowed.

**Note - Frequent desludging inhibits the anaerobic action in the tank**

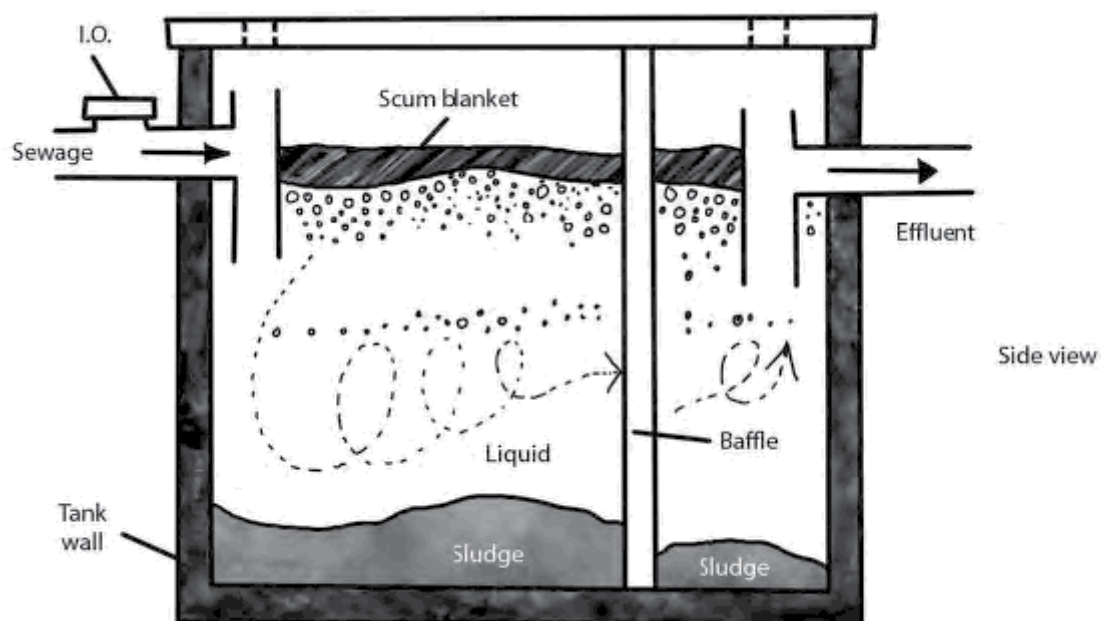


Figure 20: A typical rectangular septic tank system

### **Problem Signs in Septic Tanks**

The septic tank needs to be checked if there are signs that it is not working properly.

Some signs that a septic tank is not working properly are:

- The sewage in the toilet or the liquid waste from other fixtures flows away very slowly
- Liquid waste overflows from the disconnecter trap
- Wet areas are seen at the top of the septic tank
- There is a strong unpleasant smell near the septic tank
- The grass around the tank is very green and growing well.

These signs may indicate problems with the drain. Therefore, these drains will need to be checked at the same time as the septic tanks are checked.



# IMPROVING WASTE MANAGEMENT



As “Kayakalp” Scheme is inclined towards ensuring cleanliness and hygiene in health facilities it becomes imperative for them to manage the waste generated in an appropriate manner which ensures that facilities are clean and free from any risk which may arise due to improper waste management.

Health facilities need to streamline and standardise the entire activities required to manage waste right from its inception to its final disposal. This includes collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management.

This section of these guidelines encompasses all the requirements which hospitals need to meet for proper management of bio medical and general waste in the hospital. These requirements are subdivided into following sections:

- Implementation of BMW Rules, 2016 & 2018 (Amendment)
- Segregation, Collection and Transportation of BMW
- Sharp Management
- Storage of Bio Medical Waste
- Disposal of Bio Medical Waste
- Management of Hazardous Waste
- Solid General Waste Management
- Liquid Waste Management
- Equipment and Supplies for BMW Management
- Statutory Compliances

## IMPLEMENTATION OF BIO MEDICAL WASTE RULES, 2016 & 2018 (Amendment)

BMW management rules were revised through a gazette notification by the Central Government in 2016 & 2018 (Amendment) and it has become mandatory for health facilities to manage bio medical waste generated from the health facilities as per the new rules.

The bio medical waste as defined by the BMW Rules, 2016 is any waste which is generated during the activities of diagnosis, treatment and immunisation of human beings or any research activities pertaining thereto or in the production or testing of biological or in the health camps.

For implementation of the BMW Rules, 2016 & 2018 (Amendment) the health facilities need to be aware of the key changes that are incorporated in the BMW Rules vis-a-vis BMW Rules, 1998. The health facilities need to ensure that it has a copy of new BMW Rules for ready reference and as a guiding document for BMW management.

For implementation of the BMW Rules 2016 & 2018 (Amendment) the health facilities need to ensure the following:





- Bio medical waste generated from the health facilities is segregated as per the new colour coding scheme specified in the BMW Rules, 2016 & 2018 (Amendment)
- All the health facilities which are situated within 75 km radius of Common Bio Medical Waste Treatment Facility (CBMWTF), need to have a formal agreement with the CBMWTF for final treatment and disposal of the bio medical waste
- Health facilities which do not lie within 75 km radius of CBMWTF need to have approval for deep burial pit, used for disposal of waste from the Pollution Control Board office
- Health facilities also need to ensure that the pre-treat the waste at the health facilities as per BMW Rules before handing over the same to CBMWTF or before the final disposal
- Each health facility also needs to ensure that only non-chlorinated bags ( excluding blood bags) are used by the hospital for collection of waste in the hospital
- Health facilities also need to ensure that they monitor the activities of BMW management through a committee formed at the facility. This committee should meet at least once in six months and all the records related to the same need to be maintained by the health facility.

### SEGREGATION, COLLECTION & TRANSPORTATION OF BMW

The key activities that a hospital performs for the management of BMW include segregation of the waste at the point of generation, timely collection of waste and transportation of the waste from the interim storage areas of the hospital to the central storage area and transportation of the waste from the central storage area to the deep burial pits (in case of facilities not having agreement with CBMWTF).

#### SEGREGATION

##### GENERAL REQUIREMENTS





- It is imperative for healthcare organisations to segregate the waste generated from the facilities at the point of generation only
- Segregation of the waste is the responsibility of the waste generator only
- The waste generated from different areas of the hospital needs to be segregated as per the colour coding provided in the BMW Rules, 2016 & 2018 (Amendment).
- The general waste generated should not to be mixed with the bio medical waste.
- The work instructions are displayed at appropriate areas of the hospital for proper segregation of the waste as per the colour coding.



Figure 21: Segregation of BMW at Civil Hospital, Haryana



**Table 11: Segregation of BMW Waste as per BMW Rules, 2016 & 2018 (Amendment)**

S. No.	Category	Type of Waste	Colour & Type of Container
	Yellow Category	<ul style="list-style-type: none"> <li>Human Anatomical Waste</li> <li>Soiled Waste</li> <li>Discarded or Expired Medicine</li> <li>Chemical Liquid Waste</li> <li>Chemical Laboratory Waste</li> <li>Chemotherapy Drug Vials</li> </ul>	<p>Yellow colour non chlorinated plastic bags or containers</p> 
	Red Category	Contaminated Waste (Recyclable)	<p>Red colour non chlorinated plastic bags and containers</p> 
	White Category	Waste Sharps including metals	<p>White colour puncture proof, leak proof, tamper proof containers</p> 
	Blue Category	<ul style="list-style-type: none"> <li>Glassware</li> <li>Metallic Body Implants</li> </ul>	<p>Puncture proof and leak proof boxes or containers with blue coloured marking (2018 Amendment)</p> 

## COLLECTION OF WASTE

### GENERAL REQUIREMENTS

- All the bags used for waste collection need to be sealed once they are full to 3/4th of their capacity and transported to the central waste storage area or interim storage areas
- Collection of the waste needs to be done in closed covered containers which are sturdy preferably wheelbarrows
- Collection time needs to be fixed and size of the bins need to be appropriate to the quantity of waste produced in each area of the healthcare facility
- General waste should not be collected at the same time or in the same trolley as infectious or other hazardous wastes



- Collection of the waste should be done daily, with collection timed to match the pattern of waste generation during the day
- The collection timings should enable the HCF to minimise or nullify the use of interim storage of waste in the departments
- The collection of the waste should be done by the waste handlers only after donning of the appropriate PPE i.e. gum boots, heavy duty gloves, face masks and eye wear
- All the bags need to be labelled with biohazard or cytotoxic hazard symbol along with date of generation and area of generation for easy traceability.

#### TRANSPORTATION OF WASTE

- BMW generated from the health facilities should be transported in covered wheelbarrow based sturdy trolleys through a route which has low traffic flow of patients and visitors (whenever possible)
- The waste transportation trolleys should be dedicated for the purpose of waste transportation only
- The transportation trolleys need to be separate for general waste and for BMW
- It is preferable that the trolleys used for transportation should be as per the colour coding, as provided in the New BMW Rules.
- All the trolleys used for the transportation of the waste should be labelled with bio hazard logo
- After every transportation cycle, ensure trolley should be washed, disinfected & dried up
- Route of transportation to the BMW holding/disposal area should preferably be planned in such a way that ensures:
  - it does not include transportation through high risk areas
  - supplies and waste are transported through separate routes.
  - waste is not transported through areas having high traffic of patients and visitors
  - central waste collection area can be easily accessed through this route
  - provide safe transportation of waste to avoiding spillage and scattering of waste



Figure 22: Transportation of waste at CHC Kala Sanghian



## STORAGE OF BIOMEDICAL WASTE

The BMW generated from the hospital needs to be stored in a dedicated central waste storage area, before handing over the same to the CBMWTF. The minimum requirements that are needed to be ensured by hospitals for central waste storage area as listed as follows:

- The location of central waste collection station should be away from the public/visitors access
- The planned space should also include space provisions for storage of waste collection trolleys
- Such centre should be roofed and manned through lock and key under the responsibility of designated person
- The entrance of this centre should be accessible through a concrete ramp for easy transportation of waste collection trolleys
- During construction it is to be ensured that the centre is kept ventilated through the use of exhaust fan or by use of wire meshes for ventilation
- There should also be provision of water supply adjacent to central waste storage area for cleaning and washing of this station, trolleys and also for hand washing for the staff
- The entrance of this station should be labelled with “ENTRY FOR AUTHORISED PERSONNEL ONLY” and logo of BMW Hazard.
- It is desirable that for new health facilities under construction, the drainage system of this central waste collection is attached to the Effluent Treatment System of the health facilities
- It is to be ensured that no general waste is stored in the central waste collection area
- The hospital should ensure that waste generated from the hospital should not be stored beyond a period of 48 hours
- To ensure there is no pilferage of recyclables, it is to be ensured that central storage area is under lock and key, guarded by a designated person
- Health facilities need to maintain the record of waste handed over to the CBMWTF and also for recyclable waste generated and handed over to the authorised recyclers
- To ensure protection from animals, it is to be ensured that there is no stray animal in the health facility premises and cattle traps have been installed at the entrance of the health facility.

**Figure 22: BMW Collection area at CHC Kala Sanghian**





## DISPOSAL OF BIOMEDICAL WASTE

Hospitals need to ensure that they have adequate arrangements for the disposal of BMW generated from the health facility.

The final disposal of the BMW generated from the health facility can be taken up by the CBMWTF or through deep burial and sharp pits.

### HOSPITALS UNDER CONTRACT WITH CBMWTF

All the hospitals, which are situated within a distance of 75 km of CBMWTF, need to have a formal agreement/contract with the CBMWTF for transportation and disposal of BMW generated from the hospital. These hospitals have to hand over the waste to the CBMWTF for final disposal and should ensure that waste is not disposed of in the deep burial and sharp pits.

Hospitals need to ensure that the disposal of the BMW generated from the hospital is disposed of as per Schedule I of the BMW Rules, 2016. & 2018 (Amendment)

### HOSPITALS NOT UNDER CONTRACT WITH CBMWTF

Hospitals which are situated outside 75 km areas of the CBMWTF should ensure that they have the facility of disposal of waste within the premises of the hospital i.e. deep burial and sharp pits.

Hospitals need to have approval from Pollution Control Board office for all the deep burial pits and sharp pits created in the hospital and records of the same need to be maintained by the hospital.

The deep burial pits created in the hospital should meet the requirements as listed in the New BMW Management Rules.

### STANDARDS FOR DEEP BURIAL

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

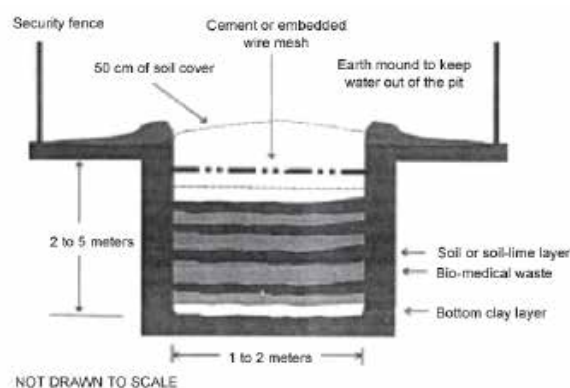


Figure23: Design of deep burial pit





### Suggested Standard for Disposal of Sharp

- A sharp pit should be constructed within the hospital premises to dispose of the sharp waste generated from the facility
- Sharp pit should be a 1mt×1mt×1mt concrete lined protected pit with a cemented lid
- Disposal of the sharp containers need to be done by discarding the containers in entirety into the sharp pits
- Encapsulation of the waste sharp for prevention of reuse may be done with use of binding material like cement or clay. The filled needle containers can be placed in the sharp pits up to 3/4th of the capacity of the pit. An immobilising material such as cement or clay is added to the pit. Once dry, the sharp pit is sealed. Another sharp pit is created for further use.

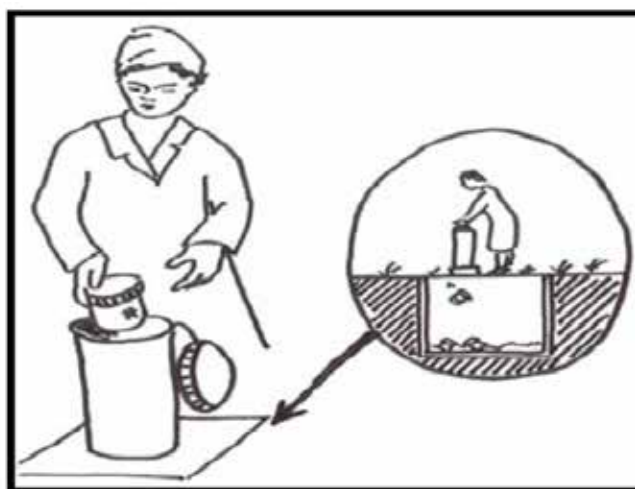


Figure24: Disposal of sharp waste containers into sharp pits

***Please refer to Annexure IV: Disposal and Treatment Option of Bio Medical Waste as per Schedule I of BMW Rules, 2016 & 2018 (Amendment)***

### HANDLING OF METAL SHARPS

Sharps of metals like blades, scalpels, needles, burnt needles and syringes with fixed needles are included under the white category of BMW, as per BMW Rules, 2016 & 2018 (Amendment). This category of the waste is handled as following:

- All the waste generating sites need to be provided with needle cutter/burner for cutting/burning of the needles and cutting of the injection tips
- All the waste generating areas of the hospital are provided with leak proof, tamper proof and puncture proof white translucent containers having narrow mouth (the hand should not go in it)
- The burnt/cut needles, blades, scalpels and syringes with fixed needles are collected and stored in the white translucent containers which should be leak proof, puncture proof and tamper proof
- The sharp containers should be handed over to the CBMWTF or sharps can be disposed off in sharp pits.

### General Instructions for Handling the Sharps

Sharps should always be handled carefully, in accordance with the following principles:

- Needles should not be bent, sheared, broken, recapped (by using both hands), removed from disposable syringes, or otherwise manipulated before disposal



- Always get help when using sharps on a confused or agitated patient
- Never pass sharps from person to person by hand
- Never walk around with sharps in your hand
- Never leave sharps lying around – dispose them off yourself
- Dispose of sharps at the point of use – take a sharps container with you. Never collect used sharps and try to segregate/dispose them together
- Dispose off syringes and needles as a single unit – do not remove the needle first
- Do not pick up broken glass with hands, use mechanical means such as a brush and dustpan, tongs, or forceps.

## HANDLING OF GLASSWARE

All the glassware generated from the hospital including broken glasses, medicine vials, contaminated glass, ampules (except that of attenuated vaccines), are covered under the **Blue Category** of BMW waste as per BMW Rules, 2016 & 2018 (Amendment). The blue category also includes all the metallic body implants being used in the hospital.

### Steps of Handling

- The glassware waste generated from the hospital needs to be first pre-treated in the hospital before handing it over to the CBMWTF or disposing in the sharp pits. Pre-treatment of the waste is carried out by immersing the waste in the 1% chlorine solution (having 30% residual chlorine) for at least 20 minutes or by use of autoclave meeting the specifications as specified in Schedule II of BMW Rules, 2016 & 2018 (Amendment). Hypochlorite must be prepared fresh before immersion

All the glassware needs to be collected and stored in Puncture proof and leak proof boxes or containers with blue coloured marking ( 2018 Amendment)

- These boxes are handed over to the CBMWTF for final treatment and disposal.

## SHARP MANAGEMENT

- Proper management of sharp waste generated from the hospital needs to be carried out in order to prevent the risk associated with inappropriate handling of the sharps like blades, needles, scalpels etc. Sharp waste generated from the hospital poses an immediate risk of needle stick injuries to waste generator or waste handlers. Safe handling and disposal of needles and other sharps should be part of overall strategy to protect staff, patients and visitors from exposure to blood-borne pathogens
- Sharp waste generated from the hospital comprises of needles, syringes, scalpels, blades, glass items and metals that may cause puncture and cuts. These include both used and unused sharps

## POST EXPOSURE PROPHYLAXIS (PEP)

In the health facility, all the healthcare personnel are at risk of exposure to blood borne pathogens. For management of any exposure to blood borne pathogens it is to be ensured by the health facilities that there is a protocol in place for reporting of such exposure and providing an appropriate post exposure prophylaxis to the exposed staff.

Post exposure prophylaxis (PEP) refers to the comprehensive management given to minimise the risk following exposure to blood borne pathogens (HIV, HBV and HCV). This includes:

- First aid



- Counselling
- Risk assessment
- Relevant laboratory investigations based on informed consent of the source and exposed person
- Depending on the risk assessment, the provision of short term (4 weeks) of antiretroviral drugs or hepatitis immunoglobulin and vaccine
- Follow up and support.
- Exposure which may place healthcare worker at risk of blood borne pathogen is defined as:
  - Per cutaneous injury (e.g. needle-stick or cut with a sharp instrument)
  - Contact with the mucous membranes of the eye or mouth
  - Contact with non-intact skin (particularly when the exposed skin is chapped, abraded, or afflicted with dermatitis)
  - Contact with intact skin when the duration of contact is prolonged (e.g. several minutes or more) with blood or other potentially infectious body fluids.

**Table 11: Potentially infectious body fluids**

POTENTIALLY INFECTIOUS BODY FLUIDS	
Exposure to body fluids considered at “risk”	Exposure to body fluids considered “not at risk”*
<ul style="list-style-type: none"> <li>• Blood</li> <li>• Semen</li> <li>• Vaginal secretions</li> <li>• Cerebrospinal fluids</li> <li>• Synovial, pleural, peritoneal, pericardial fluid</li> <li>• Amniotic fluid</li> <li>• Other body fluids contaminated with visible blood</li> </ul>	<ul style="list-style-type: none"> <li>• Tears</li> <li>• Saliva</li> <li>• Urine and faeces</li> <li>• Sweat</li> </ul> <p><b><i>*All these fluids are considered to be non-infectious only if these secretions are not contaminated with visible blood</i></b></p>

## STEPS FOR MANAGING ACCIDENTAL EXPOSURE

### STEP 1: MANAGING EXPOSURE SITE

**For skin** - If the skin is broken, after a needle-stick or sharp instrument: immediately wash the wound and surrounding skin with water and soap, and rinse. Do not scrub. Do not use antiseptics or skin washes (bleach, chlorine, alcohol, betadine).

**After a splash of blood or body fluids:**

#### For unbroken skin

- Wash the area immediately
- Do not use antiseptics
- Do not squeeze the injured site to cause bleeding.

#### For the Eye

- Irrigate exposed eye immediately with water or normal saline
- Sit in a chair, tilt head back and ask a colleague to gently pour water or normal saline over the eye
- If wearing contact lens, leave them in place while irrigating, as they form a barrier over the eye and will help protect it



- Once the eye is cleaned, remove the contact lens and clean them in the normal manner. This will make them safe to be worn again
- Do not use soap or disinfectant on the eye.

#### For Mouth

- Spit fluid out immediately
- Rinse mouth thoroughly, using water or saline and spit again. Repeat this process several times
- Do not use soap or disinfectant in the mouth
- Consult the designated physician of the institution for management of the exposure immediately.

**Table 12: Summary of Do's and Don'ts for accidental exposure**

SUMMARY OF "DOS" AND "DONTs" FOR ACCIDENTAL EXPOSURE	
<ul style="list-style-type: none"> <li>• Remove gloves, if appropriate</li> <li>• Wash the exposed site thoroughly with running water</li> <li>• Irrigate with water or saline if eyes or mouth have been exposed</li> <li>• Wash the skin with soap and water</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Do not</b> panic</li> <li>• <b>Do not</b> put the pricked finger in mouth</li> <li>• <b>Do not</b> squeeze the wound to bleed it</li> <li>• <b>Do not</b> use bleach, chlorine, alcohol, betadine, iodine or other antiseptics/detergents on the wound</li> </ul>

#### STEP 2: ESTABLISH ELIGIBILITY FOR PEP

A designated doctor in the health facility should assess the staff exposed for the risk of HIV or HBV transmission after the accidental exposure as defined above. This evaluation should **be made rapidly**, so as to start any treatment as soon as possible after the accident (ideally within two hours but certainly within 24 hours).

This assessment should be made thoroughly (because not every accidental exposure requires prophylactic treatment).

The first dose of PEP should be administered within the first few hours for HIV exposure and 24 hours for Hep B exposure. PEP taken after 72 hours may be less effective hence the risk must be evaluated as soon as possible. If the risk is insignificant, PEP could be discontinued, if already commenced.

Two main factors determine the risk of infection:

- The nature of exposure
- The status of the source patient

#### Assessing the Nature and Risk of Exposure

**Mild Exposure** (mucous membrane/non-intact skin with small volumes)

- A superficial wound (erosion of the epidermis) with a plain or low calibre needle
- Contact with the eyes or mucous membranes, subcutaneous injections small-bore needles

**Moderate Exposure** (mucous membrane/non-intact skin with large volumes/percutaneous superficial exposure with solid needle)

- A cut or needle stick injury penetrating gloves

**Severe Exposure** (percutaneous with large volume)

- An accident with a high calibre needle (>18 G) visibly contaminated with blood



- A deep wound (haemorrhagic wound and/or very painful)
- Transmission of a significant volume of blood
- An accident with material that has previously been used intravenously or intra-arterially.

### Assessing the HIV Status of Source of Exposure

PEP needs to be started as soon as possible (within hours) after the exposure and within 72 hours. PEP is not effective when given more than 72 hours after exposure. A baseline rapid HIV testing needs to be done before starting PEP. Initiation of PEP where indicated should not be delayed while waiting for the results of HIV testing of the source of exposure.

Informed consent needs to be obtained before testing of the source as per national HIV testing guidelines.

**Table 13: Categories of situations depending on the results of source**

Categories of Situations Depending on the Results of the Source	
Source HIV status	Definition of risk in source
HIV Negative	Source is not HIV infected but consider HBV and HCV
Low Risk	HIV positive and clinically asymptomatic
High Risk	HIV positive and clinically symptomatic
Unknown	Status of the patient is unknown and neither the patient nor his/ her blood sample is available for testing (e.g. injury during the BMW handling the source of the patient might be unknown. The risk assessment will be based only on the exposure.

### Assessment of Exposed Individual

- The exposed individual needs to have confidential counselling and assessment by an experienced physician
- The exposed individual needs to be assessed for pre-existing HIV infection intended for people who are HIV negative at the time of their potential exposure to HIV
- Exposed individuals who are known or discovered to be HIV positive should not receive PEP. They should be offered counselling and information on prevention of transmission and referred to clinical and laboratory assessment to determine eligibility for antiretroviral therapy (ART).

### STEP 3: COUNSEL FOR PEP

- Exposed persons should receive appropriate information about what PEP is and the risks and benefits of PEP in order to provide informed consent
- It should be clear that PEP is not mandatory. However, refusal of PEP by the exposed person should be documented
- Psychological support: Many people will feel anxious after exposure. Every exposed person needs to be informed about the risks and the measures that can be taken. This will help to relieve part of the anxiety, but some may require further specialised psychological support
- Counselling should include explanation of signs/symptoms of HIV/HBV and when to seek help
- Documentation on record is essential.

### STEP 4: PRESCRIBE PEP

- PEP must be initiated as soon as possible preferably within 2 hours of exposure in case of HIV exposure and within 24 hours in case of Hep B exposure



- Regimen of PEP to be prescribed must be decided on the basis of the type of exposure and HIV/Hep B vaccination status of the source person
- HIV/HBV testing of the source patient must not delay the decision to start PEP
- PEP must be started and then the patient can be sent for further consultation, if required
- In the case of a high risk exposure from a source patient who has been exposed to or is taking antiretroviral medications, consult an expert to choose the PEP regimen, as the risk of drug resistance is high
- Expert consultation should be sought in case exposed HCW is a pregnant female
- For details on PEP regimen, side effects of PEP, amount of medication to be dispensed, antiretroviral drugs during pregnancy, HCV Chemoprophylaxis and PEP regimen when source is known to be on ART, please refer to the NACO Guidelines on PEP.

#### **STEP 5: LABORATORY EVALUATION**

- PEP should not be delayed if HIV/HBV testing facility is not available
- The reason for HIV/HBV testing soon after an occupational exposure is to establish a “baseline” against which to compare future test results
- If the exposed person is HIV/HBV-negative at the baseline test, it is in principle possible to prove that subsequent infection identified by follow-up testing is related to the occupational exposure (depending on the timing of infection and consideration of other risks or exposures)
- When offered HIV testing, the exposed person should receive standard pre-test counselling according to the national HIV testing and counselling guidelines, and should give informed consent for testing
- Confidentiality of the test result should be ensured.

#### **STEP 6: FOLLOW-UP OF AN EXPOSED PERSON**

- Follow up is indicated to monitor for possible infections and provide psychological support irrespective of the fact that PEP has been started or not
- Persons exposed to HIV should undergo a repeat evaluation three days after exposure (in addition to the one at the time of exposure) to obtain more details about the exposure incident.
- Follow up of the exposed person must include both, the clinical follow up for any visible signs and symptoms for HIV/HBV seroconversion and laboratory follow up for post PEP HIV/HBV testing
- For details on follow up and prophylaxis drugs for HIV exposure please refer to the NACO Guidelines on PEP.

#### **REPORTING OF NEEDLE STICK INJURIES**

- All needle stick injuries or exposure, as described above, need to be reported to the appropriate authority as decided by the hospital in a standard format
- All the staff of the hospital need to be made aware of such reporting format
- All the records related to the reporting of needle stick injuries, PEP provided and follow up need to be maintained by the hospital.

***Please Refer to Annexure VI: “Needle Stick Injury Reporting Format”***





## MANAGEMENT OF HAZARDOUS WASTE

### MANAGEMENT OF MERCURY WASTE

Mercury exists in three forms i.e. elemental, inorganic and organic form. Elemental mercury vapours are colourless and odourless and very toxic when inhaled. Mercury is a potent neurotoxin. It persists in the environment for a long time, and it is extremely toxic in small amounts. Exposure to mercury impacts the central and peripheral nervous system and it can damage the brain, spinal cord, kidneys, eyes and liver. Also, mercury can easily cross the placenta, passing from mother to unborn child, where it can impact neurological development of the foetus.

In HCFs, exposure to mercury can occur through inhalation, ingestion, or skin contact and vary according to the metal speciation.

Though the release of mercury in the environment can happen in many ways like spillage, burning of medical waste mixed with mercury or disposal of mercury based residual dental amalgams without any pre-treatment. In health facilities, the main cause of release of mercury in the environment is due to spillage which may occur due to breakage of instruments and equipment having mercury like thermometers, sphygmomanometers, oesophageal dilators with mercury weight, feeding tubes, gastro intestinal tubes etc. or through release of mercury from dental amalgam kit.

The possible areas of mercury exposure in health facilities are:

- Accident & Emergency Department
- Dental Department
- Endoscopy Department
- Instrument Repair Workshop
- Laboratories
- Outpatients Clinics
- Pharmacy
- Stores and Wards
- Wastewater drains and Effluent Treatment System

Hospitals need to ensure that any spill of mercury is safely managed in order to protect the environment and staff from the adverse effect of mercury exposure.

#### **Precautions to be taken during accidental spillage or breakage of mercury based equipment**

- Ensure that all patients, people and staff are moved away from the mercury spill area
- Heaters and air conditioners which are in heating mode should be turned off to minimise volatisation of the mercury spill
- Ensure proper ventilation by opening windows and ventilators
- Any ventilation system that would spread mercury vapour to other sensitive areas should be closed
- Vacuum cleaner should not be used to clean up mercury spill
- Precaution should be taken not to handle mercury spills/broken equipment with bare hands and appropriate personal protective equipment (rubber gloves, goggles, face shields and clothing) should be used



- As far as possible, jewellery should be removed as mercury will bind with the metal and rubber gloves should be used at the time of handling mercury spills
- After handling mercury, hands should be carefully washed before eating or drinking
- Gloves used during handling of mercury should be discarded
- Broom should never be used to clean up mercury as it breaks up into mercury droplets and moves them around, making it harder to decontaminate the area
- Mercury spills should never be discharged into the drain/sewer as it can lodge in the plumbing, and contaminate the septic tank and sludge in sewage treatment plants
- In case of larger mercury spill (i.e. more than 3 grams of mercury), as far as possible collect spills at temperatures below 25°C, to avoid volatility of mercury at higher temperatures.

***Large mercury spills should be reported to SPCB/CPCB as an accidental event reporting.***

### MERCURY SPILL KIT

‘Mercury Spill Kits’ are essential for management of mercury spills. Mercury spillage collection kits should be kept at all suitable places in HCFs to allow rapid access to use the same in the event of mercury spillages.

All the staff especially housekeeping staff should be trained in Mercury Spill Kit management to prevent further exposures.

The Mercury Spill Kit should be maintained in marked boxes or portable containers. The component of the Mercury Spill Kit is as follows:

- Personal protective equipment (PPE): Rubber or nitrile gloves, safety goggles or protective eyewear, respiratory protection, face mask (designed particularly for mercury) or if no specialty masks are available, a face mask with a 0.3 micron HEPA, coveralls apron, and other protective clothing, disposable shoe covers
- Air-tight, sealable plastic bags (small and large sizes, thickness 40 to 150 microns)
- Small, air-tight, rigid plastic container or glass bottle half filled with water or vapour suppression agent for collecting elemental mercury
- Air-tight, puncture-resistant, rigid plastic or steel jar or container with a wide opening for collecting mercury-contaminated broken glass
- Plastic tray
- Tools required for removing mercury
  - Flashlight (electric torch) to locate shiny mercury beads
  - Plastic-coated playing cards or thin pieces of plastic to push mercury beads into a plastic scoop or pan; if these are not available use index cards, pieces of cardboard, or stiff paper
  - Small plastic scoop or plastic dust pan to catch the mercury beads
  - Tweezers to remove small broken glass pieces
  - Eyedropper or syringe (without needle) to draw up large mercury beads
  - Duct tape or sticky tape to pick up tiny mercury droplets.
- Vapour suppression agents
  - Sulphur powder (available from pharmacies) to absorb mercury by forming mercuric sulphide (or zinc/copper flakes to absorb mercury by forming amalgams)



- Commercial absorbent pads or vapour suppressants which contain a foam pad saturated with a suspension containing small amounts of sodium thiosulphate, copper sulphate, calcium chloride, and potassium iodide
- Small quantities of a propylene glycol solution or sodium thiosulphate or copper sulphate may also be used as vapour suppression agents
- Brush to remove powder or flakes
- Utility knife blade
- Materials for decontamination
  - Vinegar, hydrogen peroxide, and cotton swabs for final cleaning when using sulphur powder
  - Decontaminant solution or commercial decontaminant (made of 10% sodium thiosulphate solution or a mixture of sodium thiosulphate and EDTA).

Whenever a spill kit is used, the staff involved in the clean-up should ensure that the contents are replenished as soon as possible.

## **SUGGESTED STEPS FOR MERCURY SPILL CLEAN-UP IN HCFs**

### **Evacuate area**

As far as possible, keep people who are not involved in the clean-up away from spill area to limit exposures and to prevent the spread of contamination

### **Put on face mask**

In order to prevent breathing of mercury vapour, wear a protective face mask as suggested in the component of the spill kit.

### **Remove Jewellery**

Remove all jewellery from hands and wrists so that the mercury cannot combine (amalgamate) with the precious metals.

### **Wear gloves**

Put on rubber or latex gloves. If there are any broken pieces of glass or sharp objects, pick them up with care. Place all broken objects on a paper towel, fold the paper towel and place in a puncture proof plastic bag or container provided with lid. Secure the plastic bag/container and label it as containing items contaminated with mercury.

### **Locate mercury beads**

Locate all mercury beads and look for mercury in any surface cracks or in hard-to-reach areas of the floor. Check a wide area beyond the spill. Use a flashlight to locate additional glistening beads of mercury that may be sticking to the surface or in small cracked areas. Cardboard sheets should be 'used to push the spilled beads of mercury together'

### **Use syringe without a needle/eyedropper and sticky tape**

A syringe (without needle) shall be used to suck the beads of mercury. Collected mercury needs to be placed slowly and carefully into an unbreakable plastic container/glass bottle with an airtight lid half filled with water.

After removing larger beads, use sticky tape to collect smaller hard-to-see beads. Place the sticky tape in a puncture proof plastic bag and secure properly.



Commercially available powdered sulphur or zinc stains make mercury a darker colour which makes smaller beads easier to see (powder sulphur may be used because (i) it makes the mercury easier to see since there may be a colour change from yellow to brown and (ii) it binds the mercury so that it can be easily removed and suppresses the vaporisation of any missing mercury).

### **Collection in leak-proof bag or container**

Place all the materials used during the clean-up, including gloves, mercury spills collected from the spill area into a leak-proof plastic bag or container with lid and seal properly and label as per these guidelines. Such collected waste should be stored in a designated area only.

### **Cleaning of the floor surfaces contaminated with mercury and cleaning of room surfaces**

Sprinkle sulphur or zinc powder over the area which will quickly bind any remaining mercury. In case, zinc powder is used, moisten the powder with water after it is sprinkled and use a paper towel to rub it into cracks in the flooring. Use the cardboard and then dampened paper towels to pick up the powder and bound mercury. Place all towels and cardboard in a plastic bag and seal all the bags that were used and store in a designated area.

All the mercury spill surfaces should be decontaminated with 10% sodium thiosulfate solution. Keep a window open to ventilate after the clean-up. After ensuring all the mercury has been removed, resume normal vacuuming and utilise the cleaned area for routine operation.

### **Labelling**

All the bags or containers containing items contaminated with mercury should be marked properly and labelled with following details: **“Hazardous Waste, Handle with Care”**, date of storage/generation, name and address of the hospital along with the contact number.

### **Storage**

Following points should be considered for storage of mercury bearing waste within the HCFs:

The storage place should be away from heat generating equipment.

The storage room should be provided with Mercury Spill Kit provision, proper ventilation (preferably with exhaust fan). The storage room needs to have smooth tiled floor with adequate slope, and lighting arrangement.

### **Disposal**

Collected mercury waste should be handed over to the CBMWTF or the identified agency of the CPCB.

## **MANAGEMENT OF RADIOACTIVE WASTE**

For all hospitals which are using radioactive isotopes for diagnostic and therapeutic applications, safe disposal of radioactive waste is a vital component of the overall management of hospital waste. An important objective in radioactive waste management is to ensure that the radiation exposure to an individual (public, radiation worker, Patient) and the environment does not exceed the prescribed safe limits. Disposal of radioactive waste in public domain is undertaken in accordance with the **Atomic Energy (Safe Disposal of Radioactive Waste) Rules of 1987 promulgated by the Indian Central Government Atomic Energy Act 1962**.

Hospitals that envisage the use of radioactive isotopes need to ensure that the structural and functional parameters are met in order to keep the environmental radiation levels and personal radiation exposure of workers and public within the permissible limits.



Hospitals need to appoint a Radiation Safety Officer (RSO), as per the AERB guidelines for monitoring the activities of disposal of radioactive waste in the facility.

Hospitals that do not use the radioactive isotopes, needs to ensure that:

- The radiographic developer used in the processing of X-ray films in the radiology department of the hospitals is not discharged in the municipal drain
- The silver X-ray film developing fluid is an income source for the hospital. It can be sent to authorised recyclers for resource recovery
- The radiological waste generated due to decommissioning or condemnation of the X-ray machines, OPG or C Arms needs to be handled as per the Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987.

### MANAGEMENT OF THE DISINFECTANTS AND LAB REAGENTS

- All disinfectants and lab reagents used in the hospital, need to be disposed off as per the manufacturer's instructions
- It is to be ensured that such disinfectants and reagents are not directly disposed off in municipal drains
- All such waste needs to be pre-treated in the facility as per the manufacturer's instructions before disposing of the same in the municipal drains. Neutralisation of chemical should be done before disposal.

### SOLID GENERAL WASTE MANAGEMENT

Hospitals need to ensure that the solid general waste generated from the facility is handled as per the Solid Waste Management Rules, 2016.

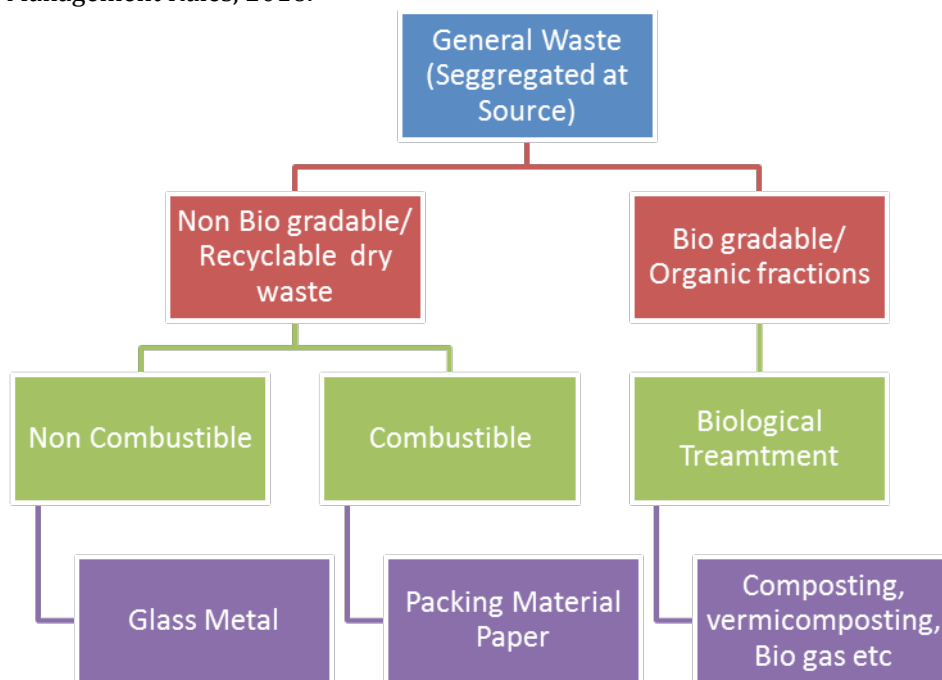


Figure25: Classification of general solid waste

The solid general waste generated from the health facilities needs to be segregated into bio-degradable and non-biodegradable waste (recyclable waste).



- Bio-degradable waste is defined as the waste of any organic material that can be degraded by micro-organisms into simpler stable compounds such as paper waste, food waste, kitchen waste etc.
- The non bio-degradable waste is defined as the waste that cannot be degraded into the simpler stable compounds with use of micro-organisms; such kind of waste is classified as recyclable waste, for example plastic bottles, aluminum cans, diapers etc.

