Bio-Medical Waste Management
Self Learning Document For Nurses & Paramedical

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Acknowledgment

Bio-Medical Waste Management is a crucial challenge faced by all hospitals. We present this manual on “Bio-Medical Waste Management- Self Learning Document For Nurses and Paramedical”, as a step towards sensitizing the hospital professionals and support staff on management of bio-medical waste. This manual is the result of sincere and hard work of all the team members.

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CONTENTS

1. Introduction ........................................................................................................................................ 1
   1.1 What is Bio- Medical Waste? ......................................................................................................... 3
   1.2 Risk from Bio- Medical Waste If Not Managed Properly ............................................................ 3
   1.2.1 Environmental Hazard ............................................................................................................. 4
   1.2.2 Occupational Hazard ............................................................................................................... 4
   1.2.3 Public Health Hazard ............................................................................................................... 4
   1.3 Advantages of Proper Management of Bio-Medical Waste ......................................................... 5

2. Legal Provision ................................................................................................................................... 6
   2.1 Salient Features of Bio- Medical Waste (Management and Handling) Rules, 1998 .............. 6
   2.1.1 Categories of Bio- Medical Waste .......................................................................................... 7
   2.1.2 Category Wise Treatment and Disposal Methodology .......................................................... 8
   2.1.3 Segregation, Packaging, Storage and Transportation ............................................................ 9

3. Occupational Safety and Health of Health Care Workers .............................................................. 11
   3.1 Occupational Risks of Chemicals - Precautions and Safety Measures .................................. 11
   3.2 Disease Transmission .................................................................................................................. 14
   3.3 Nurses Safety ............................................................................................................................. 16
   3.4 Role of Nurses in Bio- Medical Waste Management ................................................................. 18

4. Bio-Medical Waste Management ..................................................................................................... 20
   4.1 Bio- Medical Waste Management in Hospitals Where Common Bio- Medical Waste Treatment Facility is Not Available 21
   4.2 Bio -Medical Waste Management in Hospitals Where Common Bio- Medical Waste Treatment Facility is Available 35
   4.3 Bio- Medical Waste Management in Primary Health Centers and Small Scale Hospitals in Rural Areas 43
   4.4 Unit wise generation of Bio-Medical Waste and its Requirement ............................................. 46
   4.5 Facilities Required for Managing the Bio- Medical Waste ......................................................... 47
   4.6 Do’s and Don’t In Bio - Medical Waste Management ............................................................... 48

5. Management Structure and Assignment of Responsibilities ........................................................... 50

About the Manual:

With the introduction of Bio-Medical Waste (Management and Handling) Rules, 1998 and emergence of various diseases due to mismanagement of bio-medical waste, it has become important in health care establishments/hospitals to manage the waste properly. Although we do not often think about it but, health care facilities/hospitals are potential settings for transmission of diseases. It is to be understood that management of bio-medical waste is an integral part of health care. This manual on “Bio-Medical Waste Management - Self Learning Document for Nurses and Paramedical” contains five chapters describing introduction, legal provision, occupational safety and health of health care workers, role of nurses in bio-medical waste management, various steps involved in bio-medical waste management and assignment of responsibilities. If used correctly, this manual will serve as a reference guide for all hospitals in urban and rural areas.
1. INTRODUCTION

About this Module:

This module focuses upon the importance and the purpose of Bio-medical waste management, definition of bio-medical waste, risks associated (environmental, occupational and public health hazards) and advantages of proper management of bio-medical waste.

Learning Objectives:

- To know what is bio-medical waste
- To understand the importance and purpose of bio-medical Waste Management in hospitals.
- To understand the risks (environmental and occupational health from bio-medical waste).
- Appreciate the advantages of proper management of bio-medical waste.

Output:

The reader will be able to define bio-medical waste, understand the importance of bio-medical waste management, environmental and occupational health risks if not managed properly and also the advantages of proper management of waste.

Bio-Medical Waste is generated while reducing the health problems and eliminating potential risks to people’s health. Hospitals / health-care services inevitably create waste that may itself be hazardous to health. The waste produced in the course of health-care activities carries a higher potential for infection, injury and pollution due to open burning, than any other type of waste. Wherever it is generated, safe and reliable methods for its handling are therefore essential. Inadequate and inappropriate handling of Bio-Medical waste may have serious public health consequences and a significant impact on the environment. Sound management of Bio-Medical waste is thus a crucial component of environmental and health protection.

Daily operation of medical activities, mass immunization campaigns and in emergency situations, good bio-medical waste management is important to prevent the exposure of health-care workers, patients, waste handlers and the community to infections, toxic effects and injuries. Poor management of bio-medical waste may also damage the environment, in
addition to creating opportunities for the collection of disposable medical equipment (particularly syringes), its re-sale and potential re-use without sterilization - a practice causing burden of disease worldwide.

It is essential that everyone concerned of bio-medical waste should understand that its management is an integral part of health care, and that creating harm through inadequate management reduces the overall benefits of health care. Hence selection of safe and environment friendly options for the management of bio medical waste is necessary.

1.1 What is Bio-Medical Waste?

Bio-medical waste consist of solid, liquid, sharps and laboratory waste that are potentially infectious or dangerous. It differs from other types of hazardous waste such as industrial waste. Common producers of bio-medical waste are hospitals, health clinics, nursing homes, medical research laboratories, offices of physicians, dentists and veterinarians.

As per Bio-Medical Waste (Management and Handling) Rules, 1998, and as amended "Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals and including categories mentioned in Schedule I. The schedule I includes human anatomical waste, animal waste, microbiology & biotechnology waste, waste sharps, discarded medicines and cytotoxic drugs, soiled waste, solid waste, liquid waste, incineration ash and chemical waste.

As per WHO norms the health-care waste includes all the waste generated by health-care establishments, research facilities, and laboratories. In addition, it includes the waste originating from minor or scattered sources such as that produced in the course of health care undertaken in the home (dialysis, insulin injections, etc.).

In general the bio medical waste / health care waste, (the term bio medical waste is used in India and the health care waste term is used by WHO, both means the same), contains non infectious waste and infectious waste. The infectious waste includes pathological waste, sharps waste, items contaminated with blood and body fluids and chemical, pharmaceutical waste etc. As regards to the category wise percentage of waste generation, non infectious waste is 80% , pathological and infectious waste 15% , sharps waste 1% , chemical or pharmaceutical waste 3 % and others 1%.

1.2 Risk from Bio-Medical Waste If Not Managed Properly

All individuals exposed to bio-medical waste are potentially at risk of being injured or infected. They include
- Medical staff: doctors, nurses, sanitary staff and hospital maintenance personnel;
- In and out patients receiving treatment in healthcare facilities.
- Visitors of hospitals.
- Workers in support services linked to healthcare facilities such as laundries, waste handling and transportation services.
- Workers in waste disposal facilities, including scavengers.
- The general public and more specifically the children playing with the items they can find in the waste outside the healthcare facilities when it is directly accessible to them.

If bio-medical waste is not managed properly, it also causes environmental, occupational and public health hazard.

### 1.2.1 Environmental Hazard

Inappropriate treatment and disposal of bio-medical waste contributes to environmental pollution, uncontrolled incineration causes air pollution, dumping in nallas, tanks and along the river bed causes water pollution and unscientific land filling causes soil pollution.

### 1.2.2 Occupational Hazard

A risk to all those who generate, collect, segregate, handle, package, store, transport, treat and dispose bio-medical waste. Occupational exposure to blood can result from percutaneous injury (needle stick or other sharps injury), mucocutaneous injury (splash of blood or other body fluids into the eyes, nose or mouth) or blood contact with non-intact skin. The most common form of occupational exposure to blood and the most likely to result in infection is needle stick injury. The most common cause of needle stick injury is two handed recapping and the unsafe collection and disposal of sharps waste. Over 20 blood born diseases can be transmitted but particular concern is the threat of spread of infectious / communicable diseases like AIDS, Hepatitis B & C, Cholera, Tuberculosis, Diphtheria etc. Waste chemicals, radioactivity and heavy metals etc. are hazardous to health.

### 1.2.3 Public Health Hazard

Poor management of bio-medical waste can cause serious disease to health-care personnel, to waste workers, patients and to the general public. The greatest risk posed by infectious waste is accidental needle stick injuries, which can cause hepatitis B and hepatitis C and HIV infection. There are however numerous other diseases which could be transmitted by contact with infectious bio-medical wastes. During the handling of wastes, injuries occur when syringe, needles or other sharps have not been collected in puncture proof containers. Inappropriate design and / or overflow of existing sharps container and moreover
unprotected pits increase risk exposure of the health care workers, waste handlers and of the community at large, to needle stick injuries.

The reuse of infectious syringes represents a major threat to public health. The WHO estimated that in the year 2000 world wide, immunization undertaken with contaminated syringes caused about 23 million infections of Hepatitis B, C and HIV. Such situations are very likely to happen when bio-medical waste is dumped on an uncontrolled site where it can be easily accessed by public. Children and rag pickers are particularly at risk to come in contact with infectious waste.

**Worldwide, each year, the overuse of injection and unsafe injection practices combine to cause an estimated 8 to 16 million hepatitis B virus infection, 2.3 to 4.7 million hepatitis C virus infection and 80,000 to 160,000 HIV infections. Among unsafe practices, the reuse of syringes and/or needles without sterilization is of particular concern. (Source AIDE-MEMOIRE, Safe Injection Global Network, Department of Blood Safety and Clinical Technology, WHO)**

### 1.3 Advantages of Proper Management of Bio-Medical Waste:

The proper bio-medical waste management will help to control nosocomial diseases (hospital acquired infections), reduces HIV/AIDS, sepsis, and hepatitis transmission from dirty needles and other improperly cleaned/disposed medical items, control zoonoses (diseases passed to humans through insects, birds, rats and other animals), prevent illegal repackaging and resale of contaminated needles, cut cycles of infection and avoid negative long-term health effects like cancer, from the environmental release of toxic substances such as dioxin, mercury and others.

**Questions:**

1. Define bio-medical waste.
2. Who are at risk if bio-medical waste is not managed properly?
3. What are the advantages of proper management of bio-medical waste?
2. LEGAL PROVISION

About this Module:

This module draws attention on legal provisions on bio-medical waste management, categories and category wise segregation, packaging, storage, transportation, treatment and disposal as per rule.

Learning Objectives:

- To understand various categories of bio-medical wastes.
- To understand category wise treatment, disposal methodology
- To enhance skill on segregation, packaging, storage and transportation of bio-medical waste.

Output:

The reader will be able to understand various regulations which govern the waste management and the Bio-Medical Waste (Management and Handling) Rules.

National Legislation is the basis for bio-medical waste management practices in the country. It establishes control and permits for the disposal. The regulatory frame work which governs the management of waste is as follows.