#### GENERAL REQUIREMENTS FOR MANAGEMENT OF SOLID GENERAL WASTE

- Hospitals need to ensure that it has two types of bins for collection of bio-degradable and recyclable waste
- The bins should be available at the point of collection of waste and also at the central storage area
- Hospitals need to ensure that visitors and patients of the hospital are educated on identification and proper segregation of the solid general waste. Posters indicating the classification of the solid general waste should be displayed at the point of collection
- Hospitals need to ensure that all the staff is trained on proper segregation of the general solid waste
- The Infection Control Committee formed at the hospital needs to ensure that the waste is properly segregated and is not mixed with the BMW waste generated from the facility
- The solid waste generated from the health facility needs to be handed over to the municipal committee and corporations
- Hospitals where municipal committee and local corporations are not providing the facility of waste collection, need to ensure that such waste is disposed off in the composite pit created within the premises of the hospital
- In addition to listed requirements, hospitals should try to adapt and follow some innovative practices related to the general solid waste management. Some of the activities that can be adopted by the facility may include vermicomposting, converting waste to energy.

#### CONSTRUCTION OF COMPOST PIT

- A two-tank system for garden and general waste is recommended
- A small tank of 1m x 1m x 1m is made above ground under may be a shade
- The tank may be divided into two equal halves vertically by a wall containing vents
- Twigs, wigs and small branches are put on the floor
- The waste is deposited over this layer and spread in the tanks
- After a layer of 15 to 20 cm dry/green leaves is formed, a thin layer of soil is used to cover it
- Water is sprinkled over it. This process of alternate layers of waste and mud is followed till the tank is about  $\frac{3}{4}$  full following which the other tank is used
- The contents of the first tank are to be left alone for about two months and the contents can then be used as manure.







*Figure26: Compost Pit*

## VERMI COMPOSTING

In this method, few species of earthworms (*Eudrilus eugeniae* or *Eisenia foetida* and *Perionyx excavates*) are added to the compost. These help to break the waste and the added excreta of the worms makes the compost very rich in nutrients.

- To make a compost pit, a covered/selected site is selected
- Preferably the pit should be lined with granite or brick to prevent nitrite pollution of the subsoil water
- Each time when organic matter is added to the pit, it should be covered with a layer of dried leaves or a thin layer of soil which allows air to enter the pit
- Usually after 6 to 8 weeks, rich pure organic matter is ready to be used.

## LIQUID WASTE MANAGEMENT

The practice of pouring the bio medical liquid waste directly into the municipal drainage or without proper pre-treatment poses a risk of spreading the infection to staff, patients and community due to potency of liquid waste being susceptible to spilling, splashing, aerosolising and absorbing into the land. In order to minimise or nullify this risk, hospitals need to ensure that all the liquid waste generated from the health facility should be managed in a way to ensure that liquid waste does not pose any risk or adversely affect the environment, healthcare worker or community.

### LIQUID WASTE IN THE HOSPITAL

Hospitals generate liquid waste from different departments of the hospital like:

- Discarded samples
- Blood
- Body fluids and aspirated fluids
- Liquid discharge from laboratory
- Chemical waste like disinfectants and cleaning material
- Infected secretions
- Housekeeping material



To ensure that the liquid waste management in the hospital is carried out as per the BMW Rules, 2016 & 2018 (Amendment), hospitals need to have a written protocol for liquid waste management. Protocol for the management of the liquid waste should include following components:

### DISINFECTION AND TREATMENT OF LIQUID WASTE

- Infectious liquid waste generated from the hospital like blood, body fluids, secretions, discarded samples etc. needs to be disinfected by the use of 1%-2% hypochlorite solution with a minimum contact time of 30 minutes before final disposal
- Housekeeping material used in the hospital needs to be diluted with ample amount of water before discharging the same into municipal drains
- Disinfectants and laboratory reagents used in the hospital need to be treated and disposed of as per the manufacturer's guidelines
- All the liquid waste generated from the hospital needs to be appropriately treated in-house before disposing off the same into the municipal drains
- It is recommended that District Hospital level facilities should treat the liquid waste generated through dedicated Effluent Treatment System if sewage treatment facilities are not provided by municipal agencies. For smaller facilities such as CHC and PHC onsite disinfection of liquid waste can be done through local Liquid Waste Disinfection set-up.



Figure27: Liquid disinfection at a PHC laboratory

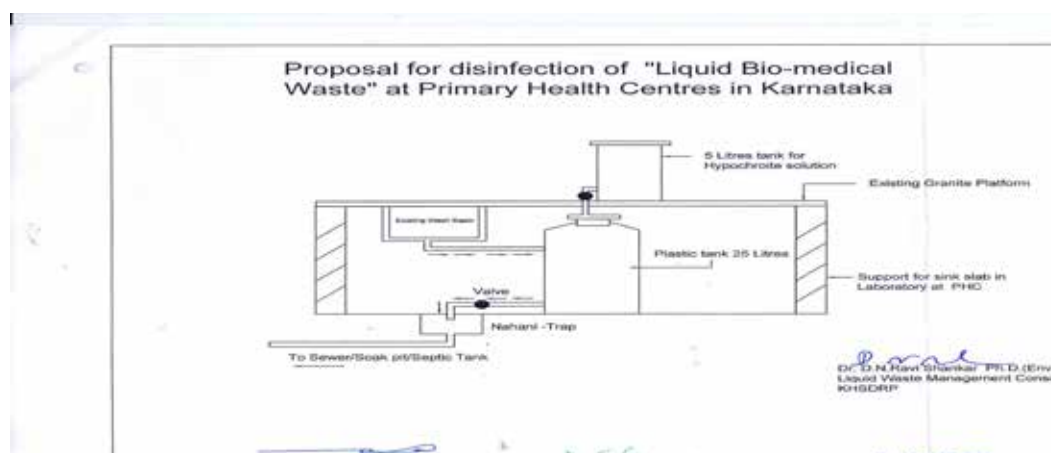


Figure28: Proposal of disinfection of liquid waste at PHCs, Karnataka



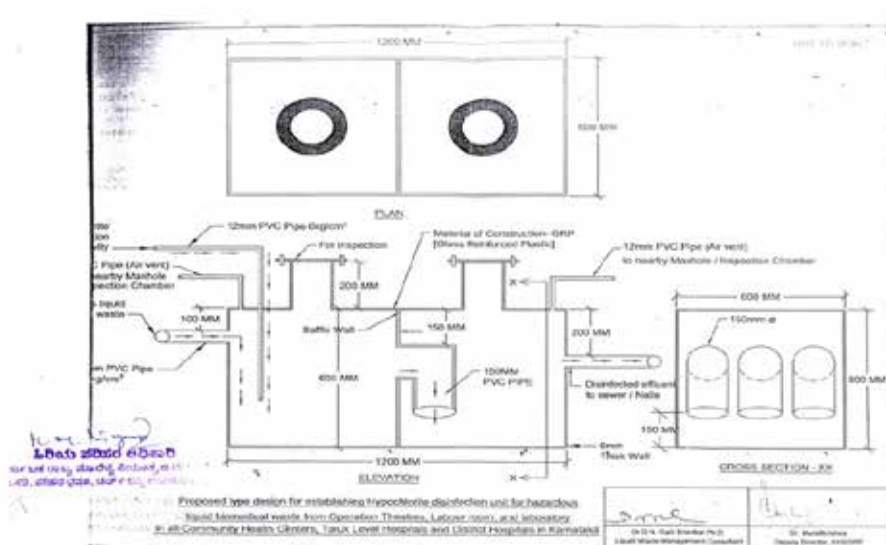


Figure 29: Schematic layout of liquid disinfection at secondary level facilities

## STANDARDS FOR TESTING OF LIQUID DISCHARGE

All the liquid waste discharge from the hospital should be tested at regular intervals for conforming to the permissible limit of various parameters as listed in Schedule II of BMW Rules, 2016 & 2018 Amendment). The testing of the discharge liquid should be done from the exit point of discharge. The standards of permissible limit of different parameters are listed below:

**Table 14: Permissible limit of different parameters of liquid discharge**

PARAMETER	PERMISSIBLE LIMIT
pH	6.5-9.0
Suspended solids	100 mg/l
Oil and grease	10mg/l
BOD	30mg/l
COD	250 mg/l
Bio assay	90% survival of fish after 96hrs in 100% effluent

## MANAGEMENT OF THE SULLAGE

Sullage i.e. liquid waste generated from sanitation, bathroom and kitchen which does not contain urine or excreta needs to be scientifically managed by the hospital.

The plumbing and drainage system should be connected to the municipal system and should have gradient which ensures that no waste water gets stagnated which may lead to breeding of pests and flies.

Hospitals, which do not have connectivity to municipal drainage system, need to ensure that sullage is collected in a soakage pit.

## SOAKAGE PIT

Soakage pits are based on the principle that the effluent gets treated as it passes through the surrounding soil before entering the ground water table or other water body.

Soakage pit is a covered, porous-walled chamber that allows water to slowly soak into the ground



## SPECIAL CONSIDERATIONS FOR CONSTRUCTION OF SOAKAGE PIT

- It should be 20m away from drinking water source
- It should 20m away from another soakage pit
- It has adequate contact area with the surrounding soil to absorb the effluent into the soil (in case of less permeable soils, larger pits are needed)
- Adequate openings need to be left in the walls of the pit to have contact with the surrounding soil
- The area for the construction of soakage pit should be sandy but should not be water logged.

## APPLICABILITY OF SOAKAGE PIT

The construction of the soakage pit is applicable only in hospitals where:

- Ground is permeable or highly permeable sandy soil
- The facility has deep water table (at least 5 m below the bottom of soakage pit)
- Population density is less and plot sizes are large
- Water is supplied through pipelines
- Septic tanks are well maintained and de-sludged regularly

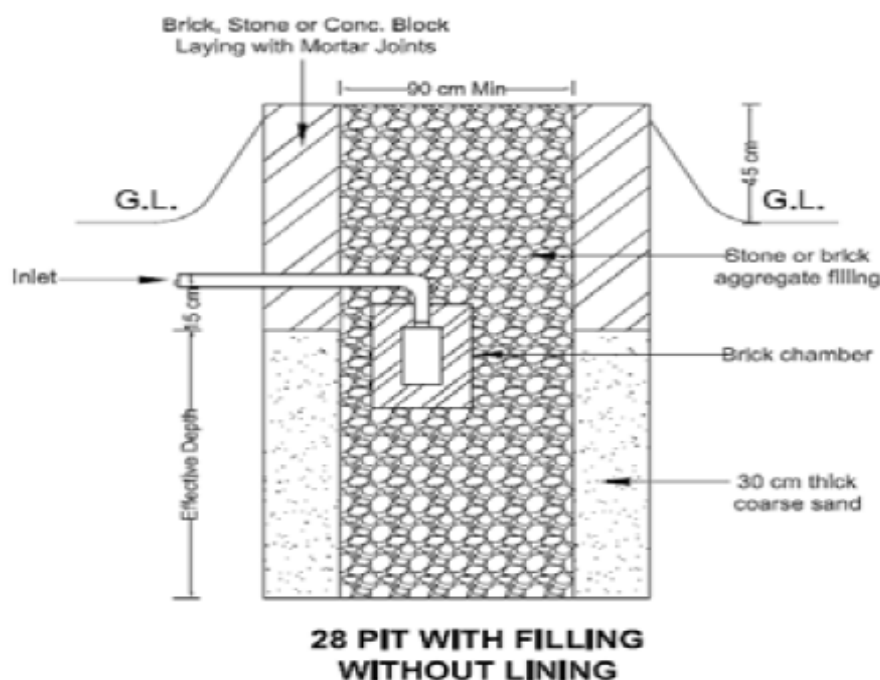


Figure 30: Typical illustration of the soakage pit (IS 2470: Part 2:1985)

## DRAINAGE SYSTEM

Hospitals need to ensure that the drainage system is planned in a way that the liquid waste generated from the hospital does not become stagnant and the surface drainage has proper connectivity with municipal drainage system with gradients which ease the runoff water during rains.

For new hospitals under construction, it is recommended that departments generating liquid waste like laboratory, OT, blood banks, laundry etc. have a separate plumbing and drainage system for collection of liquid waste generated from these departments which leads to the Effluent Treatment System installed in the hospital.



## EQUIPMENT AND SUPPLIES FOR BMW MANAGEMENT

- For proper management of BMW generated from the health facility, it is to be ensured that it has enough supply of material needed for the activities related to BMW management
- For ready availability of material required for BMW management, hospitals need to have a dedicated budget for BMW activities
- The facility needs to apply for grant under NHM in reference under Annual Programme Implementation Plan (PIP)
- State may propose the budget under the following heads:
  - A.9.4: IMEP Training
  - B16.1.14: Procurement of Equipment IMEP
  - B16.2.4: Supplies for IMEP
- Hospitals need to ensure that staff uses appropriate PPE while carrying out the activities of BMW management in the HCF
- Hospitals need to carry out regular inspections for availability of different resources at different work areas and its use
- Hospitals need to maintain records of the supply of PPE, chlorine solution and other resources needed for BMW management
- Hospitals need to ensure that at least one set of bins and liners are provided at each point of generation for collection of BMW waste and general waste
- Hospitals need to provide needle cutter, burner and puncture proof containers at each site of generation of sharp waste
- Hospitals need to ensure that PPE are provided to waste handlers and their usage by the staff is monitored regularly
- For collection and transportation of BMW, wheel based trolleys need to be provided depending on the size of the hospital and waste inventory
- Hospitals need to ensure that concentrated or powdered chlorine solution for disinfection is available
- Hospitals should conduct regular training sessions for HCW handling biomedical waste and a record of the same should be maintained
- Hospitals should ensure that all HCW handling biomedical waste are immunized against Hepatitis B.

## STATUTORY COMPLIANCES

### AUTHORISATION

- As per BMW Rules, 2016 it is mandatory for every hospital to have valid authorisation from the State Pollution Control Board for the activities being carried out for BMW management
- Each hospital needs to apply to the CPCB/SPCB or Pollution Control Board office for authorisation of the activities being carried out by the hospital in relation to BMW management
- Every facility needs to send an application to the Pollution Control Board office in **Form II as per BMW Rules, 2016 & 2018 Amendment** for seeking authorisation for all activities being carried out by the hospital for BMW handling.

Besides having a valid authorisation under BMW Rules, 2016 & 2018 (Amendment), hospitals also need to ensure that following requirements are also fulfilled:





## SUBMISSION OF ANNUAL REPORT

- Hospitals need to submit an annual report to the prescribed authority i.e. CPCB/SPCB or Pollution Control Board office on or before 31st July of every year. Annual reporting needs to be done on prescribed **Form IVA** as per BMW Rules, 2016 & 2018 (Amendment)
- Annual report submitted to the Pollution Control Board office comprise of data from January to December of preceding year
- As per BMW Rules, 2016 & 2018 (Amendment), hospitals also need to upload the submitted annual report on its website (when available).

## ACCIDENT REPORTING

- It is mandatory for every health facility to report to Pollution Control Board office, any major accident that may occur while handling BMW
- Major accidents include but are not limited to the following:
  - Toppling of the truck carrying bio-medical waste
  - Accidental release of bio-medical waste in any water body
  - Fire Hazard, blasts, flooding or erosion of the deep burial pit etc.
- The accident reporting along with remedial actions taken by the facility need to be done within 24 hours of accident in writing on the prescribed FORM I as per BMW Rules, 2016 & 2018 (Amendment)
- Hospitals also need to submit details of total number of accidents occurred, both major and minor, along with the number of persons affected, remedial actions taken and number of fatalities, along with the annual report to Pollution Control Board office.

## MONITORING AND REVIEW

Every hospital should ensure that there is a system of monitoring and review of the activities related to the handling of BMW management. The monitoring and review of BMW activities needs to be taken up by an existing Infection Control & Cleanliness Committee at facility level.

The responsibility of this Committee includes:

- Improve and streamline BMW management systems for proper implementation of BMW Management Rules 2016 & 2018 (Amendment)
- Formulate and ensure implementation of the responsibilities of various categories of the staff involved in the generation, collection, transportation, treatment and disposal of wastes
- Monitor BMW handling practices in the organisation
- Ensure periodic training of all categories of staff involved in generating and transporting waste
- Maintenance of all records related to BMW handling as per BMW Rules 2016 & 2018 (Amendment)
- Submission of reports to prescribing authority like accident reporting & annual reporting to SPCB
- To update and maintain valid authorisation from CPCB/SPCB or District Office of Pollution Control Board
- To have a valid agreement with CBMWTF
- To take appropriate remedial actions in the event of any accident

Hospitals need to ensure that the Committee should meet at least once in six months or in the event of an accident.





The agenda, proceedings/minutes of the meeting along with the planned actions with the responsibility delegated for implementation should be recorded and records are to be kept with BMW Committee for proving compliance.

All the minutes of the meetings of this Committee are to be forwarded along with the Annual Report to the prescribing authority i.e. CPCB/SPCB or District Pollution Control Board office.

### MAINTENANCE OF RECORDS

Hospitals need to maintain the following records for proving compliance to BMW Rules, 2016 & 2018 (Amendment):

- Authorisation from SPCB
- Annual Report submitted to SPCB
- Accident report submitted to SPCB including “NILL” report
- BMW Register
- Training records on BMW management including both induction and in service training records
- Annual health check-up record of all employees
- Vaccination record of all employees
- Minutes of meeting of BMW Management Committee
- Details of accident occurred including preventive and corrective actions taken by the HCFs in relation to such accidents
- Records of testing of effluent generated from health facility
- Records of recyclable waste handed over to the authorised recycler.

All the records related to the handling of BMW by health facilities need to be retained for a period commensurate with validity of authorisation. The records of autoclave of treatment through autoclave needs to be maintained for a period of five years.



# INFECTION CONTROL

Infection control is one of the most important themes under the “Kayakalp” Scheme. Clean and hygienic environment in the health facility not only leads to a better perception of the visitors towards the facility but also enables HCF to have an environment which reduce the Hospital Acquired Infection (HAI).

Healthcare-associated infections, or “nosocomial” and “hospital” infections, affect patients in a hospital or other healthcare facilities, and are not present or incubating at the time of admission. They also include infections acquired by patients in the hospital or facility but appearing after discharge, and occupational infections among staff.

As per World Health Organization (WHO), out of every 100 hospitalised patients at any given time, seven in developed and 10 in developing countries will acquire at least one healthcare-associated infection.

Nosocomial (hospital acquired) infections are a significant problem throughout the world and are increasing. People receiving health and medical care, in any health facility, are at risk of becoming infected unless precautions are taken to prevent infection.

As is the case for many other patient safety issues, healthcare-associated infections create additional suffering and come at a high cost for patients and their families. Infections prolong hospital stays, create long-term disability, increase resistance to antimicrobials, represent a massive additional financial burden for health systems, generate high costs for patients and their family, and cause unnecessary deaths.

HAIs can be prevented by having a robust Infection Control Programme in the hospital which not only covers general cleaning and sanitation of the hospital but also focuses on infection control measures taken by the hospital, monitoring of infection-related practices related to instruments and equipment, isolation practices and by surveillance of infection control activities and rates.

Most of these infections can be prevented by readily available, relatively inexpensive strategies by:

- adhering to recommended infection prevention practices, especially hand hygiene and use of PPEs
- paying attention to well-established processes for decontamination, cleaning of soiled instruments and items, sterilisation or high-level disinfection
- improving environment control in operating rooms and other high-risk areas
- following proper isolation and barrier nursing techniques
- monitoring of infection control activities, HAI and taking appropriate corrective and preventive actions.

This chapter will deal with various infection control practices that will assist healthcare workers and hospital supervisors, managers and administrators understand the basic principles of infection prevention and recommended processes and practices as per the requirement of the “Kayakalp” Scheme.



## STANDARD AND ADDITIONAL PRECAUTIONS

In healthcare setting many infections can be prevented and controlled by taking basic precautions which are needed to be applied by each healthcare worker to all patients at all times, regardless of diagnosis or infectious status.

Such precautions are termed as “Standard Precautions” which each healthcare worker should practice and execute. These include:

### HAND HYGIENE

Appropriate hand hygiene minimises micro-organisms acquired on the hands during daily duties and when there is contact with blood, body fluids, secretions, excretions and known and unknown contaminated equipment or surfaces.

### USE OF PERSONAL PROTECTIVE EQUIPMENT

Using PPE provides a physical barrier between micro-organisms and the wearer. It offers protection by helping to prevent micro-organisms from

- contaminating hands, eyes, clothing, hair and shoes
- being transmitted to other patients and staff

### APPROPRIATE HANDLING OF PATIENT CARE EQUIPMENT, INSTRUMENTS AND LINEN

Proper handling of instruments and equipment which are in contact with the patient excretions or secretions ensure that there is no transmission of patient infection to the staff or visitors nor any new infection is transmitted to the patient. Ensure all reusable equipment is cleaned and reprocessed appropriately before being used on another patient. Proper handling of linen in contact with blood or body fluids, ensures that there is no spillage and avoids contamination of clean linen.

### SAFE HANDLING OF BIO MEDICAL AND HAZARDOUS WASTE

Safe handling of the BMW and hazardous waste in the healthcare setting ensures that there is no adverse effect of such waste on the health of people and the environment. Proper handling of BMW also prevents injuries from needles, scalpels and other sharp instruments and equipment.

### DISINFECTION, ENVIRONMENT CLEANING AND SPILL MANAGEMENT

Proper cleaning, disinfection of environment and spill management ensures that the facility has dust free and microorganism free environment. It also reduces the transmission of infection from the surface areas and from the infected and hazardous spills.

*Each of these standard precautions is detailed further in these guidelines*



Figure31: Standard precautions

### **Additional Precautions:**

Additional precautions are needed to control transmission based infections. These additional precautions are:

- Airborne Precautions
- Droplet Precautions, and
- Contact Precaution

#### **Airborne Precaution**

These precautions are designed to reduce the transmission of diseases spread by the airborne route. Airborne transmission occurs when droplet nuclei (evaporated droplets) <5 micron in size are disseminated in the air. These particles can remain suspended in the air for long periods of time, especially when bound on dust particles. Tuberculosis, measles, chicken pox, pneumonia are some examples which can spread through this mode.

The following additional precautions should be taken to reduce/control airborne infection:

- Implement standard precautions
- Place patient in a single isolation room
- Keep doors closed
- Anyone who enters the room must wear a special, high filtration particulate respirator (e.g. N95) mask
- Limit the movement and transport of the patient from the room for essential purposes only,

#### **Droplet Precautions:**

Droplets transmission occurs when there is an adequate contact between the mucous membrane of nose and mouth or conjunctivae of a susceptible person and large particle droplets (>5 microns). These droplets are usually transmitted during coughing, sneezing, talking or during procedure like tracheal suctioning. Diseases which may spread through this mode are diphtheria, influenza type B, meningitis, pneumonia, pertussis etc.

The following precautions need to be taken:

- Implement standard precautions
- Place patient in a single room or in a room with same infected person
- Wear surgical mask when working within 1-2 metres of the patient
- Place a surgical mask on the patient if transport is required.

#### **Contact Precautions:**

Diseases which are transmitted by this route include colonisation or infection with multiple antibiotic resistant organisms, enteric infections and skin infections.

The following precautions are needed:

- Implement standard precautions
- Place patient in a single room or in a room with same infected person
- Wear clean, non-sterile gloves when entering room



- Wear clean, non-sterile gowns when entering the room if substantial contact with the patient, environment surfaces or items in the patient room is anticipated
- Limit the movement and transport of the patient from the room. Patient should be transported for essential purposes only, use precautions to minimise the risk of transmission.

## HAND HYGIENE

Practicing hand hygiene is a simple yet effective way to prevent the spread of infections. Failure to perform appropriate hand hygiene is considered to be the leading cause of nosocomial infections and the spread of multi-resistant micro-organisms, and has been recognised as a significant contributor to infection outbreaks. Hand hygiene is therefore the most important universal precaution to avoid the transmission of harmful germs and prevent healthcare-associated infections.

Any healthcare worker, caregiver or person involved in direct or indirect patient care needs to adhere to proper hand hygiene practices and should be able to perform it correctly and at the right time.

### PREFERRED MEDIUM OF HAND HYGIENE

#### Soap and Water (Hand Wash)

- When visibly dirty
- When visibly soiled with blood or other body fluids
- After using toilet
- Suspected or proven exposure to potential spore forming pathogens including outbreaks of *C. difficile* (preferred) and contact with patients of wet gangrene.

#### Alcohol-based Hand Rub

- If hands are not visibly soiled
- Before and after touching the patient
- Before handling an invasive device for patient care, regardless of whether or not gloves are used
- After contact with body fluids or excretions, mucous membranes, non-intact skin, or wound dressings
- If moving from a contaminated body site to another body site during care of the same patient
- After contact with inanimate surfaces and objects (including medical equipment) in the immediate vicinity of the patient
- After removing sterile or non-sterile gloves
- Before handling medication or preparing food using an alcohol-based hand rub (ABHR) or wash hands with either plain or antimicrobial soap and water.

#### Note

***\*If (ABHR) is not available wash hands with soap and water only***

***\*Soap and (ABHR) should not be used concomitantly***

### FACILITIES FOR HAND HYGIENE

All clinical areas in the hospital including consultation chambers, nursing stations, phlebotomy centres and critical care areas along with other relevant areas like wash rooms should have:

- ✓ Hand washing facilities appropriate to the area
- ✓ Clear unobstructed access to the hand washing sink



- ✓ Hand washing sinks for that purpose only
- ✓ Availability of running water at point of use
- ✓ Liquid soap/soap dish with small soap bars
- ✓ Alcohol hand rubs at every point of care
- ✓ Hand drying facilities with clean blotting paper (even clean newspaper can be used) should be readily available at every sink
- ✓ Hand washing posters should be placed at each sink
- ✓ All critical areas should have alcohol-based hand rubs installed at entry point of care
- ✓ Taps used for hand washing should preferably be elbow taps. If routine taps are used, paper should be used to turn off the tap to prevent recontamination of hands.

### **WHEN TO DO HANDWASH (5 MOMENTS OF HAND HYGIENE)**

Each healthcare worker should perform the hand hygiene as per following moments:

#### **MOMENT 1: BEFORE TOUCHING THE PATIENT**

To protect the patient against colonisation and, in some cases, against exogenous infection, by harmful germs carried on your hands. Therefore, it is essential to clean hands before touching a patient when approaching him/her.

Therefore, it applies to hand washing before:

- shaking hands, before stroking a child's forehead
- assisting a patient in personal care activities: to move, to take a bath, to eat, to get dressed, etc.
- delivering care and other non-invasive treatment: applying oxygen mask, giving a massage
- performing a physical non-invasive examination: taking pulse, blood pressure, chest auscultation, recording ECG.

#### **MOMENT 2: BEFORE CLEAN/ASEPTIC PROCEDURE**

This is essential to protect the patient against infection with harmful germs, including his/her own germs, entering his/her body. It implies that the hands should be cleaned immediately before accessing a critical site with infectious risk for the patient (e.g. a mucous membrane, non-intact skin, an invasive medical device)\*

It applies to hand washing before:

- brushing the patient's teeth, instilling eye drops, performing a digital vaginal or rectal examination, examining mouth, nose, and ear with or without an instrument, inserting a suctioning mucous
- dressing a wound with or without instrument, applying ointment on vesicle, making a percutaneous injection/puncture
- inserting an invasive medical device (nasal cannula, nasogastric tube, endotracheal tube, urinary probe, percutaneous catheter, drainage)
- disrupting/opening any circuit of an invasive medical device (for food, medication, draining, suctioning, monitoring purposes)
- preparing food, medications, pharmaceutical products, sterile material.





### **MOMENT 3: AFTER BODY FLUID EXPOSURE RISK**

This is required to protect the service provider from colonisation or infection with patient's harmful germs and to protect the healthcare environment from germ spread. Hands should be cleaned as soon as the task involving an exposure risk to body fluids has ended.

Therefore, this applies to hand washing:

- when the contact with a mucous membrane and with non-intact skin ends
- after a percutaneous injection or puncture; after inserting an invasive medical device (vascular access, catheter, tube, drain, etc.); after disrupting and opening an invasive circuit
- after removing an invasive medical device
- after removing any form of material offering protection (napkin, dressing, gauze, sanitary towel, etc.)
- after handling a sample containing organic matter, after clearing excreta and any other body fluid, after cleaning any contaminated surface and soiled material (soiled bed linen, dentures, instruments, urinal, bedpan, lavatories, etc.)

### **MOMENT 4: AFTER TOUCHING A PATIENT**

This is required to protect oneself from colonisation with patient germs and to protect the healthcare environment from germ spread. The principle is to clean hands after leaving patients side, after having touched the patient.

Situations when this applies:

- after shaking hands, stroking a child's forehead
- after you have assisted the patient in personal care activities: to move, to bathe, to eat, to dress, etc.
- after delivering care and other non-invasive treatment: changing bed linen as the patient is in, applying oxygen mask, giving a massage
- after performing a physical non-invasive examination: taking pulse, blood pressure, chest auscultation, recording ECG.

### **MOMENT 5: AFTER TOUCHING PATIENT SURROUNDINGS**

To protect the service providers from colonisation with patient germs that may be present on surfaces/ objects in patient surroundings and to protect the healthcare environment against germ spread. The hands should be cleaned after touching any object or furniture when leaving the patient surroundings, without having touched the patient.

It is applicable in situations as:

- after an activity involving physical contact with the patients immediate environment: changing bed linen with the patient out of the bed, holding a bed rail, clearing a bedside table
- after a care activity: adjusting perfusion speed, clearing a monitoring alarm
- after other contacts with surfaces or inanimate objects (note – ideally try to avoid these unnecessary activities): leaning against a bed, leaning against a night table/bedside table.



## WHEN? Your 5 moments for hand hygiene

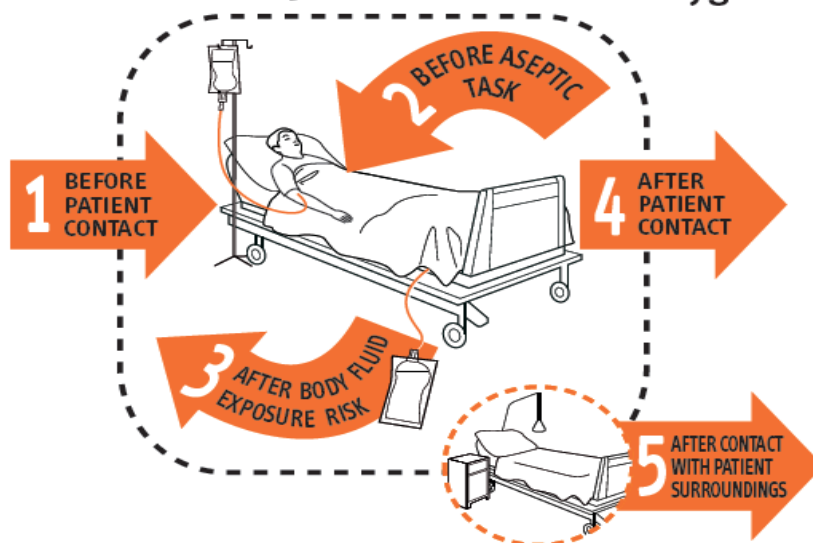


Figure32: Five moments of hand washing

<b>1 Before Patient Contact</b>	<p><b>When:</b> Clean your hands before touching a patient when approaching him/her</p> <p><b>Why:</b> To protect the patient against harmful germs carried on your hands</p> <p><b>Example:</b> Shaking hands, helping a patient to move around, clinical examination</p>
<b>2 Before Performing Clean/Aseptic Procedure</b>	<p><b>When:</b> Clean your hands immediately before performing a clean/aseptic procedure</p> <p><b>Why:</b> To protect the patients from harmful germs, including patients' own, from entering his/her body</p> <p><b>Example:</b> Oral/dental care, secretion aspiration, wound dressing, catheter insertion, preparation of food and medications</p>
<b>3 After Body Fluid Exposure Risk</b>	<p><b>When:</b> Clean your hands immediately after an exposure risk to body fluids and after glove removal</p> <p><b>Why:</b> To protect yourself and healthcare environment from harmful patient germs</p> <p><b>Example:</b> Oral/dental care, secretion aspiration, drawing and manipulating blood, cleaning up of urine, faeces, handling of waste</p>
<b>4 After Touching a Patient</b>	<p><b>When:</b> Clean your hands after touching a patient and his/her immediate surroundings, when leaving the patient's side</p> <p><b>Why:</b> To protect yourself and healthcare environment from harmful patient germs</p> <p><b>Examples:</b> Shaking hands, helping a patient to move around, clinical examination</p>
<b>5 After Touching Patient Surroundings</b>	<p><b>When:</b> Clean your hands after touching any object or furniture in the patient's immediate surroundings when leaving – even if the patient has not been touched</p> <p><b>Why:</b> To protect yourself and healthcare environment from harmful patient germs</p> <p><b>Example:</b> Changing linen, perfusion speed adjustment</p>

## HANDWASHING TECHNIQUE

World Health Organization (WHO) recommends six main steps of hand washing both through use of soap and water hand wash and also by use of alcohol-based hand rub. Both these techniques of hand washing are depicted in following educational posters:



# How to handrub?

**RUB HANDS FOR HAND HYGIENE! WASH HANDS ONLY WHEN VISIBLY SOILED!**



Duration of the entire procedure: **20-30 sec.**



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



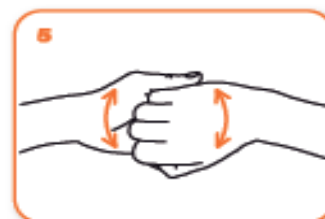
Rub hands palm to palm,



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.

Figure33: Poster for hand rub using alcohol-based hand rub

Source - WHO Guidelines on Hand Hygiene in Healthcare

## Note important points to keep in mind when using an alcohol-based hand rub:

- Take adequate quantity to wet all surfaces of both hands
- Apply to dry hands. Do not apply to latex gloves
- Dry the solution by rubbing the hands following the steps shown above
- The solution should remain wet on the hands for at least 20-30 seconds for adequate disinfection.



## Hand Hygiene Technique with Soap and Water


 **Duration of the entire procedure: 40-60 seconds**



Figure34: Poster for hand washing using soap and water

Source - WHO Guidelines on Hand Hygiene in Healthcare

### Note:

- ✓ **Each step to be done five times**
- ✓ **Nails should be cut and hands should be without jewellery for best results**



## SURGICAL HAND HYGIENE

Surgical hand hygiene is standard care prior to any surgical procedure. Surgical hand preparation reduces the release of skin bacteria from the hands of the surgical team, for the duration of the procedure, in case of an unnoticed puncture of the surgical glove releasing bacteria to the open wound. In contrast to the hygienic hand wash or hand rub, surgical hand preparation eliminates the transient and reduces the resident flora. It also inhibits growth of bacteria under the gloved hand.

### Steps before Starting Surgical Hand Preparation

#### KEY STEPS

- Keep nails short and pay attention to them when washing your hands – most microbes on hands come from beneath the fingernails
- Do not wear artificial nails or nail polish
- Remove all jewellery (rings, watches, bracelets) before entering the operating theatre
- Wash hands and arms with a non-medicated soap before entering the operating theatre area or if hands are visibly soiled
- Clean subungual areas with a nail file. Nailbrushes should not be used as they may damage the skin and encourage shedding of cells.

### PROTOCOL FOR SURGICAL SCRUB WITH A MEDICATED SOAP

#### PROCEDURAL STEPS

- Start timing
- Scrub each side of each finger, between the fingers, and the back and front of the hand for two minutes
- Proceed to scrub the arms, keeping the hand higher than the arm at all times. This helps to avoid recontamination of the hands by water from the elbows and prevents bacteria-laden soap and water from contaminating the hands
- Wash each side of the arm from wrist to the elbow for one minute
- Repeat the process on the other hand and arm, keeping hands above elbows at all times. If the hand touches anything at any time, the scrub should be lengthened by one minute for the area that has been contaminated
- Rinse hands and arms by passing them through the water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water.
- Proceed to the operating theatre holding hands above elbows
- At all times during the scrub procedure, care should be taken not to splash water onto surgical attire
- Once in the operating theatre, hands and arms should be dried using a sterile towel and aseptic technique before donning gown and use alcohol hand rub and allow hands and forearms to dry before donning sterile gloves.

### PROTOCOL FOR SURGICAL RUB USING ALCOHOL-BASED HAND RUB

The WHO approach for surgical hand preparation requires six basic steps for the hands as for hygienic hand antisepsis, but requires additional steps for rubbing the forearms. The steps of surgical hand rub are depicted in the following figure:

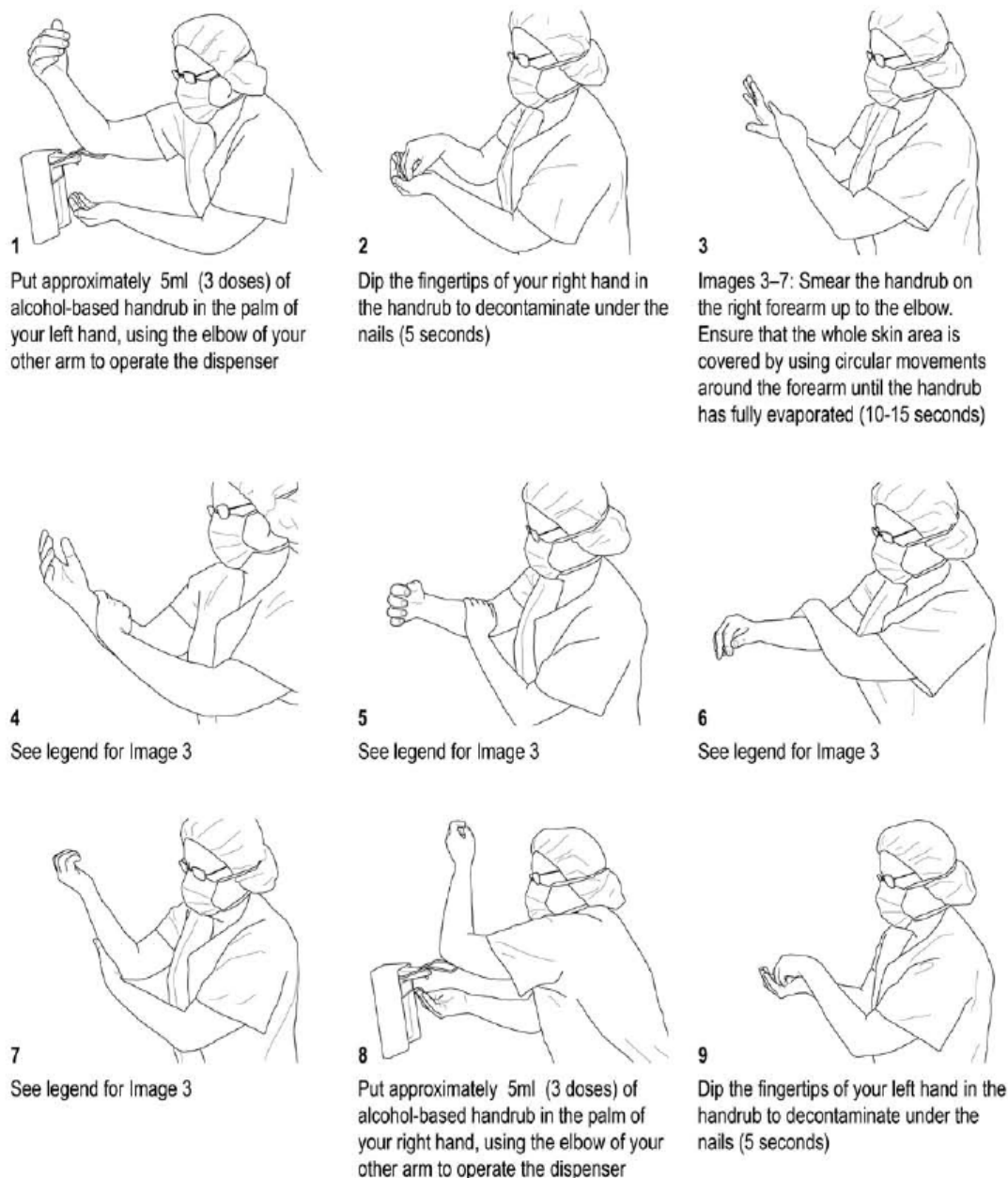


**Figure II.3**

**Surgical hand preparation technique with an alcohol-based hand rub formulation**

The handrubbing technique for surgical hand preparation must be performed on perfectly clean, dry hands. On arrival in the operating theatre and after having donned theatre clothing (cap/hat/bonnet and mask), hands must be washed with soap and water. After the operation when removing gloves, hands must be rubbed with an alcohol-based formulation or washed with soap and water if any residual talc or biological fluids are present (e.g. the glove is punctured).