- The Water (Prevention and Control of Pollution) Act, 1974 (for liquid waste)
- The Air (Prevention and Control of Pollution) Act, 1981 (for air quality)
- The Environment (Protection) Act, 1986
- The Bio-Medical Wastes (Management and Handling) Rules 1998 (for infectious waste, sharps waste, chemicals, discarded medicines and cytotoxic drugs etc.)
- The Municipal Solid Wastes (Management and Handling) Rules, 2000 (for domestic municipal waste)
- Battery (Management and Handling) Rules, 2001 (for used batteries waste)

2.1 Salient Features of Bio-Medical Waste (Management and Handling) Rules, 1998 and Amendment

The Bio-Medical Waste (Management and Handling) Rules emphasizes legal aspects and proper procedure of how to categorize, segregate, handle, transport, treat and dispose the bio-medical waste. These Rules apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio-medical waste in any form. As per the Rule
“Occupier” means in relation to any institution generating bio-medical waste, which includes a hospital, nursing home, clinic dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called, means a person who has control over that institution and / or its premises. The duty of every occupier of an institution generating bio-medical waste is to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment.

No untreated bio-medical waste shall be kept stored beyond a period of 48 hours, provided that if for any reason it becomes necessary to store the waste beyond such period, the authorized person must take permission of the prescribed authority and take measures to ensure that the waste does not adversely affect human health and the environment.

“Authorized Person” means an occupier or operator authorized by the prescribed authority to generate, collect, receive, store, transport, treat, dispose and / or handle bio-medical waste in accordance with these rules and any guidelines issued by the Central Government. The “Prescribed Authority” for enforcement of the provisions of these rules shall be the State Pollution Control Boards in respect of states and the Pollution Control Committees in respect of Union territories and all pending cases with a prescribed authority appointed earlier shall stand transferred to the concerned State Pollution Control Board or as the case may be, the Pollution Control Committees.

2.1.1 Categories of Bio-Medical Waste:

The categories of bio-medical waste are as follows.

**Category No. 1 Human Anatomical Waste** (body parts, organs, human tissues etc.).

**Category No. 2 Animal Waste** (animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges, discharge from hospitals, animal houses).

**Category No. 3 Microbiology & Biotechnology Waste** (Wastes from laboratory cultures, stocks or specimens of micro-organisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures).

**Category No. 4 Waste Sharps** (needles, syringes, scalpels, blade, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps).

**Category No. 5 Discarded Medicines and Cytotoxic drugs** (Waste comprising of outdated, contaminated and discarded medicines).

**Category No. 6 Soiled Waste** (items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, bedding, other material contaminated with blood).
**Category No. 7 Solid Waste** (Waste generated from disposal items other than the sharps such as tubings, catheters, intravenous sets etc.).

**Category No. 8 Liquid Waste** (Waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities).

**Category No. 9 Incineration Ash** (Ash from incineration of any bio-medical waste).

**Category No. 10 Chemical Waste** (Chemicals used in production of biologicals, chemicals used in production of biologicals, chemicals used in disinfection, as insecticides, etc.).

### 2.1.2 Category Wise Treatment and Disposal Methodology:

Bio-medical waste needs to be treated and disposed off in accordance with Schedule I, and in compliance with the standards prescribed in Schedule V. The schedule V explains the standards for incineration, autoclaving, microwaving, deep burial pit and liquid waste. The schedule I is as follows.

**SCHEDULE I-CATEGORIES OF BIO-MEDICAL WASTE TREATMENT AND DISPOSAL**

<table>
<thead>
<tr>
<th>Waste Category No.</th>
<th>Waste Category Type</th>
<th>Treatment &amp; Disposal Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category No. 1</td>
<td>Human Anatomical Waste (human tissues body parts)</td>
<td>Incineration @ deep burial*</td>
</tr>
<tr>
<td>Category No. 2</td>
<td>Animal Waste (animal tissues, organs) body parts parts carcasses bleeding parts, fluid blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge from hospital, animal</td>
<td>Incineration @ deep burial*</td>
</tr>
<tr>
<td>Category No. 3</td>
<td>Microbiology &amp; Biotechnology Waste (waste from laboratory cultures, stocks or specimens of micro-organisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)</td>
<td>Local autoclaving / microwaving / incineration @</td>
</tr>
<tr>
<td>Category No. 4</td>
<td>Waste Sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This treatment includes both and unused sharps)</td>
<td>Disinfection (chemical treatment)@@ autoclaving microwaving and mutilation / shredding##</td>
</tr>
<tr>
<td>Category No. 5</td>
<td>Discarded Medicines and Cytotoxic Drugs (wastes comprising outdated, contaminated and discarded medicines)</td>
<td>Incineration @/ destruct ion and drugs disposal in secured landfill drugs disposal in secured</td>
</tr>
<tr>
<td>Category No. 6</td>
<td>Soiled Waste (items contaminated with blood, and body fluids including cotton dressings, soiled Plaster casts, lines, bedding, other material contaminated with blood)</td>
<td>Incineration @ autoclaving microwaving</td>
</tr>
<tr>
<td>Category No. 7</td>
<td>Solid Waste (wastes generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets etc.)</td>
<td>Disinfection by chemical treatment @@ autoclaving /microwaving and mutilation shredding##</td>
</tr>
</tbody>
</table>
2.1.3 Segregation, Packaging, Storage and Transportation:

The segregation, packaging, storage and transportation of bio-medical wastes are to be taken up in the following way.

- Bio-medical waste shall not be mixed with other wastes.
- Bio-medical waste shall be segregated into color coded containers / bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal.
- The containers shall be duly labeled as per schedule III.
- If a container is transported from the premises where bio-medical waste is generated to any waste treatment facility outside the premises, the container shall, apart from the label prescribed in Schedule III, also carry information prescribed in Schedule IV. The schedule IV describes the type of waste where it is generated and to where it is being transferred. The schedule II and schedule III are as follows.

<table>
<thead>
<tr>
<th>Category No.</th>
<th>Waste Description</th>
<th>Disposal Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Liquid Waste (waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities)</td>
<td>Disinfection by chemical treatment and discharge into drains</td>
</tr>
<tr>
<td>9</td>
<td>Incineration Ash (ash from incineration of any biomedical waste)</td>
<td>Disposal in municipal landfill</td>
</tr>
<tr>
<td>10</td>
<td>Chemical Waste (chemicals used in production of insecticides, etc.)</td>
<td>Chemical treatment and discharge into drains for liquids and secured landfill for solids</td>
</tr>
</tbody>
</table>

@@ Chemicals treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.

## Mutilation/shredding must be such so as to prevent unauthorised reuse.

@ There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.

* Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.

+ Option given above are based on available technologies. Occupier/Operator wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down to enable the prescribed authority to consider grant of authorization.

## EPRI
## Bio-Medical Waste Management
## AHRID
Schedule II
Colour Coding and Type of Container for Disposal of Bio-Medical Waste

<table>
<thead>
<tr>
<th>Color Coding</th>
<th>Type of Container – Waste Category</th>
<th>Treatment options as per Schedule I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Plastic bag Cat. 1, Cat. 2, and Cat. 3, Cat. 6.</td>
<td>Incineration/deep burial</td>
</tr>
<tr>
<td>Red</td>
<td>Disinfected container/plastic bag Cat. 3, Cat.6, Cat.7.</td>
<td>Autoclaving/Micro waving/Chemical Treatment</td>
</tr>
<tr>
<td>Blue/White Translucent</td>
<td>Plastic bag/puncture proof Cat. 4, Cat. 7.</td>
<td>Autoclaving/Micro waving/Chemical Treatment and Destruction/shredding</td>
</tr>
<tr>
<td>Black</td>
<td>Plastic bag Cat. 5 and Cat. 9 and Cat. 10. (Solid)</td>
<td>Disposal in secured landfill</td>
</tr>
</tbody>
</table>

Notes:
1. Colour coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule I.
2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
3. Categories 8 and 10 (liquid) do not require containers/bags.
4. Category 3 if disinfected locally need not be put in containers/bags.

Schedule III
Label for Bio-Medical Waste Containers/ Bags

Handle with care

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

Details of standards for autoclaving microwaving, validation test for autoclave is mentioned in Bio-Medical Waste (Management and Handling) Rules, 1998 and Amendment prescribed in Schedule V and Bio-Medical Waste (Management and Handling) Rules is placed as Annex - I

Questions:
3. OCCUPATIONAL SAFETY AND HEALTH OF HEALTH CARE WORKERS

About this Module:

This module highlights on occupational risks from chemicals, various sources of disease transmission, occupational safety and health, and role of nurses in bio-medical waste management.

Learning Objectives:

- To know occupational risks from chemicals and practice occupational safety.
- To understand various methods of disease transmission and adopt preventive measures.
- To appreciate role of nurses in bio-medical waste management.

Output:

The reader will be able to understand the risk involved from chemicals, mode of disease transmission, safety and preventive measures. They will realize and appreciate the important role of nurses in bio-medical waste management.

It is necessary to understand that there exist occupational risks from chemicals and also transmission of diseases from patients to health care workers. Hence taking precautions and safety measures is the prime importance.

3.1 Occupational Risks of Chemicals - Precautions and Safety Measures:

Nurses are exposed to a wide variety of toxic chemicals and radiation in the course of their jobs, and the degree of this exposure correlates with their risk of cancer, asthma, miscarriages and birth defects, according to a nationwide survey conducted by the American Nurses Association, the Environmental Working Group (EWG), Health Care Without Harm and the Environmental Health Education Center at the University of Maryland School of Nursing.

The children of pregnant nurses who were exposed to chemicals were more likely to have birth defects than the children of nurses who had not been exposed while pregnant. This correlation held particularly strongly for musculoskeletal defects. Pregnant nurses who were exposed to anesthetics or sterilizing agents were seven to nine times more likely to give birth to children with such defects than nurses who had not been exposed.

Formalin is 37 % solution of the formaldehyde gas. It is used as a preservative in surgical pathology and histopathology laboratories, in autopsy rooms, and for cold sterilization of equipment in central supply and dialysis units. The risk involved with this is contact hazard. It can cause contact dermatitis and severe eye injury if accidentally splashed. A 10 % formalin solution is widely used in hospitals. Unless the process is automated, it should be
done in a fume cabinet or hood. In situation where splashes or spills are possible, goggles, face shields, aprons, boots and heavy rubber gloves should be used to prevent eye injury or contact dermatitis. In case of spills, which can result at high exposure, full-face respirators should be used.

**Glutaraldehyde** is a toxic chemical that is used as a cold sterilant to disinfect and clean heat-sensitive medical, surgical and dental equipment. It is found in products such as Cidex, Aldesen etc. Glutaraldehyde is also used as a tissue fixative in histology and pathology labs and as a hardening agent in the development of x-rays. Short term (acute) effects are contact with glutaraldehyde liquid and vapor can severely irritate the eyes, and at higher concentrations burns the skin. Breathing glutaraldehyde can irritate the nose, throat, and respiratory tract, causing coughing and wheezing, nausea, headaches, drowsiness, nosebleeds, and dizziness. Long-term (chronic) effects are it is a sensitizer. This means some workers will become very sensitive to glutaraldehyde and have strong reactions if they are exposed to even small amounts. Workers may get sudden asthma attacks with difficult breathing, wheezing, coughing, and tightness in the chest. Prolonged exposure can cause a skin allergy and chronic eczema, and afterwards, exposure to small amounts produces severe itching and skin rashes. It has been implicated as a possible cause of occupational asthma. The possible solutions are limit exposure to glutaraldehyde through work practice, engineering controls and personal protective equipment (PPE) should be practiced, make sure that rooms in which glutaraldehyde is to be used are well ventilated and large enough to ensure adequate dilution of vapor, with a minimum air exchange rate. Ideally, install local exhaust ventilation such as properly functioning laboratory fume hoods (capture velocity of at least 100 feet per minute) to control vapor. Keep glutaraldehyde baths under a fume hood where possible. Use only enough glutaraldehyde to perform the required disinfecting procedure. Store glutaraldehyde in closed containers in well ventilated areas. Air-tight containers are available. Post signs to remind staff to replace lids after using product.

Use specially designed, mobile, compact, disinfectant soaking stations to facilitate sterilization of heat sensitive equipment such as endoscopes, or GI scopes. These soaking stations provide an enclosed area for sterilizing trays, and remove fumes from glutaraldehyde and other disinfectants. Use appropriate personal protective aids such as gloves that are impervious to glutaraldehyde such as those made of butyl rubber, nitrile, and viton®, which have been shown to provide full shift protection from glutaraldehyde. For shorter exposures, one can use gloves made of polyethylene. Do not use neoprene and PVC gloves because they do not provide adequate protection against glutaraldehyde and may actually absorb it. Do not use latex surgical exam gloves for skin protection against
glutaraldehyde, except in situations where only short-term, incidental contact is expected. Wear lab coats, aprons, or gowns made of appropriate materials such as polypropylene to provide additional protection. Wear splash-proof goggles and/or full face shields when working with glutaraldehyde to protect eyes. All employees who may be exposed to above the ceiling threshold limit value (TLV) of 0.05 ppm, should use appropriate respirators for glutaraldehyde vapor during routine or emergency work. Respirator requirements are found in the OSHA respiratory protection standard. Provide eye wash fountains for immediate emergency use. Use eye wash fountains and emergency showers if there is skin contact with glutaraldehyde. Flush area with water for at least 15 minutes to remove chemical. If clothing become contaminated change the clothes. Clean up spills immediately. Do not eat, drink, or smoke in any area where glutaraldehyde is handled or stored. Use a vacuum or wet method to reduce dust while cleaning up pure glutaraldehyde. Do not dry sweep. Use less toxic products if feasible and available, or other processes for sterilization. Automate the transfer of pure glutaraldehyde or pump liquid glutaraldehyde from drums or other storage containers to appropriate containers and operations, avoiding exposure to glutaraldehyde by keeping it in a contained process.

In a general hospital the processing of X-ray films may be associated with the release of various respiratory irritants, such as sulphur dioxide, glutaraldehyde, and acetic acid. Some of these agents may cause occupational asthma. By using sealed bottles of photographic reagents and introducing them into the processor using a closed system, exposure can be considerably reduced. Inadequately controlled glutaraldehyde exposure in the health service, notably in the cleaning of endoscopes, such as in bronchoscopy and gastroscopy, has been responsible for serious ill-health in some nurses, and other health care workers.

Mercury is used in thermometers, sphygmomanometers, esophageal, Abbott & Cantor tubes and dental amalgams. Mercury waste have to be disposed as per the Hazardous Waste (Management & Handling) Rules as mercury is classified as a hazardous substance that is known to cause serious health impacts. The spilled mercury does not become part of biomedical wastes. As per Schedule -2 of Hazardous Waste (management & Handling) Rules, 2003, any waste containing equal to or more than 50 ppm of mercury is a hazardous waste and the concerned generators of the wastes are required to dispose the waste as per the Hazardous Waste (Management and Handling) Rules. Mercury spills in hospitals, clinics and labs pose risks to doctors, nurses, other health care workers and patients. People are exposed to elemental mercury when medical devices containing mercury break and when liquid mercury spills or evaporates. The most common exposure routes are through inhalation or through contact with the skin. The risk of exposure to mercury is highest in warm or poorly ventilated rooms. Mercury is a bioaccumulative and persistent chemical. Wherever possible,
always dispose of mercury as a separate hazardous waste. Instructions in managing spills should be clear to all staff through regular staff training and be made available in the spill kit. Bio-medical waste containing mercury has to be segregated, treated and disposed in an appropriate manner. Mercury-contaminated waste should not be mixed with other bio-medical waste or with general waste.

1. Remove everyone from the area that has been contaminated with mercury and shut the door. Keep the heat below 20°C and ventilate the area if possible.
2. Put on face mask in order to prevent breathing of mercury vapour, wear a protective face mask.
3. Remove all jewellery from hands and wrists so that the mercury cannot combine (amalgamate) with the precious metals.
4. Appropriate personal protective equipment (rubber gloves, goggles / face shields and clothing) should be used while handling mercury.
5. Locate all mercury beads carefully. Cardboard sheets should be used to push the spilled beads of mercury together. A syringe should be used to suck the beads of mercury. Mercury should be placed carefully in a container with some water. Any remaining beads of mercury will be picked up with a sticky tape and placed in a plastic bag.
6. Never use a broom or a vacuum cleaner.
7. Place all materials used during the cleanup, including gloves, into a leak-proof plastic bag or container. Seal and label it. Place this sealed plastic bag inside an impact-resistant sealable container made of plastic or metal.
8. It should not be swept down the drain and wherever possible, it should be disposed off at a hazardous waste facility or given to a mercury-based equipment manufacture.
9. Separate collection schemes are developed for mercury collection and recycling. Mercury should be recovered if possible in order to be recycled.

### 3.2 Disease Transmission

Diseases can be transmitted from

Nurses to patient due to unwashed hands, contaminated sharps, or improperly cleaned reusable equipment.

Patient to health worker due to being accidentally needle stick or sharps that have been used on patients. Also due to blood or body fluids accidentally splashing onto or coming in contact with broken skin.
Health worker to family and community health workers with unclean hands or contaminated clothing or shoes can carry infection home to family members.

Health facility to community improper disposal of medical waste and sharps can lead to transmission of disease to community members due to needle stick injury or needle reuse, droplet infection, respiratory route, skin contact etc.

Various modes of transmission of diseases are as follows.
Air-borne transmission e.g. tuberculosis, droplet transmission e.g., mumps, rubella, influenza etc. and direct or indirect contact with dried skin, contaminated surfaces, needle stick injury and infection etc.

Health-care workers are at risk for occupational exposure to blood borne pathogens and virus such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Exposures occur through needle sticks contaminated with an infected patient’s blood or through contact of the eye, nose, mouth, or skin with a patient’s blood. Physical (injury) and health hazards are also associated with the high operating temperatures of incinerators and steam sterilizers and with toxic gases vented into the atmosphere after waste treatment.

The risk of infection due to occupational exposure is as follows.

HBV
Health-care workers who have received hepatitis B vaccine and have developed immunity to the virus are at virtually no risk for infection. For an unvaccinated person, the risk from a single needle stick or a cut exposure to HBV- infected blood ranges from 6- 30% and depends on the hepatitis B e antigen (HBeAg) status of the source individual. Individuals who are both hepatitis B surface antigen (HBsAg) positive and (HBeAg) positive have more virus in their blood and are more likely to transmit HBV.

HCV
Based on limited studies, the risk for infection after a needle stick or cut exposure to HCV-infected blood is approximately 1.8%. The risk following a blood splash is unknown, but is believed to be very small, however, HCV infection from such an exposure has been reported.

HIV
The average risk of HIV infection after a needle stick or cut exposure to HIV- infected blood is 0.3% (i.e., three-tenths of one percent, or about 1 in 300). Stated another way, 99.7% of needle
stick /cut exposures do not lead to infection. The risk after exposure of the eye, nose, or mouth to HIV-infected blood is estimated to be, on average, 0.1% (1 in 1,000). The risk after exposure of the skin to HIV-infected blood is estimated to be less than 0.1%. A small amount of blood on intact skin probably poses no risk at all. There have been no documented cases of HIV transmission due to an exposure involving a small amount of blood on intact skin (a few drops of blood on skin for a short period of time). The risk may be higher if the skin is damaged (for example, by a recent cut) or if the contact involves a large area of skin or is prolonged (for example, being covered in blood for hours).

### 3.3 Nurses Safety:

To prevent transmission of blood borne diseases the American Nurses Association (ANA) in 1991 urged research and evaluation of devices and equipments intended to reduce risk of injury from sharps and of personal protective equipment designed to reduce exposure. In 1993 an increase of percentage of HIV / AIDS cases were related to injection during use. The sharing of contaminated needles was the primary method of transmission for intravenous drug users. The nurses of ANA supported the availability of needle exchange program. The independent survey of more than 700 nurses sponsored by ANA and Inviro Medical Devices revealed that needle stick injuries and blood born infections remain major concerns of 64% of nurses who had accidents. Every year hundreds of thousands of health care workers are exposed to deadly diseases like HIV and Hepatitis C through needle stick and sharp injury. With today’s technology nurses no longer needs to face such high risk.

It is possible to prevent the occupational exposures by adopting various techniques like not recapping needles by hand, disposing of used needles in appropriate sharps disposal containers, and using medical devices with safety features designed to prevent injuries. Many exposures to the eyes, nose, mouth, or skin can be prevented by using appropriate barriers (e.g., gloves, eye and face protection, gowns etc.).

If an exposure occurs to the blood of a patient immediately wash needle sticks and cuts with soap and water, flush splashes to the nose, mouth, or skin with water, irritate eyes with clean water, saline, or sterile irritants and report the exposure to senior nurse.

Health workers are at risk of accidental needle stick or other injuries from sharps. World health Organization (WHO) recommends the following steps after a needle stick injury.

- Wounds and skin sites exposed to blood or body fluids should be washed with soap and water and mucous membranes flushed with water

- If blood or body fluids have gotten into eyes, splash eyes with clean water.
Immediately report the incident to a designated person.

Retain, if possible, the item involved in the incident, get details of its source for identification of possible infection.

Seek additional medical attention in an emergency health department as soon as infection identified (based on body substance and severity of exposure).

Initiate post-exposure prophylaxis, if available and appropriate.

Get blood tests or other tests and counseling, if indicated.

Record the incident.

Investigate the incident and identify and implement remedial action to prevent similar incidents in the future.

The risk of acquiring diseases due to handling of bio medical waste can be reduced if following principles are adopted.