Surgical procedures may be carried out one after the other without the need for handwashing, provided that the handrubbing technique for surgical hand preparation is followed (Images 1 to 17).



*Figure35: Surgical hand rubbing using alcohol hand rub formulation*







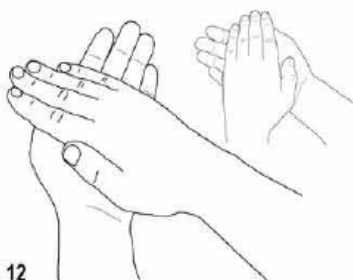
10

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



11

Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your left hand, using the elbow of your other arm to operate the distributor. Rub both hands at the same time up to the wrists, and ensure that all the steps re-presented in Images 12-17 are followed (20-30 seconds)



12

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



13

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



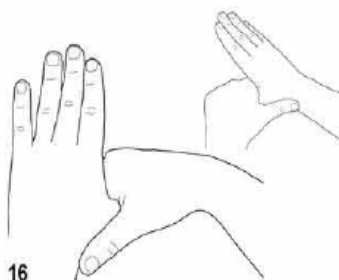
14

Rub palm against palm back and forth with fingers interlinked



15

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



16

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



17

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

Repeat the above-illustrated sequence (average duration, 60 sec) according to the number of times corresponding to the total duration recommended by the manufacturer for surgical hand preparation with an alcohol-based handrub.

Source - WHO Guidelines on Hand Hygiene in Healthcare



- Hand rubbing technique for surgical hand preparation should be performed on perfectly clean, dry hands
- After the operation and removal of gloves, hands should be de-scrubbed by washing hands with soap and water.

#### **OTHER ASPECTS OF HAND HYGIENE**

- Do not wear artificial fingernails or extenders when having direct contact with patients
- Keep natural nails short (tips less than 0.5 cm long or approximately ¼ inch)
- Remove rings, watches, and bracelets before beginning the surgical hand scrub
- Remove debris from underneath fingernails using a nail cleaner under running water
- Surgical hand antisepsis using either an antimicrobial soap or an (ABHR) with persistent activity is recommended before donning sterile gloves when performing surgical procedures
- When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms for the length of time recommended by the manufacturer, usually 2-6 minutes. Long scrub times (e.g., 10 minutes) are not necessary
- When using an alcohol-based surgical hand scrub product with persistent activity, follow the manufacturer's instructions. Before applying the alcohol solution, prewash hands and forearms with a non-antimicrobial soap and dry hands and forearms completely. After application of the alcohol-based product as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves.

#### **PERSONAL PROTECTIVE EQUIPMENTS**

PPE as defined by Occupational Safety and Health Administration (OSHA, a US Government agency) are “specialised clothing or equipment, worn by an employee for protection against infectious materials.

In healthcare setting PPEs refers to a variety of barriers used alone or in combination to protect mucous membranes, airways, skin and clothing from contact with infectious agents and from chemical agents.

Using PPE provides a physical barrier between micro-organisms and the wearer. It offers protection by helping to prevent micro-organisms from contaminating hands, eyes, clothing, hair and shoes; and being transmitted to other patients and staff.

#### **EXAMPLES OF PPE**

- Gloves
- Face masks
- Aprons
- Gowns
- Eye wear
- Boots
- Shoe cover
- Caps/Hair cover
- Eye protection wherever required



## INDICATIONS FOR USE OF PPE

The PPE should be used by

- Healthcare workers who provide direct care to patients and who work in situations where they may have contact with blood, body fluids, excretions or secretions
- Support staff including medical aides, cleaners, and laundry staff in situations where they may have contact with blood, body fluids, secretions and excretions
- Laboratory staff, who handle patient specimens
- Waste handlers
- Family members who provide care to patients and are in a situation where they may have contact with blood, body fluids, secretions and excretions.

## ADDITIONAL REQUIREMENTS FOR PPE

- Administration of the HCF should ensure that adequate number and good quality of PPE are available to the staff at the point of use and are readily accessible
- The PPE are stored in a clean/dry area to prevent contamination until required for use
- Used PPE are disposed off as per the BMW Rules, 2016



Figure36: Personal protective equipment for healthcare workers



**Table 15: Specifications for personal protective equipment**

SPECIFICATIONS OF PERSONAL PROTECTIVE EQUIPMENT		
ARTICLE	BIS STANDARDS	REMARKS
Gloves rubber	IS 6994 (pt 1):1973	Household utility gloves can also be used
Gum boots/rubber shoes	IS 13695:1995	---None---
Apron cloth	IS 5029:1979	---None---
Apron rubber	IS 4892:1987/ISO 5235:1977 synthetic rubber aprons (reinforced)	Alternatively, rubber aprons for labour rooms can be used. IS 4501:1981
Face mask	IS 6190:1971	---None---
Respiratory full face masks	IS 14166:1994	For continuous exposure at waste disposal sites/ plants

**PERSONAL PROTECTIVE PRACTICES****PRINCIPLES FOR USE OF PPE**

Basic principles for use of PPE are:

- PPE should be chosen according to the risk of exposure. The healthcare workers should assess whether they are at risk of exposure to blood, body fluids, excretions or secretions and choose their items of PPE according to this risk
- Avoid any contact between contaminated (used) PPE and surfaces, clothing or people outside the patient care area
- Discard the used PPE in appropriate disposal bags, and dispose off as per BMW Rules, 2016
- Do not share personal protective equipment
- Change PPE completely and thoroughly and wash hands each time one leaves a patient to attend to another patient or another duty.

**GLOVE USE**

Gloves are the most common type of PPE used in healthcare settings. Use of gloves helps to:

- Reduce the risk of contaminating HCWs hands with blood and other body fluids
- Reduce the risk of germ dissemination to the environment and of transmission from the HCWs to the patient and vice versa, as well as from one patient to another.

**TYPE AND SELECTION OF GLOVES**

In the healthcare setting, selection of gloves depends on various factors like:

- Purpose of use i.e. patient care, environment cleaning etc.
- Type of procedure i.e. general patient care or invasive procedure, handling of specimens
- Materials of glove: latex, vinyl or nitrile
- Single use or reusable
- Sterile or non-sterile
- Fit



**Table 16: Selection of gloves based on activity**

SELECTION OF GLOVES BASED ON ACTIVITY		
S.no.	Activity	Type of glove
1	Routine handling of patient	No gloves required
2	When touching blood, body fluids, secretions, excretions or mucous membrane	Clean non-sterile
3	Sample handling	Clean non-sterile
4	Invasive procedure including minor procedures & insertion of sterile devices such as urinary catheters, central lines and endotracheal tubes	Sterile gloves
5	Environment cleaning	Heavy duty rubber gloves
6	Waste handling	Heavy duty rubber gloves
7	Instrument processing and cleaning	Heavy duty rubber gloves

**SPECIAL INSTRUCTIONS FOR USE OF GLOVES**

- Wear gloves (clean, non-sterile) when touching blood, body fluids, secretions, excretions or mucous membranes
- Change gloves between contacts with different patients
- Change gloves between tasks/procedures on the same patient to prevent cross-contamination between different body sites
- Remove gloves immediately after use and before attending to another patient
- Wash hands immediately after removing gloves
- Use a plain soap, antimicrobial agent or waterless antiseptic agent
- Disposable gloves should not be reused but should be disposed of according to BMW Rules, 2016

**DOs AND DON'TS OF GLOVE USE****DOs**

- **Do** wear the correct size glove, particularly surgical gloves. A poorly fitting glove can limit your ability to perform the task and may be damaged (torn or cut) more easily
- **Do** work from clean to dirty side i.e. touch the clean body sites or surfaces before touching the dirty or contaminated area
- **Do** change the gloves if torn or highly contaminated (even during use on same patient. Change the gloves after each patient use
- **Do** keep fingernails trimmed moderately short (less than 3 mm or 1/8 inch beyond the finger tip) to reduce the risk of tears
- **Do** pull gloves up over cuffs of gown (if worn) to protect the wrists
- **Do** use water-soluble (non-fat-containing) hand lotions and moisturisers often to prevent hands from drying, cracking and chapping due to frequent hand washing and gloving.



## DON'Ts

- **Don't** touch your face or adjust PPE with the soiled glove
- **Don't** touch the environment surfaces except as necessary during patient care
- **Don't** use oil-based hand lotions or creams, because they will damage latex rubber surgical and examination gloves.
- **Don't** store gloves in areas where there are extremes in temperature (e.g., in the sun, or near a heater, air conditioner, ultraviolet light, fluorescent light or X-ray machines). These conditions may damage the gloves (cause breakdown of the material they are made of), thus reducing their effectiveness as a barrier
- **Don't** reuse the patient care gloves.

## CORRECT METHOD OF DONNING AND REMOVING OF GLOVES



Figure37: Method of donning and removing of non-sterile gloves

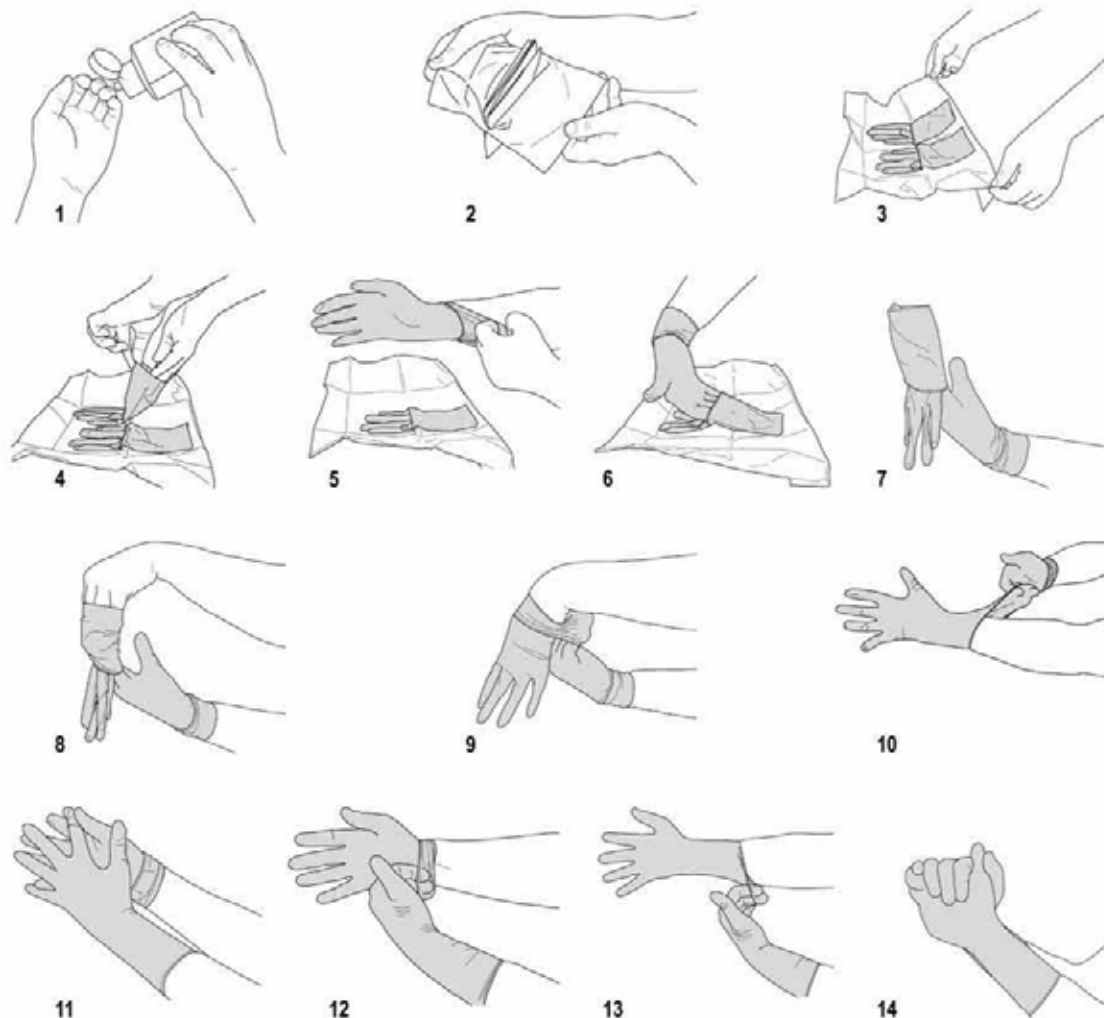
Source - WHO Guidelines on Hand Hygiene in Healthcare





The purpose of this technique is to ensure maximum asepsis for the patient and to protect the health-care worker from the patient's body fluid(s). To achieve this goal, the skin of the health-care worker remains exclusively in contact with the inner surface of the glove and has no contact with the outer surface. Any error in the performance of this technique leads to a lack of asepsis requiring a change of gloves.

## I. HOW TO DON STERILE GLOVES



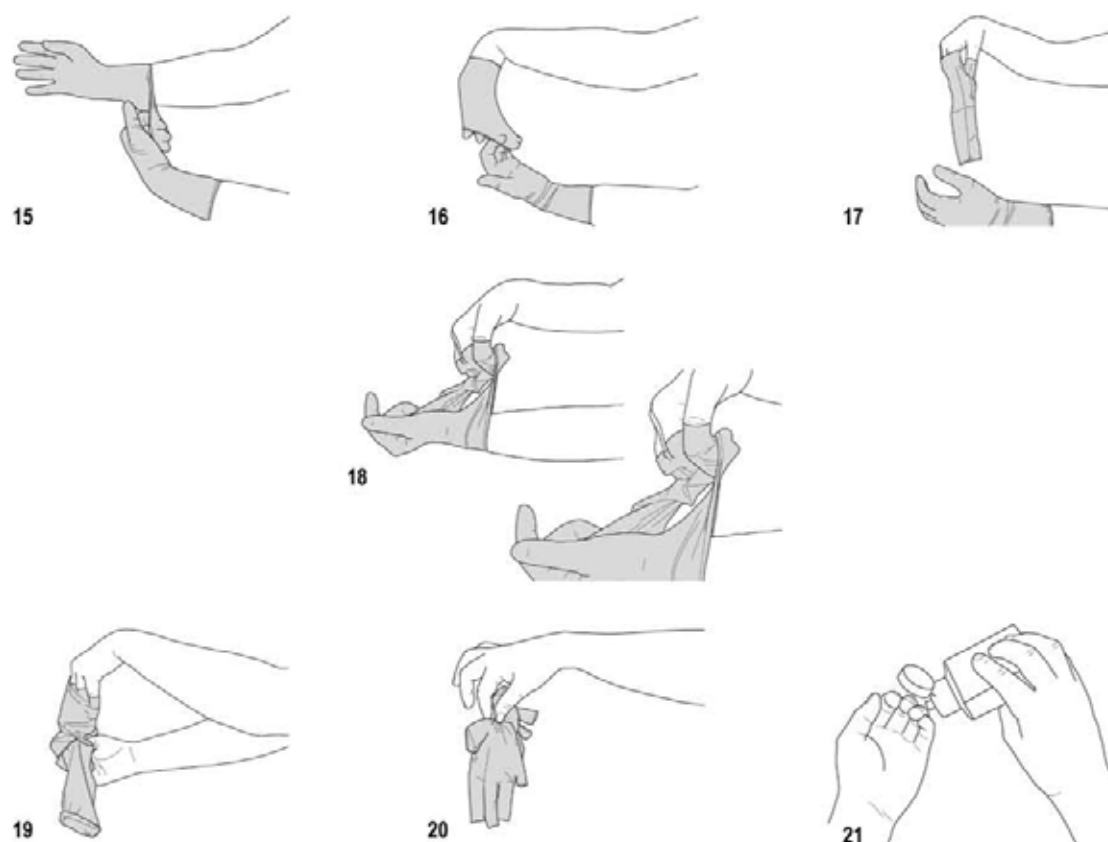
1. Perform hand hygiene before an "aseptic procedure" by handrubbing or hand washing.
2. Check the package for integrity. Open the first non-sterile packaging by peeling it completely off the heat seal to expose the second sterile wrapper, but without touching it.
3. Place the second sterile package on a clean, dry surface without touching the surface. Open the package and fold it towards the bottom so as to unfold the paper and keep it open.
4. Using the thumb and index finger of one hand, carefully grasp the folded cuff edge of the glove.
5. Slip the other hand into the glove in a single movement, keeping the folded cuff at the wrist level.
- 6-7. Pick up the second glove by sliding the fingers of the gloved hand underneath the cuff of the glove.
- 8-10. In a single movement, slip the second glove on to the ungloved hand while avoiding any contact/resting of the gloved hand on surfaces other than the glove to be donned (contact/resting constitutes a lack of asepsis and requires a change of glove).
11. If necessary, after donning both gloves, adjust the fingers and interdigital spaces until the gloves fit comfortably.
- 12-13. Unfold the cuff of the first gloved hand by gently slipping the fingers of the other hand inside the fold, making sure to avoid any contact with a surface other than the outer surface of the glove (lack of asepsis requiring a change of gloves).
14. The hands are gloved and must touch exclusively sterile devices or the previously-disinfected patient's body area.

*Figure38: Method of donning sterile gloves*

Source - WHO Guidelines on Hand Hygiene in Healthcare



## II. HOW TO REMOVE STERILE GLOVES



- 15-17. Remove the first glove by peeling it back with the fingers of the opposite hand. Remove the glove by rolling it inside out to the second finger joints (do not remove completely).
18. Remove the other glove by turning its outer edge on the fingers of the partially ungloved hand.
19. Remove the glove by turning it inside out entirely to ensure that the skin of the health-care worker is always and exclusively in contact with the inner surface of the glove.
20. Discard gloves.
21. Perform hand hygiene after glove removal according to the recommended indication.

NB: Donning surgical sterile gloves at the time of a surgical intervention follows the same sequences except that:

- it is preceded by a surgical hand preparation;
- donning gloves is performed after putting on the sterile surgical gown;
- the opening of the first packaging (non-sterile) is done by an assistant;
- the second packaging (sterile) is placed on a sterile surface other than that used for the intervention;
- gloves should cover the wrists of the sterile gown.

*Figure39: Method to remove sterile gloves*

Source - WHO Guidelines on Hand Hygiene in Healthcare

## USE OF GOWNS

Gowns made of impervious material are worn to protect the wearer's clothing/uniform from possible contamination with micro-organisms and exposure to blood, body fluids, secretions and excretions.

The gown is to be used only once for one patient and discarded or sent for laundering. Healthcare workers should remove gowns before leaving the unit.



## SELECTING A GOWN

Gowns need to be clean and non-sterile. The gown should be impervious and water repellent. It should be long enough to cover the clothing of the wearer and should have long sleeves and high neck. Disposable gowns are preferable. If they are not available, terycot (50% cotton and 50% polyester) reusable gowns can be used with a plastic apron underneath.

Selection of gowns and aprons as a PPE depends on the type of exposure and potential risk associated with the procedure or the work area with which they are associated. The aprons and gowns are meant to provide protection from the potential splash of blood and other infectious secretions.

## WEARING THE GOWN

- Wash hands, and dry.
- Hold the gown at the neck on the inside permitting to unfold
- Slide hands and arms down the sleeves.
- Fasten the ties at the neck.
- Overlap the gown at the back as much as possible and secure the waistband
- Request assistance to fasten the waist ties.



Figure40: Correct method of wearing gown

## USE OF APRONS

In the Indian healthcare scenario, aprons are used as general attire for the healthcare worker especially doctors.

Aprons are used as PPE to protect the wearer and the uniform from contact with the contaminated body fluids.

Plastic aprons can be used over the gown when caring for patients where possible splashes with blood and body substances may occur.

## USE OF CAPS

Caps are used when splashes of blood and body fluids are expected. Caps protect the hair from aerosols that may otherwise lodge on the hair and be transferred to other parts of the healthcare worker such as face or clothing by the hands or onto inanimate objects.

Use of caps also prevents contamination of the patients and other items like food, instruments and equipment from the hair fall of the healthcare worker.

Caps of appropriate size and which are disposable and are water proof in nature are used.



*Figure41: Correct method of wearing caps*

## REMOVAL OF CAPS

Remove by holding inside of the cap lifting it straight off head and folding inside out. Caps should be discarded as per BMW Rules, 2016.

## USE OF MASKS

A surgical mask protects healthcare providers from inhaling respiratory pathogens transmitted by the droplet route. It prevents the spread of infectious diseases such as varicella (chickenpox) and meningococcal diseases (meningococcal meningitis).

An N95 mask protects healthcare providers from inhaling respiratory pathogens that are transmitted via the airborne route like pulmonary TB.

In order to prevent the spread of infection, an appropriate mask should be worn by healthcare providers and visitors when attending to a patient suffering from a communicable disease that is spread via the airborne or droplet route.

The patient with a communicable disease spread via the droplet or airborne route should wear a surgical mask when being transferred to other departments or hospitals.

Disposable masks are for single use only and should be discarded after use. They should not be stored in bags and re-used, shared or hung around the neck, etc. If a mask is splashed wet, it should be changed using clean gloves and strict hand washing. Mask is needed to be immediately replaced if it becomes soiled or damaged.



## SELECTING A MASK

A surgical mask should be worn in circumstances where there are likely to be splashes of blood, body fluids, secretions and excretions or when the patient has a communicable disease that is spread via the droplet route.

An N95 respirator mask needs to be chosen for those circumstances when a patient has a communicable disease that is spread via the airborne route.

## CORRECT METHOD OF WEARING AND REMOVAL OF MASK

- Choose the appropriate mask size
- Perform hand hygiene before putting on a mask
- The mask should fit snugly over the face
- The coloured sides of the mask should face outwards with the metallic strip uppermost
- For the masks without a coloured side, the side with folds should face downwards on the outside and with the metallic clip uppermost (*Image 1*)
- For tie-on surgical mask, secure upper tie at the crown of head. Then secure lower tie at the nape (*Image 2*)
- For ear-loops type, position the elastic bands around both ears
- Mould the metallic strip over nose bridge so that the mask fits snugly over the face (*Image 3*)
- Extend the mask to fully cover mouth, nose and chin (*Image 4*)
- Avoid touching the mask after wearing. Otherwise, perform hand hygiene before and after touching the mask
- When taking off tie-on surgical mask, unfasten the tie at the nape first; then unfasten the tie at the crown of head (*Image 5*)
- For ear-loops type, hold both the ear loops and take off gently from face. Avoid touching the outside of face mask during taking off as it may be covered with germs
- After taking off the surgical mask, discard and perform hand hygiene.

**Figure 42: Correct Method of Wearing a Mask**



## USE OF PROTECTIVE EYEWEAR/GOGGLES

Protective eyewear/goggles should be worn at all times during patient contact when there is a possibility that a patient's body fluids may splash or spray onto the caregiver's face/eyes (e.g. during throat, endotracheal and tracheostomy suctioning, removal of indwelling catheter etc.). The amount of exposure can be reduced through the use of protective eyewear. Full face shields may also be used to protect the eyes and mouth of the healthcare worker in such high-risk situations. Ordinary spectacles do not provide



adequate protection, although caregivers may wear their own glasses with extra protection added at the sides. Goggles that fit over glasses are available. Protective eyewear should be changed after each shift.

## DECONTAMINATION AND CLEANING

**Decontamination** and **cleaning** are two highly effective infection prevention measures that can minimise the risk of transmission of HAI to healthcare workers or patients. These measures are also important steps in breaking the infection transmission cycle for patients. Both processes are easy to do and are inexpensive ways of ensuring that patients and staff are at a lower risk of becoming infected from contaminated instruments and other inanimate objects.

Decontamination of the environment surfaces after each patient use is done through use of effective decontaminating agent. The environment area of the patient has to be decontaminated and cleaned after each patient use. The operating tables, examination tables, dressing tables etc. are to be cleaned through use of appropriate disinfectant and as per the hospital policy of cleaning and disinfection.

***\*The cleaning and decontamination of the hospital environment has already been detailed in the “Sanitation and Hygiene” section of these guidelines.***

## REPROCESSING OF REUSABLE INSTRUMENTS AND EQUIPMENTS

Transmission of the infection through used equipment and instruments can happen between patients through use of unsterile or partially sterilised instruments and equipment and also to the staff through injury from the used instruments. To ensure that the instruments and equipment are safe to use, it is to be ensured by the health facility that it implements and follows basic processes of cleaning, disinfection and has a strong policy for reprocessing of the used instruments and equipment.

There are three types of instruments and equipment which are needed to be reprocessed:

- Items that come in contact with the intact skin (stethoscopes) need to be routinely kept free of visible contamination. These require intermediate to low level disinfection or washing with soap and water depending on the nature and amount of decontamination
- Medical instruments that pierce human tissue like blades and scalpels should be sterilised between each patient contact
- Medical instruments that touch but do not penetrate mucous membrane (anaesthesia breathing circuits, laryngoscope blades, vaginal speculum, flexible fibrotic endoscopes) should ideally be sterilised; if it is not feasible then they should be reprocessed through high-level disinfection.





## Splauding's Classification of Medical Instruments and Required Level of Reprocessing

**Table 17: Splauding's classification of medical instruments and required level of reprocessing**

Classification	Definition	Level of Reprocessing	Example
Critical	Equipment/devices that enter sterile tissues, including the vascular system	Cleaning followed by sterilisation	<ul style="list-style-type: none"><li>• Surgical instruments</li><li>• Implants</li><li>• Biopsy instruments</li><li>• Foot care equipment</li><li>• Eye and dental equipment</li></ul>
Semi Critical	Equipment/devices that comes in contact with non-intact skin or mucous membranes but do not penetrate them	Cleaning followed by high-level disinfection (as a minimum). Sterilisation is preferred	<ul style="list-style-type: none"><li>• Respiratory therapy equipment</li><li>• Anaesthesia equipment</li><li>• Tonometer</li></ul>
Non Critical	Equipment/devices that touch only intact skin and not mucous membranes, or do not directly touch the client/patient/resident	Cleaning followed by low-level disinfection (in some cases, cleaning alone is acceptable)	<ul style="list-style-type: none"><li>• ECG machines</li><li>• Oximeters</li><li>• Bedpans, urinals, commodes</li></ul>

The six recommended steps of instrument reprocessing are listed as follows:

- Transportation of instruments/equipment
- Cleaning of instruments and equipment
- Packaging
- Disinfection of the instruments/equipment
- Sterilisation
- Storage and issue

### TRANSPORTATION OF SOILED INSTRUMENTS

- Disposable sharps such as needles and blades shall be removed and disposed off in an appropriate puncture-resistant sharps container at point of use, prior to transportation
- If cleaning cannot be done immediately, the medical equipment/devices should be submerged in tepid water and/or detergent and enzymatic to prevent organic matter from drying on it
- Gross soil should be removed immediately at point of use if the cleaning process cannot be completed immediately after use
- Soiled medical equipment/devices should be handled in a manner that reduces the risk of exposure and/or injury to personnel and clients/patients/residents, or contamination of environmental surfaces
- Closed carts or covered containers with easily cleanable surfaces need to be used for handling and transporting soiled medical equipment/devices
- Soiled equipment/devices needs to be transported by direct routes to areas where cleaning will be done.

### CLEANING OF THE INSTRUMENTS

The first step of equipment reprocessing is the thorough cleaning of equipment. Cleaning is of importance because:



- It is an effective way to reduce the number of micro-organisms, especially endospores that cause tetanus, on soiled instruments and equipment
- Neither sterilisation nor high-level disinfection is effective without prior cleaning

### **METHOD OF CLEANING**

The process for cleaning includes protocols for disassembly, sorting and soaking, physical removal of organic material, rinsing, drying, physical inspection and wrapping.

### **DISASSEMBLY**

- Unless otherwise recommended by the manufacturer, equipment/devices should be disassembled prior to cleaning
- The manufacturer's recommendations shall be followed when disassembling medical equipment/devices prior to washing.

### **SORTING AND SOAKING**

- Sort equipment/devices into groups like products requiring the same processes of sterilisation
- Segregate sharps and/or delicate equipment/devices to prevent injury to personnel and damage to the equipment/devices
- Soak equipment/devices in a hospital approved instrument soaking solution to prevent drying of soil, making cleaning easier. Wear appropriate PPE
- Saline should not be used as a soaking solution as it damages some medical equipment/devices
- Detergent-based products, including those containing enzymes, may be used as part of the soaking process
- Ensure that detergents (including enzymatic detergents) are appropriate to the equipment/device being cleaned.

### **PHYSICAL REMOVAL OF ORGANIC MATERIAL**

- Completely submerge immiscible items during the cleaning process to minimise aerosolisation of micro-organisms and assist in cleaning
- Remove gross soil using tools such as brushes and clothes
- Employ manual or mechanical cleaning, such as an ultrasonic cleaning, after gross soil has been removed
- Ultrasonic cleaners are recommended for medical equipment/devices that can withstand mechanical cleaning, to achieve the required exposure for cleaning and to reduce potential risk to personnel
- If manual cleaning is performed, physical removal of soil should occur under the water level to minimise splashing
- Tools used to assist in cleaning, such as brushes, should be cleaned and disinfected after use.

### **RINSING**

Rinsing, following cleaning is necessary as residual detergent may neutralise the disinfectant.

- Rinse all equipment/devices thoroughly after cleaning with water to remove residues which might react with the disinfectant/sterilant. Avoid use of untreated well and bore well water, use safe drinking water for this purpose.



## **DRYING**

- Drying is an important step that prevents dilution of chemical disinfectants which may render them ineffective and prevents microbial growth
- Follow the manufacturer's instructions for drying of the equipment/devices
- Equipment/devices may be air-dried or dried by hand with a clean, lint-free towel. Lumens should be adequately flushed with air to ensure drying
- Dry stainless steel equipment/devices immediately after rinsing to prevent spotting.

## **INSPECTION**

- Visually inspect all equipment/devices once the cleaning process has been completed and prior to terminal disinfection/sterilisation to ensure cleanliness and integrity of the equipment/devices (e.g. cracks, defects, adhesive failures)
- Repeat the cleaning on any item that is not clean
- Follow the manufacturer's guidelines for lubrication
- Do not reassemble equipment/devices prior to disinfection/sterilisation.

Monitoring of the cleaning activities should be done to justify the method and materials for cleaning. Monitoring should be done by physical observations.

## **PACKAGING**

Packaging is a necessary step before sterilisation of the instruments is carried out by the hospital.

It has to be ensured that packaging for sterilisation needs to be suitable for the sterilisation method used to ensure that the packaging material can be penetrated by the sterilisation agent (e.g. steam). The packaging also provides protection during transport and storage. Proper packaging protects the sterilised goods from micro bacterial recontamination during transport and storage. The packaging units are to be kept as small as possible.

After sterilisation the packaged material needs to be provided with labels indicating the contents, date of sterilisation, use-by date, batch number and sterilisation indicator.

The recommended practices for packaging activity are as follows:

- ✓ Packaging systems should be compatible with the specific sterilisation process for which it is designed
- ✓ Packaging materials needs to be stored and processed to maintain the qualities required for sterilisation
- ✓ Package contents needs to be assembled, handled and wrapped in a manner that provides for an aseptic presentation of package contents
- ✓ Paper-plastic pouch packages should be used according to manufacturer's written instructions
- ✓ Packages to be sterilised should be labelled
- ✓ Sterilised packages should be considered sterile until an event occurs to compromise the package barrier integrity
- ✓ A chemical indicator/integrator should be placed inside each package and external chemical indicator affixed outside each package to be processed.

### **Packaging system of the sterile items should:**

- ✓ Provide adequate seal integrity and be tamperproof



- ✓ Provide an adequate barrier to particulate matter
- ✓ Withstand physical conditions of the sterilisation process
- ✓ Provide an adequate barrier to fluids
- ✓ Permit adequate air removal
- ✓ Allow penetration and removal of sterilant
- ✓ Protect package content from physical damage
- ✓ Resist tears and punctures
- ✓ Be free of holes
- ✓ Be free of toxic ingredients
- ✓ Have a low lint content
- ✓ Be used according to the manufacturers' written instructions.

### **DISINFECTION OF INSTRUMENTS**

Disinfection removes micro-organisms without complete sterilisation. Disinfection is used to destroy organisms present on delicate or heat-sensitive instruments which cannot be sterilised or when single use items are not available.

***Disinfection is not a sterilising process and should not be used as a convenient substitute for sterilisation. Thermal disinfection is not appropriate for instruments that will be used in critical sites and these must be sterile.***

Certain products and processes are providing different level of disinfections. They fall into three major categories:

- Low-level disinfection
- Intermediate level disinfection
- High-level disinfection

### **LOW-LEVEL DISINFECTION**

It kills most bacteria, some viruses and some fungi, but may not be reliable to kill more resistant bacteria such as M.tuberculosis or bacterial spores.

### **INTERMEDIATE LEVEL DISINFECTION**

Inactivates Mycobacterium tuberculosis vegetative bacteria, most viruses and most fungi, but does not always kill bacteria spores.

### **HIGH-LEVEL DISINFECTION (HLD)**

Destroy all micro-organisms except some bacterial spores (especially if there is heavy contamination).

***This is an alternative to sterilisation when either sterilisation equipment is not available or it is not feasible to carry out sterilisation.***

High-level Disinfection of instruments can be performed through:

- Pasteurisation (Boiling in water)
- Chemical disinfectants



## Pasteurisation

If an instrument is able to withstand the process of heat and moisture and is not required to be sterile, then thermal disinfection is appropriate. By using heat and water at temperature that destroys pathogenic, vegetative agents, this is a very effective method of disinfection.

The level of disinfection depends on the water temperature and the duration of instrument exposed to this temperature.

**Table 18: Minimum surface temperature and time required for thermal disinfection\***

Surface temperature (°C)	Minimum disinfection time required (In minutes)
90	1
80	10
75	30
70	100

*\*Source - Practical guidelines for infection control in healthcare facilities - WHO*

Semi-critical medical equipment/devices suitable for pasteurisation include equipment for respiratory therapy and anaesthesia. Equipment/devices require thorough cleaning and rinsing prior to pasteurisation.

Advantages of pasteurisation include rapid disinfection cycle and moderate cost of machinery but it has a major disadvantage that it is hard to validate the effectiveness of the process.

While performing HLD using pasteurisation it has to be ensured that:

- The process should be monitored with mechanical temperature gauges and timing mechanisms for each load
- Cycle time of disinfection should be verified manually and recorded for each cycle
- Calibration of pasteurisation equipment should be performed according to the manufacturer's recommendations
- Daily cleaning of pasteurising equipment is required to be done.

Following pasteurisation, medical equipment/devices need to be handled in a manner that prevents contamination. Equipment/devices need to be transported directly from the pasteuriser to a clean area for drying, assembly and packaging.

## HLD using Chemicals

The performance of chemical disinfectants is dependent on the following factors:

- Temperature
- Contact time
- Concentration and pH
- Presence of organic or inorganic matter
- Resistance of the initial bioburden on a surface.



## Steps of HLD using Chemicals

*Glutaraldehyde is recommended to use, as it is the most appropriate chemical disinfectant to provide HLD. The following steps should be taken:*

- First and foremost requirement is to clean the contaminated instruments thoroughly as per instructions. The instruments are then dried thoroughly before placing them in the disinfectant solution
- Completely immerse all items in the HLD
- Record the time and soak the instruments for at least 20 minutes
- Remove the items using sterile forceps or gloves
- Rinse well with boiled and filtered water three times and use immediately or dry with sterile cloth.

### **During HLD it has to be ensured that:**

- Prepared solutions shall not be topped up with fresh solution
- During manual disinfection it is to be ensured that the container used for disinfection is kept covered during use and washed, rinsed and dried when the solution is changed
- Each device shall be thoroughly rinsed following chemical HLD, according to the chemical manufacturer's instructions
- Unless a device is to be used immediately, it shall be thoroughly dried
- Drying of non-critical devices may be done by air-drying or other methods.

### **Note:**

1. ***There is no single ideal disinfectant. Different grades of disinfectants are used for different purposes***
2. ***Only instruments grade disinfectants are suitable for medical instruments and equipment***
3. ***Hospital grade or household grade disinfectant must not be used on instruments; they are only suitable for environmental purposes.***

## STERILISATION OF INSTRUMENTS

Sterilisation is the elimination of all disease-producing micro-organisms, including spores (e.g. *Clostridium* and *Bacillus* species) and prions. Sterilisation is used on critical medical equipment/devices and, whenever possible, semi critical medical equipment/devices.

All critical instruments that enter sterile tissues, including the vascular system (e.g. biopsy forceps, foot care equipment, dental hand pieces, etc.) present a high risk of infection if the equipment/device is contaminated with any micro-organisms, including bacterial spores. All these critical instruments need to be sterilised before next usage.

Before any instrument or equipment goes under the process of steam sterilisation, the following should be checked:

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





Sterilisation of the medical instruments can be achieved through:

- Thermal Sterilisation
- Chemical Sterilisation

### **THERMAL STERILISATION**

Thermal Sterilisation is performed via:

- **Wet sterilisation:** Exposure to steam saturated with water at 121°C for 30 minutes, or 134°C for 13 minutes in an autoclave. Please note these cycle parameters differ as per autoclave type (gravity/dynamic air removal) and need to follow as per type of autoclave.
- **Dry sterilisation:** Exposure to 160°C for 120 minutes, or 170°C for 60 minutes; this sterilisation process is often considered less reliable than the wet process, particularly for hollow medical devices. It should mainly be used for lab glassware and oils. Metal instruments are very likely damaged by this process.

Do not perform sterilisation for equipment which are not compatible to the heat sterilisation like endoscopes or fibro optic scopes and other related materials. It should be processed with use of HLDs.

### **CHEMICAL STERILISATION**

This is sterilisation with the use of chemicals also known as cold sterilisation. This is often used for instruments likely to be damaged by heat. It is based on the premise that some HLDs would kill endospores after prolonged exposure (10-24 hours).

Chemical sterilisation may be achieved through use of 2-4% Glutaraldehyde Solution, by immersing the instruments for a minimum contact time of 10 hours.

### **FLASH STERILISATION**

Flash sterilisation is a modification of conventional steam sterilisation in which the flashed item is placed in an open tray or is placed in a specially designed, covered, rigid container to allow for rapid penetration of steam.

Flash sterilisation is performed on unwrapped objects at temperature of 132° C, with 27-28lbs pressure and for minimum exposure time of three minutes.

Flash sterilisation should be used only in case of a dropped instrument during surgery and never as a routine method of sterilisation.

### **ENDOSCOPE REPROCESSING**

Endoscopes are medical devices which are problematic to clean and disinfect (long narrow channels, complex internal design, etc.). Products and/or processes used (chemical or thermo-chemical disinfection) may not be as reliable as sterilisation methods.

To reduce nosocomial transmission of micro-organisms by endoscopy, a standard reprocessing procedure should be systematically followed.

- Immediately after use, the air-water channel should be cleared with forced air, and treated tap water or detergent suctioned or pumped through the aspiration/biopsy channel(s) to remove organic debris
- All detachable parts (e.g. hoods and suction valves) should be removed and soaked in a detergent solution, and the external parts of the endoscopes gently wiped



- All accessible channels should then be irrigated with treated tap water or detergent solution, brushed (using sterile or single use brush) and purged
- Before any immersion, the endoscope should be leak-tested
- After pre-treatment and mechanical cleaning the endoscope needs to be cleaned and disinfected, either manually or automatically. In both cases, the complete cycle includes several stages:
  - Cleaning using an approved detergent (this solution cannot be reused)
  - Rinsing (treated tap water is sufficient for this in-between rinsing stage)
  - Disinfection. Using an approved, HLD
  - Rinsing: The level of microbial purity of the water used depends on the further use of the endoscope (bacteriologically controlled water or sterile water)
  - Drying: If the endoscope is not stored, this drying stage includes only air-blowing the channel to remove residual water.

## STORAGE

- Storage of instruments and equipment is a very important component to maintain its sterility or disinfection. Most instruments and equipment should be dry and packaged once they have been sterilised
- They should be stored in a clean, dry environment and protected from any damage
- Correct storage of sterile instruments and equipment are very crucial for keeping them sterile.

## MAINTAINING STERILITY

Proper storage conditions are essential to maintain the integrity of sterilised items. Thus healthcare settings should have procedures for storage and handling of clean and sterile medical equipment/devices that include:

- The end-user should check the integrity of the package before use
- Sterile medical equipment/devices should be used before the expiration date
- Stock should be rotated, so that oldest stock can be used first
- Sterility should be maintained until used
- Sterile packages that lose their integrity should be re-sterilised prior to use
- Equipment/devices should be handled in a manner that prevents recontamination of the item.

## MONITORING OF STERILISING PROCESS

Quality control parameters for the sterilisation process which also serve as a checklist for the sterilisation department includes:

- Load number
- Load content
- Temperature and time exposure record chart
- Chemical indicator testing (with each load)
- Biological Indicator testing (at least weekly)

***Regular maintenance of sterilisation equipment should be performed and documents should be maintained.***



Monitoring of the sterilising process is carried through mechanical, chemical and biological indicators.

### MECHANICAL INDICATORS

- Mechanical monitoring involves checking the steriliser gauges, computer displays, or printouts, and documenting sterilisation records that pressure, temperature, and exposure time have reached the levels recommended by the steriliser manufacturer. Since these parameters can be observed during the sterilisation cycle, this might be the first indication of a problem.
- The mechanical monitors for steam sterilisation include the daily assessment of cycle time and temperature by examining the temperature record chart (or computer printout) and an assessment of pressure via the pressure gauge. The mechanical monitors for ETO include time, temperature, and pressure recorders that provide data via computer printouts, gauges, and/or displays.

### CHEMICAL INDICATORS

- Chemical monitoring uses sensitive chemicals that change colour when exposed to high temperatures or combinations of time and temperature. Examples include chemical indicator tapes, strips, or tabs and special markings on packaging materials.
- ***Chemical indicator results are obtained immediately following the sterilisation cycle and therefore can provide more timely information about the sterilisation cycle than a spore test.***
- A chemical indicator should be used inside every package to verify that the sterilising agent has penetrated the package and reached the instruments inside. If the internal chemical indicator is not visible from the outside of the package, an external indicator should also be used. External indicators should be inspected immediately when removing packages from the steriliser; if the appropriate colour change did not occur, do not use the instruments. Chemical indicators help to differentiate between processed and unprocessed items, eliminating the possibility of using instruments that have not been sterilised.
- The two categories of chemical indicators are single-parameter and multi-parameter. A single-parameter chemical indicator provides information about only one sterilisation parameter (e.g., time or temperature). Multi-parameter chemical indicators are designed to react to two or more parameters (e.g., time and temperature or time, temperature, and the presence of steam) and can provide a more reliable indication that sterilisation conditions have been met.
- ***Chemical indicators (no matter what class or type) do not verify sterility and do not replace the need for weekly spore testing.***

### BIOLOGICAL INDICATORS

- Biological indicators, or spore tests, are the most accepted means of monitoring sterilisation because they assess the sterilisation process directly by killing known highly resistant micro-organisms (e.g., *Geobacillus* or *Bacillus* species).
- ***However, because spore tests are only done weekly and the results are usually not obtained immediately, mechanical and chemical monitoring should also be done on daily basis.***

### SPILL MANAGEMENT

In a hospital, hazardous substances such as body fluids, drugs, cleaning fluids and other chemicals are in very close proximity to hundreds of people each day. Thus in hospital spillage of blood, body fluids or chemicals can occur at any time due to broken or faulty equipment or human error. Any such spill poses risk to the staff, visitors and patients who are extremely susceptible to infection.



It is therefore essential for the hospital to have the right material and well trained staff to deal with any spill immediately.

## **SPILL MANAGEMENT OF BLOOD AND BODY FLUIDS**

### **Small volumes of spill (few drops):**

- Wear workman's gloves and other PPE appropriate to the task
- When sharps are involved use forceps to pick up sharps, and discard these items in a puncture-resistant container
- Wipe the spill with a newspaper moistened with hypochlorite solution (1% dilution containing minimum 500ppm chlorine). Discard the paper as infected waste
- Repeat until all visible soiling is removed
- Wipe the area with a cloth mop moistened with 1% hypochlorite solution and allow drying naturally
- All contaminated items used in the clean-up should be placed in a bio-hazardous bag for disposal.

### **Large spills (>10ml):**

- Confine the contaminated area
- Wear workman's gloves and other PPE appropriate to the task
- Cover the spill with newspaper or appropriate absorbent material to prevent from spreading
- Flood the spill with 10% hypochlorite solution. While flooding the spill with 10% hypochlorite solution it is to be ensured that both the spill and absorbent material is thoroughly wet
- Alternatively, chlorine granules can be sprinkled on the spill first and then the paper put over it
- Wait for five minutes.
- Remove and discard the paper as infected waste
- Wipe the area with paper moistened with 10% hypochlorite again if required until all visible soiling is cleaned
- Wipe the area once with 10% hypochlorite and a cloth mop and allow drying naturally
- All contaminated items used in the clean-up should be placed in a bio-hazardous bag for disposal.

## **SPILL KIT**

Blood and body fluid spill kit contents:

- Workman's gloves x 2 pairs
- Apron
- Mask
- Shoe cover or plastic bag to cover the shoes
- Absorbent material like newspaper or blotting paper
- Waste collection bag

Cleaning equipment – bucket, mop, cloths, and hypochlorite solution can be obtained from housekeeping and must be washed and disinfected appropriately after use.

If chlorine solution is not prepared fresh daily, it can be stored at room temperature for up to 30 days in a capped, opaque plastic bottle with a 50% reduction in chlorine concentration after 30 days of storage (e.g., 1000 ppm chlorine [approximately a 1:50 dilution] at day 0 decreases to 500 ppm chlorine by day 30).



All the spill kits must be readily available with all departments especially where risk of spill is more, like laboratory, sample collection room, wards etc.

***Spill kit must be immediately replenished after use and stored at the original location after every use.***

### **DISPLAY OF SPILL MANAGEMENT PROTOCOLS**

Spill management protocols need to be displayed at prominent locations in the hospital. Displayed protocols serve as a ready reference for the staff for management of spills.

### **TRAINING OF STAFF ON SPILL MANAGEMENT**

All the staff in hospitals need to be trained in spill management protocols of the hospital. Staff must be trained by performing mock drills for spill management. Training must also be done for chemical spill management.

## **CHEMICAL SPILL MANAGEMENT**

### **SPILL PREVENTION**

Chemical spills can be prevented in the workplace by:

- ❖ Ensuring appropriate chemical containers are used with seals that are in good condition (i.e. glass containers for corrosive chemicals)
- ❖ Ensuring all chemicals are stored appropriately
- ❖ Provision of locked cupboards and storage areas
- ❖ Provision of drip trays or purpose built chemical storage cupboards/cabinets with inbuilt spill retention
- ❖ Storage of chemicals as per their respective Material Safety Data Sheets (MSDSs)
- ❖ Ensuring appropriate equipment and procedures are in place for chemical spill management
- ❖ For chemical spill management it is to be ensured by the hospital that it maintains and reviews the relevant MSDSs to ensure appropriate risk controls are in place for accidental spill. MSDSs should be no more than five years old from date of issue.

### **CHEMICAL SPILL KIT**

Spill kits need to be provided and be readily accessible in relevant locations at the hospital. A chemical spill kit should include the following items:

#### **Absorbents:**

- Universal Spill Absorbent: 1:1:1 mixture of Flor-Dri (or unscented kitty litter), sodium bicarbonate and sand. This all-purpose absorbent is good for most chemical spills including solvents, bases and acids (with the exception of hydrofluoric acid)
- Absorbent pads and rolls: 'HazMat' absorbent pads
- Acid Spill Neutraliser: Sodium bicarbonate, sodium carbonate or calcium carbonate
- Alkali (Base) Neutraliser: Sodium bisulphate, boric acid or oxalic acid
- Solvents/Organic Liquid Absorbent: Inert absorbents such as clay and sand
- PPE



- Hand protection: Chemical resistant safety gloves (i.e. nitrile gloves)
- Eye protection: Safety goggles
- Body protection: Laboratory coat/Corrosive apron
- Foot protection: Enclosed footwear, shoe covers
- Respiratory protection: Dust mask/Respirator (All personnel should be properly fit tested before using a respirator)

Clean-up material for spills can be obtained from housekeeping; including:

- Brooms, plastic dustpan and square mouth shovel to sweep up the absorbent material
- Paper towels for minor spills
- Plastic tongs/scoops to pick up contaminated absorbent material
- A chemical resistant bin with a close fitting lid to hold the volume of spill and absorbent residues prior to disposal
- Heavy duty plastic bags for wrapping contaminated PPE.

### **SPILL RESPONSE**

Dangerous goods or hazardous substance spills should be cleaned up immediately, taking appropriate precautions for hazards of the material.

#### **STEP 1 - Assess Safety and Stop the Source of the Spill**

Limit access to the immediate area where the spill has occurred and ensure that only personnel with appropriate training and equipment deal with the spill.

This may involve righting an overturned container or placing the source (e.g. cracked container) in a larger container to contain the spill.

#### **STEP 2 - Review Safety Precautions and Risk Controls**

Review relevant MSDS for the spilt chemical (MSDS should be located where the chemicals are used and stored). The MSDS will have specific instructions on how to deal with chemical spills as well as first aid information.

#### **STEP 3 - Clean up the Spill**

Using appropriate PPE promptly cover the spill with absorbent material taking care not to spread the spill further.

Using a dust pan, collect the absorbent material/waste and place into a thick walled, puncture-proof chemical resistant bag/bin which is suitably labelled.

#### **STEP 4 - Notify the Appropriate Authority**

Spill of dangerous chemicals should be reported to the appropriate authority.

#### **STEP 5 - Restock the Chemical Spill Kit**

Restock the spill kit and return it to its designated storage location.

#### **Note:**

**The chemicals should be treated as per manufacturer's instructions before disposing off the same into municipal drainage system**





## SPECIFIC GUIDANCE FOR CHEMICAL SPILL MANAGEMENT

### Neutralising Acid Spills

Acid spills can be neutralised with sodium bicarbonate, sodium carbonate, or calcium carbonate.

#### Process

- Contain the liquid first
- Sprinkle powder over the spill slowly, starting from the outside
- Acid is neutralised if effervescence ceases in the presence of excess bicarbonate
- Avoid breathing in the fine powder and the gas evolved (carbon dioxide).

### Neutralising Alkali Spills

Alkali spills can be neutralised with sodium bisulphite, boric acid or oxalic acid. Many alkalis can result in serious burns to skin and eyes, so it is necessary to proceed with extreme caution.

#### Process

- Ensure that there is adequate ventilation
- Eliminate all sources of ignition as neutralisation of alkali can produce heat. This includes removing all combustible materials that are close to the spill
- Right any overturned containers where the spill originated or stop leak at source only if safe to do so
- Avoid handling fluid even with nitrile gloves
- Liberally apply the alkali neutraliser around the perimeter of the spill to limit the extent of spreading and continue sprinkling it towards the centre. This should be done until the entire spill is covered and there is no free liquid or liquid migration. The neutralisation reactions should occur 1-5 minutes after application
- Stand clear as splattering of reaction products might occur. The heat and vigour of the reaction will depend on the type and concentration of the alkali being neutralised
- The alkali will be neutralised when the reaction has stopped and there is no more fizzing from the liquid.

#### Caution

- Neutralised alkalis may produce heat. Wait until mixtures have cooled before sweeping up spilled material
- Avoid handling spilled material until absorption is complete
- Use non-metal, non-sparking tools such as a broom, scoop or scraper to clean up neutralised spill. Take care not to overly disturb the neutralised spill.

### Solid Spills

#### Process

- Sweep solid material into a plastic dust pan and place in a sealed container. Care should be taken so as to minimise dust or the contaminated powder becoming airborne
- Use of a dust mask is advisable
- Wipe the area down with a wet paper towel and dispose off the used paper towel in a strong polyethylene bag. Seal the bag and ensure all waste is collected for proper disposal.



## Liquid Spills (Other than flammable liquids)

### Process

- Spread absorbent pads over the spill starting with the edges first. This will help to contain the spill to a smaller area. Enough pads should be used to completely cover the liquid
- Pick up the contaminated pads with tongs or a scoop and place into a chemical resistant bin
- If the chemical is water soluble, wipe the area down with a paper towel, followed by wet mop and detergent
- Appropriately dispose off used paper towel.

## Flammable Liquid Spills

### Process

- ❖ Control all sources of ignition - turn off all electrical and heat generating equipment
- ❖ Spread the absorbent pads over the spill starting from the edge. Allow the pads to completely soak up the liquid
- ❖ Pick up the contaminated pads with tongs or scoop and minimise direct contact
- ❖ Place the waste into the chemical resistant bin
- ❖ Wipe the area down with a paper towel and copious amounts of water
- ❖ Dispose off paper towel into a chemical resistant bin and seal the bin so it is airtight
- ❖ Never use wet vacuum cleaner on flammable solvents.

## ISOLATION AND BARRIER NURSING

Isolation for the control of infection is used to prevent infected patients from infecting others (source isolation), and/or prevent susceptible patients, with weak immune system, from being infected (protective isolation).

Isolation and barrier nursing is needed to be followed by the hospital to prevent the spread of infections to other patients or to the medical staff from the patients carrying infections.

**Barrier nursing** is a set of stringent infection control techniques used in nursing. The aim of barrier nursing is to protect medical staff against infection by patients, particularly those with highly infectious diseases.

**Isolation** is defined as the voluntary or compulsory separation and confinement of those known or suspected to be infected with a contagious disease agent (whether ill or not) to prevent further infections. (In this form of isolation, transmission-based precautions are imposed)

The minimum requirements that hospitals need to fulfil with regard to isolation and barrier nursing are listed as follows:

### SINGLE ROOM

Single rooms reduce the risk of transmission of infection from one patient to others, and direct or indirect contact transmission.

Single room should have following facilities:

- Hand washing facilities
- Attached toilet and bathroom facilities



## COHORTING

This is also one strategy of infection control if single room is not possible or there is shortage of single rooms. During cohorting, patients infected with the same organism can be cohorted (sharing of room/s).

Cohorting may be done during outbreaks. A ward may be designated for this purpose and it should be clearly segregated from the other patient care area.

## PROVISION OF ISOLATION WARD

- Every hospital needs to have a provision of isolation ward for all infectious patients being admitted in the hospital
- It is to be ensured by the hospital that infectious patients are admitted in the isolation ward only and no general patient is admitted in the isolation ward
- An air handling system providing 6-12 air changes per hour with the air being discharged outside through a filtration mechanism is recommended. These systems should be checked periodically to ensure that they are offering negative pressure room
- An air-conditioned single room with an exhaust or a well ventilated room may also be a good idea for health facilities
- Isolation ward in the hospitals need to have self-closing doors.

## SPACING BETWEEN BEDS

- It is recommended that hospitals have single room for placement of patients in need of the isolation
- In hospitals where it is not possible to have a single room for isolation patients and patients are kept in common isolation ward, there is need to have proper bed spacing between two beds to minimise the transmission of patient to patient infection.
- A minimum bed spacing of 1.2 metres is recommended for spacing between the two beds in isolation ward to reduce the risk of cross transmission from direct or indirect contact or droplet transmission.

## RESTRICTION OF EXTERNAL FOOTWEAR IN CRITICAL AREAS

In order to have safe and infection-free environment in critical areas of the hospital, hospital authorities needs to follow these protocols for visitors and staff while entering a critical area in the hospital.

While entering the critical areas like OT, labour room, ICU, burn ward, etc., in the hospital all the staff and visitors need to ensure:

- All entering the critical areas should not be allowed to carry external footwear. The hospital needs to provide either dedicated footwear for the particular critical areas or should encourage the use of shoe covers
- All the staff and visitors accessing critical areas of the hospital need to adhere to the protocol of wearing the PPE including the gown, mask, gloves and shoe covers and use of hand sanitisers before and after entering the critical areas of the hospital.

## RESTRICTION OF VISITORS TO THE ISOLATION AREA

- The staff involved in patient care need to inform patients and relatives regarding the measures to be taken and the importance of restriction of visitors
- The patient and the relatives should be given health education about the cause, spread, and prevention of the infection in detail
- The movement of visitors is restricted in the critical areas like OT, ICU, SNCU, burn ward etc.



- Where appropriate, staff and visitors should wear PPE to protect the patient from micro-organisms
- To minimise the risk of infection it is to be ensured that only one attendant is allowed in the isolation area. All visitors need to wait for their turn while accessing these critical areas
- Children below 12 years of age should not be allowed into isolation areas
- Visitors' footwear, bags, and other belongings should be left outside the room
- Visitors should not be allowed to sit on the patient's bed
- Do not put flowers or plants in the room
- The visitors are not allowed to access the critical areas, if they are sick.

## HOSPITAL INFECTION CONTROL PROGRAMME

The staff involved in the delivery of healthcare services is responsible for prevention of HAIs at the facility. While all the activities, as mentioned in this section of the guideline, are required to be carried out to minimise the risk of HAIs, a formal administrative structure is important for continuous monitoring of these activities.

The principal goal of infection control programme is the prevention of nosocomial infection in patients, personnel, and visitors in order to provide a safe environment for patients and personnel in the process involving every member of the hospital in the surveillance, prevention and control of nosocomial infections.

The administrative structure and processes related to prevention of HAIs need to be defined and included in the "Hospital Infection Control Programme". The key component of the infection control programme includes hospital Infection Control Committee, monitoring of daily activities for infection control, having an antibiotic policy in place, ensuring occupational safety of staff through immunisation and regular health check-up, ensuring proper environment control measures and monitoring of HAI rates.

## HOSPITAL INFECTION CONTROL AND CLEANLINESS COMMITTEE

For monitoring of the activities related to infection control in the facility, a hospital Infection Control Committee needs to be formed. This Committee will be directly responsible for ensuring that the facility and employees comply with the requirements of infection control in the facility.

The hospital Infection Control Committee needs to be formed with an official order undersigned by the head of facility.

The suggested composition of the hospital Infection Control Committee is listed as follows:

- Medical Superintendent/Medical Officer In-charge - Chairperson
- Nursing in charge/Infection Control Nurse - Convener
- Physician/Microbiologist with knowledge of infection control - Member Secretary. This person will also be designated as Infection Control Officer.
- Surgeon
- Blood Bank In-charge
- OT/ICU In-charge
- Lab technician
- Hospital Manager/Quality Manager
- Chief Pharmacist
- Housekeeping In-charge



**The overall responsibility of this Committee is to:**

- To disseminate “Swachhata Guidelines and Guidelines for Implementation of Kayakalp Initiative” among all clinical and support staff of the hospital
- To develop and approve infection control policies and implement infection control practices in the hospital
- To conduct internal assessment using “Kayakalp” checklist at least once in a quarter, identify gaps and prepare action plan based on findings
- To monitor and review progress of the facility towards meeting “Kayakalp” criteria
- To ensure periodic microbiological surveillance, collection and analysis of data related to HAIs
- To direct resources to address problems identified for effective management of infection control programme
- To ensure availability of appropriate supplies needed for infection control at the facility
- To facilitate and support the training of staff related to housekeeping and infection control
- To monitor the housekeeping and cleanliness activities including services provided by outsourced agencies
- To monitor hand hygiene practices in patient care areas
- To monitor proper segregation and storage of BMW
- To coordinate and monitor waste disposal services provided by common treatment facility provider
- To ensure periodic medical check-up and immunisation of staff
- To monitor the hygiene of staff, especially food handlers and cleaning staff
- To ensure that all clinical and support staff of the hospital adhere to defined dress code
- To develop and implement SOPs on cleanliness and infection control
- To involve members of “Rogi Kalyan Samiti” and local civil society organisations for monitoring and promotion of cleanliness of the hospital
- To promote hygiene among patients and visitors through display of IEC materials and counsel them
- To facilitate development of antibiotic policy for the hospital
- Report outbreaks of nosocomial infections in the facility
- To participate in outbreak investigations of nosocomial infections
- To submit monthly reports to the district and/or state level as required
- To meet at least once in a month and review the progress towards meeting criteria for cleanliness and infection control
- To ensure compliance to all applicable legal provisions regarding waste management and environment control including BMW Management Rules 2016 & 2018 (Amendment) as mandated in clause 4 (r).

**MEETING SCHEDULE AND RECORDING OF THE PROCEEDINGS**

The Infection Control Committee in the hospital has to meet at least once in every month to review the activities carried out in the hospital related to infection control. The focus of the review is to analyse regular monitoring activities and HAI surveillance activities being carried out in the hospital.

The Committee also needs to meet in the event of any hospital infection outbreak and when required.

The Committee should meet with a pre-defined agenda and all the proceedings of the meeting need to



be recorded in the minutes of meeting, along with the attendance record, agenda of discussion, planned actions and suggestions and delegation of responsibility.

### **MONITORING OF INFECTION CONTROL PRACTICES**

The Infection Control Committee needs to carry out regular daily monitoring of infection control practices being followed by the staff. The focus of this monitoring is to ensure that the staff regularly follows and practices infection control measures like hand washing, use of PPE, barrier and isolation nursing and also the resources available for carrying out these activities like availability of appropriate number of PPE, availability of hand washing facilities like elbow operated taps, hand wash and hand washing posters.

This regular monitoring of infection control activities through daily rounds needs to be carried out by the members of Infection Control Committee, preferably through hospital infection control nurse/nursing in-charge. This monitoring is to be carried out in a proper format and needs to be signed by the monitoring authority.

All the records of the monitoring of activities need to be discussed in Infection Control Committee meeting and records need to be kept for proving compliance.

### **ANTIBIOTIC POLICY**

The main aim of the antibiotic policy is to minimise morbidity and mortality due to antibiotic resistance infections; and to preserve the effectiveness of antimicrobial agents in the treatment and prevention of communicable diseases.

The policy shall incorporate specific recommendations for the treatment of different high-risk/special groups such as immuno-compromised hosts; hospital-associated infections and community-associated infections.

The antibiotic policy being prepared in the hospital needs to be based on the following:

- Spectrum of antibiotic activity
- Pharmacokinetics/pharmacodynamics of these medicines
- Adverse effects
- Potential to select resistance
- Analysis of the results of culture sensitivity tests done on patient samples (this is one of the most important inputs)
- Cost
- Special needs of individual patient groups.

To develop an antibiotic policy each hospital shall establish a multidisciplinary antibiotic management team (AMT). The team's functions include developing a hospital antimicrobial policy, monitoring the implementation of the antibiotic policy, receiving feedback, assessing outcome and discussing with clinicians, conducting a revision of the policy based on the experience of prescribers and antimicrobial susceptibility profiles.

The AMT should include members with expertise and experience in different subjects (infectious diseases, medicine, surgery, paediatrics, clinical microbiology, and pharmacology and hospital pharmacy).

General principles that need to be followed while adapting the antibiotic policy in the hospital:

- Antibiotic use data is analysed on quarterly basis based on the hospital records
- Standard treatment guidelines





- Periodic prescription audits
- Review of surveillance data generated from antibiograms and prescription auditing
- Education and training for all infection control activities in collaboration with the Hospital Infection Control Committee.

## OCCUPATIONAL HEALTH AND SAFETY

The healthcare staff is at potential risk of infection owing to their exposure to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces or contaminated air. Therefore, prevention strategies have to be the part of Hospital Infection Control Programme.

Infection control objectives of the personal health service should be an integral part of a healthcare organisation's general programme for infection control. The objectives may be:

- Educating healthcare staff on the principles of infection control and individual responsibility
- Teaming up with the infection control department in monitoring and evaluating potentially harmful infectious outbreaks and exposures
- Providing care if a healthcare staff is exposed to an occupational hazard
- Identifying work related risks and constituting preventive measures to mitigate them
- Reducing costs by preventing infectious diseases that result in absenteeism and disability.

The elements of healthcare staff safety can be elaborated as:

- **Coordination with Other Departments**

For achieving appropriate standards of infection control, the activities of healthcare staff should be coordinated with infection control and other appropriate department personnel. This would help in adequate surveillance of infections and provision of preventive services.

- **Pre-Placement Evaluations**

Medical evaluation of the staff prior to their placement in a health facility can ensure that they are not placed in jobs that would pose undue risk of infection to them, other staff, patients or even visitors. The evaluation should include details of immunisation status and obtaining histories of any condition that might predispose personnel to acquiring or transmitting communicable diseases. A detailed physical examination needs to be carried out for all personnel joining the facility.

- **Healthcare Staff Health and Safety Education**

To increase compliance of the staff to infection control measures, staff orientation, education and training on basic infection control principles is imminent. Clearly written policy, guidelines and SOPs give clarity of instruction and ensure uniformity, and effective coordination of activities.

- **Immunisation Programmes for Service Providers**

A continuous ongoing vaccination programme would be required in the facility and all staff need to be immunised against potential exposure to communicable diseases especially tetanus and Hepatitis B. A comprehensive medical check-up needs to be undertaken for every staff at the time of joining. .

- **Regular Health Check-up of the Staff**

It has to be ensured by the health facility that it has a policy of conducting regular health check-up of all staff. Regular health check-up should include comprehensive medical assessment, immunisation status and deworming of the staff especially that of food handlers and housekeeping staff.



- **Maintenance of Records**

It is to be ensured by the health facilities that they maintain all health records of the employees of the hospital. The health records contain details of comprehensive medical assessment, immunisation status, PEP (if any), and deworming records. These records need to be stored along with the personal records of the employees and confidentiality of the same has to be ensured.

## **HOSPITAL ACQUIRED INFECTION SURVEILLANCE**

For effective implementation of the infection control programme and ensuring effectiveness of the activities related to infection control, hospitals need to carry out the surveillance of these activities and take appropriate corrective and preventive actions based on the results of the surveillance.

Surveillance is one of the most important components of an effective infection control programme. It is defined as the systematic collection, analysis, interpretation, and dissemination of data about the occurrence of HAIs. Surveillance of hospital associated infections involves recording and counting of infections arising in the hospital. Surveillance provides ways to identify and clarify quality issues, understand the causes and then, plan corrective actions to rectify them and in the long run, bring about improvements.

Hospitals need to carry out targeted surveillance of high risk or critical areas and procedures, as identified by the hospital.

The minimum activities that hospitals needs to carry out for the surveillance of HAI include:

- Microbiological surveillance of critical areas
- Monitoring of surgical site infection rates
- Monitoring of device-related HAI rates
- Monitoring of blood-related and respiratory tract HAI
- Corrective action on occurrence of HAI.

## **MICROBIOLOGICAL SURVEILLANCE OF CRITICAL AREAS**

- Do not perform routine environmental sampling in any hospital location except the operation theatres. Presence of an organism on a surface does not confirm it as the cause of infection in patients in that area even if it is the same strain
- Routine environmental surface sampling (swabs) should not be done in areas like the ICU and/or wards. Take corrective actions if any growth of micro-organisms is found to be positive.

### **Environmental sampling should be done for the following purposes only:**

- Monitoring the effectiveness of the cleaning and disinfection procedures in certain situations as a part of quality assurance e.g., the operation theatre
  - ✓ Evaluation of efficiency of an OT ventilation system (high efficiency particulate air {HEPA} filtered positive pressure air supply system)
- As a part of epidemiological investigation of an outbreak in which environmental sources/reservoirs or transmission routes are suspected
- Monitoring the quality of water for drinking, cleaning, surgical scrub and after flooding.

## **MICROBIOLOGIC MONITORING OF THE OT**

Since the OT is designed to function as a clean room and microbial burden control is the most important here, routine environmental surface and air sampling should be done in all OTs.



## OT SWABS:

- Surface swabs need to be obtained from each OT for microbiological culture testing as per hospital infection control programme
- The sampling process should be as follows:
  - Sampling should be done as soon as the OT is opened in the morning before any cleaning is done
  - Obtain the required numbers of sterile swabs and media from the microbiology lab before taking samples; keep the swabs and media outside the refrigerator for at least 30 minutes (they should be at room temperature when sample is taken)
  - Label the sampling media with the date, OT number, and sample site (e.g., table, trolley etc.)
  - Change into OT dress, wear cap, mask, sterile gown and sterile gloves and enter the OT with the swabs and media
  - The ventilation system/AC should be kept off. It may be turned on if air sampling is to be done at the same time
  - Swabs should be collected from the following locations in each OT (different from sampling after new OT construction or OT renovation):
    - OT table
    - OT lights
    - Sterile instruments trolley (If more than one trolley is present all should be sampled)
    - The medication preparation surface of the anaesthesia machine
    - Floor – one swab of the floor adjacent to the OT table
    - Any one wall at waist to shoulder height
  - Collect samples using aseptic technique
  - The samples should be sent to the laboratory immediately after collection. Do not place collected samples in the refrigerator
  - Maintain a record of the samples sent
- The laboratory should test the swabs for presence of both aerobic and anaerobic bacteria (both spore forming and non-spore forming ones)
- Any growth in the swabs should immediately be communicated by the laboratory to the hospital authorities
- The test reports should be informed to the Chairperson, Infection Control Committee and filed for records.

**Table 19: Suggested actions for OT swab culture**

ORGANISM GROWN	REMARK	ACTION
No organisms grown	Acceptable	Use the OT
Skin commensals e.g., <i>S epidermidis</i> (sparse growth in any 1-2 swabs from the sample set)	Acceptable	Use the OT (unless the lab reports heavy growth or growth from multiple swabs). Re-clean positive growth locations before using the OT.
Known pathogen ( <i>S aureus</i> )	Unacceptable	Do not use the OT. Re-clean, re-fogg and repeat swab samples



ORGANISM GROWN	REMARK	ACTION
Gram negative organisms (aerobic/ anaerobic)	Unacceptable	Do not use the OT. Re-clean, re-fogg and repeat swab samples
Aerobic/anaerobic spore bearers	Unacceptable	Do not use the OT. Re-clean, re-fogg and repeat swab samples
Mixed growth	Unacceptable	Do not use the OT. Re-clean, re-fogg and repeat swab samples

### CORRECTIVE AND PREVENTIVE ACTIONS IN CASE OF UNACCEPTABLE RESULTS

- Postpone elective cases. Repeat cleaning, disinfection and OT swabs. The procedure should be supervised by the OT in-charge
- All cases operated in the duration between sampling and reporting of unacceptable swab should be identified and followed up for surgical site infection
- Investigate for the causes of unacceptable results. Check the chemical dilution methods, cleaning techniques, cleanliness of mops and buckets, function of the fogger machine, etc. The lab should check the sample collection and processing methods used.

### OT AIR SAMPLING

- Air sampling should be done regularly once a week for OTs with high efficiency particulate air (HEPA) filtered positive pressure ventilation system to monitor the efficacy of the system
- In OTs without a ventilation system it should be done once a month and whenever air is suspected as a source/transmission route of surgical site infection.
- The procedure for sampling by settle plate method is as follows:
  - Obtain the required numbers of culture media plates from the microbiology lab. Before taking samples, keep them outside the refrigerator for at least 30 minutes (they should be at room temperature when sample is taken)
  - Sampling should be done on an empty OT immediately after opening the OT in the morning
  - If OT swabs are to be taken at the same time, then **air sampling should be done before taking swab samples**
  - The ventilation system/air conditioner should be turned on and allowed to run for at least 10 minutes with the OT closed and empty before sampling
  - The person performing the sampling should wear sterile gown, sterile gloves, cap and mask and OT dress and footwear before entering the OT
  - The culture plate should be labelled with the date, OT number and sampling location before taking it into the OT
  - Expose one plate on the OT table for 40 minutes. This should be done aseptically without touching the culture media or contaminating the plate lid. The technique should be taught to the OT staff by the microbiology lab
  - After 40 minutes the plates should be closed, sealed and sent to the lab for further processing
- The lab should report the total colony counts after 24 hours of incubation at 37°C. The predominant type of growth, if any, should be identified and reported.
- The following results (both conditions together) will be considered satisfactory for an OT with a HEPA filtered positive pressure ventilation system:
  - No growth of any organism



- No growth of any fungus, gram-negative organisms or known pathogens such as staphylococcus aureus
- If results are not satisfactory, investigation should be done and appropriate corrective actions are needed to be taken
- In case of unsatisfactory results,
  - Do not use the OT until the problem is resolved
  - Monitor the cases operated since the last acceptable result onwards
- Settle plate positivity rate pattern should be studied and used in interpretation of test results in an individual set-up
- Test reports should be informed to the hospital authorities and filed for records.

## **SURVEILLANCE OF SURGICAL SITE INFECTION**

### **SURGICAL SITE INFECTION**

#### **SUPERFICIAL INCISIONAL SURGICAL SITE INFECTION**

Infection occurs within 30 days after the operation and infection involves only skin and subcutaneous tissue of the incision and at least one of the following:

- Purulent drainage with or without laboratory confirmation, from the superficial incision
- Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
- At least one of the following signs or symptoms of infection: pain or tenderness, localised swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negative
- Diagnosis of superficial incisional SSI made by a surgeon or attending physician.

#### **DEEP INCISIONAL SURGICAL SITE INFECTION**

Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation and infection involves deep soft tissue (e.g. fascia, muscle) of the incision and at least one of the following:

- Purulent drainage from the deep incision but not from the organ/space component of the surgical site
- A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever ( $>38^{\circ}\text{C}$ ), localised pain or tenderness, unless incision is culture-negative
- An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- Diagnosis of deep incisional SSI made by a surgeon or attending physician.

#### **ORGAN/SPACE SURGICAL SITE INFECTION**

Infection occurs within 30 days after the operation if no implant is left in place or within one year if implant is in place and the infection appears to be related to the operation and infection involves any part of the anatomy (e.g., organs and spaces) other than the incision which was opened or manipulated during an operation and at least one of the following:

- Purulent drainage from a drain that is placed through a stab wound into the organ/space
- Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space



- An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination
- Diagnosis of organ/space SSI made by a surgeon or attending physician.

**The key factors to be recorded clinically are:**

- The severity and the extent of the infection in the patient
- The type of operation
- The time period between the operation and the development of the infection
- Results of culture sensitivity testing of the infection site.

**Factors which influence the frequency of surgical site infections include:**

- Surgical technique
- Extent of endogenous contamination of the wound at surgery (clean, clean contaminated)
- Duration of operation
- Underlying patient status
- Operating room environment

**SURGICAL SITE INFECTION (SSI) MONITORING**

- All post-operative cases need to undergo physical inspection of the stitch lines and the surgical wounds by the concerned surgeon and evidence of infection is recorded in the patient's case sheet/ card
- Surveillance for SSI should also be maintained in the OPD and dressing rooms as many patients with surgical infection may present at follow up
- Culture swabs should be sent from suspicious cases as required for laboratory investigations
- SSI reporting is done on the prescribed form.

***Please Refer to Annexure VII: "Sample Surgical Site Infection Reporting Format"***

**SURVEILLINANCE OF HOSPITAL ASSOCIATED RESPIRATORY INFECTIONS**

Hospital-associated respiratory tract infections can lead to nosocomial pneumonia and is one of the most serious HAIs. Nosocomial pneumonia is defined as a lower respiratory tract infection that appears during or after hospitalisation of the patient who was not incubating the infection on admission to hospital.

The diagnostic criteria are:

- Fever, cough, development of purulent sputum
- Radiological changes showing progressive infiltration, and sputum gram-stain showing >25 WBCs per low field and bacteria.

**SPECIMEN TO BE COLLECTED**

- Sputum
- Tracheal aspirate or
- Bronchoscopic aspirate

Specimens collected are sent to laboratory for investigations. Results of culture are to be interpreted in the light of clinical findings.





## VENTILATOR-ASSOCIATED PNEUMONIA (VAP)

Ventilator-associated Pneumonia (VAP) is the most common nosocomial infection diagnosed in ICUs. It is defined as pneumonia that occurs 48 hours or more after endotracheal intubation or tracheostomy, caused by infectious agents not present or incubating at the time mechanical ventilation was started.

It can be of two types:

- early-onset VAP which is defined as VAP that occurs within the first four days of ventilation
- late-onset VAP which is defined as VAP that occurs more than four days after initiation of mechanical ventilation

## SURVEILLANCE OF URINARY TRACT INFECTIONS

Urinary tract Infections are the most frequent nosocomial infections. A great majority of these infections are associated with an indwelling urethral catheter.

**Definition:** An infection of the urinary tract that was not incubating at the time of admission.

The diagnostic criteria are:

- Clinical symptoms of fever, suprapubic tenderness, frequency and dysuria.
- Presence of bacteria in the urine in significant quantity, i.e. more than  $10^5$  per ml

## SPECIMEN FOR CULTURE

Urine should be collected aseptically for culture by needle aspiration from the catheter. Catheter tips and specimens from urine bags are generally unsuitable for culture because the results are hard to interpret.

## INTRAVASCULAR CATHETER RELATED INFECTIONS

- Exit site infections: Infections with erythema, tenderness, induration or purulence within 2cm of the skin at the exit site of the catheter. These are commonly caused by Staph. aureus and coagulase-negative staphylococci
- Contaminated infusions can lead to bacteraemia or systemic infection and are mainly caused by gram negative rods. Infusate and intravascular medications can cause primary blood stream infection if they are contaminated. Aseptic technique in preparation of infusate and of single unit dose IV medications is highly recommended.

Key practices for all vascular catheters include:

- Avoiding indwelling intravenous catheterisation unless there is a medical indication
- Limiting the use of catheters to as short a duration as possible
- Preparing fluids aseptically and immediately before use
- Training of personnel in catheter insertion and care
- A high level of aseptic technique should be used for insertion and handling of catheters.
- If local infection or phlebitis occurs, the catheter should be removed or reinserted immediately
- The dressing should be changed at the time of the change of lines, using surgical asepsis techniques.

## SURVEILLANCE

- Monitor catheter sites visually or by palpation through the intact dressing on a regular basis. If patient has tenderness at the insertion site, fever without obvious source, or other manifestations suggesting local or systemic infection, the dressing should be removed to allow thorough examination of the site



- Encourage patients to report to their healthcare provider any changes in their intravascular catheter site or any new discomfort.

**Table 20: Criteria for surveillance of hospital acquired infections**

S.no.	Type of HAI	Criteria
1	Surgical Site Infection (SSI)	Any purulent discharge, abscess, or spreading cellulitis at the surgical site during the month after the operation
2	Urinary Infection	Positive urine culture (1 or 2 species) with at least $10^5$ bacteria/ml, with or without clinical symptoms
3	Respiratory Infection	Respiratory symptoms with at least two of the following signs appearing during hospitalisation: — cough — purulent sputum — new infiltrate on chest radiograph consistent with infection
4	Vascular Catheter Infection	Inflammation, lymphangitis or purulent discharge at the insertion site of the catheter
5	Ventilator Associated Pneumonia	Clinical pulmonary infection from endotracheal aspirate (ETA) and bronchoalveolar lavage (BAL) samples

#### **CORRECTIVE AND PREVENTIVE ACTION ON REPORTED HOSPITAL ACQUIRED INFECTIONS**

- An effective surveillance system should identify priorities for preventive interventions and improvement in quality of care
- By providing quality indicators, surveillance enables the Infection Control Programme, in collaboration with units, to improve practice, and to define and monitor new prevention policies
- Surveillance is a continuous process and needs to evaluate the impact of changes in practices and to validate the prevention strategy, to see if initial objectives are attained.

**Table 22: Calculation of HAI rate**

S No	Quality Indicator	Numerator	Denominator	Formula
1	Surgical site infection Rate	All Surgical site infection detected	All major & minor surgeries conducted	(Total number of observed surgical site infection*100/Total number of surgeries done)
2	UTI Rate	Total number of UTI cases detected	Total catheter days	(Total number of UTI detected*1000/Total catheter days)
3	VAP Rate	Total number of VAP cases detected	Total ventilator days	(Number of patients with VAP*1000/Total Ventilator days)

#### **ENVIRONMENT CONTROL**

For prevention of HAIs in the hospital it is to be ensured that proper environment control measures are taken by the organisation. Environmental controls measures help eliminate trigger factors that initiate hospital infections and reduce the conditions that sustain it. The minimum environment measures that are needed by the hospital to be followed include following:



## MAINTENANCE OF POSITIVE PRESSURE IN OT AND ICU

Positive pressure is a pressure within the system that is greater than the environment that surrounds the system. Thus maintenance of positive pressure in OT and ICU enable the environment to decrease the chances of spread of infection from the surrounding environment to the OT and ICU.