While handling waste, wear appropriate protective clothing, including a water-resistant apron, thick gloves, boots or closed-toe shoes, and eye protection.

Handle all sharps with care to minimize needle stick injury.

Do not sort waste or open waste containers to sort waste.

Wash hands after working with waste or infected material.

Be aware of procedures for treatment of injuries, cleaning of contaminated areas, and reporting sharps injuries or accidents or accident to appropriate personnel.

A full course of hepatitis B and tetanus vaccination will protect the nurses from the hepatitis -B virus and tetanus–anyone handling sharps should be vaccinated.

Nurses need to protect themselves by establishing a barrier between themselves and the infective agent. The type of protection needed depends on the worker’s activities. Protective clothing must be worn at all times when handling bio-medical waste. It must be properly maintained and kept clean. The clothing should not be taken home, must remain at the health facility to avoid possible contamination of the community. Protective clothing includes:

Gloves—always wear gloves when contaminated items are handled. Puncture-Resistant gloves should be used when handling sharps containers or bags with unknown contents.

Boots or closed-toe shoes—rubber boots or leather shoes provide extra protection to the feet from injury by sharps or heavy items that may accidentally fall. They must be kept clean. If possible, avoid wearing sandals or shoes made of soft materials.
- **Aprons** - rubber or plastic aprons provide a protective, waterproof barrier to the body.

- **Goggles** - plastic goggles can protect the eyes from accidental splashes.

- **Hand washing** - Wash with soap and antiseptic detergent.

### 3.4 Role of Nurses in Bio Medical Waste Management:

Staff nurse is a first level professional nurse who provides direct patient care or group of patients assigned to her / him during duty shift and assist in management of wards / units / special departments etc. Other than the administrative assignments various other technical tasks have to be performed, related to nursing care. Few of the responsibilities are as follows.

- Administration of medication, i.e. tablets, injections, infusions and transfusion on prescription, or according to standing instructions.

- Assisting doctors in various medical and surgical diagnostic procedures by preparing patients and getting ready with required things.

- Performing simple diagnostic procedures viz. haemoglobin % etc.

- Collecting and sending of specimens for laboratory diagnostic procedures.

- Recording of vital signs, i.e. temperature, pulse, respiration and blood pressure.

- Performing gastric lavage, giving enema etc.

- Prepares patients for operations and see that he / she is sent to operation theater with all necessary papers and medicines.

- Takes care of eyes, ears, back, bowel, bladder, perineum, and breast, etc. whenever needed.

- Observes all patients conditions and take suitable action accordingly and / or reports changes to ward in charge and / or doctor.

- Give expert bed-side nursing to all patients.
Attends last offices in case of a patient dying during shift and arrange to preserve dead body in mortuary, or hand over the body with respect to concerned family members / relatives / authorities.

While attending to above activities bio-medical waste is generated. The nursing staff are to be trained in safe handling of waste and its procedures. The role of nurses in bio-medical waste management is very much important. The head nurse should keep an inventory of materials required such as bags, bins, containers, mutilating aids, protective aids etc. and check for the adequate supply. Nursing staff should ensure that waste bags are tightly closed or sealed when they are about three-quarter full. Matron or senior nursing officer is responsible for training new nurses and medical assistants in good bio-medical waste handling. Responsibilities of nurses in bio-medical waste management is presented in detail in chapter 5 (Management Structure and Assignment of Responsibilities)

Questions:
1. Explain occupational risks of chemicals?
2. How diseases get transmitted from nurses to patients?
3. What are the recommendations of World Health Organization after the needle stick injury?
4. Name Protective aids?
4. BIO - MEDICAL WASTE MANAGEMENT

About this Module:

This module draws attention on unit-wise generation of bio-medical waste, various steps involved in management of bio-medical waste given different scenarios, things to do and not do.

Learning Objectives:

- To understand how to manage bio-medical waste scientifically without leaving any ill-effect on environment as well as on humans.
- To enhance knowledge and skill on segregation of waste in specific color-coded bags.
- To appreciate various types of bio-medical waste management options in urban and rural areas, big and small hospitals, with and without common bio-medical waste treatment facilities.
- To enhance knowledge on various activities / actions to do and not to do.

Output:

The reader will be able to understand unit-wise generation of bio-medical waste, its management in all given scenarios, items required to manage the waste and do’s and dont’s while generating, segregating, transporting, treating and final disposal of bio-medical waste.

Although there are 10 categories of bio-medical waste, most frequently the nurses come across or are closely related to are human anatomical waste (category 1), waste sharps such as needles, syringes, scalpels, blade, glass, etc. (category 4), discarded medicines and cytotoxic drugs (category 5), soiled waste that is items contaminated with blood, body fluid etc. (category 6), solid waste such as tubing, catheters, intravenous sets etc. (category 7), liquid waste (category 8) and chemical waste (Category 10).

Handling, segregation, mutilation, disinfection, storage, transportation and final disposal are vital steps for safe and scientific management of bio-medical waste in any establishment. The key to minimization and effective management of bio-medical waste is segregation (separation) and identification of the waste. The most appropriate way of identifying the categories of bio-medical waste is by sorting the waste into colour coded plastic bags or containers. Waste should be segregated into containers/bags at the point of generation into yellow/red/white translucent puncture proof/blue/black depending on the disposal methodology planned. Cytotoxic wastes are to be collected in black container clearly labeled.
as Cytotoxic Waste along with its specific logo. General waste like garbage, garden refuse etc., should join the stream of domestic refuse which can be put preferably in green bin. Bags and containers for infectious waste should be marked with Biohazard symbol. Sharps should be collected in puncture proof containers. Needles and syringes should be destroyed with the help of needle destroyer and syringe cutters provided at the point of generation. Infusion sets, bottles and gloves should be cut with scissors and stored in blue bin/bag after disinfection. All disposable plastic should be subjected to shredding before disposing off to registered/authorized recycler of plastic waste. Shredding is essential to ensure that items are not used again. Disinfection to be achieved by 1% Sodium Hypochlorite solution or any other equivalent chemical solution with minimum contact period of 1 hour. Fresh solution should be made in each shift.

Appropriate containers or bag holders should be placed in all locations where particular categories of waste may be generated. Instruction on waste separation and identification should be posted at each waste collection point to remind staff of the procedures. Containers should be removed when they are three-quarter full. Waste should be collected daily (or as frequent as required). Bags are to be picked up from the neck and placed so that bags can be picked up by the neck again for further handling. Manual handling of waste bags should be minimized to reduce the risk of needle prick injury and infection. Other forms of waste should not be mixed with bio-medical waste as different rules apply to the treatment of different types of waste. There should be an easy access to waste collection vehicle. The waste should be transported to central temporary storage place through predefined route within the hospital by means of wheeled trolleys, containers or carts that are not used for any other purpose. The trolleys have to be cleaned daily. Suitable system for securing the load during transport should be ensured. Final treatment and disposal is incineration/deep burial/autoclave/microwave following the standards stipulated under the Bio-Medical Waste (Management and Handling) Rules, 1998 and as amended. Though there are various categories of waste and disposal methodologies, but basic waste streams are three and so the segregation of various categories of waste at source has to follow three waste streams, such as

1. Incineration or deep burial* (*if population is less than 500000)
2. Disinfection by autoclave/microwave/chemical
3. Disinfection by autoclave/microwave/chemical (for sharps waste)

4.1 Bio-Medical Waste Management in Hospitals Where Common Bio-Medical Waste Facility is Not Available

The bio-medical waste management is crucial which starts from the point of generation to disposal. Policy and planning depending on the feasibility option and optimal treatment technologies for disposal of waste needs to be in place. As a guideline, the cradle to grave management of bio-medical waste is planned in the following four steps:
STEP I - IDENTIFICATION OF AREAS OF BIO-MEDICAL WASTE GENERATION:

The first step is to identify the areas of waste generation in the hospitals. In almost all the units i.e. out patient, wards, operation theater, labour room, pathology labs, intensive care units etc., waste is generated, the only difference is in quantity and category.
STEP II- CATEGORIZATION AND QUANTIFICATION OF BIO-MEDICAL WASTE:

The second step is to categorize the waste according to Bio-Medical Waste (Management and Handling) Rules. The quantification will help in placing the bins, bags, containers of appropriate quantity and at appropriate places as close to the source of waste generation as possible. Among the categories of bio-medical waste, the most common waste which the nurses handle are:

Cat. 1: Human Anatomical Waste (human tissues, organs, body parts),

Cat. 4: Waste Sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps.),

Cat. 5: Discarded Medicines and Cytotoxic Drugs (waste comprising of outdated, contaminated and discarded medicines),

Cat. 6: Soiled Waste (items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, bedding, other material contaminated with blood),

Cat. 7: Solid Wastes (waste generated from disposable items other than waste sharps such as Tubings, catheters, intravenous sets etc.),

Cat. 8: Liquid Waste (waste generated from laboratory and washing, cleaning, house-keeping and disinfection activities) and

Cat. 10: Chemical Waste (chemical used in production of biological, chemicals used in disinfection, as insecticides, etc.).

Categories of Bio-Medical Waste
Category 1: Human Anatomical Waste (Human Tissues, Organs, Body Parts)
Category 4: Waste Sharps (Needles, Syringes, Scalpels, Blades, Glass, etc.)

Category 5: Discarded Medicines And Cytotoxic Drugs
(Waste Comprising Of Outdated, Contaminated And Discarded Medicines)
Category 6: Soiled Waste (Items Contaminated with Blood, and Body Fluids Including Cotton, Dressings, Soiled Plaster Casts, Bedding, Other Material Contaminated with Blood)

Category 7: Solid Wastes (Waste Generated from Disposable Items Other Than Waste Sharps Such As Tubings, Catheters, Intravenous Sets etc.)
STEP III - SEGREGATION, HANDLING AND STORAGE:

Segregation:

Segregation is a very important factor in bio-medical waste management system. Depending on the categories of bio-medical waste, specific color coded containers are used for proper segregation and storage of wastes for further appropriate treatment and disposal. For instance, the waste which goes for incinerator or deep burial should be collected in yellow plastic bag, bin, container. (Category 1: Human anatomical waste and Category 6: Soiled waste), the waste which goes for autoclaving/microwaving/chemical treatment should be collected in red bin, bag, container. (Category 6: Soiled waste and category 7: Solid waste), the waste which goes for autoclaving or microwaving or chemical treatment and destruction shredding should be collected in blue bin, bag, container. (Category 7: Solid waste), the waste sharps such as needles, blades etc. which goes for autoclaving / microwaving / chemical treatment and destruction/shredding should be collected in white puncture proof, translucent container, the waste which goes for disposal in secured land fill should be collected in black bin, bag, container. (Category 5: Discarded medicines and cytotoxic drugs and category 10: Solid chemical waste).