Positive pressure in these areas can be maintained through use of Air Handling Units (AHU). The filtration system designed to provide clean air should have (HEPA) filters in high risk areas.

As described earlier in these guidelines the isolation rooms planned in the hospital need to have negative pressure gradient, so that the surrounding environment of the isolation ward is not contaminated with infectious particles when the door is opened for patient transpiration and other purposes.

For the operating room, the critical parameters for air quality include:

- Frequent maintenance/validation of efficacy of filters (in accordance with manufacturer's requirements)
- Pressure gradient across the filter bed and in the operation theatre
- Air changes per hour (15-20 air changes per hour)
- Temperature should be maintained between 20°C and 22°C and humidity between 30% and 60% to inhibit bacterial multiplication
- General areas should be well ventilated if they are not air-conditioned.

## LAYOUT OF OPERATION THEATRE & SURGICAL SUITS

In OTs a high degree of asepsis is to be ensured to provide appropriate environment for staff and patients. For this, zoning of the OTs should be done to keep the theatres free from micro-organisms. There may be four well defined zones of varying degree of cleanliness:

- Protective area
- Clean Area
- Sterile Area
- Disposal Corridor

**PROTECTIVE ZONE:** Containing mostly theatre supply, changing rooms, pre-anaesthetic examination room and waiting area

**CLEAN ZONE:** It includes the casualty theatres, recovery room, theatre pack preparation and pre-operative wards

**ASEPTIC or STERILE ZONE:** It consists of scrub stations, operation theatres, anaesthetic and sterilising rooms. This zone should provide the highest degree of antibacterial precautions

**DISPOSAL or DIRTY ZONE:** Soiled instruments and dressings are transacted through this area for washing and re-sterilisation or disposal. It includes the sluice rooms and disposal corridor



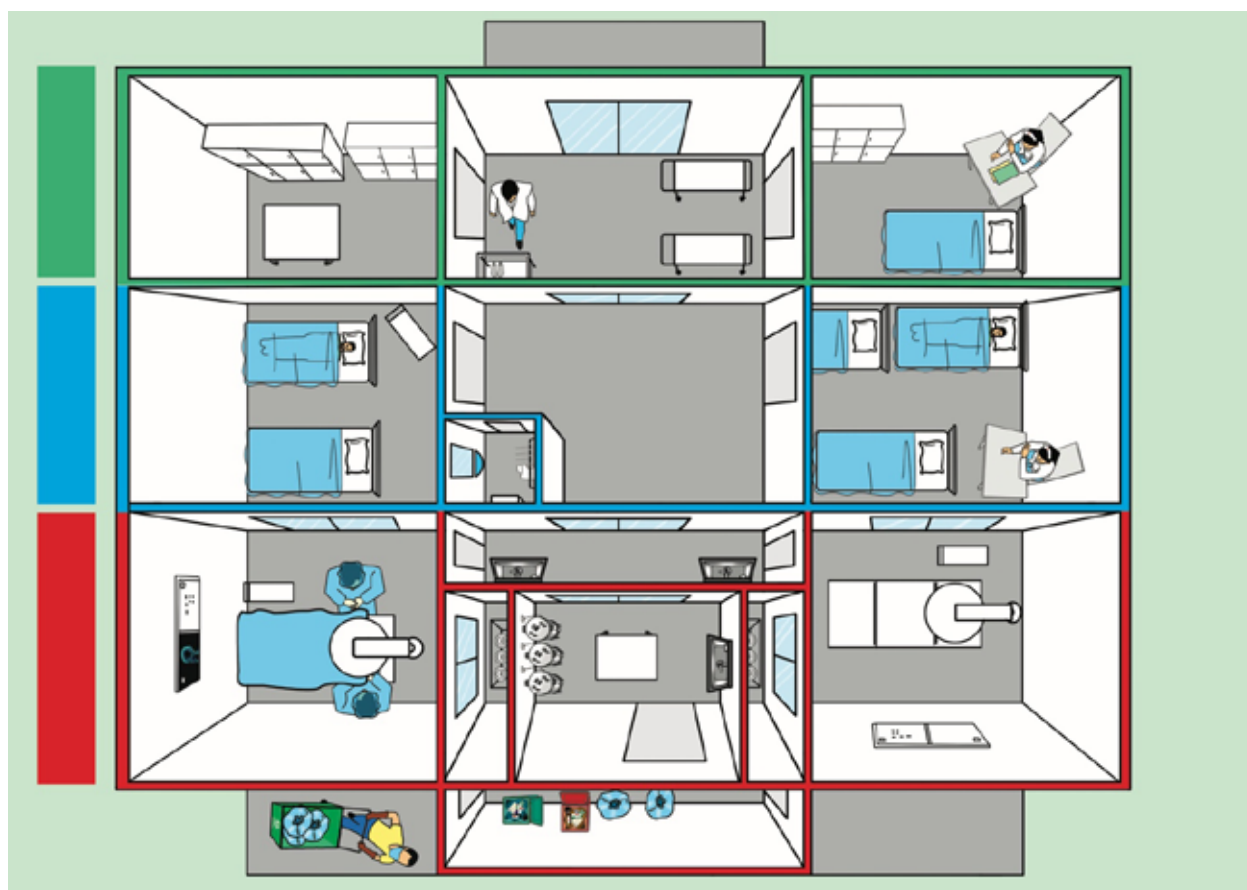


Figure 43: Schematic diagram for zoning of operation theatre

## FOGGING

The origin of fogging can be traced to the 19th century when Joseph Lister aerosolised carbolic acid to improve antisepsis in operative practice.

Fumigation (fogging with formalin) is no longer used in the Western Literature and most of the International Infection Control Guidelines including CDC does not advocate fumigation practice as these developed nations have all the modern critical parameters required for OT in place with a well-equipped heat ventilation air conditioning (HVAC) system. HVAC system maintains indoor air temperature and humidity, control odours, remove contaminated air and minimise the risk of transmission of airborne micro-organisms. An HVAC system with modern AHU helps to maintain positive air pressure in OT, and maintain 15-20 air changes/hour. Use of HEPA filters (to remove particles of size of  $> 0.3 \mu\text{m}$ ), laminar air flow and UV radiations further helps in maintaining asepsis and infection control.

In India, there are extreme situations in OT facilities, ranging from rooms with fans, window air conditioning, (OTs in DHs and CHCs) to the more sophisticated laminar airflow systems (medical colleges).

Most of OTs in DH and CHC do not have air handling unit (AHU) and other modern facilities with critical parameters. In hospitals that lack HVAC systems the quality of air in the OT cannot be guaranteed.

Although, no studies demonstrate that fogging actually reduces the incidence of HAI, it seems to be the only alternative for health facilities not having HVAC system. The method of fogging is recommended mainly to ensure uniform application of the disinfectant to all surfaces in the room. At the same time, the age old tradition of formalin fumigation is not recommended as it is difficult to perform, dangerous to use (especially the liquor ammonia), unreliable (as conditions required for bactericidal activity are difficult to



maintain) and formalin itself is a known carcinogen.

Hence, disinfection of OTs is categorised into two categories:

- **Disinfection of OT with HVAC system**
- **Disinfection of OT without HVAC system**

However, the following precautions should be taken while fogging:

- Replace formalin with safer agents like “an aldehyde based product containing Glutaraldehyde and chemically bound formaldehyde as principal disinfecting agents” e.g. Bacillocid\*.
- Advantages of these compounds are:
- Has deep penetrating capability
- Has no known resistant strains
- Effective against Bacteria, Viruses, Mycobacteria, Amoeba, Fungi and spore forming organisms
- ***After fogging do the air sampling and keep the records.***

#### **A. Disinfection of OT with HVAC system**

Fogging is not required for an OT with a HEPA filtered positive pressure air supply system. However, the following should be ensured before deciding not to fog such an OT:

- The ventilation system design is appropriate and system performance is validated during installation and at least once a year. Records of validation should be available. All parameters in every validation testing should be within permissible limits
- Maintenance of the ventilation system is done at least once a year. HEPA filters are changed at the time intervals recommended by the manufacturer or based on results of the validation tests. Maintenance of the AHU is done as a part of yearly maintenance. Records of maintenance filter replacement to be available
- Weekly air count monitoring using settle plates/air sampler is done. Results are within acceptable limits and test reports are available
- Surface cleaning protocols are implemented correctly with OT cleaning staff knowing clearly how they are supposed to perform the cleaning
- Adequate time is given for OT cleaning.

***If any of the above are unsatisfactory/in doubt, fogging should be done.***

The general steps are mentioned below:

- Wear a gown, cap, mask and utility gloves
- Clean blood spills, remove waste, clean and disinfect items used in surgery
- Inspect all surfaces in the OT in detail for visible soiling/dust. Clean any soiling with an HLD
- Wipe and clean all equipment completely i.e. wipe the entire OT table, OT lights, trolleys, anaesthesia machine
- Lastly, clean and mop the floor twice (scrub by hand or a floor scrubber machine if possible) with a high-level disinfectant beginning at the end farthest from the door and moving towards it
- Cover all electronic equipment with plastic overs. The fogged liquid should not enter them
- Turn off the ventilation system



- Fog the OT with “an aldehyde based product containing Glutaraldehyde and chemically bound formaldehyde as principal disinfecting agents” e.g. Bacillocid\* until a fog is seen in the air. Stop the fogging and exit from the OT with the machine
- Thereafter, the OT should be closed
- The OT should not be entered after it has been closed down for the day (except for emergency cases).

#### **B. Disinfection of OT without HVAC system**

Procedure:

- After all cases are over, clean the OT as per the procedure for cleaning after all cases are over
- Keep ventilation system off (in case it is working). Turn the AC off
- Ensure all electronic equipment has been wiped and covered with a plastic cover (important to prevent the fogged liquid from going into the machines). No electronic equipment may be left uncovered
- Prepare solution of “an aldehyde based product containing Glutaraldehyde and chemically bound formaldehyde as principal disinfecting agents” e.g. Bacillocid\* solution in the fogger tank (quantity as per manufacturer recommendations). Place the fogger in one corner of the OT (preferably near a door so it can be taken out easily) on a trolley. Place a double folded towel under the machine (to prevent it from slipping off as it vibrates when running)
- Direct the nozzle to the opposite corner of the room elevated at 45 degrees
- Start the fogger and close the OT
- Allow the fogger to run until a fog can be seen in the OT atmosphere. Check through the door window
- Once a suspended fog is seen, wear a cap and mask, open the OT door, turn off the fogger and remove it to the outside
- Keep the OT closed for at least one hour\*\*. It may be used any time after this.

#### **Note**

- Inspect the floor for wet patches after opening the OT. All surfaces should be dry. If water deposits are present keep the OT closed to allow them to dry naturally (turn AC on if available). Do not wipe the water with sterile mop
- Check floor and working surfaces for excess stickiness (the foot slips or there are white streaks of deposit). This can be removed using soap and water. If excessive stickiness or deposits are observed, check the dilution of the cleaning and fogging solution and correct it if excess chemical was added during preparation. If the problem still persists, reduce the fogging time by 1-2 minutes and monitor.

#### **Fogging of wards/rooms:**

Important: wards and rooms need not be fogged on a routine basis. Fogging of wards and rooms should be done in the following situations:

- After an isolation ward/room is emptied at the end of an outbreak
- After an infected patient is discharged from a room (in absence of an outbreak)
- When an outbreak of infection occurs in a ward.

The general steps for cleaning and fogging of a ward/room are as follows:

- Wear cap, mask, gown and utility gloves. Arrange all cleaning material before beginning
- Perform thorough cleaning as mentioned for terminal disinfection





- First remove contaminated items, waste, linen, instruments to be cleaned
- Change the gloves and begin cleaning from periphery to centre. Move from clean to unclean areas and top to down. The general order would be doors, walls, windows and wall mounted objects, floor-based furniture and patient care items, attached toilets and lastly, floor
- After cleaning is over, close the windows and doors and fog the area with “an aldehyde based product containing Glutaraldehyde and chemically bound formaldehyde as principal disinfecting agents” e.g. Bacillocid\* until a good fog is seen in the air
- Stop fogging, remove the fogger machine and keep the area closed for at least one hour\*\*. It can be used after this

***\*NHSRC does not endorse any commercially available product. Please note that term Bacillocid has been used merely as an example. Any safe propriety product can be used.***

***\*\* Please consult literature on the chemicals used for fogging. It may be noted that duration of closure of space would vary.***

### **TRAFFIC FLOW IN CRITICAL AREAS**

- ✓ The layout should be planned in a way to ensure that there is no overlapping of general and patient traffic in critical areas like OT and ICU to minimise the spread of infection in these areas.
- ✓ For this purpose it is to be ensured that OTs and ICUs are located away from the general traffic areas of the hospital. The design should support concept of zoning and ventilation standards in these acute care areas. Clean corridor and dirty corridor should not be adjacent and they should facilitate traffic flow of clean and dirty items separately.

### **CARBOLISATION OF OT AND LABOUR ROOM**

For carbolisation of OT and labour room, a high-level disinfectant with assured activity needs to be used which should have “an aldehyde based product containing Glutaraldehyde and chemically bound formaldehyde as principal disinfecting agents” e.g. Bacillocid\*. It can be used for the purpose of surface disinfection of all critical care areas.

Although phenols are reasonably good disinfectants, they should be phased out as they may cause damage to environmental water sources and aquatic life. If phenyl is to be used, then black phenyl should be suggested as white phenyl is mainly fragrance with reduced disinfectant activity.





# E

## HOSPITAL SUPPORT SERVICES

Support services in the hospital play a major role in ensuring that they provide the defined services in an efficient manner and also enable the other staff of the hospital to carry on the activities which are required for patient care delivery. An engaged and integrated support service team has significant effect on hospital services which allows patients to heal quicker, promotes a safer environment, and improves the satisfaction of staff, patients, and families. The contributions made by support service personnel in today's hospitals have become a crucial component to the organisation's success. Support service departments ensure that the hospital is clean, limiting the risk for infections; patient rooms are ready and available, improving throughput; food is nourishing and delicious, improving healing and wellbeing; linens are fresh, instilling trust and comfort; equipments work, improving clinical diagnostics and outcomes.

The major support services areas covered under these guidelines include:

- Laundry Services & Linen Management
- Water Sanitation
- Kitchen Services
- Security Services
- Outsourced Services Management

### LAUNDRY SERVICES AND LINEN MANAGEMENT

The provision of clean linen is a fundamental requirement for patient care. Incorrect procedures for handling or processing of linen can present an infection risk both to staff and patients who subsequently use it. Hence, correct linen management is important to prevent HAI and ensure a better hygienic hospital environment.

The term 'hospital linen' includes all textiles used in the hospital including mattresses, pillow covers, blankets, bed sheets, towels, screens, curtains, doctors coats, theatre clothes and table clothes. The hospital receives all these materials from different areas like OT, wards, outpatient departments and office areas.

#### ESTIMATION OF STOCK OF LINEN NEEDED BY THE HOSPITAL

Hospitals need to ensure that they have enough stock of linen (including reserve) readily available for all the areas of the hospital.

Different types of linen needed in the hospital include:

- **General Purpose Linen:** This includes linen which is not used for patient care like curtains, drapes, table clothes and similar items commonly used in all parts of the hospital
- **Patient Linen:** This consists of patient clothing such as pajamas, shirts, gowns, coats etc. worn by patients.
- **Bed Linen:** This consists of bed clothing such as bed sheets, pillow covers, blankets used by the patient.



- **OT, Labour Room, Procedure Room Linen:** This includes items such as pajamas, kurtas, gowns, coats, shirts etc. worn by surgeons, anaesthetists, OT personnel and also surgical gowns, caps, masks, trolley covers, OT towels etc. required in OT, labour room and procedure room.

### Number of Linen Sets

Hospitals need to ensure that they have at least four sets of linen per day, even though six sets are preferable.

Classification of six sets of linen needed in hospitals is as follows:

- One already in use (on bed)
- One ready to use (in sub store)
- One in transit-route to laundry or to the ward
- One in washing cycle in laundry
- Two in stock (in central store)

Thus, in an ideal situation, for a 100-bedded hospital, 600 bed sheets are needed.

Hospitals need to maintain the linen stock register for available linen in the central store or with laundry in-charge of the hospital.

## GENERAL INSTRUCTIONS FOR LAUNDRY MANAGEMENT

### LINEN

The basic principles of linen management are as follows:

- Place used linen in appropriate bags at the point of generation
- Contain linen soiled with body substances or other fluids within suitable impermeable bags and close the bags securely for transportation to avoid any spills or drips of blood, body fluids, secretions or excretions
- Do not rinse or sort linen in patient care areas (sort in appropriate areas)
- Handle all linen with minimum agitation to avoid aerosolisation of pathogenic micro-organisms
- Separate clean from soiled linen and transport/store separately
- Wash used linen (sheets, cotton blankets) in hot water (70°C to 80°C) and detergent, rinse and dry preferably in a dryer or in the sun
- Autoclave linen before being supplied to the operating rooms/theatres
- Wash woollen blankets in warm water and dry in the sun, in dryers at cool temperatures or dry-clean.

### BEDDING

- Mattresses and pillows with plastic covers should be wiped over with a neutral detergent
- Mattresses without plastic covers should be steam cleaned if they have been contaminated with body fluids. If this is not possible, contaminations should be removed by manual washing, ensuring adequate personnel and environmental protection
- Wash pillows either by using the standard laundering procedure described above, or dry clean if contaminated with body fluids.

### CLASSIFICATION OF LINEN

For laundry purposes, linen in the hospital is classified into two categories:

Dirty Linen	Soiled Linen
Dirty linen is used linen, but not visibly soiled with blood or blood tinged body secretions.	Soiled linen is known, or potentially, infected/infested linen. All linen which is contaminated with excreta, blood or body fluids or contaminated linen from a patient who is known or clinically suspected, to be infected with diseases like salmonella, Hepatitis A, B or C, open pulmonary tuberculosis, HIV etc.



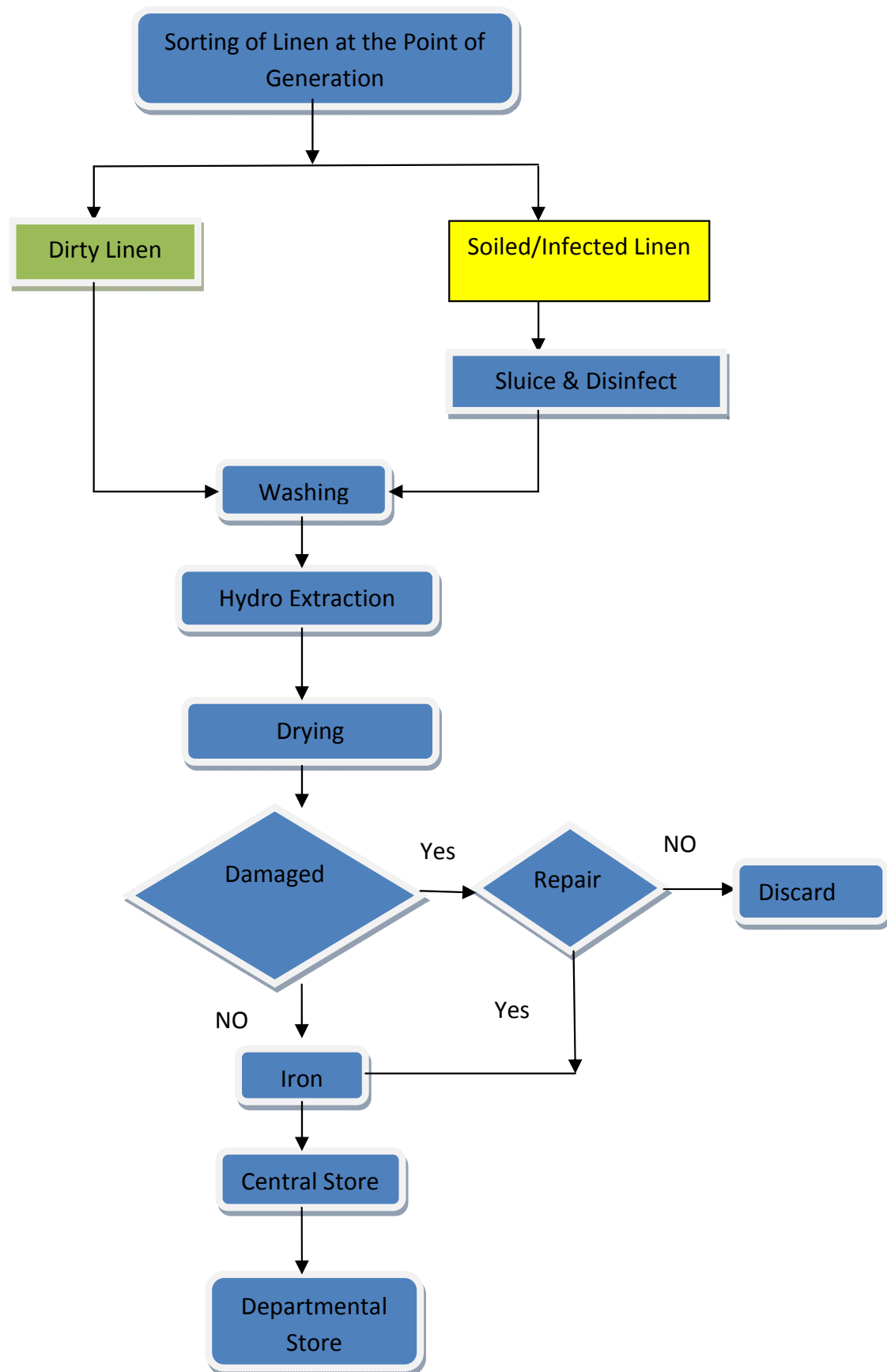


Figure 44: FLOW CHART OF LINEN MANAGEMENT



## PROCESS OF LINEN MANAGEMENT IN THE HOSPITAL

### LABELING OF LINEN

All linen being used in hospitals needs to be labelled for identification and traceability. Proper labelling of the linen also helps in proper inventory management. The label of the linen includes the following minimum details:

- Name of the hospital (XYZ)
- Name of the Department or Number of ward (ICU/OBS/WARD)
- Type of linen like Bed Sheets (BS), Patient Gown (PG), Pillow Cover (PC)
- Number of linen i.e. 1, 2, 3...
- Doctors coat labelled with Doctor's name

For example, bed sheets used in ICU of hospital can be labelled as: XYZ/ICU/BS/1, similarly bed sheet in general ward 1 can be labelled as: XYZ/GW1/BS/06

### LINEN COLLECTION AND SEGREGATION

- The hospital should have fixed schedule for the collection of linen from different areas of the hospital
- All the patient linen including bed sheets, patient gowns needs to be changed daily
- All the linen of critical areas like OT and ICU etc. need to be changed daily
- The staff linen needs to be changed on weekly basis
- It is strongly recommended to change all the linen used in the hospital when visibly dirty or are soiled
- While collecting linen, care should be taken to ensure all sharps or patient equipment is removed
- Staff should wear appropriate PPE like heavy duty gloves, apron and mask during linen handling. Any skin lesions on hands should be covered
- Hand hygiene should be practiced after linen handling
- Linen needs to be collected in bags and trolleys and should not be placed on the floor or any other surfaces
- All the linen generated from patient care areas should be segregated into dirty and infected linen. Linen generated from different areas of the hospital needs to be collected in different colour coded trolleys
- Dirty linen needs to be collected in a green coloured trolley and soiled linen in yellow coloured trolley. The laundry management protocol of the hospital needs to include segregation guidelines for all the staff of the hospital
- To minimise aerosolisation of any organisms contaminating linen, linen should not be rinsed, shaken or sorted in the clinical area. The personnel should keep his/her hands away from face while handling linen
- The collected linen needs to be stored at a designated place i.e. in dirty utility of the area of generation.
- The attendant/sister in-charge of the area needs to update the daily transaction register every time linen is collected from the area. The transaction register should include the details of the number of different types of linen items collected from the particular area. A separate register has to be maintained in different areas for the same.





*Colour coded bags for segregation of linen at the source*

*Figure 23: Colour coded bags for segregation of linen*

#### **TRANSPORTATION OF LINEN**

- Linen collected from different areas of the hospital needs to be transported in the covered trolleys to the laundry
- Dirty and soiled linen needs to be transported in separate trolleys
- A dedicated trolley for transportation of linen needs to be used and trolleys used for waste collection or any other purpose should not be used for transportation of linen
- During transportation it is to be ensured that the bags used for collection of linen are properly tied
- In case of any spillage of the soiled linen during transport, the linen needs to be securely placed in the transportation trolley and cleaning of the surface is undertaken as per the spill management protocol of the hospital.

#### **RECEIVING IN THE LAUNDRY**

The person responsible for receiving linen in the laundry needs to enter the details of the linen in the receiving and distribution register at the laundry. The details include type and quantity of linen received, the department from where linen is received, time and date of receiving.

Records are necessary to ensure quality assurance of linen and laundry management in the hospital.

#### **DISINFECTION AND SLUICING**

The first step of processing of the soiled linen is disinfection and sluicing of the linen. All infected linen needs to be soaked in 0.5% bleaching solution for 30 minutes, then thoroughly rinsing of the linen is carried out with plain water to remove the bleach. The linen is then handed over for washing.

If the laundry services are outsourced, it is the responsibility of the hospital to disinfect and sluice the soiled linen within the facility itself before handing over the same to the outsourced agency or personnel for further processing.





## WASHING

- **Washing by Hand**

**STEP 1:** Wash heavily soiled/infected 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

REMEMBER: Pre-soak in soap, water and bleach ONLY if linen is soiled

- Use warm water if available
- Add bleach (for example, 30–60 ml [about 2–3 tablespoons], of a 5%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 it is dirty or stained

**STEP 4:** Rinse the item with clean water.

- **Machine Washing**

**STEP 1:** Wash heavily soiled linen separately from non-soiled linen

**STEP 2:** Adjust the temperature and time cycle of the machine according to manufacturer's instructions and the type of soap or other washing product being used

**STEP 3:** When the wash cycle is complete, check the linen for cleanliness. Rewash if it is dirty or stained. (Heavily soiled linen may require two wash cycles)

**Dirty Linen:** Dirty linen (non-infected linen) is to be washed in the first batch, with plain water and detergent. Use of hot water with temperature > 71°C is recommended.

**Soiled & Infected Linen:** Infected linen is defined as linen derived from known infectious patients, including those with HIV, Hepatitis B, C and other infectious agents. After sluicing the infected linen is treated with hot water and detergent having temperature of more than 71°C with a minimum wash cycle for 25 minutes.

## HYDRO EXTRACTING AND DRYING

- Washed linen is put in the mechanised hydro-extractor for extraction of water from the processed linen. If hospital does not have the facility of hydro extracting the linen can be put to air dry in direct sunlight
- During the process of drying of the linen it is to be ensured that the linen is kept off the ground and away from dust exposure.

## REPAIR OF LINEN (IF NECESSARY)

- All the linen is checked for any damage, wear and tear
- In case of any damage like minor hole or tear observed, it should be sent for repair and mending
- If the linen is severely damaged and cannot be repaired, the same can be discarded or condemned as per the hospital condemnation policy, by the laundry supervisor.

## CALENDERING AND IRONING

- Bed sheets and other heavy linen needs to be calendered with mechanised calendering machines installed at the hospital



- If the hospital does not have the facility of calendering machines, the linen needs to be ironed using flat work iron and is folded properly.

#### **DELIVERY OF CLEAN LINEN**

- The processed linen is transported in clean covered trolley to the central store.
- It is to be ensured that the storage of clean linen before distribution is separate from dirty linen
- From the central store the clean linen is issued to respective departments based on the indent generated from the departments
- From the central store the linen is distributed to respective departments in the clean trolleys
- Record of issued linen needs to be updated in the central store room while the respective departments need to update the transaction register with the details of linen received in the department.

#### **BEDDING**

- Mattresses and pillows with plastic covers should be wiped over with disinfectant such as 70% alcohol or 1% chlorine solutions.
- Mattresses and pillow cover without plastic covers should be washed with water and detergent and left for air drying after discharge of every patient, or on weekly basis if occupied by same patient
- Blankets may be dry cleaned or hand washed. It can be done by soaking for 15 minutes in lukewarm water. Then soap suds are squeezed through the blanket and then rinsed in cold water at least twice. The blanket should not be twisted or wrung. It should be dried by spreading on clean surface.

#### **RESPONSIBILITY OF LINEN MANAGEMENT**

- **Change of Linen** - Staff Nurse/Ward Attendant
- **Sorting and Storing of used Linen** - Ward Attendant/Housekeeping Staff
- **Disinfection of Soiled/Infected Linen** - Housekeeping/Laundry Staff
- **Collection of Used/Soiled Linen** - Laundry staff
- **Counting of Collected Linen** - Laundry Staff/Nursing In-charge
- **Transporting Dirty Linen** - Laundry Staff
- **Washing, Drying and Ironing** - Laundry Staff
- **Receipt of Washed Linen in Departments** - Nursing In-charge
- **Storage and Issue of Washed Linen** - Nurse In-charge
- **Table 23: Do's and don'ts for Linen Management**

Do's	Don'ts
A rack for keeping used and ready to use linen should be available close to the point of use	Carry used linen close to the body
Sharps to be removed from the linen	Drop linen on the floor
Appropriate tagging and labelling of linen bags	Shaking linen as this will result in the dispersal of potentially pathogenic micro-organisms
Decontaminating hands immediately following removal of PPE after handling used linen and before handling clean linen	Overfilling of used linen bags
A disposable plastic apron should always be worn when handling used linen and disposable gloves should be worn where linen is soiled/foul.	Linen bags containing used linen stored in corridors (should be keep in a separate designated area)  Storing clean and used linen in the same area.



## RECORDS

List of files and registers to be maintained for linen management in the hospital:

- Linen stock register at the central store
- Area wise daily transaction register
- Laundry and linen receiving register and distribution register at the laundry

## WATER SANITATION

Availability of adequate water, sanitation and hygiene services are essential components of providing basic healthcare services in the healthcare facilities.

In a survey done by WHO, involving data from 54 low and middle income countries and, representing 66,101 facilities show that, 38% of health facilities do not have an improved water source, 19% do not have improved sanitation and 35% do not have water and soap for hand washing. This lack of services compromises the ability to provide basic, routine services, such as child delivery and compromises the ability to prevent and control infections.

In the health facilities, availability of clean drinking water is one of the major components contributing to patient safety. Hence water sanitation is inevitable in health facilities for better patient care.

In order to assure better healthcare services, in relation to water sanitation in the healthcare facilities, it is to be ensured that hospitals have adequate supply of water, with proper storage facilities and quality of water supplied is ensured.

## WATER REQUIREMENT IN THE HOSPITAL

The use of water in hospitals is not only limited to cleaning or drinking purposes but is also needed for carrying out other important functions in various departments like sterilisation & disinfection, kitchen, radiology (film processing), analytical labs, pure water systems, laundry, gardening, firefighting, dialysis etc. Thus for continuation of the basic services in hospitals and ensuring safe patient care, uninterrupted supply of water is a prerequisite to be met. Hospitals need to calculate the water requirement of the facility and should plan accordingly.

As per BIS the water requirement in the hospital is as follows:

**Table24: Water requirements of the hospital**

Type of Facility	Water Requirement
Bed Strength: Not exceeding 100	340 lt/bed/day
Bed Strength: Exceeding 100	400 lt/bed/day

Water requirement for hospitals having bed strength not exceeding 100 need to have a supply of at least 340 litres per bed per day and for hospitals having bed strength exceeding 100 in number needs to meet the requirement of 400 litres per bed per day. The water requirement of hospitals needs to be calculated as described.

It is to be ensured by the hospital that water in the hospital is available on **24X7** basis and is readily available at all points of use. Any interruption in ready supply of water needs to be immediately resolved to ensure the continuity of supply at the place of work.

***It is to be noted that this water requirement does not include the water requirement for fire safety.***



## STORAGE OF WATER

- Water supply in the hospital, as per requirements listed above, needs to be stored in an appropriate manner in overhead tanks or underground tanks required in case of fire emergencies in the hospital
- The storage tanks need to have capacity to store up to 48 hours of water requirement of the hospital
- The storage tanks need to be covered with appropriate sealed lid and needs to be under lock and key, under the jurisdiction of a dedicated person of the hospital
- It is recommended that while planning the storage tanks, ease of cleaning factor should be kept under consideration.

## ENSURING THE QUALITY OF WATER

### WATER TESTING

Since water is used extensively for drinking, cleaning and disinfection purposes all over the hospital, the quality of supplied water becomes very critical.

#### Physical Testing of Water

- Physical testing for hardness, total dissolved solids (TDS) and other parameters needs to be done at least once a year on samples obtained directly from the source e.g. well water and bore water
- Testing should also be repeated if the source of water changes e.g., new bore well is made or major repairs/cleaning is done on existing source e.g., well is cleaned/disinfected
- Physical testing is not required if municipal/corporation water supply is used for all purposes at all times.

#### Microbiological Testing of Water

1. Water used for cleaning and disinfection needs to be tested microbiologically by methods that will allow growth of waterborne organisms. Standard microbiology protocols are to be followed for the testing
2. Microbial testing of water at a given location is to be done every three months and additionally when the source is changed/major repairs are done on the supply system or a water related outbreak of infection is suspected
3. Generally, the following samples should be obtained at the minimum:
  - OT scrub basin tap (any one tap)
  - ICU/SNCU hand wash basin tap (sample all ICUs/SNCU present)
  - Casualty/emergency ward hand wash basin tap
  - Hand wash basin tap in a ward that caters to maximum number of patients
  - Drinking water sources

The samples should show absence of coliform organisms. If water contamination is observed investigate for possible water contamination. The supply source and system should be checked (and disinfected if required).

For ensuring the quality of water being supplied in the hospital, the following minimum listed interventions are needed to be carried out by the hospital:

### STEP1: CLEANING OF STORAGE TANKS



- Water storage tanks need to be manually cleaned for any residual debris or any growth of unwanted flora or fauna in the tanks. Records of cleaning of tanks need to be kept by the hospital for proving compliance
- All overhead tanks need to be manually cleaned at least at an interval of six months
- The date of water tank cleaning needs to be written on the water tank for ready visibility and easy remembrance for next schedule of cleaning
- It is suggested that tanks that previously held water but have been out of use for some time should also be cleaned and disinfected.

### **Steps of Cleaning**

- Open the outlet valve or tap and drain out any remaining liquid
- Permanent storage tanks are usually fitted with a washout valve that draws liquid from the base. Use this, rather than the normal outlet valve, for emptying
- Use a mixture of detergent and hot water (household laundry soap powder will do) to scrub and clean all internal surfaces of the tank. This can be done with a stiff brush or a high pressure jet. Attaching the brush to a long pole may make it possible to clean the tank without entering it
- Drain all the water from the tank and collect for safe disposal as before. Continue flushing the tank until there are no longer traces of detergent in the water
- Pumps and pipes used for filling and emptying the tank should also be cleaned. Flush a mixture of hot water and detergent through the pipes and pump to remove deposits and other waste material. Once cleaned, flush the system with clean water to remove the detergent.

### **STEP 2: DISINFECTION OF WATER TANKS**

The most common way of disinfecting a water tank is by chlorination. Chlorination is the process of adding chlorine to drinking water to disinfect it and kill germs. Chlorination of drinking water helps in neutralising the micro-organisms present in the water and eventually helps in reduction of transmission of diseases in the community or in the health facility. Drinking water with small amounts of chlorine does not cause harmful health effects and provides protection against waterborne disease outbreaks.

Chlorine is delivered in a variety of ways but the most common is high-strength calcium hypochlorite (HSCH), which, when mixed with water, liberates 60 to 80% of its volume as chlorine.

### **Steps of Disinfection of Tanks**

- Add the disinfectant; fill the tank a quarter full with clean water
- Sprinkle 80 grams of granular HSCH into the tank for every 1000 litres total capacity of the tank
- Fill the tank completely with clean water, close the lid and leave to stand for 24 hours
- If the tank is required for use urgently, double the quantity of chlorine added to the tank. This will reduce the time of disinfection from 24 to 8 hours
- Wash and flush the tank. This is most easily done with a high pressure hose pipe or water jet but if they are not available the tank can be filled with (preferably hot) water and left to stand for a few hours
- Prepare for use. cCompletely empty the tank and carefully dispose off the disinfecting water as it will contain a high concentration of chlorine
- Fill the tank with drinking water; allow to stand for about 30 minutes then empty the tank again
- The tank is now ready for use.



### STEP 3: TESTING OF WATER QUALITY

#### Testing of Free Chlorine

- The presence of chlorine residual in drinking water indicates that:
  - a sufficient amount of chlorine was added initially to the water to inactivate the bacteria and some viruses that cause diarrheal disease; and,
  - the water is protected from recontamination during storage.
- The presence of free residual chlorine in drinking water is correlated with the absence of disease-causing organisms, and thus is a measure of the potability of water
- Hospitals need to carry out testing for presence of free chlorine at 0.2 ppm
- Testing needs to be carried out at regular intervals from the samples drawn from potable water and records of the same need to be maintained for proving compliance.

#### MICROBIOLOGICAL SURVEILLANCE OF WATER

- Hospitals need to carry out microbiological surveillance of the water, drawing samples from overhead tanks and from drinking water facilities
- Records of this surveillance need to be kept for proving compliance.

**Table25: Quantity of chemicals needed to disinfect water for drinking\***

Water (m <sup>3</sup> )	Bleaching Powder (25-35%) (g)	High Strength Calcium Hypochlorite (70%) (g)	Liquid Bleach (5%sodiumhypochlorite) (ml)
1	2.3	1	14
1.2	3	1.2	17
1.5	3.5	1.5	21
2	5	2	28
2.5	6	2.5	35
3	7	3	42
4	9	4	56
5	12	5	70
6	14	6	84
7	16	7	98
8	19	8	110
10	23	10	140
12	28	12	170
15	35	15	210
20	50	20	280
30	70	30	420
40	90	40	560
50	120	50	700
60	140	60	840
70	160	70	980
80	190	80	1100
100	230	100	1400





Water (m <sup>3</sup> )	Bleaching Powder (25-35%) (g)	High Strength Calcium Hypochlorite (70%) (g)	Liquid Bleach (5% sodium hypochlorite) (ml)
120	280	120	1700
150	350	150	2100
200	470	200	2800
250	580	250	3500
300	700	300	4200
400	940	400	5600
500	1170	500	7000

*\*Approximate dose - 0.7mg of applied chlorine per litre of water*

**Table 26: Bacteriological Quality of drinking water<sup>a</sup>**

Organism	Guideline Value
All water intended for drinking	
E.Coli or thermotolerant coliform bacteria <sup>b</sup>	Should not be detectable in any 100ml sample
Treated water entering the distribution system	
E.Coli or thermotolerant coliform bacteria <sup>b</sup>	Should not be detectable in any 100ml sample
Total coliform bacteria	Should not be detectable in any 100ml sample. In case of large supplies, where sufficient samples are examined, should not be present in 95% of samples taken throughout any 12-month period
<p><i>a. Immediate investigative action should be taken if either E. Coli or total coliform bacteria are detected. The minimum action in case of total coliform bacteria is repeat sampling; are these bacteria detected in the repeat sample, the cause should be determined by immediate further investigation</i></p> <p><i>b. Although E. Coli is the more precise indicator of faecal pollution, the count of thermotolerant coliform is an acceptable alternative. If necessary, proper confirmatory tests need to be carried out. Total coliform bacteria are not acceptable indicators of the sanitary quality in rural water supplies, particularly in tropical area where many bacteria of no sanitary significance occur in almost all untreated supplies</i></p>	

## KITCHEN SERVICES

- Kitchen serves as one of most important support services department in the hospital as it helps in stimulation of rapid recovery of patients by providing food to the patients as per the specific patient requirements. However, kitchen establishments are identified as places that may lead to outbreaks of food-borne infections
- Quality and quantity of food are key factors for patient recovery. Ensuring safe food is an important service delivery in healthcare. Hospital patients may be more susceptible to food-borne infection, and suffer more serious consequences than healthy people. Thus, high standards of food hygiene should be maintained throughout the service delivery. The need for adequate food hygiene facilities



is of paramount importance in kitchen services. Assuring safe food requires management and control of microbiological, chemical, and physical hazards

- For maintenance of proper hygiene and infection-free environment in the kitchen services department of the hospital, the following minimum interventions need to be carried out while planning or executing the kitchen or dietary services in the healthcare settings.

#### LOCATION OF THE KITCHEN DEPARTMENT

- The kitchen department needs to be located away from the patient care areas, if feasible, in a separate building
- It is preferable if kitchen department is located on the ground floor of the hospital where there is easy accessibility for receiving of raw materials and distribution of food through food trolleys
- Location should ensure that any noise or cooking odours emanating from the department do not cause any inconvenience to the other departments
- The location should involve the shortest possible time in delivering food to the wards.

#### GENERAL LAYOUT AND REQUIREMENTS

- The kitchen area should be physically separate from patient care areas and located away from biomedical waste collection/disposal area.
- The kitchen complex should contain, at the minimum, the following physically separate areas:
  - Raw supply receiving and checking area
  - Separate room for storage of raw material, vegetables with appropriate numbers of refrigerators, racks, etc.
  - The kitchen itself should have defined areas for processing of raw food (washing, cutting vegetables etc.), cooking area (where the food is actually cooked), holding area for cooked food and dispensing counter/area
  - Separate area to temporarily hold waste from the kitchen
  - Separate area to store cleaning equipment e.g., mops, buckets and cleaning chemicals. This should not be connected to the storage area in any manner (open door/ window)
  - A dedicated toilet for use by kitchen staff
- Adequate supply of treated water should be ensured at all times. If borewell/well water is used, there should be a provision for disinfection using chlorine or boiling before use
- Windows should be fitted with mesh screens to prevent entry of insects, lizards etc.
- All food grain storage should be done on raised pallets/stands with a minimum clearance of 8-12 inches from the floor. Pallets should ideally be made of metal as wooden ones are not easy to clean. All refrigerators, freezers and other floor-based equipment should have the same clearance above the floor
- Storage pallets, refrigerators should have clearance from all sides to enable inspection and cleaning
- The storage room should not have high temperature. An AC should be installed if possible. An exhaust fan should be installed if an AC is not available. The windows should be kept closed at all times. A thermometer to measure room temperature should be available in the room and a daily log of the same should be maintained
- The storage room should have smooth internal surfaces without cracks and crevices in the walls or floor



- Separation of cooked and raw food should be maintained at all locations. Holding/storage areas for the two should be separate from each other
- Hand wash basins should be available in the food preparation area. These should be separate from the basin used to wash raw food
- Alcohol hand rub should be available in the food preparation area
- Adequate ventilation should be provided. Exhaust fans should be available in the cooking area to exhaust the hot air generated by stoves
- Weighing/measuring apparatus for raw and clean/cooked foods should be separate e.g., different jugs should be used to measure raw milk and heated milk.

#### GENERAL CLEANING OF ENVIRONMENT

- Separate mops, buckets and cleaning chemical supplies should be used for the kitchen
- All floors in the kitchen complex should be cleaned at least twice a day using soap and water. Cleaning should begin with the food storage room and proceed to preparation and cooking area. The waste storage area and the cleaning equipment storage area should be cleaned last (clean to dirty sequence should be followed)
- Additional cleaning should be done as and when required e.g., spills should be cleaned immediately. If the floor appears dirty, it should be cleaned immediately
- Food storage pallets should be cleaned by wiping with soap and water at least weekly
- Equipment such as tables and food preparation and holding counters should be wiped with chorine solution containing 500 ppm of chlorine (1% dilution of hypochlorite) at least twice a day or before and after food preparation, whichever is suitable. The solution should remain wet on the surfaces for at least one minute
- Weighing machines used to weigh raw material should be cleaned once a day and whenever soiled, by wiping/washing with soap and water
- Cooking stoves should be wiped clean with soap water before and after use. They should always appear clean. Cooking gas cylinders attached to the gas stove should also be wiped with soap and water once a day.
- Change the mop heads/mop and brushes when they become frayed or at least every two weeks, whichever is earlier. Clean with soap and water before next use.

#### Cleaning of items used to handle food

- Equipment that comes in contact with food – cutting boards, knives, mixing utensils, cooking utensils, serving plates and bowls, glasses, etc should be washed with soap and hot water (if available) and then immersed in chorine solution containing at least 250 ppm chorine (0.5% dilution of hypochlorite) for at least one minute. Do not use hot water to prepare chlorine solutions. After immersion, rinse with plain water immediately and allow to dry naturally before use
- Cleaning of these equipments should be done before the first use of the day. During the day, these equipments should be washed with soap water after use and whenever they appear soiled/dirty
- When not in use, store these items in a closed cupboard or container e.g., all knives, spoons will be cleaned at the end of the day, dried and stored in a closed plastic box until next morning; utensils will be stored in closed cupboards or covered with a plastic sheet.



## Hygiene and medical examination of food handlers

- All persons handling food will undergo periodic medical examination and laboratory testing at the following times:
  - Initially before joining the job
  - Subsequent medical examination should be done as under:
- Complete physical exam – once a year.
- Stool examination for ova, cysts and parasites – every three months
- Stool culture for salmonella – every three months.
- Routine complete blood counts (CBC) – every three months
- Other investigations such as chest x-ray, widal test, stool culture for cholera etc. should be done as and when required based on the findings of routine testing or reported symptoms
- Testing frequency of relevant tests should be increased during an outbreak of diarrheal disease
- All food handlers should be vaccinated against Hepatitis B, salmonella, and cholera.
- The following hygiene rules should be followed by all kitchen workers:
  - Fresh washed clothes are worn every day
  - Hair is kept short or tied in a bun in case of females. Loose hair should not be allowed in the kitchen under any circumstances. Male employees should preferably be clean shaven. If beards are grown they should be properly maintained
  - Netted cap covering all head hair will be worn by all kitchen workers on duty
  - Nails will be kept short and clean
  - Hand jewellery will not be worn while on duty
  - Apron should be worn when handling food
  - Hand washing should be done on joining duty, after completing a task (e.g., vegetable cutting, cooking the food, etc.) and whenever the hands are visibly dirty/soiled. Hands should also be washed after using the washrooms, after eating food and before leaving duty
  - Hands should be disinfected using an alcohol hand rub before handling raw food, before beginning cooking, before dispensing cooked food, after washing utensils, before leaving duty
- Any illness should be promptly reported and the worker should undergo appropriate examination and take the recommended treatment without delay.

## Receipt and storage of raw food

- Raw food supplies should be checked for contamination in the receiving area before taking them to the storage area
- Gross dirt should be removed by washing foods such as potatoes and fruits before storage
- Boxes should be wiped with soap and water to remove external dirt before being taken to the storage area. Excessive water should not be applied
- Only clean food supplies should be taken to the storage area
- Grains should be stored in closed containers on raised pallets. Containers should be washed and dried before they are refilled with grains. Grains requiring aerated storage may be stored in clean



- jute bags with the mouth securely tied
- Vegetables and fruits should be stored in the refrigerator at 2-4°C temperature
- Excessive stocking of perishable items such as bread, eggs should be avoided
- The storage room should be maintained dry and clean at all times
- Cooked food should never be stored in the storage room
- Monitor for pests on a daily basis and report immediately, if seen.

#### **Cleaning and disinfection of vegetables before use**

- Wash vegetables and fruits in running plain water of drinking quality
- Remove damaged/bruised areas of leafy vegetables. Do not cut open fruits, potatoes before disinfection
- Immerse in chlorine solution containing 200 ppm chlorine (can be prepared by making a 0.5% dilution of hypochlorite solution or using chlorine tablets/powders as recommended by manufacturer). Immerse for one minute for proper disinfection
- Immediately after this rinse with plain water to remove all residual chlorine
- Drip dry or wipe dry as suitable and transfer to food preparation area immediately. Cleaned food should not be left in the washing area.

#### **Processing of raw food for cooking**

- Preliminary preparation of the food should be done in a designated area of the kitchen
- Wash and disinfect hands before handling the food
- Make sure cutting boards, knives and other containers and the counter tops are clean
- Use separate knives and cutting boards for vegetables and fruits
- Take up the prepared raw food for cooking/serving as soon as possible. Avoid storing and using later as much as possible.

#### **Food preparation**

- Wash hands with soap and water before beginning cooking
- Ensure all utensils and other equipment are clean before beginning
- Use a clean container/measuring apparatus to measure out food portions
- Use correct temperatures for cooking the food
- Cook eggs until the yolk and white are firm
- Cooked and raw food should be kept separate e.g., use different counters for each
- Food should not be consumed in preparation area.

#### **Storage and dispensing of prepared food**

- Prepared food should be kept covered and served as soon as possible
- Wear clear plastic gloves when dispensing food
- Plates, glasses, ladles, cups etc. used to handle cooked food should be clean. Inspect visually before using.



## REFRIGERATORS

- Monitor the temperature of all refrigerators by placing a thermometer inside them and record the readings at least once daily. The temperature should be maintained between 2-4°C. Electronic sensors may be used, if available
- Place refrigerators away from heat sources and keep clearance at the back of the unit to allow hot air to escape
- The following cleaning procedure should be used to clean all refrigerators:
  - Switch off the unit and remove all food items, ensuring that these are covered in the appropriate manner and are kept safe during the cleaning process
  - Remove all shelves and scrub clean with soap and water
  - Clean the fridge walls and base in that order with soap and water
  - Remove all condensation from drip/chiller trays (if applicable) and wipe down all inner walls with a clean cloth
  - Replace all shelves and switch on the unit.

## Waste disposal

- Kitchen waste should be segregated into dry and wet at the point of generation.
- Wet waste should be collected in waterproof bags. This waste can be used for composting.
- Waste bags should be tied and disposed off each evening or when three fourths full, whichever is earlier.
- Kitchen waste should not be mixed with biomedical waste.

## Pest control

- The entire kitchen area should be sprayed with pesticides every three months and whenever large numbers of pests are detected
- Rodent traps should be placed in various areas and checked daily
- Pest infestation should be looked for daily and reported immediately when detected.



Figure 46: Food distribution through covered trolley





## HOSPITAL SECURITY SERVICES

Security services of hospitals are of vital importance, being public dealing organisations visited by thousands of people every day. It is very difficult to anticipate the intentions of antisocial elements. It is also very difficult to check visitors without offending their sentiments.

Each hospital should have Safety and Security Management protocols to describe the processes designed to eliminate or reduce, to the extent possible, hazards in the physical environment and to manage staff activities, to reduce the risk of injuries to individuals and loss of property.

In relation to maintenance of cleanliness and hygiene, security services in the hospital need to carry out the following functions in the hospital:

### DRESSING AND BEHAVIOUR OF SECURITY STAFF

- All the security staff need to be dressed meticulously as per the dress code of the hospital
- Smoking, drinking, chewing tobacco should be prohibited while on duty
- Security personnel should observe compassionate and commensurate behaviour within the facility
- Hospital security services need to be trained in crowd management and handling of agitated patient and visitors
- Security services need to be provided with communication system to be used in the event of an emergency and for alarming purpose.

### GUARDING OF CRITICAL GATEWAYS

It is to be ensured by the hospital that all the main entrances of the hospital are guarded by security personnel. Locations where security needs to be present to check the nuisance and unauthorised entry are:

- Main entrance of the hospital
- Wards especially prison wards
- OT and labour room
- Critical care area like ICU, HDU, SNCU
- Emergency
- Waiting area

It is also recommended that security services are available in the hospital on 24X7 basis.

### CROWD MANAGEMENT

Crowd management in the hospital is one of the critical functions being performed by the security personnel. Hospital environment is mostly stressful for most of the visitors. Thus efficient crowd management in the hospital is necessary to ensure safety of staff and environment.

- For efficient crowd management, security personnel should maintain professional manner, and remain neutral in word and deed, in the face of antisocial behaviour of the crowd
- Security personnel need to proactively and repeatedly attempt to establish and to maintain communication and cooperation with representatives of agitated crowd or individual
- Security personnel need to supervise the availability of patient amenities in the waiting areas of the facility, as unavailability of these are the major factors for discontent among visitors



- Security personnel need to ensure that the patient calling system is followed in the OPD area though proper queue management
- Security personnel are also responsible for visitor management as per the visiting hours policy of the hospital.

## VIGILANCE AND REPRIMAND ACTIVITY

### VIGILANCE ACTIVITY

Besides carrying out the normal function of ensuring safety in the hospital, hospital security personnel is also needed to carry out the vigilance activity with respect to hygiene, sanitation and cleanliness in the health facility.

- Security personnel should take round of all the important and sensitive points of the premises as specified by the hospital and check/block access of loitering/unlawful persons and vagabonds
- Guards on duty should take care of vehicles, scooters/motor cycles/bicycles parked in the parking sites located within the premises of the hospital and should ensure that the vehicles are parked in designated spaces and should not block the access pathways
- Security personnel also need to be vigilant for any stray animals within the premises
- They should ensure that flower plants, trees and grassy lawns are not damaged either by the staff or by the outsiders or by stray cattle
- They should keep a strict vigil on suspicious looking persons/objects and take immediate action as deemed suitable
- Security personnel should also ensure that any person including staff, visitor or patient do not indulge in unhygienic behaviour like littering, spitting, open field urination, defecation etc.
- They should restrict unauthorised vendors or rag pickers inside the campus
- Hospital security services should also ensure that central waste storage area of the hospital is secured.

### REPRIMAND ACTIVITY

- Hospital security services need to be empowered with authority to reprimand any person involved in any unhygienic behaviour in the hospital
- The reprimand authority needs to be fixed by the hospital administration.

## OUTSOURCED SERVICES MANAGEMENT

There are two facets to service delivery in health facility - the Cure and the Care part. "The Cure" part is the services offered by medical team for the diagnosis and treatment of the ailment whereas "the Care" part is the hospitality services within the hospital provided by nonmedical and skilled/semiskilled/unskilled employees.

Many hospitals prefer to outsource their care services like security, housekeeping, laundry etc. to external agencies as creating infrastructure to render these services and most importantly managing the manpower and regulating their rate of absenteeism, unavailability, and uncalled legal issues is difficult. Hence, hospitals today prefer focusing on medical care and latest technology and offloading the ancillary services to experienced facility management agencies.

With outsourcing, an external contractor assumes responsibility for managing one or more of a healthcare organisation's business or services. Because the contractor specialises in providing a specific service



and can achieve economies of scale, he/she may be able to provide a service more efficiently and less expensively than the healthcare organisation.

### Types of Outsourcing Services in Hospitals

- **Outsourcing of non-clinical services:** such as security, housekeeping, laundry, janitorial and security services
- **Outsourcing of specialised healthcare services:** such as diagnostics and laboratory.

While outsourcing the services, hospitals need to ensure the following minimum requirements:

### VALID AGREEMENT/CONTRACT WITH OUTSOURCED AGENCY

- Hospitals need to evaluate services to be outsourced based on the need of the hospital. They should independently evaluate the extent of service required including number of personnel, timing of service, deliverables etc.
- Hospitals need to form a committee for detailing the request for proposal, for designing the measurable tools to monitor and evaluate performance of outsourced agency
- Hospitals need to have a valid agreement with the outsourced agency for any services that are being outsourced
- A formal agreement/contract needs to be signed between both the parties i.e. hospital and the outsourced agency, covering all the requirements to ensure that the services are provided as per the need of the hospital and are monitored and reviewed periodically
- Having a formal agreement/contract with the outsourced agency also puts the outsourced agency under legal obligations for ensuring the delivery of services
- The outsourced agency should be hired through tendering and the letter for award of work should be issued to the agency.

### ESSENTIAL COMPONENTS OF THE CONTRACT

The contract signed between the hospital authorities and outsourced agency needs to cover at least the following essential components:

### Well Defined Measurable Deliverables

While engaging an outsourced agency it is to be ensured that the deliverables of the outsourced agency in regards to the service parameters are clearly defined in terms of work to be done and verification of the deliverables.

**Table27: Example of measurable deliverable of contract**

S.no.	Measurable Deliverable	Type of Service
1.	Qualification and training of staff, TAT for various tests, Quality Assurance System	Laboratory investigations and diagnostics
2.	Response time for repairs	Maintenance
3.	Waste collection timings	BMW waste
4.	Cleanliness frequency and schedule, manpower requirements	Housekeeping services
5.	Manpower requirement, duty hours etc.	Security services



## PENALTY CLAUSE FOR NON-PERFORMANCE OR SUB STANDARD PERFORMANCE

A penalty clause is defined as a provision listed within a contract which imposes a certain sum of money on the part of contracting party for a specific default.

The contract/agreement with the outsourced agency needs to clearly define the penalty clause and events or circumstances for which the penalty can be imposed. These events need to be listed against the defined measurable deliverable of the contract and penalty enforced in case of non-performance and substandard performance of the outsourced agency.

Penalty may include reduction in agreed payment terms or non-payment of services or cancellation of the services.

Hospitals need to ensure that they evoke the penalty clause in event of non-performance or sub-standard performance of the services. Any such event needs to be duly recorded and records of the same are to be retained by the hospital.

## RELEASE OF PAYMENTS

The contract/agreement signed between both the parties need to clearly define the payment terms clause in the contract. The terms of payments should include:

- The cost of services
- Payment delivery mode
- Frequency of payment i.e. monthly, quarterly, annually etc.
- Break-up of costs and submission of invoice for the services provided
- Timeline to be followed for release of payments after receiving of undisputed invoice
- Details of other charges to be paid by the client in respect of the services.

## PERFORMANCE EVALUATION OF OUTSOURCED SERVICES

The services provided by the outsourced agency should be monitored by a nominated officer of the hospital. For poor quality services received, suitable intimation should be sent clearly bringing out the deficiency. Suitable action and penalty should also be imposed for improvement.

Performance of the outsourced services can be measured against:

- Measurable deliverables listed in the contract
- Timeliness and promptness of services being rendered
- Quality of services
- Communication and satisfaction parameters

Hospitals needs to ensure that they out performance evaluation of the outsourced agencies and all the records of the same are kept for proving compliance.



# HYGIENE PROMOTION



Hygiene promotion is a planned and systematic approach to preventing diseases and promoting health through the widespread adoption of safe hygienic practices.

Hospitals being an integral part of society, as social and medical organisations, provide plentiful opportunities for healthcare workers to interact with representatives from different sections of society in the form of patients, their attendants and visitors. Hence, health facilities are most suited for hygiene promotion and can play a pivotal role in hygiene promotion.

Improving access to safe water and sanitation facilities leads to healthier families and communities. However, when people are also motivated to practice good hygiene, health benefits of the community are significantly increased. This could be through hand washing practices, cleaning practices, safe waste disposal methods and other good practices regarding hygiene and sanitation.

The goal of hygiene promotion is to help people understand and develop good hygiene practices, so as to prevent diseases and promote positive attitudes towards cleanliness. Several community development activities can be used to achieve this goal, including education and learning programmes, encouraging community management of environmental health facilities, and social mobilisation and organisation. Hygiene promotion is not simply a matter of providing information. It is more a dialogue with communities about hygiene and related health problems to encourage and improved hygiene practices.

This section of the guidelines talks about the different methods which can be adopted for hygiene promotion both in the community and within the hospital as well.

## COMMUNITY MONITORING AND PATIENT PARTICIPATION

Community participation is one of the key ingredients to empower the community with regard to maintaining and promoting cleanliness and hygiene in society. Participation of the community with engagement of citizens and social partners results in community awareness and development, raising more resources, achieving better results and developing a more holistic and integrated approach towards hygiene and cleanliness. Community participation is critical to community success in maintaining and promoting cleanliness in particular sections of society.

Monitoring cleanliness of the facility with participation from different sections of society empowers the society by providing the ownership towards cleanliness of the hospital. Patient participation in promoting hygiene and cleanliness in the facility also enables the individuals to contribute towards overall hygiene and cleanliness of the facility.



## INVOLVEMENT OF LOCAL GOVERNANCE BODIES IN CLEANLINESS DRIVE

Hospitals should involve the Rogi Kalyan Samiti (RKS) or local NGOs, civil society organisations for monitoring of activities within the facility. Hospitals should also involve these local bodies in not only monitoring cleanliness but also in carrying out cleanliness activities in the facility. Such collective efforts for promoting the overall hygiene in hospital also increase the accountability of society and staff in maintaining and promoting the cleanliness drive.

It is recommended that the monitoring of cleanliness activity by RKS committee should be done on monthly basis and records of such monitoring need to be kept for proving compliance.

## PATIENT COUNSELLING

Hospitals should ensure that they carry out counselling of patients with regard to hygiene promotion and best practices to be followed for personal and facility cleanliness. Patient counselling can be done by the treating doctors, staff nurse or members of Infection Control Committee of the hospital.

Patient counselling includes education on:

- Personal hygiene
- Hand washing technique
- Segregation and safe disposal of waste (General and BMW)
- Overall cleanliness methods and benefits
- Water sanitation and rain water harvesting etc.

Patient counselling can be carried out during general interactions with patients during hospital rounds or by organising special counselling sessions.

## PATIENT RESPONSIBILITY WITH REGARD TO CLEANLINESS

Hospitals should frame patient responsibilities in relation to cleanliness of the hospital and these may be included in the overall responsibilities of the patients.

Hospitals need to ensure that the framed patient responsibilities are prominently displayed at various locations of the hospital.

**Some patient responsibilities are listed below. It is suggested that hospitals may add or modify these as per their requirements.**

- To maintain overall cleanliness in the hospital
- To perform proper waste disposal methods
- Not to litter, spit or spill in open spaces in the facility
- To follow hand washing instructions as displayed in the hospital
- To provide feedback on cleanliness of hospital
- To limit the number of visitors in the facility and follow the visiting timings
- To educate families and attendants regarding cleanliness protocol of the hospital
- To report to the staff of the facility any issues or complaints in relation to the cleanliness of the facility.

## FEEDBACK SYSTEMS FOR PATIENT FEEDBACK ON HYGIENE AND CLEANLINESS

Hospitals should ensure that they have a system in place for obtaining feedback from patients and visitors





of the hospital in relation to the overall cleanliness of the facility.

System of obtaining the feedback:

- Through use of structured feedback format
- Obtaining suggestions and complaints through complaint or suggestion boxes installed at prominent locations
- Obtaining feedback using complaint or suggestion registers.

Hospitals need to analyse and take corrective actions based on feedback of the patients. All the records related to the same need to be kept by the hospital for proving compliance.

## **INFORMATION, EDUCATION AND COMMUNICATION**

IEC combines strategies, approaches and methods that enable individuals, families, groups, organisations and communities to play active roles in achieving, protecting and sustaining their own health. IEC means sharing information and ideas in a way that is culturally acceptable to the community, using appropriate channels, messages and methods. IEC interventions should involve the active participation of the target audience and adopt channels and techniques that are familiar to the community.

IEC activities can provide people with the opportunity to develop their personal knowledge, skills and confidence and to reconsider their attitudes, beliefs and behaviour. It can increase awareness, provide information, persuade and motivate people to change behaviour.

Hospitals can use a range of materials, activities, and approaches as part of an IEC campaign. They need to promote social awareness and community change by putting up posters and other visuals in health facilities and public places. Some of the approaches that can be used include the following:

- Printed materials
  - Brochures
  - Posters
  - Wall calendars
- Mass media
- Billboards
- Advertisements
- Desktop flipcharts
- Television, radio and the use of DVDs/VCDs
- Public service announcements
- Print media, i.e. newspapers, magazines
- Use of education materials on hospital stationery and other materials like medicine dispensing covers

Hospitals need to ensure that the IEC material is printed in bilingual language. Use of local language should be preferred. Some of the IEC materials related to “SBA” and Kayakalp has been placed at annexure “. Hospitals are advised to use these IEC materials after considering local context and priorities.

### **General Instructions while Planning IEC Materials**

- Do not clutter too many messages at one place



- Use simple local idioms so that the messages are readily accepted by the community
- IEC materials should preferably be in pictorial form
- Use local art forms: e.g. Madhubani art of Madhubani, Guler art of Kangra, Patchitra of Odisha, Tanjore art of Tamil Nadu etc. should be encouraged
- Display at places visited by maximum number of patients and visitors like registration counter, waiting area, near entrance, corridors
- Display at appropriate height; preferably at eye-level
- There should be adequate space between two posters/displays.



Figure 47: IEC corner made at SDH Rajpura

Hospitals should ensure that they prepare and display IEC materials related to following:

- **Hand Hygiene:** Hand washing instructions and posters are needed to be displayed at all the hand washing stations
- **Swachhata Abhiyan:** IEC materials may include aims and objectives of SBA, initiatives taken up by the hospital, community awareness material, waste segregation posters, general waste management posters, responsibilities of patients in relation to cleanliness etc.
- **Use of Toilets:** Education posters on proper use of toilets and elimination of open defecation need to be displayed inside toilets.
- **Water Sanitation:** Education posters and materials on water sanitation including water conservation, rain water harvesting, chlorination of water, safe sanitation practices and their impact on health, various aspects of safe drinking water, water borne diseases and prevention

It is suggested that hospitals may adopt various IEC materials available on website of MoHFW, Ministry of



Drinking Water and Sanitation etc. for this purpose.

For community participation, hospitals can also organise different community awareness events like:

- Swachhata Divas
- Swachhata Mela
- Swachhata Run
- Swachhata Walk-a-thons
- Swachhata Bike-a-thons
- Nukkad Naataks.
- Swachhata Rallies.

Hospitals also need to disseminate hygiene messages using some innovative measures like:

- Creating social networking groups
- Use of social networking sites for disseminating hygiene promotion
- Email
- Puzzles
- Swachhata Kiosks
- Leaflets
- IEC corners run by volunteers, etc.

## LEADERSHIP AND TEAMWORK

Swachhata Abhiyan is focused on improving cleanliness in public places and “Kayakalp” initiative is inclined towards providing a clean environment in the public hospitals and to improve the cleanliness and hygiene, thus preventing nosocomial infections and also provide patients and visitors a positive experience. It is essential to have an influential leadership and good teamwork for achieving success of this magnitude.

Every hospital needs to work with active involvement of all staff to achieve the objectives “Kayakalp” and SBA.

It is essential that the head/in-charge of the hospital i.e. Medical Superintendent of the hospital along with his administration team provide necessary leadership and motivation to the staff for accomplishing the objective of a clean and hygienic facility.

Some of the basic requirements that are needed to be met by the hospital in this regard are:

### CLEANLINESS AND INFECTION CONTROL COMMITTEE

- Hospital needs to form an Infection Control Committee at the facility level to implement, monitor and review the activities of cleanliness, sanitation and hygiene and infection control within the facility
- While forming the Committee it is to be ensured by the hospital that it has representation from the entire category of the staff
- Roles and responsibilities of each and every member of the Committee need to be explicitly defined and well communicated and documented
- Goals and objectives of the Committee shall be well defined and communicated to its members. The objectives and goals should be **SMART** i.e.
  - **S-Specific:** Targets should be objective, fact based and explicit stating what is intended to be done



- **M-Measurable:** Targets should be measurable in numbers, ratios, proportions, percentages or other measurable indicators
- **A-Attainable:** Targets should be realistic, practical, focusing on real problems that are evolved and not radically assigned
- **R-Reviewable:** There should be mechanisms in place to monitor the progress on achieving the goals
- **T-Time bound:** Begin with an end in mind. Timelines to achieve the targets shall be set at the time of setting.

## REVIEW OF THE PROGRESS

- Periodic review is crucial for continuous improvement. Hence, it is prudent that the top management sets a system of monitoring and reviewing of progress made in the cleanliness drive and take corrective and preventive measures for improving cleanliness, hygiene and infection control practices
- The review activities should be inclined towards the objectives set by the Committee
- It is suggested that the review of the activities are carried out on weekly basis by the top management of the hospital and all the review meetings are properly documented and meeting records are kept for proving the compliance.

## REWARD AND RECOGNITION

- Hospitals need to adopt the practice of reward and recognition for best performing staff and departments of the hospital in relation to cleanliness and infection control
- Such practices provide direct motivation to the staff and establish a system of healthy competition amongst different departments and staff categories
- Innovative methods can be used for rewarding and recognising the departments and staff. Incentivisation of departments and staff can be one of the methods or the name and photograph of the best performing staff can be displayed prominently for recognition.

## TRAINING, CAPACITY BUILDING AND STANDARDISATION

Capacity building is fundamentally about improving effectiveness of an organisation. Capacity building focuses on furthering an organisation's ability to do new things and improve what they currently do. Most simply, capacity building improves the organisation's performance and enhances its ability to function. Capacity building typically involves training, mentoring and other resource support to individuals and organisations. Typically capacity building will result in the adoption of new skills and knowledge as well as systems to sustain and expand these improvements over time.

Regular training sessions need to be conducted to ensure that the activities are being carried out in a standardised manner in the hospital in relation to the cleanliness and infection control activities. .

Standardisation of the activities helps in maximising the repeatability, uniformity and safety in the hospital thus increasing the efficiency and efficacy of the services.

## MINIMUM REQUIREMENTS

### Training Need Assessment

The first and foremost step for implementing any training programme is to identify the training need for all staff of the hospital. The training need assessment of the employees is done for measuring their competence in relation to activities needed to be carried out for cleanliness, hygiene and infection control in the hospital.



Training needs analysis of the staff should be conducted on the following parameters:

- Theoretical knowledge
- Demonstration of methods
- Practical implementation

Based on the training needs assessment of the employees, a training schedule and training material should be prepared as per competence gaps.

### Training Topics

As per “Kayakalp” Scheme regular trainings need to be conducted in the hospital for carrying out the activities of cleanliness and infection control in a standardised manner.

Few of the listed trainings are:

- Housekeeping and cleanliness activities
- SOPs of cleaning
- Preparation of disinfectants
- Standard methods of cleaning
- Monitoring of cleanliness and housekeeping activities
- BMW Management Rules: Once at the time of induction and at least once a year thereafter
- Infection Control
  - Hand hygiene: Hand wash and surgical hand scrub
  - PPE: Use gloves and other protective attire
  - Processing of instruments and proper storage
  - Housekeeping and maintaining a sterile field
  - Preventing accidents and use of disposal of sharps
  - Proper waste disposal
  - Spill management.

## STAFF HYGIENE AND DRESS CODE

### DRESS CODE POLICY

- Hospitals need to have uniform dress code policy which outlines professional image and to help visitors and employees feel safe, confident and comfortable
- It is preferable if hospitals have dress code for every category of staff for easy identification for patient and visitors
- All the staff should adhere to the dress code policy within the premises of the hospital
- Religious beliefs of the staff and the visitors shall be taken into account while drafting the dress code policy

Dress code policy shall have explicitly defined standards for:

- *General Appearance:* Acceptable and non-acceptable practices related to good personal hygiene, hair, nails, jewellery, tattoos, make-up, perfume
- *Uniform details* for different categories of staff (both male and females)- top, lower, colour, fabric, shoes, socks, lab coats, aprons, etc.



## IDENTITY CARDS AND NAME PLATES

Hospital name badges/name plates should be provided to all healthcare providers, in accordance with the hospital policy. The identification badges should be worn with the name and picture facing out.

## ADHERENCE TO DRESS CODE

Management shall ensure that all categories of staff adhere to the dress code policy including doctors, nurses, technicians, paramedics and Group-D staff. The policy needs to be applicable to regular, outsourced, and contracted staff.

### ANNEXURE I: CHARACTERISTICS OF THE MAIN DISINFECTANT GROUPS

OPTION	USES	ADVANTAGES	DISADVANTAGES
<b>Alcohols (60-90% ethanol/Isopropyl alcohol)</b>	<ul style="list-style-type: none"> <li>External surfaces of some equipment (e.g., stethoscopes, oral and rectal thermometer)</li> <li>Disinfect small surfaces such as rubber stoppers of multi-dose vials</li> <li>Non-critical equipment used for home healthcare</li> <li>Disinfection is achieved after 10 minutes of contact</li> </ul>	<ul style="list-style-type: none"> <li>Non-toxic</li> <li>Low cost</li> <li>Rapid action</li> <li>Non-staining</li> <li>No residue</li> <li>Readily available</li> </ul>	<ul style="list-style-type: none"> <li>Evaporates quickly - not a good surface disinfectant</li> <li>Evaporation may diminish concentration</li> <li>Flammable - store in a cool well-ventilated area</li> <li>May dissolve lens mountings</li> <li>Hardens and swells plastic tubing</li> <li>Harmful to silicone causes brittleness</li> <li>May harden rubber or cause deterioration of glues</li> <li>Inactivated by organic material</li> </ul>
<b>Chlorines (e.g., sodium hypochlorite or bleach, calcium hypochlorite, sodium dichloroisocyanurate)</b>	<ul style="list-style-type: none"> <li>Used decontaminating soiled linen, infected plastic waste</li> <li>Non-critical equipment used for home healthcare</li> <li>Blood spills (use 1% sodium hypochlorite for a minor blood spill and 10% for a major blood spill)</li> </ul>	<ul style="list-style-type: none"> <li>Low cost</li> <li>Rapid action</li> <li>Readily available</li> <li>Available as liquid, tablets or powders</li> </ul>	<ul style="list-style-type: none"> <li>Corrosive to metals</li> <li>Do not use to disinfect surgical instruments</li> <li>Inactivated by organic material; for blood spills, blood should be removed prior to disinfection</li> <li>Irritant to skin and mucous membranes</li> <li>Should be used immediately once diluted</li> <li>Use in well-ventilated areas as chlorine may release gas especially with hypochlorite</li> <li>Must be stored in closed containers away from ultraviolet light and heat to prevent deterioration</li> <li>Stains clothing and carpets</li> <li>Causes bleaching of fabrics</li> <li>Cannot be mixed with soap</li> </ul>





OPTION	USES	ADVANTAGES	DISADVANTAGES
<b>Glutaraldehyde</b>	<ul style="list-style-type: none"> <li>Mostly used as high-level disinfectant</li> </ul>	<ul style="list-style-type: none"> <li>Good material compatibility</li> </ul>	<ul style="list-style-type: none"> <li>Allergic, fumes are irritating to skin and respiratory tract</li> </ul>
<b>Phenolics</b>	<ul style="list-style-type: none"> <li>Floors, walls and furnishings</li> <li>Only for environmental surfaces not in direct contact with the patient</li> </ul>	<ul style="list-style-type: none"> <li>Commercially available with added detergents to provide one-step cleaning and disinfecting</li> <li>Slightly broader spectrum of activity than QUATs</li> <li>Weak activity against gram negative organisms</li> <li>No antiviral activity</li> </ul>	<ul style="list-style-type: none"> <li>Do not use in nurseries or equipment contacting infants (e.g. baby scales)</li> <li>Leaves residual film on environmental surfaces</li> <li>Not recommended for use on food contact surfaces</li> <li>May be absorbed through skin or by rubber</li> <li>May be toxic if inhaled, corrosive</li> <li>Harmful to the environment</li> </ul>
<b>Quaternary ammonium compounds (QUATs)</b>	<ul style="list-style-type: none"> <li>Floors, walls and furnishings in non-critical areas</li> </ul>	<ul style="list-style-type: none"> <li>Non-corrosive, non-toxic, low irritant</li> <li>Good cleaning ability, usually have detergent properties</li> <li>May be used on food surfaces</li> </ul>	<ul style="list-style-type: none"> <li>Do not use to disinfect instruments</li> <li>Limited use as disinfectant because of narrow microbicidal spectrum</li> <li>Diluted solutions may support the growth of micro-organisms</li> <li>May be neutralised by various materials (e.g. cotton gauze)</li> </ul>
<b>Iodophors (non-antiseptic formulations)</b>	<ul style="list-style-type: none"> <li>Hydrotherapy tanks</li> <li>Thermometers</li> <li>Hard surfaces and equipment that do not touch mucous membranes (e.g., IV stands, wheelchairs, beds, call bells)</li> <li>DO NOT use antiseptic iodophors as hard surface disinfectants</li> </ul>	<ul style="list-style-type: none"> <li>Rapid action</li> <li>Non-toxic</li> </ul>	<ul style="list-style-type: none"> <li>Corrosive to metal unless combined with inhibitors</li> <li>Inactivated by organic materials</li> <li>May stain fabrics and synthetic materials</li> </ul>
<b>Hydrogen peroxide 7.5%</b>	<ul style="list-style-type: none"> <li>Can be used for cold sterilisation of heat sensitive critical items</li> <li>Requires 30 minutes at 20°C</li> <li>Should be used as antiseptic only</li> </ul>	<ul style="list-style-type: none"> <li>Rapid action</li> <li>Safe for the environment</li> <li>Non-toxic</li> <li>No odour</li> </ul>	<ul style="list-style-type: none"> <li>Contraindicated for use on copper, zinc, brass, aluminium</li> <li>Store in cool place, protect from light</li> <li>Costlier than other environment high-level disinfectants</li> </ul>



## ANNEXURE II: STANDARD OPERATING PROCEDURES FOR CLEANING

### CLEANING OF PATIENT CARE AREA/ROOM

#### Daily Routine Patient Bed Space/Room Cleaning

Cleaning of patient care areas/rooms should follow a methodical, planned format that includes the following elements:

##### Assessment

- Check for additional precautions (isolation) signs and follow the precautions indicated
- Walk through room to determine what needs to be replaced (e.g., toilet paper, paper towels, soap, ABHR, gloves, sharps container) and whether any special materials are required; this may be done before or during the cleaning process.

##### Gather supplies

- Ensure adequate supply of clean clothes is available
- Prepare fresh disinfectant solution according to manufacturer's instructions.

##### Wash hands and put on PPE

##### Clean room, working from clean to dirty and high to low areas of the room

- Use fresh cloth(s) for cleaning each patient bed space:
  - If a bucket is used, do not 'double-dip' cloth(s)
  - Do not shake out cloth(s)
  - Change the cleaning cloth when it is no longer saturated with disinfectant and after cleaning heavily soiled areas such as toilet and bedpan cleaner.
- Start by cleaning doors, door handles, push plate and touched areas of frame
- Check walls for visible soiling and clean if required
- Clean light switches and thermostats
- Clean wall mounted items such as (ABHR) dispenser
- Check and remove fingerprints and soil from glass partitions, glass door panels, mirrors and windows with glass cleaner
- Check privacy curtains for visible soiling and replace, if required
- Clean all furnishings and horizontal surfaces in the room including chairs, window sill, telephone, over bed table etc. Lift items to clean the table. Pay particular attention to high-touch surfaces
- Wipe equipment on walls such as top of suction bottle, intercom and blood pressure manometer as well as IV pole
- Clean bedrails, bed controls and call bell
- Clean bathroom/shower (applicable for single room) (see bathroom cleaning procedure)
- Clean floors (see floor cleaning procedure).

##### Disposal

- Place soiled clothes in designated container for laundering
- Check sharps container and change when 2/3rd full (do not dust the top of a sharps container)
- Remove soiled linen if bag is full



- Place waste in colour coded bins as prescribed under New BMW Rules
- Remove waste.

**Remove gloves and clean hands with ABHR; if hands are visibly soiled, wash with soap and water. Do not leave room wearing soiled gloves**

**Replenish supplies as required (e.g., gloves, ABHR, soap, tissue roll/paper towel etc.)**

Housekeeping in-charge should complete the monitoring and evaluation of the cleaning after each cleaning procedure.

In addition to routine daily cleaning of patient care areas/rooms, the following additional cleaning should be scheduled:

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

High dusting includes all surfaces and fixtures above shoulder height, including vents. Ideally, the patient/resident should be out of the room during high dusting to reduce the risk of inhaling spores from dust particles.

### **Procedure for Routine, Discharge/Transfer Cleaning of a Patient Bed Space/Room**

#### **Assessment**

- Check for additional precautions signs and follow the precautions indicated
- Walk through room to determine what needs to be replaced (e.g., toilet paper, paper towels, soap, ABHR, gloves, sharps container) and whether any special materials are required; this may be done before or during the cleaning process.

#### **Gather supplies**

- Ensure an adequate supply of clean clothes is available
- Prepare fresh disinfectant solution according to manufacturer's instructions.

#### **Wash hands and put on PPE**

#### **Remove dirty linen**

- Strip the bed, discarding linen into soiled linen bag; roll sheets carefully to prevent aerosol formation
- Inspect bedside curtains and window treatments; if visibly soiled, clean or change
- Remove gloves and clean hands.