Waste minimization practice is to be adopted at source of generation i.e., reuse, recycle and reduction. Reuse of chemicals, medical equipments etc. translates into cost saving. Recycling of specific materials like disinfected and shredded plastic helps secondary industry. Reduction in waste generation decreases waste disposal costs. Maximizing segregation is very effective in reducing waste management costs, environmental impacts and also complexity of management.

Handling:

As soon as the bio-medical waste is generated, it should be segregated into color coded containers, bins, bags as mentioned above. When these are three quarter full, the handling of bags should be such that it should be picked up from the neck and placed in the trolley so that bags can be picked up by the neck again for further handling. Manual handling of waste bags should be minimized to reduce the risk of needle prick injury and infection. While handling, care should be taken that no other forms of waste should be mixed with bio-medical waste. An easy access to waste collection vehicle should be provided. The waste should be transported through pre defined route within the hospital by means of wheeled trolleys, containers or carts that are not used for any other purpose, to the central temporary storage area. The trolleys should be cleaned daily.
Temporary Central Storage:

Location for central storage area for bio-medical waste should be designated inside the health-care establishment. The waste, in bags or containers, should be stored in a separate area, room, or building of a size appropriate to the quantities of waste produced and the frequency of collection. Ideally, all the hospitals should have a dedicated space to store the bio-medical waste, which will act like a central storage area before treatment and disposal of waste. Cytotoxic waste should be stored separately from other waste in a designated secure location. This central storage area should be ideally situated on the ground floor near the rear entrance. This makes the transportation of waste to the site of final disposal easier. It should have sufficient storage capacity to store the required number of waste bags, depending upon the quantum of waste generated in the hospital. It should have the storage capacity of at least 2 days waste. It should have good flooring, light, ventilation, water supply and drainage system. A full time storekeeper should be there to receive and dispatch the waste and to maintain proper record. As per rules, bio-medical waste should not be stored for more than 48 hours (refrigerated storage room should be available where wastes have to be stored in bulk for over 48 hours and needs to be taken permission from the prescribed authority). Recommendations for the storage area and its equipment are as follows:

- The storage area should have an impermeable, hard-standing floor with good drainage; it should be easy to clean and disinfect.
- There should be water supply for cleaning purposes.
- The storage area should afford easy access for staff in charge of handling the waste.
- It should be possible to lock the store to prevent access by unauthorized persons.
- Easy access for waste collection vehicles is essential.
- There should be protection from the sun.
- The storage area should be inaccessible for animals, insects, and birds.
- There should be good lighting and at least passive ventilation.
- The storage area should not be situated in the proximity of fresh food stores or food preparation areas.
- A supply of cleaning equipment, protective clothing, and waste bags or containers should be located conveniently close to the storage area.
Segregation and Storage in Yellow Bin / Bag / Container

Category : 1
Human Anatomical Waste

Category : 6
Soiled Waste

Onsite Centralized Storage Place

Yellow Bin

Segregation and Storage in Red Bin / Bag / Container

Category : 6
Soiled Waste

Category : 7
Solid Waste

Onsite Centralized Storage Place

Red Bin
Segregation and Storage in Blue Bin / Bag / Container

Category : 7
Solid Waste

Onsite Centralized Storage Place

Blue Bin

Segregation and Storage in White Translucent Bin / Bag / Container

Category : 4
Sharps Waste

Onsite Centralized Storage Place

White Puncture Proof
SEGREGATION AND STORAGE IN BLACK BIN / BAG / CONTAINER

**Category : 5**
Discarded Medicines & Cytotoxic Drugs

**Category : 10**
Chemical Waste (Solid)

Onsite Centralized Storage Place

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**STEP IV - TREATMENT, DESTRUCTION AND DISPOSAL OF BIO-MEDICAL WASTE**

Depending on the category of waste, as per the policy and planning of bio-medical waste management, the treatment, destruction and disposal method needs to be adopted. The category wise details of treatment, destruction and disposal methods are as follows:

**Category 1: Human Anatomical Waste (human tissues, organs, body parts)**

As soon as it is segregated, before 48 hours, it should be incinerated or subjected to deep burial. The deep burial option is for towns and in rural areas where population is less than five lakhs.

**Category 4: Waste Sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps):**

After the injection is administered, the needles has to be cut from the hub by a needle cutter. This is to ensure that it should not be reused again. The cut needle gets segregated in the pot which is fixed to the needle cutter. The cut syringe goes in the plastic bucket with sieve, which
A Sharp Pit has 1% sodium hypochlorite solution. Metal needles from the pot can be stored in the puncture proof translucent container having 1% sodium hypochlorite solution or any other equivalent chemical agent. It must be ensured that chemical treatment ensures disinfection. The disinfected needles can be encapsulated for disposal into municipal landfill or can be given to authorized metal recycler.

If auto disabled syringes are provided it prevents the reuse of non sterile syringes as it self locks after single use. The waste syringes should follow the same route of management of sharps waste as mentioned above.

**Category 5: Discarded Medicines and Cytotoxic Drugs (waste comprising of outdated, contaminated and discarded medicines.)**

The discarded medicines and cytotoxic drugs should either be directly incinerated or after destruction put in secured landfill.

**Category 6: Soiled Waste** (items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, bedding, other material contaminated with blood.)

The soiled waste can be either incinerated or after disinfection by autoclave / microwave put in municipal secured landfill.
Category 7: Solid Waste (waste generated from disposable items other than waste sharps such as tubing, catheters, intravenous sets etc.)

Destroy the plastic waste to ensure prevention of reuse. Disinfect by keeping it in 1% sodium hypochlorite solution or any other equivalent chemical agent. It must be ensured that chemical treatment ensures disinfection. If recycling is planned, after destroying/shredding and disinfection, it can be given to authorized recyclers.

Category 8: Liquid Waste (waste generated from laboratory and washing, cleaning, house-keeping and disinfection activities)

The liquid waste need to be disinfected and flushed in the drains, meeting the norms stipulated under schedule V of the Bio-Medical Waste (Management and Handling) Rules.

Category 10: Chemical Waste (chemical used in production of biological, chemicals used in disinfection, as insecticides, etc.)

Chemical treatment using 1% Sodium hypochlorite solution or any other equivalent chemical agent. Liquids should be discharged in drains and solids in secured landfill.

Disinfection of Waste:

Disinfection is an important phenomena in bio-medical waste management. The details of disinfection are as follows:

Disinfectants are antibacterial agents that are applied to non-living objects to destroy microorganisms, the process of which is known as disinfection. The aim of disinfection is to eliminate microorganisms or at least reduce their numbers to a satisfactory level. Some disinfectants are effective in killing or inactivating specific types of microorganisms and others are effective against all types. It is therefore essential to know the identity of the target microorganisms to be destroyed. However, selection of disinfectants depends not only on their effectiveness, but also on their corrosiveness and other hazards related to their handling. The types of chemicals used for disinfection of health-care waste are mostly aldehydes, chlorine compounds, ammonium salts and phenolic compounds. Powerful disinfectants are often hazardous and toxic. Many are harmful to skin and mucous membranes. Users should therefore wear protective clothes, including gloves and other protective aids. Disinfectants are also aggressive to certain building materials and should be handled and stored accordingly. Small amounts of disinfectants can be discharged into sewers without pretreatment, provided that there is an adequate sewage-treatment process. Large amounts of disinfectants should never be discharged into sewers. No disinfectants should be discharged into natural water bodies.
Hypochlorite solution of 0.5 % 1% and 2 % available chlorine

<table>
<thead>
<tr>
<th>Product</th>
<th>Chlorine available</th>
<th>How to dilute to 0.5%</th>
<th>How to dilute to 1%</th>
<th>How to dilute to 2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium hypochlorite liquid</td>
<td>3.5%</td>
<td>1 part bleach to 6 parts water</td>
<td>1 part bleach to 2.5 parts water</td>
<td>1 part bleach to 0.7 parts water</td>
</tr>
<tr>
<td>Sodium hypochlorite liquid</td>
<td>5%</td>
<td>1 part bleach to 9 parts water</td>
<td>1 part bleach to 4 parts water</td>
<td>1 part bleach to 1.5 parts water</td>
</tr>
<tr>
<td>NaDCC (sodium dichloro isocyanurate) powder</td>
<td>60%</td>
<td>8.5 grams to 1 litre water</td>
<td>17 grams to 1 litre water</td>
<td>34 grams to 1 litre water</td>
</tr>
<tr>
<td>NaDCC (1.5g / tablet) tablets</td>
<td>60%</td>
<td>6 tablets to 1 litre water</td>
<td>11 tablets to 1 litre water</td>
<td>23 tablets to 1 litre water</td>
</tr>
<tr>
<td>Chloramine powder</td>
<td>25%</td>
<td>20 grams to 1 litre water</td>
<td>40 grams to 1 litre water</td>
<td>80 grams to 1 litre water</td>
</tr>
</tbody>
</table>

Note: Bleach solution becomes unstable rapidly, hence it needs to be freshly prepared daily or changed on becoming dirty or turbid.

The common disinfectants used for environmental cleaning in health centers/ hospitals are as follows:
<table>
<thead>
<tr>
<th>Disinfectants</th>
<th>Recommended Use</th>
<th>Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium hypochlorite 1% In-use dilution, 5% solution to diluted 1:5 in clean water</td>
<td>Disinfections of material contaminated with blood and body fluids</td>
<td>Should be used in well-ventilated areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Protective clothing required while handling and using undiluted solutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do not mix with strong acids to avoid release of chlorine gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Corrosive to metals</td>
</tr>
<tr>
<td>Bleaching powder 7g/litre with 70% available chlorine</td>
<td>Toilets or bathrooms, If liquid bleach is not available, this may be used</td>
<td>Same as above</td>
</tr>
<tr>
<td>Alcohol (70%) Isopropyl, ethyl, methylated spirit</td>
<td>Smooth metal surfaces, tabletops and other surfaces on which bleach cannot be used.</td>
<td>Flammable, toxic, to be used in well-ventilated area, avoid inhalation, Keep away from heat source, Electrical Equipment, flames, hot Surfaces. Allow it to dry completely, particularly when using Diathermy, as it can cause diathermy Burns.</td>
</tr>
</tbody>
</table>

The effectiveness of thermal sterilization may be checked, by the *Bacillus stearothermophilus* test and chemical sterilization by the *Bacillus subtilis* test.

The category wise treatment and disposal options for all categories of biomedical waste is presented in the following table:
## Category Wise Treatment and Disposal

<table>
<thead>
<tr>
<th>Category</th>
<th>Treatment and Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Human anatomical waste</td>
<td>No treatment required- Incineration@/ deep burial*</td>
</tr>
<tr>
<td>2. Animal Waste</td>
<td>No treatment required- Incineration @/ deep burial*</td>
</tr>
<tr>
<td>3. Microbiology and Biotechnology Waste</td>
<td>No treatment required- Incineration @</td>
</tr>
<tr>
<td>5. Discarded medicines and Cytotoxic</td>
<td>No treatment required - Incineration @</td>
</tr>
<tr>
<td>6. Soiled waste (Cotton dressings etc.)</td>
<td>No treatment required - Incineration @</td>
</tr>
<tr>
<td>7. Solid waste (Tubing, Catheters etc)</td>
<td>Disinfection @@ / Autoclaving / Microwaving / Mutilating / Shredding## - Recycling</td>
</tr>
<tr>
<td>8. Liquid waste</td>
<td>Disinfection by chemical treatment @@ - Discharge into drain</td>
</tr>
<tr>
<td>9. Incineration ash</td>
<td>No treatment required Disposal in municipal land fill</td>
</tr>
<tr>
<td>10. Chemical waste (Chemicals used in production of biological, Chemicals used in disinfection etc.)</td>
<td>Chemical treatment @@ - Discharge into drains for liquids and secured landfill for solids.</td>
</tr>
</tbody>
</table>

@@ Chemical treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.

## 4.2 Bio-Medical Waste Management in Hospitals Where Common Bio-Medical Waste Treatment Facility is Available

Follow all the three steps: (Step I- Identification of Areas of Waste Generation, Step II - Categorization and Quantification of Waste and Step III - Segregation, Handling and Storage) as mentioned above at 4.1. After following all the above three steps, the 4th step to be followed is mentioned below.

### Step IV - Treatment, Destruction and Disposal

After segregation and keeping in colour coded bags / bins the following methodology to be adopted category wise, to give to the facilitator of common bio-medical waste treatment facility.
Category 1: Human Anatomical Waste (human tissues, organs, body parts)
After segregating the human anatomical waste in yellow bin / bag, hand over to facilitator of common bio-medical waste treatment facility, without any treatment.

Category 4: Waste Sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps)
After mutilation, keep the sharps in white translucent bin/container having 1% sodium hypochlorite solution to disinfect. When it occupies 3/4th of the bin, hand over to the facilitator of common bio-medical waste treatment facility.

Category 5: Discarded Medicines and Cytotoxic Drugs
(waste comprising of outdated, contaminated and discarded medicines.)
Keep the waste (discarded medicines and cytotoxic drugs) in black bag / bin and hand over to the facilitator of common bio-medical waste treatment facility without any treatment.

Category 6: Soiled Waste (items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, bedding, other material contaminated with blood.)
After segregation into yellow or red bin / bag, hand over to the facilitator of common bio-medical waste treatment facility without any treatment.

Category 7: Solid Waste (waste generated from disposable items other than waste sharps such as tubing, catheters, intravenous sets etc.):
Mutilate and store in blue or red bin / bag, hand over the plastic waste to the facilitator of common bio-medical waste treatment facility.

Category 8: Liquid Waste (waste generated from laboratory and washing, cleaning, housekeeping and disinfection activities):
The liquid waste need to be disinfected and flushed in the drains.

Category 10: Chemical Waste (chemical used in production of biological, chemicals used in disinfection, as insecticides, etc.):
Chemical waste (liquid) to be treated by using 1% sodium hypochlorite solution or any other equivalent chemical agent. Discharge into drains for liquids and for solid waste, hand over to the facilitator of common bio-medical waste treatment facility.
BIO-MEDICAL WASTE MANAGEMENT STEPS

Category 1: Human Anatomical Waste

- Onsite Centerized Storage Place
  - Or
  - Deep Burial Pit
  - Or
  - Incinerator
  - Or
  - Common Bio-medical Waste Treatment Facility
BIO-MEDICAL WASTE MANAGEMENT STEPS
Category 3: Microbiology And Biotechnology Waste

Onsite Centralized Storage Place

Incinerator

Onsite Centralized Storage Place

Secured Landfill
BIO-MEDICAL WASTE MANAGEMENT STEPS

Category 4: Waste Sharps

Onsite Centralized Storage Place

Common Bio-medical Waste Treatment Facility

Or Recycling Industry

Or
BIO-MEDICAL WASTE MANAGEMENT STEPS
Category 5: Discarded Medicines & Cytotoxic Drugs

Secured Landfill
BIO-MEDICAL WASTE MANAGEMENT STEPS
Category 6: Soiled Waste

Common Bio-medical Waste Treatment Facility

Onsite Centralized Storage Place

Incinerator

Secured Landfill
BIO-MEDICAL WASTE MANAGEMENT STEPS

Category 7: Solid Waste

Onsite Centralized Storage Place

Recycling Industry

Common Bio-medical Waste Treatment Facility
4.3 Bio Medical Waste Management in Primary Health Centers and Small Scale Hospitals in Rural Areas:

The small scale hospitals in rural areas or the PHCs are scattered, small units, placed very far away from the common bio-medical waste treatment facilities. They produce very less amount of waste when compared to bigger hospitals, it is not viable and feasible for the facilitator to collect such a small amount of waste from these places within 48 hours. In absence of such facility / arrangement, a cost effective management plan for bio-medical waste disposal is designed. All categories of waste are not generated but only categories 1, 4, 5, 6, 7, 8 and 10 are generated. The main steps in managing the waste are **Segregation**, **Treatment** and **Disposal**. The category wise bio-medical waste segregation, treatment and disposal are as follows:

**Category 1 (Human Anatomical waste) and Category 6 (Soiled Waste)** to be segregated and placed in yellow bin. No treatment is required, with in 48 hours it should be buried in deep burial pit.
Category 4 (Waste Sharps) As soon as injection is administered, the needle should be mutilated and stored in white puncture proof translucent bin/container having 1% sodium hypochlorite or any other equivalent chemical reagent. When it is 3/4 filled remove the mutilated needles and pour in sharp pit and lock the lid of the pit.

Category 7 (Solid Plastic Waste): Mutilate the plastic waste and disinfect with 1% sodium hypochlorite solution or any other equivalent chemical reagent. After ensuring disinfection, store it in blue bin for sale.
**Category 5 (Discarded Drugs):** Hand over the discarded drugs to the District Medical Health Officer (DM&HO) for onward transmission to secured landfill.

**Category 8 (Liquid Waste):** Disinfect by chemical treatment using 1% sodium hypochlorite solution or any other equivalent chemical reagent and discharge in the drain, after meeting the norms stipulated under schedule V of Bio-Medical Waste (Management and Handling) Rules.

**Category 10 (Chemical Waste):** Disinfect by chemical treatment using 1% sodium hypochlorite solution or any other equivalent chemical reagent. Discharge into drains for liquid and hand over the solid chemical waste to DM & HO for onward transmission to secured landfill.

The detail guideline for planning the Bio-Medical Waste Management for PHCs and Small Scale Hospitals in Rural Areas is as follows.

<table>
<thead>
<tr>
<th>Category</th>
<th>Waste</th>
<th>Requirement</th>
<th>Treatment</th>
<th>Disposal</th>
<th>Post Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Human Anatomical waste</td>
<td>1. Deep burial pit 2. Yellow bin / bag</td>
<td>Not required</td>
<td>Handover the yellow bag to transporter of CBMWTF or Deep burial</td>
<td>Cover it with soil and lime.</td>
</tr>
<tr>
<td>6</td>
<td>Soiled Waste</td>
<td>1. Deep burial pit 2. Yellow or Red bin / bag</td>
<td>Not required</td>
<td>Handover the yellow or red bag to transporter of CBMWTF or Deep burial</td>
<td>Cover it with soil and lime</td>
</tr>
<tr>
<td>4</td>
<td>Waste Sharps</td>
<td>1. Needle cutter / burner 2. Sharp pit 3. White puncture proof translucent container 4. 1% Sodium Hypochlorite solution</td>
<td>Mutilate the needle &amp; disinfect</td>
<td>Handover the bag to transporter of CBMWTF or Dispose mutilated needles in sharp pit</td>
<td>Close the sharp pit and lock.</td>
</tr>
<tr>
<td>7</td>
<td>Solid Waste (Plastic)</td>
<td>1. Scissors / knife for mutilation 2. 1% Sodium Hypochlorite solution 3. Blue bin / bag</td>
<td>Mutilate the plastics &amp; disinfect</td>
<td>Handover the bag to transporter of CBMWTF or Store in bigger container and dispose by sale for recycle or Put it in municipal secured landfill</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>General Waste like paper, eatables etc.</td>
<td>Green bin</td>
<td>Not required</td>
<td>Put in Municipal secured land fill</td>
<td>-</td>
</tr>
</tbody>
</table>

CBMWTF = Common Bio-medical Waste Treatment Facility
### 4.4 Unit Wise Generation of Bio-Medical Waste and its Requirement:

The unit wise generation of Bio-Medical Waste and its requirement is as follows.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Waste Generation</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Out Patient</strong></td>
<td>Soiled Waste (cotton gauze, bandages etc.), Solid waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td></td>
<td>(syringes, saline bottles etc.) and Sharps (needles, blades etc.)</td>
<td></td>
</tr>
<tr>
<td><strong>Post Operation Ward</strong></td>
<td>Soiled Waste (cotton gauze, bandages etc.), Solid waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td></td>
<td>(syringes, saline bottles etc.) and Sharps (needles, scalpels, blades etc.)</td>
<td></td>
</tr>
<tr>
<td><strong>Dressing Room</strong></td>
<td>Soiled Waste (cotton gauze, bandages etc.), and Sharps</td>
<td>Yellow / red, and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td></td>
<td>(needles, blades etc.)</td>
<td></td>
</tr>
<tr>
<td><strong>Injection Room</strong></td>
<td>Soiled Waste, Sharps and Solid waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td><strong>General Ward and Rooms</strong></td>
<td>Sharps waste, Solid waste and Soiled waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td><strong>Labour Room</strong></td>
<td>Body part (placenta etc.), Sharps waste, Solid waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td></td>
<td>and Soiled waste</td>
<td></td>
</tr>
<tr>
<td><strong>Operation Theater</strong></td>
<td>Body parts, Sharps waste, Solid waste and Soiled waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td><strong>Intensive Care Unit</strong></td>
<td>Sharps waste, Solid waste, Soiled waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td><strong>Casualty/Emergency</strong></td>
<td>Sharps waste, Solid waste and Soiled waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td><strong>Pediatric ward</strong></td>
<td>Sharps waste, Solid waste and Soiled waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td><strong>Orthopedic</strong></td>
<td>Sharps waste, Solid waste, Soiled waste</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td><strong>Laboratory</strong></td>
<td>Sharps waste, Solid waste, Soiled waste, Biologicals (culture / media)</td>
<td>Yellow / red, blue and white puncture proof translucent bin or bag</td>
</tr>
<tr>
<td><strong>Pharmacy</strong></td>
<td>Discarded medicines</td>
<td>Black bin or bag</td>
</tr>
</tbody>
</table>

*Needle cutter for destroying needles & scissors for destroying plastic waste, disinfection solution and specific colour coded containers to be placed appropriately.*
4.5 Facilities Required for Managing the Bio-Medical Waste:

The facilities required for managing the bio-medical waste are as follows.