#### **Clean room, working from clean to dirty and high to low areas of the room**

- Use fresh cloth(s) for cleaning each patient/resident bed space:
  - If a bucket is used, do not 'double-dip' cloth(s)
  - Do not shake out cloth(s)
  - Change the cleaning cloth when it is no longer saturated with disinfectant and after cleaning heavily soiled areas such as toilet.
- Start by cleaning doors, door handles, push plate and touched areas of frame



- Check walls for visible soiling and clean if required
- Clean light switches and thermostats
- Clean wall mounted items such as (ABHR) dispenser
- Check and remove fingerprints and soil from glass partitions, glass door panels, mirrors and windows with glass cleaner
- Check privacy curtains for visible soiling and replace, if required
- Clean all furnishings and surfaces in the room including chairs, window sill, television, telephone, computer keypads, over bed table etc. Lift items to clean the tables. Pay particular attention to high-touch surfaces
- Wipe equipment on walls such as top of suction bottle, intercom and blood pressure manometer as well as IV pole
- Clean inside and outside of patient/resident cupboard or locker.

#### **Clean the bed**

- Clean top and sides of mattress, turn over and clean underside
- Clean exposed bed springs and frame
- Check for cracks or holes in mattress and have mattress replaced as required
- Inspect for pest control
- Clean headboard, foot board, bed rails, call bell and bed controls; pay particular attention to areas that are visibly soiled and surfaces frequently touched by staff
- Clean all lower parts of bed frame, including castors
- Allow mattress to dry.

#### **Clean bathroom/shower (see bathroom cleaning procedure)**

#### **Clean floors (see floor cleaning procedure)**

#### **Disposal**

- Place soiled cloths in designated container for laundering
- Check sharps container and change when 2/3rd full (do not dust the top of a sharps container)
- Remove soiled linen bag and replace with fresh bag
- Place waste in colour coded bins as prescribed under New BMW Rules
- Close waste bags and remove and add a clean bag.

**Remove gloves and clean hands with ABHR; if hands are visibly soiled, wash with soap and water. Do not leave room wearing soiled gloves**

**Remake bed and replenish supplies as required (e.g., gloves, ABHR, soap, paper towel, toilet brush)**

**Return cleaned equipment (e.g., IV poles and pumps, walkers, commodes) to clean storage area.**

### **CLEANING OPERATING ROOMS**

Environmental cleaning in surgical settings minimises patients' and healthcare providers' exposure to potentially infectious micro-organisms.

#### **First cleaning of the day (before cases begin)**

- This should be performed first, every morning irrespective of whether the OT will be used or not



- Wear a clean gown, cap, mask and clean utility gloves
- The surgeon/anaesthetist should not enter the OT before cleaning is complete
- Clean all horizontal surfaces by wet wiping with an HLD. Every horizontal surface should be cleaned
- Follow the sequence of cleaning as mentioned previously (top to down; in to out)
- Clean all antiseptic bottles and the trays in which they are kept. Clean the sterile containers
- Ensure colour coded waste collection bags are placed in the waste bins
- Keep the OT closed for 10-15 min with ventilation equipment on after cleaning
- Wash the scrub basin and tap with soap and water. Check for leakage and report immediately if seen. Clean the soap and antiseptic bottles at the scrub basin. Replace the bottles if empty
- During cleaning, only cleaning personnel should be present in the OT and the doors should be kept closed
- After cleaning is over, wash and remove utility gloves, gown and cap. Wash hands and disinfect them by using an alcohol hand rub before proceeding to other work.

### **Cleaning Operating Rooms in between Cases**

- Keep ventilation equipment on and OT door closed
- Wear OT dress, footwear and a cap
- Place a cautionary 'Wet Floor' sign at the entrance of the room
- Prepare fresh disinfectant solution according to manufacturer's instructions
- Clean hands and put on gloves
- Collect and remove waste
- Collect and remove all soiled linen segregating soiled and dry linen
- Remove gloves and clean hands. Wear a different set of gloves
- Use a cloth dampened in hospital-approved disinfectant solution to clean and disinfect surfaces that have come in contact with a patient or body fluids, including tops of surgical lights, blood pressure cuffs, tourniquets and leads
- Clean suction canisters, reflective portion of surgical lights
- Clean and disinfect OT table
- Clean electronic equipment (i.e., monitors) according to manufacturer's instructions
- Damp mop floor in a 1 to 1.3 metre (3 to 4 feet) perimeter around the OT table (larger area if contamination present)
- Insert colour coded bags in waste bins
- Damp-dust equipment from other areas such as X-ray machines, C-arm etc. before being brought into the operating room and prior to leaving
- When cleaning is complete, remove gloves and clean hands.

### **Procedure for Terminal Cleaning of Operating Rooms**

- Place a cautionary 'Wet Floor' sign at the entrance of the room
- Prepare fresh hospital approved disinfectant solution according to manufacturer's instructions
- Clean hands and put on gloves
- Collect and remove waste
- Collect and remove all soiled linen



- Clean hands and change gloves
- Clean and disinfect lights and ceiling-mounted tracks
- Clean and disinfect all door handles, push plates, light switches and controls
- Clean and disinfect telephones and computer keyboards
- Spot-check walls for cleanliness
- Clean and disinfect all exterior surfaces of machines and equipment (e.g., anaesthesia carts), allowing adequate drying time for the disinfectant before storage
- Clean and disinfect all furniture including wheels/casters
- Clean and disinfect exterior of cabinets and doors, especially around handles
- Clean and disinfect all surfaces
- Clean scrub sinks and surrounding walls
- Mop floor, making sure the OT table is moved and the floor is washed underneath; move all furniture to the centre of the room and continue cleaning the floor; apply a sufficient amount of disinfectant/detergent to ensure that the floor remains wet for five minutes; use a fresh mop/mop head and fresh solution for each room
- Replace all furniture and equipment to its proper location
- Wash the colour coded bins, dry them and put colour coded bags once it is dried
- Report any needed repairs
- Clean and store cleaning equipment
- Remove gloves and clean hands.

#### **Detailed Wash-down of the OT Complex**

- A detailed wash-down should be done at least once a week for OTs that are used daily
- For OTs that are used less frequently, detailed wash-down should be done at least once a month and before any camp patients are operated.

#### **Method**

- Wear utility gloves
- Shift all movable equipment and materials out of the OT
- Inspect the OT surfaces for cracks, loose tiles etc. If any maintenance work is required, perform the maintenance before proceeding
  - In case the maintenance involves civil work that generates dust, then the cleaning and disinfection protocol for cleaning and disinfection new OT should be followed after the maintenance work is completed.
- Wipe all surfaces of the OT liberally with soap and water
  - Begin at the ceiling. Use a long handled mop to wipe the ceiling
  - Proceed down the walls. Clean all wall fixtures on the way down
  - Clean all ceiling mounted fixtures e.g., OT lamp
  - Then clean all fixed floor based equipment
  - Lastly scrub the floor with soap and water
- Repeat cleaning until all visible dust is removed
- Allow the OT to dry naturally





- Then wipe all surfaces with HLD. Allow the disinfectant to dry naturally
- Meanwhile, clean all the equipment moved outside with soap and water. Remove all dirt and dust. Clean every surface of the equipment
  - Remove all materials stored on trolleys and clean the entire trolley. Also clean the bottles, containers, etc. by wiping them on the outside to remove all soiling
- Clean the wheels by running them 10-15 times over a Turkish towel soaked with soap and water
- Wipe the equipment with HLD and allow to air dry
- Move the equipment back into the OT. Wipe equipment with high-level disinfectant
- Cover electronic equipment with properly fitting plastic covers and fog the OT with high-level disinfectant until a fog is seen in the air
- Keep the OT closed for at least one hour
- Meanwhile, clean the rest of the OT complex (passages, other rooms) with soap and water followed by wiping with high-level disinfectant. Clean and wipe from ceiling to floor. Clean all furniture
- The OT may be used after it has remained closed for at least one hour.

#### **Cleaning and Disinfection of New OT and after any Civil Work**

- First ensure all civil work is completed
- Ensure all movable equipment has been shifted out
- Wear utility gloves
- Wipe all surfaces of the OT using liberal amount of soap and water. Repeat wiping until all visible dust is removed
  - Clean all fixed equipment like OT lamp with soap water until all visible dust is removed
- **The mechanical action of wiping is very important to remove spores and improve the action of disinfectants used subsequently**
- Allow all surfaces to dry completely
- Wipe all surfaces (including the ceiling) with a high-level disinfectant. Allow to dry completely
- Wipe down all equipment to be moved into the OT with soap and water to remove all visible dust. Allow to dry completely. Clean the wheels by running them 10-15 times over a Turkish towel soaked with soap and water. This equipment cleaning is to be done outside the OT
- Move the cleaned equipment into the OT
- Wipe all surfaces (excluding the ceiling and walls up to the height the hands can reach) with high-level disinfectant
- Allow to dry completely
- Fog the OT with high-level disinfectant until a fog is seen in the air
- Stop and remove the fogger and close the OT for at least one hour with any ventilation system/AC off
- After 1-2 hours open the OT and take post fogging swabs. Change into OT dress, cap, mask and use sterile gloves when performing the sampling. Only the person taking the samples should enter the OT.

Sample the following sites at the minimum:

- OT table upper surface
- OT lights lower glass surface



- Anesthesia machine (swab the area where medications are placed during use)
- Sterile instruments trolley surface
- Any two walls (sample sites above OT table height)
- Floor (two samples on either side of the OT table)
- Air conditioner outlet louvers (if AC present)
- After sampling close the OT. No one should enter the OT until next day
- On second day, wear OT dress, footwear and cap; wipe all surfaces (including ceiling with a long handled mop) once with soap water, allow drying and then wiping once with a high-level disinfectant
- Keep OT closed for at least one hour with ventilation system/AC off
- Repeat the OT swab sampling as mentioned above
- On third day, repeat the entire procedure (third time) and sample the swabs (third sampling)
- Wait for the OT swab reports. The OT can be used if all the three swabs reports show no growth of any organisms OR sparse growth of skin commensals in any one out of nine swabs taken per sampling
- In case growth of spore bearing organisms, pathogens (e.g. *Staphylococcus aureus*), aerobic gram negative bacilli or fungus is seen, disinfectant wiping of the entire OT and fogging should be repeated and swabs sampled again (once only)
- If results are not satisfactory even now, seek help of an expert in infection control.

### CLEANING OF STERILE AREAS

Sterile processing areas in CSSD/TSSU

- Use same high-level disinfectant used for OT cleaning
- Clean all counters and floors once daily
- Clean shelves in sterilisation areas, preparation and packing areas and decontamination areas once daily
- Clean shelves once daily in sterile storage areas
- Clean case carts after every use
- Clean walls once every month and whenever visibly soiled
- Clean light fixtures, sprinkler heads and other fixtures once every month

### CLEANING OF LABOUR ROOMS

#### General Rules

- Whenever any equipment from the outside is brought into the labour room, wipe all equipment surfaces down with HLD before bringing them into the room
- Cleaning sequence
  - Always clean the labour room before cleaning the connected passages and rooms
  - When cleaning the labour room proceed in a top-to-down sequence i.e., ceiling based equipment first, walls, then floor based equipment and lastly the floor. When cleaning the floor, begin at the end farthest from the door and move towards the door (*in to out*). The cleaning staff should always move from clean to unclean areas and never vice versa
  - When cleaning individual equipment: clean from top to down



- Apply the following general rules to facilitate fast and easy cleaning:
  - Minimise the numbers of equipment
  - Minimise the number of horizontal surfaces
  - Provide smooth finishes and minimum joints in surfaces
  - Round off corners wherever possible for easy cleaning access
- Equipment and environment surfaces that have become rough should be repaired/replaced.
- Soiling with blood/body fluids should be cleaned as soon as possible
- Items that are not regularly required in the labour room should not be stored there. Materials that are used at other locations should not be stored in the labour room
- A broom should not be used in the labour room. Use a dust pan and a piece of stiff plastic/cardboard to gather particulate debris from the floor. All cleaning should be done by wet mopping/wiping technique
- When picking up sharp items from the floor e.g., dropped needles, use a forceps to hold it. Do not pick up sharps by hand
- Do not use domestic vacuum cleaners in the labour room
- Always use the recommended cleaning/mopping technique
- Never mix any two disinfectants or disinfectant with soap
- During cleaning inspect all areas for water seepage and report immediately. Mop the affected area with HLD at least once a day until the problem is resolved
- Use separate dedicated mops for
  - Floor and ceiling based equipment e.g., labour table, lights, trolleys etc.
  - Floors and walls
  - Use colour coding (one colour for each type a & b) to prevent accidental exchange
- Labour room walls may be cleaned 2-3 times a week. Clean as soon as possible if visible dust is present and whenever soiling with blood/body fluids occurs.

### **Daily Routine Cleaning and Disinfection for Labour Rooms**

The labour room and connected passages and rooms should be cleaned at least twice a day at fixed times. At other times spot cleaning of visibly soiled areas and cleaning of blood/body fluid spills should be done as soon as possible when soiling occurs.

- Use an HLD. Use the same dilution as used for OT cleaning
- Wear utility gloves. Change the gloves when indicated
- Perform all cleaning by wet mopping/wiping
- Daily morning wet clean all surfaces as follows:
  - Prepare all cleaning material and wear clean utility gloves
  - Wipe all switches on the wall, the door handles
  - Wipe all equipment beginning at the top and moving downwards. Clean the sides and legs also
  - Clean all trays, bottles and sterile containers on the trolley
  - Clean the equipment in the new-born baby corner. Place clean covers on the equipment



- Check all surfaces – especially horizontal surfaces – for visible dust and ensure all such dust is removed
- Wash the hand wash basin with soap and water. Clean the soap and antiseptic bottles. Replace them if empty
- Check BMW bins for presence of proper colour coded waste bags. Add bags to the bin if required. Check whether the sharps waste container is available and ready for use
- Clean the floor last, beginning farthest from the door and moving towards it.
- BMW
  - Remove BMW at least thrice a day or when the waste container is 3/4ths full.
- Cleaning after a delivery
  - Begin cleaning as soon as possible
  - Wear utility gloves. Wear a gown and goggles if splashing is expected
  - Clean all blood/body fluid spills
  - Ensure BMW is discarded into the correct colour coded bag
  - Remove soiled linen carefully and put it in a waterproof container/bag
  - Remove any instruments used in the delivery and send/transport them for cleaning and sterilisation
  - Change the utility gloves and wet wipe the equipment used in the delivery (i.e., table, IV stand, stool, etc.) with an HLD
  - Wet mop the floor around the labour table with an HLD
- Labour room slippers should be washed with soap and water every evening and when they are visibly soiled/dirty
- Soiled gowns used during delivery, soiled goggles, soiled footwear should be collected separately and disinfected by immersion in chlorine solution (500-1000 ppm) for 5-10 min) followed by a plain water rinse before washing them with soap water
- Cleaning after all deliveries are over
  - Perform the steps mentioned for “cleaning after a delivery”
  - Perform the steps mentioned for daily morning cleaning
  - Keep the labour room closed after the final cleaning.

### **Detailed Wash-down of the Labour Room**

Perform detailed wash-down of the labour room, using the procedure mentioned for detailed wash-down of the operation theatre.

Perform this cleaning at least twice a month.

### **CLEANING OF TOILETS**

- All toilets should be cleaned at least thrice a day especially the ones in general areas
- Cleaning equipment for toilets (i.e., floor mops, hand mops, buckets, bottles used to prepare disinfectant dilutions) should be separate and not be used in other areas of the hospital
- Use the following method to clean toilets:



- Prepare all cleaning material first. Ensure mops and buckets are clean
- Wear utility gloves and waterproof apron and protective goggles
- Wash the basin and tap with soap and water and rinse with plain water
- Clean any buckets and tumblers in the toilet
- Clean the toilet fixtures and pans using a soap and brush. Brush walls up to waist height each time. Brush at higher levels if soiling is seen
- Rinse away the soap by spraying water under pressure. A piece of tubing can be fixed to the tap in the toilet and water sprayed through it with pressure by partially closing the outlet opening of the tube with the finger. A car sprayer attachment should be obtained if possible
- Brush any remaining stains and soiled areas using more soap and water applying pressure
- Drain away excess water on the floor using a rubber floor wiper
- Sprinkle chlorine solution containing at least 5000 ppm chlorine on all surfaces except metal ones (taps). This can be prepared by making a 10% dilution by volume of a hypochlorite solution containing minimum 5% chlorine or by dissolving chlorine powder in water in proportion recommended by the manufacturer to provide this strength of chlorine
- Allow to dry naturally
- Wash the cleaning equipment with soap and water and keep it in the correct place
- Wash the utility gloves with soap and water and hand them to dry
- Wash hands with soap and water and disinfect them using an alcohol hand rub before proceeding to other work.

#### CLEANING OF ISOLATION WARDS

- Cleaning of this area should preferably be done after cleaning other areas
- Additional PPE – disposable cap, mask, linen gown and if required, goggles - should be used during cleaning. These items should be put on just before entering the area and should be removed immediately after coming out. They should not be taken to other areas of the hospital without putting them in plastic bag first
- Prepare all cleaning equipment and chemicals before starting cleaning. All cleaning should be completed in one session. Use an HLD
- Wear cap, mask, gown and rubber gloves
- Enter the area. Keep door closed to prevent traffic. If patient has a respiratory infection, keep windows open
- Clean blood and body fluid spills first
- Remove all contaminated items and items to be replaced from the area – linen, curtains, waste, sharps containers, etc. Inspect the area to make sure no item is missed. Soiled linen should be put in plastic bags at the point of removal itself. Make sure sharps containers are closed tightly and handle carefully to prevent dropping the container. Segregate any waste at source by putting it into the appropriate container. Waste bags should be closed, tied and labelled before transport
- Change gloves and begin cleaning
- First clean and disinfect all patient care items dedicated to the area e.g., thermometers, blood pressure apparatus, tongue depressors, weighing scales, ambu bags, sterile containers placed in the area, etc. Do not take these to another location or use on another patient before they are cleaned and disinfected properly



- Begin cleaning the environment after this. General direction for cleaning – from clean to dirty and from top to down
- **Begin cleaning from the periphery** of the area e.g., clean doors, door handles, windows and walls first. Clean walls from top to down. Clean all wall mounted items (switches, hand rub bottles etc.). Wall cleaning may be done on alternate days unless soiling is frequent
- Next clean all floor based items – lockers, chairs, IV stands, waste bins etc. Pay particular attention to high touch surfaces like handles, bedrails. Make sure all horizontal surfaces are cleaned
- Clean the bed last
- Clean any attached toilets next
- Lastly clean the floor
- Gather used mops in a plastic bag to transport them to the cleaning and disinfection area. Mops and buckets used to clean this area should be cleaned and disinfected before using them in another area. Disinfectant bottles should be dedicated to the infected ward/rooms only and not used in other area
- Disposable cap and masks should be removed immediately and discarded in the correct bio-medical waste container. Linen gown should be removed without touching the outer side and bagged as soiled linen
- **Wash and remove the utility gloves;** wash hands with soap and water; disinfect them using an alcohol hand rub
- If any items are to be replaced in the area, do it now. Wear fresh PPE before entering the area
- Disinfect footwear by immersion in chlorine solution with 500-1000ppm chlorine for 5-10 minutes before using again. If they are soiled with blood and/or body fluids, first disinfect with chlorine solution before washing with soap and water using a brush.

### **Terminal Disinfection after Discharge of Infected Patients**

Terminal disinfection of the room/ward should be done **after discharge** of infected patients. The aim of this procedure is to thoroughly clean and disinfect all items and surfaces in the room/ward (eliminate any reservoirs of infection) and prevent further transmission to patients admitted there and staff working in the area. Detailed cleaning and disinfection of all surfaces and removal/disinfection of all potentially infected patient care items (thermometers, stethoscopes, tongue depressors etc.) is very critical to reduce the risk.

Steps for terminal disinfection of an area:

- Determine whether the patient was on any particular isolation precautions – contact/droplet/airborne. If so appropriate precautions should be taken during cleaning and disposal of waste
- Prepare for cleaning – gather the cleaning equipment and items to be replaced. Once cleaning begins, the cleaning staff should not go to other areas of the hospital until all cleaning is finished
- Clean hands and use an alcohol hand rub
- Put on utility gloves. Wear a cap, mask and gown if patients were on isolation precautions
- Walk through the area and make a list of items that should be replaced e.g., soap, empty alcohol hand rub bottles, towels, linen etc.
- Remove all contaminated items and items to be replaced from the area – linen, curtains, waste, sharps containers, etc. Inspect the area to make sure no item is missed. Soiled linen should be put in plastic bags at the point of removal itself. Make sure sharps containers are closed tightly and handle carefully to prevent dropping the container. Segregate any waste at source by putting it into the appropriate container. Waste bags should be closed, tied and labelled before transport





- Clean any spills of blood/body fluid first
- Change gloves and begin terminal cleaning. Use a disinfectant. Use the pour wipes technique. Do not use plain water or only soap and water
- General direction for cleaning – from clean to dirty and from top to down
- Begin cleaning from the periphery of the area e.g., clean doors, door handles, windows and walls first. Clean walls from top to down. Clean all wall mounted items (e.g., switches, hand rub bottles, etc.).
- Next, clean all floor based items – beds, lockers, chairs, IV stands, waste bins etc. Pay particular attention to high touch surfaces like handles, bedrails, etc. Make sure all horizontal surfaces are cleaned
- Clean and disinfect all patient care items dedicated to the area e.g., thermometers, blood pressure apparatus, tongue depressors, weighing scales, ambu bags, sterile containers placed in the area, etc. Do not take these to another location or use on another patient before they are cleaned and disinfected properly
- Cleaning the bed
  - Check all sides of the mattress for soiling (replace the mattress if soiled)
  - Wipe mattress with disinfectant (if there is waterproof cover). Otherwise, soiled mattresses should be replaced. Wipe the removed mattress with plenty of disinfectant and keep in bright sunlight until thoroughly dry. Thereafter check whether it is usable. If not discard the mattress
  - Clean the entire bed (i.e., frame, side rails, wheels, etc.)
- Clean any attached toilets next
- Lastly clean the floor
- If possible, clean and disinfect the used mops now. If not possible, keep them aside for later cleaning and disinfection. Mops and cleaning equipment used to clean an infected area should be cleaned and disinfected before using them in another area
- Cap, masks and gown used for infected area cleaning should be removed using proper technique and bagged as soiled linen
- **Wash and remove the utility gloves** and wash hands with soap and water
- Disinfect hands with an alcohol hand rub
- If fogging is to be done, go to the next step; otherwise proceed to one step after that
- Use the same OT HLD to fog the area. In case of aldehyde based chemical, use double concentration than what is used for routine OT fumigation. Close all doors and windows and cover electrical equipment with plastic covers. Run the fogger until a fog is seen in the air. Then turn off the machine, remove from the area and keep the area closed for at least one hour. Post a sign on the door and mention the hour until which the area should be kept closed on the sign
- When room is cleared to enter again, replace the linen, towels, waste collection bags and any other materials
- Inspect the area for cleanliness and check that all replaceable items have been replenished.

## CLEANING OF EQUIPMENT

Materials required: Disinfectant working solution, hand mops, utility gloves

Prepare and arrange all materials before beginning.



Note: Use separate mops for equipment and environmental surfaces such as floors and walls.

- Wear utility gloves.
- Fold the mop twice (to make four layers)
- Pour the disinfectant/cleaner on the mop. Quantity to be poured should be enough to leave the wiped surface wet for two minutes after wiping (exception: soap and water should be allowed to dry as soon as possible)
- Wipe the equipment surface moving the mop in one direction over it. Wipe with pressure. Do not go back into the wiped area
- Always begin cleaning at the top of the equipment and move downwards (top to down)
- When moving from one piece of equipment to another, change the fold of the mop, add more disinfectant/cleaner and proceed
- When all the folds of the mop are used, keep it aside for washing and continue with a new mop. Change mops when the room is changed
- Allow the disinfectant/cleaner to dry naturally.

Note: During equipment cleaning, do not rinse the mop in water.

## **ROUTINE CLEANING OF FLOORS**

### **Mopping Floors using Dust Control Mop (microfiber)**

Working from clean areas to dirty areas:

- Remove debris from floor and dry any wet spots with old newspaper
- Remove gum or other sticky residue from floor
- Starting in the farthest corner of the room, drag the mop toward you, then push it away, working in straight, slightly overlapping lines and keeping the mop head in full contact with the floor
- Do not lift dust mop off the floor once you have started, use swivel motion of frame and wrist to change direction
- Move furniture and replace after dust mopping, including under and behind bed
- Carefully dispose off debris, being careful not to stir up dust
- Replace mop head/pad when soiled and after mopping a room.

### **Mopping Floors using Wet Loop Mop and Bucket**

Working from clean areas to dirty areas:

- Prepare fresh cleaning solution according to the manufacturer's instructions using appropriate PPE according to MSDS
- Place 'wet floor' caution sign outside of room or area being mopped
- Divide the area into sections (eg. corridors may be divided into two halves, lengthwise, so that one side is available for movement of traffic while the other is being cleaned)
- Immerse mop in cleaning solution and wring out
- Push mop around skirtings first, paying particular attention to removing soil from corners; avoid splashing walls or furniture
- In open areas use a figure eight stroke in open and wide spaces, overlapping each stroke; turn mop head over every five or six strokes. While in small spaces, starting in the farthest corner of the room,



drag the mop toward you, then push it away, working in straight, slightly overlapping lines and keeping the mop head in full contact with the floor

- Repeat until entire floor is done
- Change the mop head when heavily soiled or at the end of the day.

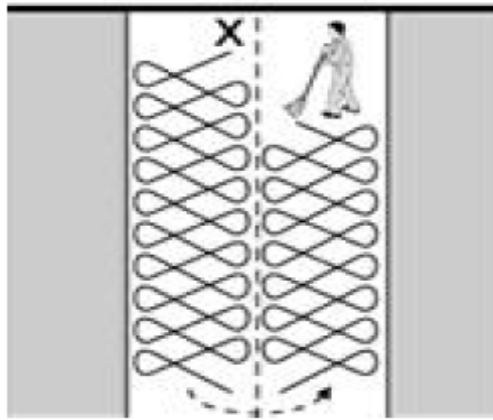


Figure48: Eight stroke technique for mopping

#### CLEANING OF AMBULANCE

- The ambulance should be cleaned daily in the morning and after every patient transport
- Morning cleaning – wipe all surfaces with freshly prepared low-level disinfectant. Clean both, the patient compartment as well as the driver's compartment
- Check supplies and replenish if required
- After transport of the patient
  - Wear utility gloves and arrange cleaning mops, disinfectant bottles and paper
  - Clean visible blood spills first
  - Remove BMW (e.g., dressings, bandages, soiled linen) in an appropriate colour coded waste bag
  - Dispose sharps that are found during cleaning in the sharps container. Use a forceps to pick up sharps
  - Remove used linen/blankets for laundering
  - Clean and disinfect/sterilise equipment used in the call
  - Clean and disinfect the patient compartment by wet wiping with a low-level disinfectant
  - If the vehicle is heavily contaminated take it out of service and perform detailed cleaning by wiping all surfaces and equipment with an HLD
  - Restock the supplies as required
- Detailed cleaning to be done in case of heavy contamination of the ambulance should be done as follows:
  - Park the ambulance away from common traffic areas
  - Wear utility gloves, disposable cap, mask and clean linen gown (use a waterproof gown if slashing is expected)
  - Remove all equipment from both compartments – driver and patient



- Remove stretchers, trolleys, mattresses, belts, suction bottles, waste containers, kits and boxes. Remove contents of all shelves and drawers
- Inspect the surfaces for visible blood and body fluid spills and clean them first with an HLD
- Clean all surfaces (above the floor, including the roof) by wet wiping with a HLD. Every surface should be wiped. Check all surfaces for spills of blood and body fluids
- Clean the floor last. Wipe with an HLD.
- Clean all equipment by wiping with an HLD and allow to dry before putting it back into the vehicle
- Replenish the supplies as required
- Once a month or more frequently depending on the use, wash down the vehicle interior and equipment by wiping with liberal amount of soap and water. The method is the same as detailed cleaning except that soap and water are used first followed by wiping with an HLD.

### CLEANING OF WATER COOLERS

- Water cooler tanks should be kept covered at all times
- The tank cover should fit properly with no gaps between the tank and the cover
- The outside of the cooler, electrical cord and plugs, the tap and the drain tray should be wet wiped daily with soap and water. Drainage should be provided for overflow of water
- The cooler tank should be emptied and cleaned at least once in two weeks or more frequently. **In general, less frequently used coolers need more frequent cleaning as stagnation of water promotes microbial growth.** In areas and at times when water supplied appears turbid/muddy, more frequent cleaning may be required e.g., every week
- Empty the tank and clean it with soap and water using a brush. Rinse with plenty of water to remove all soap
- Wipe the inner surfaces of the tank liberally with chorine solution containing 500 ppm of chlorine (0.5% dilution of sodium hypochlorite or prepared from chlorine powder as per manufacturer recommendations). The chlorine solution should remain wet on the surface for at least 1-2 minutes
- Rinse with plain water twice to remove the chorine. Check the level of residual chlorine in the water before allowing consumption
  - In coolers without an attached carbon filter/softener the chlorine level should be 0.2 to 0.5 ppm. If the cooler has these attached, chlorine level will always be zero.

### CLEANING OF AIR CONDITIONERS (ACs)

1. Wipe the outer surface of all ACs (especially the louvers on the air outlet) with soap and water at least once a week or more frequently (daily) if easily accessible. Wiping should be done more frequently (2-3 times a week) if the area is heavily used
2. Once a week, the dust filters in the AC should be removed, taken outside the area and washed to remove all dust and fibres. They should be dried and then fitted back into the AC
3. Proper drainage should be provided to drain away all condensation from the unit. Any leakage should immediately be reported and rectified urgently
4. Regular servicing of the units should be carried and records maintained. During the servicing, the roller fan inside the unit should be wiped clean using an HLD.



### ANNEXURE III: SAMPLE CHECKLIST

*Sample Checklists (can be modified as per individual set up)*

#### DEPARTMENT DAILY CLEANING CHECK LIST

Name of Department:

Date:

Cleaning Time	De Dusting	Dry Mopping	Wet Mopping	Dust Bin Clearance	Cleaner Name	Monitoring Time	Supervisor Sign/ Name	Remarks



**Checklist for Monitoring Environmental Cleaning in the ICU:****(to be used by the ICU in-charge or infection control nurse or competent authority)**

<b>Date</b>	
<b>Unit</b>	
<b>Name of cleaning staff</b>	
<b>Signature of ICU in-charge</b>	

**Evaluate the following:**

Surfaces in the ICU	Cleaned		Not Cleaned		Not Present in ICU	
	M	E	M	E	M	E
Patient trolley						
Medication trolley						
Intubation trolley						
Telephone						
Bedside locker						
Chair						
Hand wash basin						
Light switch						
Bathroom floor						
Bathroom sink						
Toilet seat						
Bedpan cleaning sink						

**Evaluate the following additional sites:**

High-touch Surfaces	Cleaned			Not Cleaned			Not Present in ICU		
	M	E	N	M	E	N	M	E	N
Syringe IV pump control buttons									
Monitor control buttons									
Monitor touch screen									
Ventilator control panel									
Bedrails									
IV stand (grab area)									
ICU door handle									

**M- Morning, E- Evening, N- Night****Monitoring method used: Direct visual observation**



**ANNEXURE IV: SCHEDULE I: BMW CATEGORIES AND THEIR SEGREGATION,  
COLLECTION, TREATMENT, PROCESSING AND DISPOSAL OPTIONS**

**PART 1**

Category	Type of Waste	Type of bag or container to be used	Treatment & disposal options
(1)	(2)	(3)	(4)
<b>Yellow</b>	<b>(a) Human Anatomical Waste</b> Human tissues, organs, body parts and foetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time)	Yellow coloured non-chlorinated plastic bag	Incineration or Plasma Pyrolysis or deep burial*
	<b>(b) Soiled Waste</b> Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components	Yellow coloured non-chlorinated plastic bag	Incineration or Plasma Pyrolysis or deep burial*  In absence of above facilities, autoclaving or micro-waving/hydroclaving followed by shredding or mutilation or combination of sterilisation and shredding. Treated waste to be sent for energy recovery
	<b>(c) Expired or Discarded Medicines</b> Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.	Yellow coloured non-chlorinated plastic bag	Expired cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature >1200°C or to common BMW treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >1200°C Or Encapsulation or Plasma Pyrolysis at >1200°C  All other discarded medicines shall be either sent back to manufacturer or disposed by incineration



Category	Type of Waste	Type of bag or container to be used	Treatment & disposal options
(1)	(2)	(3)	(4)
	<b>(d) Chemical Waste</b> Chemicals used in production of biological and used or discarded disinfectants	Has to collected in yellow coloured non-chlorinated plastic bag	Disposed off by incineration or Plasma  Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility
	<b>(e) Chemical Liquid Waste</b> Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, silver X-ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washings, cleaning, housekeeping and disinfecting activities etc.	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule-III
	<b>(f) Discarded linen, mattresses, beddings contaminated with blood or body fluid, routine mask and gown (2018 Amendment)</b>	Yellow coloured non-chlorinated bags or suitable packing material	Non-chlorinated chemical disinfection followed by incineration or Plasma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilisation and shredding. Treated waste to be sent for energy recovery or  incineration or Plasma Pyrolysis



Category	Type of Waste	Type of bag or container to be used	Treatment & disposal options
(1)	(2)	(3)	(4)
	<b>(h) Microbiology, Biotechnology and other clinical laboratory waste</b> Blood bags, laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures	Autoclave or Microwave or Hydroclave safe plastic bags or containers (2018 Amendment)	Pre-treat to sterilise with non-chlorinated chemicals on-site  as per World Health Organisation guidelines on Safe management of wastes from health care activities and WHO Blue Book, 2014 and thereafter sent for incineration (2018 Amendment)
<b>RED CONTAMINATED WASTE (RECYCLABLE)</b>	Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes) and vacutainers with their needles cut) and gloves	Has to be collected in RED coloured non-chlorinated plastic bags or containers	Autoclaving or micro-waving/hydroclaving followed by shredding or mutilation or combination of sterilisation and shredding. Treated waste to be sent to registered or authorised recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites
<b>WHITE (TRANSLUCENT)</b>	<b>Waste sharp including metals</b> Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpel, blades or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharp.	Has to be collected in puncture-proof, tamper-proof and leak-proof containers	Autoclaving or dry heat sterilisation followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for  final disposal to iron foundries (having consent to operate from the SPCBs or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit



Category	Type of Waste	Type of bag or container to be used	Treatment & disposal options
(1)	(2)	(3)	(4)
<b>Blue Glassware</b>	<b>(a) Glassware</b> Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes	Puncture proof and leak proof boxes or containers with blue coloured marking ( 2018 Amendment)	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling
	<b>(b) Metallic Body Implants</b>	Puncture proof and leak proof boxes or containers with blue colored marking (2018 Amendment)	

## PART 2

- All plastic bags shall be as per BIS standards as and when published, till then the prevailing Plastic Waste Management Rules shall be applicable
- Chemical treatment using at least 1% to 2%(2018 Amendment) Sodium Hypochlorite having 30% residual chlorine for 20 minutes or any other equivalent chemical reagent that should demonstrate Log104 reduction efficiency for micro-organisms
- Mutilation or shredding should be to an extent to prevent unauthorised reuse
- There will be no chemical pre-treatment before incineration, except for microbiological, lab and highly infectious waste
- Dead foetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time) can be considered as human anatomical waste. Such waste should be handed over to the operator of common BMW treatment and disposal facility in yellow bag with a copy of the official Medical Termination of Pregnancy certificate from the Obstetrician or Medical Superintendent of the hospital or healthcare establishment
- Cytotoxic drug vials shall not be handed over to unauthorised person under any circumstances. These shall be sent back to the manufacturer for necessary disposal at a single point. As a second option, these may be sent for incineration at common BMW treatment and disposal facility or TSDFs or Plasma Pyrolysis at temperature >1200°C
- Residual or discarded chemical wastes, used or discarded disinfectants and chemical sludge can be disposed at hazardous waste treatment, storage and disposal facility. In such case, the waste should be sent to hazardous waste treatment, storage and disposal facility through operator of common BMW treatment and disposal facility only
- On-site pre-treatment of laboratory waste, microbiological waste, blood samples, blood bags through disinfection or sterilisation onsite in the manner as prescribed by the WHO on safe management of wastes from healthcare activities and WHO Blue book, 2014 and then given to the common BMW treatment and disposal facility for safe disposal.
- Installation of in-house incinerator is not allowed. However in case there is no common bio-medical



facility nearby, the same may be installed by the occupier after taking authorisation from the SPCB

- Syringes should be either mutilated or needles should be cut and/or stored in tamper-proof, leak-proof and puncture-proof containers for sharps storage. Wherever the occupier is not linked to a disposal facility it shall be the responsibility of the occupier to sterilise and dispose in the manner prescribed
- BMW generated in households during healthcare activities shall be segregated as per these rules and handed over in separate bags or containers to municipal waste collectors.



## **ANNEXURE V: LOGO FOR BMW CONTAINERS AND BAGS**

### **LABEL FOR BMW INCLUDING SHARPS**



HANDLE WITH CARE

### **LABEL FOR CYTOTOXIC WASTE**

### **CYTOTOXIC HAZARD SYMBOL**



HANDLE WITH CARE





## ANNEXURE VI: NEEDLE STICK INJURY REPORTING FORMAT

*(To be completed by treating physician and sent to the Infection Control Officer/ Nurse)*

### Needle Stick Sharp Injury Protocol

Name of HCW \_\_\_\_\_

Designation & Duty Area \_\_\_\_\_

Date of Needle Stick/Sharp Injury/Body Fluid Exposure \_\_\_\_\_

Date of Reporting to Casualty \_\_\_\_\_

Site & Depth of Injury \_\_\_\_\_

Nature of Injury: Needle Prick/Sharp Cut/Laceration/Splash of Fluids/Splattered Glass

Action taken in Casualty

Hep. B. vaccination given: Yes/No

HBIG Yes/No

If immunised: Date \_\_\_\_\_ Intra-dermal/Intramuscular

Anti Hbs Ag Titre \_\_\_\_\_

Hbs Ag Positive/Negative

HIV antibody Positive/Negative

Information about Source of Contamination (if available)

- Whether the patient has symptoms of HIV infection or no symptoms
- Serum sent for: (Reports to be entered in follow-up visit)
  - Anti-HIV 2. HBs-Ag 3. Anti-HCV 4. CD4/CD8 counts

**(Name & Signatures of immediate Supervisor/HOD)**

**(Name & Signatures of MO I/C)**

**Date and Time:**



### **PEP INFORMED CONSENT/REFUSAL FORM**

*(When PEP has been advised this form should be filled in and signed by the exposed person, and signed by the designated officer for PEP. This should be kept in the file)*

Name: .....

Date of birth: ..... Gender: .....

Date of the accidental exposure: .....

***I, the undersigned, hereby declare:***

- ***That I have been informed of the recommendations with regard to prophylactic treatment after accidental exposure to HIV/HBV***
- ***That I understand the risk of transmission after accidental exposure to blood***
- ***That I have been informed of the effectiveness and the possible side-effects of this treatment***

*(Please select one option in the following section)*

- ***That I have been offered prophylactic treatment, and***
  - ***That I have decided not to take it***
  - ***I agree to follow this prophylactic treatment for a period of 28 days/as recommended and I agree to accept medical supervision and follow up testing for this***

Date: .....