- Colored bins / bags / containers (yellow, red, blue & white translucent, puncture proof and black) having Bio Hazard Logo for segregation of waste on all coloured containers except black. Label of cytotoxic to be put on black container.
- Big plastic container for storing mutilated and disinfected plastic waste.
- Needle cutter / Needle burner for destroying needle and syringe.
- Scissors or knife for destroying plastic waste.
- Autoclave / Microwave for disinfection.
- Incinerator for incinerating waste (this is discouraged and common bio-medical waste facility is encouraged).
- Deep burial pit for the burial of waste where population is less than five lakhs.
- Sharp pit for keeping mutilated sharps.
- Sodium hypochlorite solution or any other disinfecting agent for disinfection.
- Soap to wash hands.
- Protective aids for handling bio-medical waste.

The detail of deep burial pit and sharp pit are as follows.

**Deep Burial Pit:**

- A pit or trench should be dug about 2 meter deep. It should be half filled with waste, then covered with lime within 50 cm of the surface before filling the rest of pit with soil.
- It must be ensured that animals do not have any access to burial site. Covers of galvanized iron / wire meshes may be used.
- On each occasion, when wastes are added to pit, layer of 10 cms of soil shall be added to cover the wastes.
- Burial must be performed under close and dedicated supervision.
- Pits should be distant from habitation so as to ensure that no contamination of ground water occurs. The area should not be prone to flooding or erosion.
- The institution shall maintain record of all the pits for deep burial.
- Fencing of the deep burial pit has to be maintained.
- The deep burial site should be relatively impermeable and no shallow well should be close to the site.
• The location of the deep burial site shall be authorized by the prescribed authorities.

**Sharp Pit:**

A pit is to be dug according to the requirement of the hospital. All the sides of the pit should be plastered with cement. A cylindrical metal pipe of 4 inches diameter or more should be fixed at the ceiling of the pit. The opening of the metal pipe should have locking facility. The sharps are deposited in this pit through the pipe from the puncture proof translucent container after mutilating.

**4.6 Do’s and Don’ts in Bio-Medical Waste Management:**

**Do’s**

1. Generate waste when it is essential.
2. Segregate waste as soon as it is generated and at the point where it is generated into specific categories of waste.
3. Collect the waste in specific color coded covered bins.
4. Clean regularly with soap and water / disinfect the bins regularly.
5. Collect the domestic waste / eatables, wrappers, fruit peels, papers etc., in green bin.
6. Carry / transport the waste in closed containers.
7. Use dedicated waste collection bins / trolleys / wheel barrows for transporting waste.
8. Transport waste through a pre-defined route within the hospital.
9. Mutilate the needle soon after injection.
10. Mutilate plastic waste (solid waste) as soon as it is generated.
11. Disinfect needle and solid waste (plastic) after mutilation.
12. Dispose body parts in yellow bin, if Common Bio-Medical Waste Treatment Facility is available, hand over to them with in 48 hours, otherwise dispose by incineration or deep burial where population is less than five lakhs people.
13. Wastes sharps should be kept in white translucent bin, ¾ filled with disinfectant solution.
**Don'ts**

1. Do not generate waste unnecessary for e.g. avoid injection by prescribing oral medicines.
2. Never mix infectious and non-infectious waste.
3. Never mix chlorinated wastes with the waste which goes for incineration.
4. Never overfill the bins.
5. Never store waste beyond 48 hrs.
6. There should not be any spillage of waste on the way of transport.
7. Avoid transport of waste through crowded areas.
8. Do not give infectious waste to authorized recyclers without treatment, mutilation and disinfection.
9. Don't dispose the body part into deep burial where population is more than five lakhs.
10. Don't dispose waste sharps with other wastes.
11. Don't dispose the solid waste and sharp waste without mutilation and disinfection.

**Question:**

1. What are the steps involved in bio-medical waste management in the absence of common bio-medical waste treatment facility?
2. What is deep burial pit?
3. Explain unitwise bio-medical waste generation in hospital and tools required to manage the waste?
4. Name few do's and don'ts while managing bio-medical waste?
5. MANAGEMENT STRUCTURE AND ASSIGNMENT OF RESPONSIBILITIES IN MANAGING BIO-MEDICAL WASTE

About this Module:

This module explains the management structure and assignment of responsibilities in managing the bio-medical waste properly.

Learning Objectives:

• To understand management structure in handling bio-medical waste
• To realize the assigned responsibilities in bio-medical waste management.

Output:

The reader will be able to realize duties assigned in connection with bio-medical waste management.

A committee to be constituted with members drawn from all the departments of hospital (doctor/specialist doctor, nurse, paramedical staff etc.) and one representative from common bio-medical waste treatment facility if available. The coordinator (preferably Head Nurse) will be in charge for health care waste management and allocates resources to support the system and ensures arrangements are in place to deal with emergencies and investigates any waste-related accidents.

Head of the unit should ensure that all doctors, nurses and other staff like porters, cleaners and auxiliary staff are aware of the waste segregation and local storage procedures, encourage good practices and enforce compliance. The Bio-medical Engineer/Head nurse is responsible for overseeing and training doctors, nurses, medical assistants, other support staff that handle and transport bio-medical waste, operate and maintain on-site segregated storage and incharge of any treatment and disposal. Must ensures that supplies of consumable items are available (e.g. waste bags, protective aids etc.).

A nurse has to keep an inventory of materials required such as bags, bins, protective aids etc and check for the adequate supply. Nursing and other clinical staff should ensure that waste bags are tightly closed or sealed when they are about three-quarter full. Management structure and assignment of responsibilities are as follows.

• The Medical Officer/RMO to monitor the proper handling of the wastes in different places of generation, he/she has to check the records in regular intervals and maintain them.
• Staff Nurse has to monitor adoption of proper bio-medical waste management practice in operation theater, labour room, general ward, rooms and injection room etc., in which ever place his/her duty is.

• Lab Technician has to maintain the Lab and see that the waste is managed properly.

• Pharmacist has to check the expiry date of the medicines and duly return the expired medicines to main office / return to DM&HO / send to secured landfill.

• Class IV employees and sweepers has to clean the premises in regular intervals and dispose the wastes as per the Bio- Medical Waste (Management & Handling) Rules - 1998

• Records of the generation and disposal of the waste to be maintained regularly by incharge nurse.

• Head Nurse will be over all incharge of waste management. Ensure supply of all items required for bio-medical waste management and its proper placement.

• District Medical & Health Officers (DM&HO) to review the management of bio-medical waste in their internal meetings atleast once in a month.

• All the nursing staff specially Head Nurse to train all the medical and paramedical staff, check and ensure that as soon as the waste is generated, it is segregated in specific colour coded containers. It is a must that as soon as the injection is administrated, it is never recaped, the needle is mutilated, disinfected and put in white translucent puncture proof container. Plastic waste to be mutilated and disinfected. When the bags are three forth filled, ir should be transferred to temporary central storage room and fresh bags are replaced. He or she should ensure that the waste is being transported through a pre-defined route to central storage place.

**Question:**

1. What responsibilities the nursing cadre needs to take in bio-medical waste management?
Segregation of Waste
Segregation of Waste
Segregation of Waste
Segregation of Waste
Segregation of Waste
S.O. 630 (E).- Whereas a notification in exercise of the powers conferred by Sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986) was published in the Gazette vide S.O. 746 (E) dated 16 October, 1997 inviting objections from the public within 60 days from the date of the publication of the said notification on the Bio-Medical Waste (Management and Handling) Rules, 1998 and whereas all objections received were duly considered.

Now, therefore, in exercise of the powers conferred by section 6, 8 and 25 of the Environment (Protection) Act, 1986 the Central Government hereby notifies the rules for the management and handling of bio-medical waste.

1. SHORT TITLE AND COMMENCEMENT:

   (1) These rules may be called the Bio-Medical Waste (Management and Handling)(Second Amendment) Rules, 2003.

   (2) They shall come into force on the date of their publication in the official Gazette.

2. APPLICATION:

   These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form.

3. DEFINITIONS: In these rules unless the context otherwise requires

   (1) "Act" means the Environment (Protection) Act, 1986 (29 of 1986);

   (2) "Animal House" means a place where animals are reared/kept for experiments or testing purposes;

   (3) "Authorisation" means permission granted by the prescribed authority for the generation, collection, reception, storage, transportation, treatment, disposal and/or any other form of handling of bio-medical waste in accordance with these rules and any guidelines issued by the Central Government.

   (4) "Authorised person" means an occupier or operator authorised by the prescribed authority to generate, collect, receive, store, transport, treat, dispose and/or handle bio-medical waste in accordance with these rules and any guidelines issued by the Central Government;

   (5) "Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities
pertaining thereto or in the production or testing of biologicals, and including categories mentioned in Schedule I;

(6) "Biologicals" means any preparation made from organisms or micro-organisms or product of metabolism and biochemical reactions intended for use in the diagnosis, immunisation or the treatment of human beings or animals or in research activities pertaining thereto;

(7) "Bio-medical waste treatment facility" means any facility wherein treatment, disposal of bio-medical waste or processes incidental to such treatment or disposal is carried out and includes common treatment facilities.

7 (a) “Form” means Form appended to these Rules

(8) "Occupier" in relation to any institution generating bio-medical waste, which includes a hospital, nursing home, clinic dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called, means a person who has control over that institution and/or its premises;

(9) "Operator of a bio-medical waste facility" means a person who owns or controls or operates a facility for the collection, reception, storage, transport, treatment, disposal or any other form of handling of bio-medical waste;

(10) "Schedule" means schedule appended to these rules;

4. DUTY OF OCCUPIER:
It shall be the duty of every occupier of an institution generating bio-medical waste which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called to take all steps to ensure that such waste is handled without any adverse effect to human health and the environment.

5. TREATMENT AND DISPOSAL
(1) Bio-medical waste shall be treated and disposed of in accordance with Schedule I, and in compliance with the standards prescribed in Schedule V.

(2) Every occupier, where required, shall set up in accordance with the time-schedule in Schedule VI, requisite bio-medical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste, or, ensure requisite treatment of waste at a common waste treatment facility or any other waste treatment facility.

6. SEGREGATION, PACKAGING, TRANSPORTATION AND STORAGE
(1) Bio-medical waste shall not be mixed with other wastes.

(2) Bio-medical waste shall be segregated into containers/bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and
disposal. The containers shall be labeled according to Schedule III.

(3) If a container is transported from the premises where bio-medical waste is generated to any waste treatment facility outside the premises, the container shall, apart from the label prescribed in Schedule III, also carry information prescribed in Schedule IV.

(4) Notwithstanding anything contained in the Motor Vehicles Act, 1988, or rules thereunder, untreated biomedical waste shall be transported only in such vehicle as may be authorised for the purpose by the competent authority as specified by the government.