Signature of the Exposed Person:

Signature of the Designated Officer



## ANNEXURE VII: SURGICAL SITE INFECTION REPORTING FORMAT

Hospital	_____
Unit	_____
<b>Patient</b>	
Patient identification	_____
Age (years)	_____
Gender <input type="checkbox"/> male <input type="checkbox"/> female	_____
Date of admission (in the hospital) (dd/mm/yy)	_____
Date of discharge (from the unit) (dd/mm/yy)	_____
<b>Operation</b>	
Date of operation (dd/mm/yy)	_____
Main procedure (code)	_____
Wound class <input type="checkbox"/> Clean <input type="checkbox"/> Contaminated <input type="checkbox"/> Clean-contaminated <input type="checkbox"/> Dirty/infected	_____
ASA score <input type="checkbox"/> I <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	_____
Duration of operation (minutes)	_____
Urgent <input type="checkbox"/> Yes <input type="checkbox"/> No	_____
Prosthesis/implant <input type="checkbox"/> Yes <input type="checkbox"/> No	_____
Multiple procedures <input type="checkbox"/> Yes <input type="checkbox"/> No	_____
Coeliosurgery <input type="checkbox"/> Yes <input type="checkbox"/> No	_____
<b>Antibiotics</b>	
Antimicrobial prophylaxis <input type="checkbox"/> Yes <input type="checkbox"/> No	_____
Starting date (dd/mm/yy)	_____
Duration (days)	_____
<b>Surgical site infection</b>	
Surgical site infection <input type="checkbox"/> Yes <input type="checkbox"/> No	_____
Date of infection (dd/mm/yy)	_____
Infection site <input type="checkbox"/> superficial <input type="checkbox"/> deep <input type="checkbox"/> organ/space	_____
Microorganism 1	_____
Microorganism 2	_____
Date of last contact (dd/mm/yy)	_____



## ANNEXURE VIII: INSPECTION CHECKLIST- (CPWD)

**Annexure - 15**

### (a) Inspection of Buildings (Civil)

- (a) House no. and Type : (b) Location :  
(c) Date of Last Inspection : (d) Date of present inspection :

S.No.	Item No.	<u>Needs Repair</u>		<u>Needs Replacement</u>		<u>Priority</u>			
		Action	Quantity	Cost	Quantity	Cost	Immediate	Annual	Routine Repairs
1	2	3	4	5	6	7	8	9	10
<b>1.</b>	<b>Walls</b>								
1.1	Cracks								
1.2	Repair to plaster								
1.3	Repair to brick work								
1.4	Dampness								
<b>2.</b>	<b>Floors</b>								
2.1	Cracks								
2.2	Settlement								
2.3	Slopes								
2.4	Skirting cracks								
2.5	Dados cracks								
<b>3.</b>	<b>Doors, Windows, Ventilators &amp; Cupboards</b>								
3.1	Glass panes broken								
3.2	Panels in shutters broken								
3.3	Panels fit improperly								
3.4	Improper/missing fittings								
	1.1.1 Hinges								
	1.1.2 Handles								
	1.1.3 Tower Bolts								
	1.1.4 Aldrops								
	1.1.5 Floor door stopper								
	1.1.6 Knobs								
	1.1.7 Cleats								
	1.1.8 Hooks & Eyes								
	1.1.9 Curtain Rods								
	1.1.10 Stays								
	1.1.11 Pelmets								
<b>4.</b>	<b>Roofs</b>								
4.1	Leakages/Damp patches								
4.1	Water proofing treatment								
4.2	Golas								
4.3	Khurras								
4.4	Brick drip course								
4.5	Rain water pipe								
4.6	Regrading								



- 4.7 Top Layer of tiles
- 4.8 Parapet, coping
- 5. Water Supply & Sanitary fittings**
  - 5.1 Leakages in pipe joints
  - 5.2 Functioning of washers
  - 5.3 Functioning of traps in fittings
  - 5.4 Functioning of floor traps
  - 5.5 Functioning of overhead/low level cistern
  - 5.6 Air Locking
  - 5.7 Leakages in pipe joints
  - 5.8 Condition of overhead tank
  - 5.9 Cleaning of overhead tank
  - 5.10 Fittings
    - 5.10.1 Wash basin
    - 5.10.2 Soap container
    - 5.10.3 Mirror
    - 5.10.4 Glass shelf
    - 5.10.5 Towel rail
    - 5.10.6 Hangers
    - 5.10.7 Sinks
    - 5.10.8 Taps
    - 5.10.9 Pillar cocks
    - 5.10.10 Showers
    - 5.10.11 Cisterns
    - 5.10.12 Ball valves
    - 5.10.13 Seat cover
    - 5.10.14 Steps
- 6. External Services**
  - 6.1 Manhole covers
  - 6.2 Covers to gully traps
  - 6.3 Cleaning of manholes
  - 6.4 Plinth protection
  - 6.5 Cleaning of storm water drain
  - 6.6 Approach roads
  - 6.7 Service lanes
- 7. Finishing**
  - 7.1 White washing/colour washing/distemper
    - (a) When was it done last?
    - (b) When is it due?
    - (c) Existing condition.
  - 7.2 Painting
    - (a) When was it done last?
    - (b) Existing conditions
    - (c) When is it due.
- 8. Common Areas**
  - 8.1 Railing to staircase
  - 8.2 Staircase steps
  - 8.3 Staircase nosing
  - 8.4 Shafts



3

**(b) Inspection of Buildings (Electrical)**

- (a) House No. and Type : (b) Location :  
(c) Date of Last Inspection : (d) Date of present inspection :

S.No.	Item No.	Needs Repair		Needs Replacement		Priority		
		Action	Quantity	Cost	Quantity	Cost	Immediate	Annual Routine Repairs
<b>1.</b>	<b>Switch Boards</b>							
1.1	Regulator							
1.2	Switches							
1.3	Fixing of tiles							
<b>2.</b>	<b>Fans</b>							
2.1	Conopy fixing							
2.2	Speed and noise							
<b>3.</b>	<b>Socket outlet points and connection</b>							
3.1	Tile							
3.2	Switch							
3.3	Outlet connection if any							
<b>4.</b>	<b>Fittings</b>							
4.1	Reflector							
4.2	Louvers/perspex cover							
4.3	Suspension rod							
<b>5.</b>	<b>Exhaust Fans</b>							
5.1	Speed and noise							
5.2	Louvers							
5.3	Connecting wires i/c. ceiling rose							
<b>6.</b>	<b>Call bells</b>							
6.1	Bell push							
6.2	Connecting wire							
6.3	Ball Buzzer							
<b>7.</b>	<b>Sub distribution boards/BDB/Main Board</b>							
7.1	Switch covers							
7.2	Fuse Kit Kats							
7.3	Earth connection							
7.4	Fuse rating							
7.5	Inter connection							
7.6	Boards							





**(c) Inspection of buildings/gardens :**

**(A) LAWN :**

- i) Weeding
- ii) Patch repair
- iii) Renovation
- iv) Regrassing

**(B) HEDGE :**

- I) Gap filling
- II) Replacement

**(C) PRUNNING & TRAINING :**

- i) Naturally required pruning
- ii) Prunning required for security purpose of building as well as occupant

**(D) PLANTING BEDS :**

- i) Needs Replacement
- ii) Gap filling

**(E) U/F WATER SUPPLY**

- i) Matter to be reported to U/F Water Division after inspection.

**(F) ROCKERIES :**

- i) Gap filling of dead one
- ii) Replacement of damaged, weak
- iii) Replacement of stones
- iv) Thinning, trimming
- v) Redesigning of paths, Maintenance of paths

**(G) KITCHEN GARDEN**

- i) Change in site
- ii) Plan for planting of vegetables

**(H) ROAD SIDE PLANTATION :**

- i) Gap filling Nos.
- ii) Trimming, pruning
- iii) Tree Guards not required & to be removed/repair/painting etc.
- iv) Proposal for new plantation, Digging of holes etc.
- v) Misc.
- vi) MOU-Detailed report(performance & financial achievements)



ANNEXURE IX: IEC FOR SWACHH BHARAT ABHIYAN & “Kayakalp”



Figure49: May be used as hospital banner



Figure 50: May be used at registration counter





Figure 51: May be used in food trolley



Figure 52: May be used on T-shirts of hospital cleaning staff





Figure 53: Generic posters for hospital



Figure 54: Generic message





Figure 55: Generic IEC for hospital



Figure 56: May be used in washrooms







Figure 57 Logo for Swachhata and Kayakalp



## ANNEXURE X: GLOSSARY OF TERMS

### A

**Aerosol:** Particles of respirable size ( $<10\ \mu\text{m}$ ) generated by both humans and environmental sources that can remain viable and airborne for extended periods in the indoor environment

**Airborne Transmission:** Means of spreading infection in which airborne droplet nuclei are inhaled by the susceptible host

**Alcohol-based Hand Rub:** An alcohol-containing preparation designed for application to the hands for reducing the number of viable micro-organisms on the hands. These are waterless antiseptic agents not requiring the use of exogenous water. After applying such an agent, the hands are rubbed together until the agent has dried

**Antimicrobial Soap:** A soap (i.e., detergent) containing an antiseptic agent

**Antiseptic:** A germicide that is used on skin or living tissue for the purpose of inhibiting or destroying micro-organisms. Examples include alcohols, chlorhexidine, chlorine, hexachlorophene, iodine, quaternary ammonium compounds, and triclosan

**Antiseptic Hand Wash:** Washing hands with water and soap or detergents containing an antiseptic agent. **Antiseptic hand rub:** The process of applying an antiseptic hand rub product to all surfaces of the hands to reduce the number of micro-organisms present

**Asepsis:** Prevention from contamination with micro-organisms. It includes sterile conditions on tissues, on materials, and in rooms, as obtained by excluding, removing, or killing organisms

**Audit:** A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements, are implemented effectively and are suitable to achieve objectives

### B

**Biological Indicator:** A device to monitor the sterilisation process that consists of standardised population bacterial spores, known to be resistant to the mode of sterilisation being monitored. Biological indicators indicate that all the parameters necessary for sterilisation were present

**Bio-Medical Waste:** Bio-Medical Waste means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps, including the categories mentioned in BMW Rules, 2016, Schedule I

**Blood-borne Pathogens:** Disease-producing micro-organisms spread by contact with blood or other body fluids contaminated with blood from an infected person

### C

**Chemical Indicator:** A device to monitor the sterilisation process that changes colour or form with exposure to one or more of the physical conditions within the sterilising chamber (e.g., temperature, steam). Chemical indicators are intended to detect potential sterilisation failures that could result from incorrect packaging, incorrect loading of the steriliser, or malfunctions of the steriliser





**Chemical Sterilant:** Chemicals used for the purpose of destroying all forms of microbial life including bacterial spores

**Cleaning:** The removal of visible soil, organic and inorganic contamination from a device or surface, using either the physical action of scrubbing with a surfactant or detergent and water or an energy-based process (e.g., ultrasonic cleaners) with appropriate chemical agents

**Contact precautions:** Precautions that are used in addition to routine practices to reduce the risk of transmitting infectious agents via contact with an infectious person

**Contaminated:** State of having been in contact with micro-organisms. As used in healthcare, it generally refers to micro-organisms capable of producing disease or infection

**Critical:** The category of medical devices or instruments that are introduced directly into the human body, either into or in contact with the bloodstream or normally sterile areas of the body (e.g., surgical scalpel). These items are so called because of the substantial risk of acquiring infection if the item is contaminated with micro-organisms at the time of use

## D

**Decontamination:** A process or treatment that renders a medical device, instrument, or environmental surface safe to handle. According to OSHA, “the use of physical or chemical means to remove, inactivate, or destroy blood-borne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal”

**Detergents:** Compounds that possess a cleaning action and have hydrophilic and lipophilic parts. Although products used for hand washing or antiseptic hand wash in a healthcare setting represent various types of detergents, the term “soap” is used to refer to such detergents in this guideline

**Direct Contact Transmission:** Physical transfer of micro-organisms between a susceptible host and an infected or colonised person

**Disinfectant:** A chemical agent used on inanimate objects (i.e., non-living) (e.g., floors, walls, sinks) to destroy virtually all recognised pathogenic micro-organisms, but not necessarily all microbial forms (e.g., bacterial endospores)

**Disinfection:** The destruction of pathogenic and other kinds of micro-organisms by physical or chemical means. Disinfection is less lethal than sterilisation, because it destroys most recognised pathogenic micro-organisms, but not necessarily all microbial forms, such as bacterial spores. Disinfection does not ensure the margin of safety associated with sterilisation processes

**Distilled Water:** Water heated to boiling point, vaporised, cooled, condensed, and collected so that no impurities are reintroduced

**Droplets:** Small particles of moisture (e.g., spatter) that may be generated when a person coughs or sneezes or when water is converted to a fine mist by an aerator or shower head. Intermediate in size between drops and droplet nuclei, these particles, although they may still contain infectious micro-organisms, tend to quickly settle out from the air so that any risk of disease transmission is generally limited to persons in close proximity to the droplet source



## E

**Environment of the Patient:** The immediate space around a patient that may be touched by the patient and may also be touched by the healthcare provider when providing care. The patient environment includes equipment, medical devices, furniture (e.g., bed, chair, bedside table), telephone, privacy curtains, personal belongings (e.g., clothes, books) and the bathroom that the patient uses

**Exposure Time:** Period of time during a sterilisation or disinfection process in which items are exposed to the sterilant or disinfectant at the parameters specified by the manufacturer (e.g., time, concentration, temperature, pressure)

## G

**Germicide:** An agent that destroys micro-organisms, especially pathogenic organisms. Other terms with the suffix “-cide” (e.g., virucide, fungicide, bactericide, tuberculocide, sporicide) indicate an agent that destroys the micro-organism identified by the prefix. Germicides may be used to inactivate micro-organisms in or on living tissue (antiseptic) or on environmental surfaces (disinfectants)

## H

**Hand Hygiene:** A general term that applies to hand washing, antiseptic hand wash, antiseptic hand rub, and surgical hand antisepsis

**Hand Washing:** The physical removal of micro-organisms from the hands using soap (plain or antimicrobial) and running water

**Hazardous Waste:** Hazardous waste means any waste which by reason of characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment, whether alone or in contact with other wastes or substances

**HAZMAT:** It is an abbreviation for “hazardous materials” – substances in quantities or forms that may pose a reasonable risk to health, property, or the environment. HAZMATs include such substances as toxic chemicals, fuels, nuclear waste products, and biological, chemical, and radiological agents. HAZMATs may be released as liquids, solids, gases, or a combination or form of all three, including dust, fumes, gas, vapour, mist, and smoke

**Health-care-associated Infection:** Any infection associated with a medical or surgical intervention in the healthcare settings. The term “health-care-associated” replaces “nosocomial,” which is limited to adverse infectious outcomes occurring in hospitals

**Healthcare Professionals/Workers:** HCWs include, but are not limited to, physicians, nurse practitioners, clinical nurse specialists, physician assistants, registered nurses, infusion therapists, licensed practical or vocational nurses, ancillary personnel delivering bedside care (e.g., equipment, supplies, nutrition, etc.), respiratory care practitioners, and rehabilitation staff (i.e., physical therapist)

**High-level Disinfection:** A disinfection process that inactivates vegetative bacteria, mycobacteria, fungi, and viruses but not necessarily high numbers of bacterial spores. The Food and Drug Administration (FDA) further defines an HLD as a sterilant used under the same contact conditions except for a shorter contact time

**Hypersensitivity:** An immune reaction (allergy) in which the body has an exaggerated response to a specific antigen (e.g., food, pet dander, wasp venom)



## I

**Information Education and Communication (IEC):** “IEC” refers to a public health approach aiming at changing or reinforcing health-related behaviours in a target audience, concerning a specific problem and within a pre-defined period of time, through communication methods and principles

**Immunisation:** The process by which a person becomes immune, or protected, against a disease

**Implantable Device:** According to FDA, “device that is placed into a surgically or naturally formed cavity of the human body if it is intended to remain there for a period of 30 days or more”

**Infection:** The entry and multiplication of an infectious agent in the tissues of the host. Asymptomatic or subclinical infection is an infectious process running a course similar to that of clinical disease but below the threshold of clinical symptoms. Symptomatic or clinical infection is one resulting in clinical signs and symptoms (disease)

**Indirect Contact Transmission:** Contact of a susceptible host with a contaminated, intermediate object, usually inanimate. Infectious micro-organisms: micro-organisms capable of producing infection in susceptible hosts

**Intermediate-level Disinfection:** A disinfection process that inactivates vegetative bacteria, most fungi, mycobacteria, and most viruses (particularly the enveloped viruses) but not bacterial spores

## J

**Junk:** Old or discarded articles that are considered to be of no use or of little value or having low quality

## L

**Landscaping:** Landscaping is the process of making a garden or other piece of land more attractive by altering the existing design, adding ornamental features, and planting trees and shrubs

**Low-level Disinfection:** A process that will inactivate most vegetative bacteria, some fungi, and some viruses but cannot be relied on to inactivate resistant micro-organisms (e.g., mycobacteria or bacterial spores)

## M

**Manufacturer:** Any person, partnership or incorporated association that manufactures and sells medical equipment/devices under its own name or under a trade mark, design, trade name or other name or mark owned or controlled by it

**Material Safety Data Sheet (MSDS):** A document that contains information on the potential hazards (health, fire, reactivity and environmental) and how to work safely with a chemical product. It also contains information on the use, storage, handling and emergency procedures related to the hazards of the material. MSDSs are prepared by the supplier or manufacturer of the material

**Medical Equipment/Device:** Any instrument, apparatus, appliance, material, or other article, whether used alone or in combination, intended by the manufacturer to be used for human beings for the purpose of diagnosis, prevention, monitoring, treatment or alleviation of disease, injury or handicap; investigation, replacement, or modification of the anatomy or of a physiological process; or control of conception

**Monitoring:** A planned series of observations or measurements of a named parameter (e.g., monitoring, cleaning of client/patient/resident rooms)



## N

**N-95 Respirator:** Disposable particulate respirators. “95” refers to the percentage of particles filtered

**Non-critical:** The category of medical items or surfaces that carry the least risk of disease transmission. This category has been expanded to include not only non-critical medical devices but also environmental surfaces. Non-critical medical devices touch only unbroken (non-intact) skin (e.g., blood pressure cuff). Non-critical environmental surfaces can be further divided into clinical contact surfaces (e.g., light handle) and housekeeping surfaces (e.g., floors, countertops).-

**Nosocomial:** Describes an infection acquired in a hospital as a result of medical care (see definition for health-care-associated infection)

## O

**Occupational Exposure:** A reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee’s duties

**Outsourced:** To contract a particular service from an outside supplier or source

## P

**Parenteral:** Means piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts, and abrasions

**Percutaneous Injury:** An injury that penetrates the skin (e.g., needle stick, or cut with a sharp object)

**Personal Protective Equipment (PPE):** Is specialised clothing or equipment worn by an employee for protection against a hazard (e.g., gloves, masks, protective eyewear, gowns). General work clothes (e.g., uniforms, pants, shirts or blouses) not intended to function as protection against a hazard and are not considered to be personal protective equipment

**Plain or Non-antimicrobial Soap:** Soaps or detergents that do not contain antimicrobial agents or contain very low concentrations of such agents which are effective solely as preservatives

**Policy:** Policy is a statement of expectations meant to influence or determine decisions and actions. Policies are the rules and principles that guide and inform the organisation’s procedures and processes

**Post-exposure Prophylaxis:** The administration of medications following an occupational exposure in an attempt to prevent infection

**Potable (drinking) Water:** Water suitable for drinking as per applicable public health standards

**PPM (Parts per million):** A measure of concentration in solution. For example, a 5.25% chlorine bleach solution (undiluted as supplied by the manufacturer) contains approximately 52,500 parts per million of free available chlorine

**Precautions:** Interventions to reduce the risk of transmission of micro-organisms (e.g., patient-to-patient, patient-to-staff, staff-to-patient, contact with the environment, contact with contaminated equipment)

**Prevalence:** The number of disease cases (new and existing) within a population at a given time



## Q

**Quality:** ISO 8402-1986 standard defines quality as “the totality of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs”

## R

**Reprocessing:** The steps performed to prepare used medical equipment for use (e.g., cleaning, disinfection, sterilisation)

**Reservoir:** Any person, animal, substance or environmental surface in or on which an infectious agent survives or multiplies, posing a risk for infection

## S

**Sanitation:** Promotion of hygiene and prevention of disease by maintenance of sanitary condition

**Semi-critical:** The categories of medical devices or instruments (e.g., mouth, mirror) that come into contact with mucous membranes and do not ordinarily penetrate body surfaces

**Septic Tank:** A water-tight single-storeyed tank in which sewage is retained sufficiently long to permit sedimentation

**Sewage:** The liquid waste of a household or community including human excreta

**Sharps:** Objects capable of causing punctures or cuts (e.g., needles, lancets, sutures, blades, clinical glass)

**Sludge:** Sludge is the settled solid matter in semi-solid condition

**Spatter:** Visible drops of liquid or body fluid that are expelled forcibly into the air and settle out quickly, as distinguished from particles of an aerosol, which remain airborne indefinitely

**Spaulding Classification:** A strategy for sterilisation or disinfection of inanimate objects and surfaces based on the degree of risk involved in their use. The three categories are critical, semi-critical, or non-critical. The system also established three levels of germicidal activity for disinfection (high, intermediate, and low)

**Sterilant:** A liquid chemical germicide that destroys all forms of microbiological life, including high numbers of resistant bacterial spores

**Sterile/Sterility:** State of being free from all living micro-organisms. In practice, usually described as a probability function, (e.g., the probability of a surviving micro-organism being 1 in 1,000,000)

**Sterilisation:** The use of a physical or chemical procedure to destroy all micro-organisms including large numbers of resistant bacterial spores

**Surgical Hand Scrub:** An antiseptic-containing preparation that substantially reduces the number of micro-organisms on intact skin; it is broad-spectrum, fast-acting, and persistent

## T

**Transmission-based Precautions:** A set of practices that apply to patients with documented or suspected infection or colonisation with highly transmissible or epidemiologically important pathogens for which precautions beyond the standard precautions are needed to interrupt transmission in healthcare settings



## V

**Vaccination:** The term “vaccination” is defined as the injection of a killed or weakened infectious organism into the body in order to prevent a specific disease

**Vaccine:** A product that produces immunity therefore protecting the body from the disease. Vaccines are administered through needle injections, by mouth and by aerosol

**Ventilation:** The process of supplying and removing air by natural or mechanical means to and from any space; such air may be conditioned

## W

**Water Conservation:** Water conservation refers to the preservation, control and development of water resources, both surface and groundwater, and prevention of pollution

**Water Harvesting:** Water harvesting is the collection and storage of runoff water especially of rain water, for productive purposes

**Work Practice Controls:** Are practices incorporated into the everyday work routine that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique)





## LIST OF ABBREVIATIONS

1	ABHR	Alcohol-Based Hand Rub
2	AC	Air Conditioner
3	AERB	Atomic Energy Regulatory Board
4	AHU	Air Handling Unit
5	AIDS	Acquired Immune Deficiency Syndrome
6	AMT	Antibiotic Management Team
7	ART	Antiretroviral Therapy
8	BIS	Bureau of Indian Standards
9	BMW	Bio-Medical Waste
10	BOD	Biochemical Oxygen Demand
11	CBC	Complete Blood Count
12	CBMWTF	Common Bio-Medical Waste Treatment Facilities
13	CCTV	Closed-Circuit Television
14	CDC	Centers for Disease Control
15	CFL	Compact Fluorescent Lamp
16	CHC	Community Health Centre
17	COD	Chemical Oxygen Demand
18	CPCB	Central Pollution Control Board
19	CPWD	Central Public Works Department
20	CSSD	Central Sterile Services Department
21	DH	District Hospital
22	DNA	Deoxyribonucleic Acid
23	ECG	Electrocardiography
24	EDTA	Ethylenediaminetetra Acetic Acid
25	ETO	Ethylene Oxide
26	ETP	Effluent Treatment Plant
27	FDA	Food and Drug Administration
28	GI	Gastrointestinal
29	GOI	Government of India
30	HAI	Hospital Acquired Infection
31	HBV	Hepatitis B Virus
32	HCF	Healthcare Facilities
33	HCV	Hepatitis C Virus
34	HCW	Healthcare Worker
35	HDU	High Dependency Unit
36	HEPA	High Efficiency Particulate Air
37	HIV	Human Immunodeficiency Virus
38	HLD	High-level Disinfection
39	HOD	Head of Department
40	HSCH	High Strength Calcium Hypochlorite
41	HVAC	Heating, Ventilation, Conditioning System
42	ICU	Intensive Care Unit
43	IEC	Information Education and Communication



44	IV	Intravenous
45	LED	Light Emitting Diode
46	LPG	Liquefied Petroleum Gas
47	MCH	Mother and Child Health
48	mm	Millimetre
49	MO	Medical Officer
50	MSDS	Material Safety Data Sheet
51	NACO	National AIDS Control Organisation
52	NHM	National Health Mission
53	NHSRC	National Health Systems Resource Centre
54	NICU	Neonatal Intensive Care Unit
55	NQAS	National Quality Assurance Standards
56	OBS	Obstetrician
57	OPD	Out Patient Department
58	OPG	Orthopantomography
59	OSHA	Occupational Safety and Health Administration
60	OT	Operation Theatre
61	PCPNDT	Pre-Conception and Pre-Natal Diagnostic Technique
62	PHC	Primary Health Centre
63	PNG	Piped Natural Gas
64	PPE	Personal Protective Equipment
65	PVC	Polyvinyl Chloride
66	QUATS	Quaternary Ammonium Compounds
67	RKS	Rogi Kalyan Samiti
68	RNA	Ribonucleic Acid
69	RO	Reverse Osmosis
70	RSO	Radiation Safety Officer
71	SBP	Stable Bleaching Powder
72	SDH	Sub Divisional Hospital
73	SNCU	Sick New-born Care Unit
74	SOP	Standard Operating Procedure
75	SPCB	State Pollution Control Board
76	SSI	Surgical Site Infection
77	TAT	Turn Around Time
78	TB	Tuberculosis
79	TDS	Total Dissolved Solids
80	TOT	Training of Trainers
81	US	United State
82	USG	Ultrasonography
83	UV	Ultraviolet
84	WHO	World Health Organization



## REFERENCES

1. Kayakalp – Award to Public Health Facilities, Ministry of Health & Family Welfare, Government of India
2. National Quality Assurance Standards (NQAS) for Public Health Facilities -2016.
3. [https://www.publichealthontario.ca/en/eRepository/Best\\_Practices\\_Environmental\\_Cleaning\\_2012.pdf](https://www.publichealthontario.ca/en/eRepository/Best_Practices_Environmental_Cleaning_2012.pdf) A Manual on Hygiene Promotion, UNICEF, The London School of Hygiene and Tropical Medicine, 1999.
4. IEC guidelines for Total Sanitation Campaign, Ministry of water and Sanitation, Government of India 2010.
5. IEC Reference Manual for Health Managers, Zimbabwe National Family Planning Council, Second Edition 1998
6. IPHS Guidelines for District Hospital, 2012
7. Signage Programme in Hospitals: A System for Quality Improvement Through Patient Access and Convenience, Vol. 16, No. 1 (2004-01 - 2004-06), Journal of the Academy of Hospital Administration
8. Effective wayfinding and signing systems, guidance for healthcare facilities, Published by TSO
9. Hospital Outdoor Landscape Design, Gökçen Firdevs Yücel
10. National building code of India, 2005 bureau of Indian standards
11. Energy Assessment Guide for Commercial Buildings, 2009 USAID ECO-iii Project
12. 10 Steps Guide for implementing Pest Management Programme
13. Armed Forces Pest Management Board's technical guide, "Pest Management Operations in Medical Treatment Facilities"
14. How to control pests in healthcare facilities, February 4, 2015 by Jim Fredericks Ph.D. and Missy Henriksen
15. Help Control Mosquitoes that Spread Dengue, Chikungunya, and Zika Viruses, CDC Guidelines
16. Government of Kerela-Health and Family Welfare Department- Condemnation of unserviceable Hospital Equipment, furniture and Electrical Equipment in all Hospitals-Instructions/orders issued.
17. Government of India-Directorate of Field Publicity-Procedure for condemnation and disposal of stores.
18. National Centre for Chronic Disease Prevention and Health Promotion; <https://www.cdc.gov/oralhealth/infectioncontrol/glossary.htm>
19. IS 4347 (1967) Code of practice for hospital lighting [ETD 24: Illumination Engineering and Luminaries] Reaffirmed 2005
20. IS 1172:1993 Reaffirmed 2007, Indian Standard CODE OF BASIC REQUIREMENTS FOR WATER SUPPLY, DRAINAGE AND SANITATION (Fourth Revision)
21. General Guidelines for Water Audit and Water Conservation. Govt of India ministry of water resources.
22. Provincial Infectious Diseases Advisory Committee (PIDAC). Best practices for environmental cleaning for prevention and control of infections in all healthcare settings - 2nd Edition. Ontario; 2012.



23. American Hospital Association. Manual of Hospital Housekeeping Publication
24. WHO safe management of Healthcare waste
25. Indian Standard CODE OF PRACTICE FOR INSTALLATION OF SEPTIC TANKS PART I DESIGN CRITERIA AND CONSTRUCTION (Second Revision): IS: 2470 (Part 1 ) – 1985. Reaffirmed 1996
26. NACO Guidelines on Post Exposure Prophylaxis (PEP)
27. Environmentally sound management of mercury waste generated from the healthcare facilities: Hazardous Waste Management Series: HAZWAMS/39/2011-2012; CPCB 31st January, 2012
28. Solid Waste Management Rules, 2016
29. Journal of Academy of Hospital Administration Vol 14. No. 1(2002-01-2002-06)
30. Technological Options for Solid and Liquid Waste Management in Rural Areas; MDW&S, April 2015
31. [gpsc\\_ccisc\\_fact\\_sheet\\_en.pdf](#)
32. [http://www.wpro.who.int/publications/docs/practical\\_guidelines\\_infection\\_control.pdf](http://www.wpro.who.int/publications/docs/practical_guidelines_infection_control.pdf)
33. WHO Guidelines on hand hygiene in healthcare
34. WHO Pocket Leaflet: Clean Care is Safer Care: Hand Hygiene When and How
35. WHO Guidelines on Hand Hygiene in Healthcare: First Global Patient Safety Challenge Clean Care Is Safer Care Geneva: World Health Organization; 2009
36. WHO: Practical Guidelines for Infection Control in Healthcare Facilities
37. <https://www.cdc.gov/hai/pdfs/ppe/ppeslides6-29-04.pdf>
38. <http://medical.tpub.com/14295/css/Gowning-And-Gloving-109.htm>
39. [http://www.chp.gov.hk/files/pdf/Use\\_Mask\\_Properly.pdf](http://www.chp.gov.hk/files/pdf/Use_Mask_Properly.pdf)
40. Best Practices for Cleaning, Disinfection and Sterilisation in All Healthcare Settings | May 2013: Provincial Infectious Diseases Advisory Committee (PIDAC)
41. Best Practice Guidelines for the Cleaning, Disinfection and Sterilisation of Medical Devices in Health Authorities March 2007 British Columbia; Patient Safety Branch Ministry of Health
42. WHO Guidelines on prevention of SSI
43. Association of Perioperative Registered Nurses (AORN) Recommended Practices Committee. US
44. Prevention of hospital-acquired infections: a practical guide WHO/CDS/CSR/EPH/2002.12
45. CDC Guideline for Disinfection and Sterilisation in Healthcare Facilities, 2008
46. CDC Guidelines for Environmental Infection Control in Healthcare Facilities; 2003
47. Guidance Sheet 4: Chemical Spill Management. State Government Victoria Department of education and training
48. As per Indian Standard basic requirements for hospital planning part 2 up to 100 bedded hospital; IS 12433:(Part 2): 2001 ( Reaffirmed in 2006)
49. Step-by-step approach for development and implementation of hospital antibiotic policy and standard treatment guidelines; WHO Regional Office of South East Asia
50. <http://nicd.nic.in/writereaddata/mainlinkfile/File559.pdf> ; Hospital Infection Prevention and Control Guidelines



51. WHO: Guidelines on Prevention and Control of Hospital Associated Infections
52. Prevention of hospital-acquired infections A PRACTICAL GUIDE 2nd edition; WHO/CDS/CSR/EPH/2002.12
53. NABH Revised guidelines for Air conditioning in OT
54. IS 12433-2 (2001): Basic Requirements for Hospital Planning, Part 2: UP to 100 Bedded Hospital [MHD 18: Imaging and Radiotherapy Equipment]
55. <http://hshrc.gov.in/wp-content/uploads/Laundry.pdf>
56. IS 15195 (2002): Performance guidelines for quality assurance in hospital services
57. Laundry Protocols for District Hospitals, HSHRC
58. Hospital infection control manual for small healthcare organisations; NABH HIC GUIDEBOOK
59. Water, sanitation and hygiene in healthcare facilities Status in low- and middle-income countries and way forward; ; WHO 2015.
60. IS 1172: 1993 (Reaffirmed 2007) Indian Standard CODE OF BASIC REQUIREMENTS FOR WATER SUPPLY, DRAINAGE AND SANITATION
61. "WHO Cleaning and disinfecting water storage tanks and tankers, TECHNICAL NOTES ON DRINKING-WATER, SANITATION AND HYGIENE IN EMERGENCIES
62. [https://www.cdc.gov/safewater/publications\\_pages/chlorineresidual.pdf](https://www.cdc.gov/safewater/publications_pages/chlorineresidual.pdf)
63. National Guidelines for Clean Hospitals
64. Operating Room Nurses Association of Canada (ORNAC) Standards, Guidelines and Position Statements for Perioperative Registered Nursing Practice. 10th Edition. Section 2, Infection Prevention and Control. 2011.
65. Canadian Standards Association, Z314.3-09, Effective Sterilisation in Healthcare Facilities by the Steam Process: Table 1, Cleaning Frequencies.
66. Manual for Implementation of 5S in Hospital Setting, TQM Unit, Hospital Services Management, DGHS Dhaka, Bangladesh
67. Modern trends in Planning and Designing of hospital : Principles and Practice by Shakti Kumar Gupta
68. Basic requirements for Hospital Planning, Bureau of Indian Standards-1998; IS:12433(Part 1) 1988
69. Guidelines for Environmental Infection Control in Healthcare Facilities. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). U.S. department of Health and Human Services Centres for Disease Control and Prevention (CDC) Atlanta, GA 30333 2003.
70. Swachhta Guidelines for public healthcare facilities. National Health Mission. Ministry of Health and Family Welfare, India. 2015.
71. Safe management of wastes from healthcare activities Second edition. Edited by Annette Prüss-Ustun, Jorge Emmanuel, Philip Rushbrook, Raki Zghondi, Ruth Stringer, Ute Pieper, William King Townend, Susan Wilburn and Yves Chartier. WHO 2013.
72. Best Practices for the Safe Use of Glutaraldehyde in Healthcare. Occupational safety and Health Administration (OSHA), USA. OSHA 3258-08N 2006. [www.osha.gov](http://www.osha.gov)
73. About Bleach Neutralisers. <http://facilities-med.sites.olt.ubc.ca/files/2011/12/Information-about->



Bleach-Neutralisers.pdf accessed 31/07/2016. University of British Columbia.

74. Environmental contamination by multidrug-resistant micro-organisms after daily cleaning. Laura Gavalda MD, MPH, Sandra Pequeño MD, MPH, Ana Soriano RN, M. Angeles Dominguez MD, MPH. American Journal of Infection Control 43 (2015) 776-8. 0196-6553/\$36.00 - Copyright 2015 by the Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved. <http://dx.doi.org/10.1016/j.ajic.2015.03.009>
75. Understanding and Preventing Transmission of Healthcare-Associated Pathogens Due to the Contaminated Hospital Environment. David J. Weber, MD, MPH; William A. Rutala, PhD, MPH. infection control and hospital epidemiology may 2013, vol. 34, no. 5. Copyright 2013 by The Society for Healthcare Epidemiology of America. All rights reserved. 0899-823X/2013/3405-0001\$15.00. DOI: 10.1086/670223.
76. Guideline for Disinfection and Sterilisation in Healthcare Facilities, 2008. William A. Rutala, Ph.D., M.P.H.1,2, David J. Weber, M.D., M.P.H.1,2, and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Centres for Disease Control (CDC), Atlanta. USA
77. Factsheet: Using Microfiber Mops in Hospitals. Environmental Best Practices for Healthcare Facilities, November 2002. US EPA Region 9 Pollution Prevention Programme.
78. Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, June 2007. CDC. Atlanta. <http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf>
79. WHO Technical brief. Boil water. WHO/FWC/WSH/15.02. [http://apps.who.int/iris/bitstream/10665/155821/1/WHO\\_FWC\\_WSH\\_15.02\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/155821/1/WHO_FWC_WSH_15.02_eng.pdf?ua=1) accessed on 01/08/16.
80. Accreditation standards for processing reusable textiles for use in healthcare facilities. 2016 edition. The Healthcare Laundry Accreditation Council. P.O. Box 1306, Plainfield, IL USA [www.hlacnet.org](http://www.hlacnet.org)
81. Award to Public Health Facilities Kayakalp
82. NHS Fife Infection Control Manual Chapter 2. 5 - Safe Management of Linen Procedure, <http://admin.1fife.org.uk/weborgs/nhs/uploadfiles/publications/IC%20Manual%20Ch2%205%20linen%20Jul%2011.pdf>
83. Health and safety executive (reference <http://www.hse.gov.uk/biosafety/blood-borne-viruses/laundry-treatments.htm>)
84. NHS Executive HSG(95)18. Hospital laundry arrangements for used and infected linen (under review). Available as a PDF download at: [HSG \(95\)18: Hospital laundry arrangements for used and infected linen](#)
85. Infection prevention ,guidelines for healthcare facilities with limited resources by JHPIEGO. [http://pdf.usaid.gov/pdf\\_docs/Pnact433.pdf](http://pdf.usaid.gov/pdf_docs/Pnact433.pdf).
86. <http://www.cgwb.gov.in/documents/AR/Roof%20Top%20Rain%20Water%20Harvesting.pdf>
87. CODE OF BASIC REQUIREMENTS FOR WATER SUPPLY, DRAINAGE AND SANITATION, (Fourth Revision), Fourth Reprint DECEMBER 2010
88. <http://www.hercenter.org/facilitiesandgrounds/waterconserve.cfm>
89. Reference -Guidelines for drinking-water quality, 2nd ed. Vol.2. Health criteria and other supporting information. World Health Organization, Geneva, 1996





90. Reference:(WHO guidelines on water, sanitation and health [http://www.who.int/water\\_sanitation\\_health/hygiene/envsan/tn03/en/](http://www.who.int/water_sanitation_health/hygiene/envsan/tn03/en/))
91. Indian standard: code of basic requirements of water supply.76(Fourth reprint).
92. Best practices guide-Food waste reduction, Green healthcare.<http://www.greenhealthcare.ie/wp-content/uploads/2013/08/Food-Waste-Reduction-Best-Practice-updated.pdf>
93. Ventilator-associated pneumonia in a tertiary care intensive care unit: Analysis of incidence, risk factors and mortality,Neelima Ranjan, Uma Chaudhary, Dhruva Chaudhry, and K. P. Ranjan
94. Quality Management in Hospitals, S.K.Joshi
95. Park's Textbook on Preventive and Social Medicine; K Park
96. CPWD Maintenance manual

### LIST OF CONTRIBUTORS

EXPERT GROUP (in Alphabetical Order)		
	Dr Anurag Srivastava	Professor & HOD Surgery, AIIMS New Delhi
	Dr Archana Verma	GM (Quality) UP NHM
	Dr Ashok Agrawal	Professor & Dean, IIHMR Delhi & President Indian Society of Hospital Waste Management
	Dr Babban Jee	Scientist – C, Department of Health Research, MoHFW, GOI
	Dr Pankaj Arora	Asst. Professor, Department of Hospital Administration, PGI Chandigarh
	Dr Renu Varma	Senior Consultant, Gynaecology and Obstetrics, VJBMC Lucknow
	Dr Sanjay Kulkarni	Hospital Infection Control Consultant
	Dr Sarika Mohan	Senior Scientific Advisor - CMAI
	Ms Santosh Mehta	Principal, RAK College of Nursing, New Delhi

MOHFW		
	Ms. Limatula Yaden	Director, NHM
	Dr Jayendra Kasar	Consultant

NHSRC TEAM		
	Dr J N Srivastava	Advisor
	Dr Parminder Gautam	Senior Consultant
	Dr Nikhil Prakash Gupta	Senior Consultant
	Dr Deepika Sharma	Consultant
	Dr Sushant Agrawal	Consultant
	Ms. Vinny Arora	Consultant
	Mr Jagjeet Singh	Consultant
	Dr Namit Singh Tomar	Consultant
	Ms. Surbhi Sharma	Consultant
	Dr. Abhay Dahiya	Ex Consultant
	Dr Neha Parakh	Ex Consultant