(5) No untreated bio-medical waste shall be kept stored beyond a period of 48 hours. Provided that if for any reason it becomes necessary to store the waste beyond such period, the authorised person must take permission of the prescribed authority and take measures to ensure that the waste does not adversely affect human health and the environment.

(6) The Municipal body of the area shall continue to pick up and transport segregated non bio-medical solid waste generated in hospitals and nursing homes, as well as duly treated bio-medical wastes for disposal at municipal dump site.

7. PRESCRIBED AUTHORITY

(1) The prescribed authority for enforcement of the provisions of these rules shall be the State Pollution Control Boards in respect of States and the Pollution Control Committees in respect of the Union territories and all pending cases with a prescribed authority appointed earlier shall stand transferred to the concerned State Pollution Control Board, or as the case may be, the Pollution Control Committees.

(1A). The prescribed authority for enforcement of the provisions of these rules in respect of all health care establishments including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, Animal houses, pathological laboratories and blood banks of the Armed Forces under the Ministry of Defence shall be the Director General, Armed Forces Medical Services.

(2) The prescribed authority for the State or Union Territory shall be appointed within one month of the coming into force of these rules.

(3) The prescribed authority shall function under the supervision and control of the respective Government of the State or Union Territory.

(4) The prescribed authority shall on receipt of Form 1 make such enquiry as it deems fit and if it is satisfied that the applicant possesses the necessary capacity to handle bio-medical waste in accordance with these rules, grant or renew an authorisation as the case may be.
(5) An authorisation shall be granted for a period of three years, including an initial trial period of one year from the date of issue. Thereafter, an application shall be made by the occupier/operator for renewal. All such subsequent authorisation shall be for a period of three years. A provisional authorisation will be granted for the trial period, to enable the occupier/operator to demonstrate the capacity of the facility.

(6) The prescribed authority may after giving reasonable opportunity of being heard to the applicant and for reasons thereof to be recorded in writing, refuse to grant or renew authorisation.

(7) Every application for authorisation shall be disposed of by the prescribed authority within ninety days from the date of receipt of the application.

(8) The prescribed authority may cancel or suspend an authorisation, if for reasons, to be recorded in writing, the occupier/operator has failed to comply with any provision of the Act or these rules:

Provided that no authorisation shall be cancelled or suspended without giving a reasonable opportunity to the occupier/operator of being heard.

8. AUTHORISATION

(1) Every occupier of an institution generating, collecting, receiving, storing, transporting, treating, disposing and/or handling bio-medical waste in any other manner, except such occupier of clinics, dispensaries, pathological laboratories, blood banks providing treatment/service to less than 1000 (one thousand) patients per month, shall make an application in Form 1 to the prescribed authority for grant of authorisation.

(2) Every operator of a bio-medical waste facility shall make an application in Form 1 to the prescribed authority for grant of authorisation.

(3) Every application in Form 1 for grant of authorisation shall be accompanied by a fee as may be prescribed by the Government of the State or Union Territory.

(4) The authorization to operate a facility shall be issued in Form IV, subject to conditions laid therein and such other condition, as the prescribed authority, may consider it necessary.

9. ADVISORY COMMITTEE

(1) The Government of every State/Union Territory shall constitute an advisory committee. The committee will include experts in the field of medical and health, animal husbandry and veterinary sciences, environmental management, municipal administration, and any other related department or organisation including non-
governmental organisations. As and when required, the committee shall advise the Government of the State/Union Territory and the prescribed authority about matters related to the implementation of these rules.

(2) Notwithstanding anything contained in sub-rule (1), the Ministry of Defence shall constitute in that Ministry, an Advisory Committee consisting of the following in respect of all health care establishments including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories and blood banks of the Armed Forces under the Ministry of Defence, to advise the Director General, Armed Forces Medical Services and the Ministry of Defence in matters relating to implementation of these rules, namely:-

(1) Additional Director General of Armed Forces Medical Services …….. Chairman

(2) A representative of the Ministry of Defence not below the rank of Deputy Secretary, to be nominated by that Ministry …….. Member

(3) A representative of the Ministry of Environment and Forests not below the rank of Deputy Secretary To be nominated by that Ministry ……….. Member

(4) A representative of the Indian Society of Hospitals Waste Management, Pune ……….. Member”

9A. Monitoring of implementation of the rules in Armed Forces Health Care Establishments

(1) The Central Pollution Control Board shall monitor the implementation of these rules in respect of all the Armed Forces health care establishments under the Ministry of Defence.

(2) After giving prior notice to the Director General Armed Forces Medical Services, the Central Pollution Control Board along with one or more representatives of the Advisory Committee constituted under sub-rule (2) of rule 9 may, if it considers it necessary, inspect any Armed Forces health care establishments.

10. ANNUAL REPORT

Every occupier/operator shall submit an annual report to the prescribed authority in Form 11 by 31 January every year, to include information about the categories and quantities of bio-medical wastes handled during the preceding year. The prescribed authority shall send
this information in a compiled form to the Central Pollution Control Board by 31 March every year.

11. MAINTENANCE OF RECORDS
(1) Every authorised person shall maintain records related to the generation, collection, reception, storage, transportation, treatment, disposal and/or any form of handling of bio-medical waste in accordance with these rules and any guidelines issued.
(2) All records shall be subject to inspection and verification by the prescribed authority at any time.

12. ACCIDENT REPORTING
When any accident occurs at any institution or facility or any other site where bio-medical waste is handled or during transportation of such waste, the authorised person shall report the accident in Form III to the prescribed authority forthwith.

13. APPEAL
(1) Any person aggrieved by an order made by the prescribed authority under these rules may, within thirty days from the date on which the order is communicated to him, prefer an appeal in form V to such authority as the Government of State/Union Territory may think fit to constitute:

Provided that the authority may entertain the appeal after the expiry of the said period of thirty days if it is satisfied that the appellant was prevented by sufficient cause from filing the appeal in time.
(2) Any person aggrieved by an order of the Director General, Armed Forces Medical Services under these rules may, within thirty days from the date on which the order is communicated to him prefer an appeal to the Central Government in the Ministry of Environment and Forests.”.

14. COMMON DISPOSAL/INCINERATION SITES.
Without prejudice to rule 5 of these rules, the Municipal Corporations, Municipal Boards or Urban Local Bodies, as the case may be, shall be responsible for providing suitable common disposal/incineration sites for the biomedical wastes generated in the area under their jurisdiction and in areas outside the jurisdiction of any municipal body, it shall be the responsibility of the occupier generating bio-medical waste/operator of a bio-medical waste treatment facility to arrange for suitable sites individually or in association, so as to comply with the provisions of these rules.
<table>
<thead>
<tr>
<th>Waste Category Number</th>
<th>Waste Category Type</th>
<th>Treatment &amp; Disposal Option</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 1</strong> Human Anatomical Waste** (human tissues) body parts</td>
<td><strong>Incineration @ deep burial</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 2</strong> Animal Waste (animal tissues, organs) body parts carcasses bleeding parts, fluid blood and experimental animals used in research, waste generated by veterinary hospitals colleges, discharge from hospital, animal</td>
<td><strong>Incineration @ deep burial</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 3</strong> Microbiology &amp; Biotechnology Waste (waste from laboratory cultures, stocks or specimens of micro-organisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)</td>
<td><strong>Local autoclaving / microwaving / incineration @</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 4</strong> Waste Sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This treatment includes both and unused sharps)</td>
<td><strong>Disinfection (chemical treatment) @</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 5</strong> Discarded Medicines and Cytotoxic Drugs (wastes comprising outdated, contaminated and discarded medicines)</td>
<td><strong>Incineration @ destruct ion and drugs disposal in secured landfill drugs disposal in secured</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 6</strong> Soiled Waste (items contaminated with blood, and body fluids including cotton dressings, soiled plaster casts, lines, beddings, other material contaminated with blood)</td>
<td><strong>Incineration @ autoclaving microwaving</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 7</strong> Solid Waste (wastes generated from disposable items other than the waste sharps such as tubings, catheters, intravenous sets etc.)</td>
<td><strong>Disinfection by chemical treatment @ autoclaving microwaving and multilation shredding</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 8</strong> Liquid Waste (waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities)</td>
<td><strong>Disinfection by chemical treatment @ and discharge into drains</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 9</strong> Incineration Ash (ash from incineration of any biomedical waste)</td>
<td><strong>Disposal in municipal landfill</strong></td>
</tr>
<tr>
<td><strong>Category</strong></td>
<td><strong>No. 10</strong> Chemical Waste (chemicals used in production of insecticides, etc.)</td>
<td><strong>Chemical treatment @ and discharge into drains for liquids and secured landfill for solids</strong></td>
</tr>
</tbody>
</table>

+ Options given above are based on available technologies. Occupier/operator Pollution Control Board to get the standards laid down to enable the prescribed authority to consider grant of authorization

@@@ Chemicals treatment using at least 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.

### Multilation/shredding must be such so as to prevent unauthorised reuse.

@ There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.

*Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.

“Occupier/Operator wishing to use other state of the art technologies shall approach the Central Pollution Control Board to get the standards laid down to enable the prescribed authority to consider grant of authorization.”
**SCHEDULE-II**

(See Rule 6)

**COLOUR CODING AND TYPE OF CONTAINER FOR DISPOSAL OF BIOMEDICAL WASTES**

<table>
<thead>
<tr>
<th>Colour Coding</th>
<th>Type of Container -I</th>
<th>Waste Category</th>
<th>Treatment options as per Schedule I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Plastic bag</td>
<td>Cat. 1, Cat. 2, and Cat. 3, Cat. 6.</td>
<td>Incineration/deep burial</td>
</tr>
<tr>
<td>Red</td>
<td>Disinfected container/plastic bag</td>
<td>Cat. 3, Cat. 6, Cat. 7.</td>
<td>Autoclaving/Microwaving/Chemical Treatment</td>
</tr>
<tr>
<td>Blue/White Translucent</td>
<td>Plastic bag/puncture proof Container</td>
<td>Cat. 4, Cat. 7.</td>
<td>Autoclaving/Microwaving/Chemical Treatment and destruction/shredding</td>
</tr>
<tr>
<td>Black</td>
<td>Plastic bag</td>
<td>Cat. 5 and Cat. 9 and Cat. 10. (solid)</td>
<td>Disposal in secured landfill</td>
</tr>
</tbody>
</table>

**Notes:**
1. Colour coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule I.
2. Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
3. Categories 8 and 10 (liquid) do not require containers/bags.
4. Category 3 if disinfected locally need not be put in containers/bags.
SCHEDULE-III
(See Rule 6)

Label for Bio Medical Waste Containers/ Bags

HANDLE WITH CARE

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

SCHEDULE IV
(see Rule 6)

LABEL FOR TRANSPORT OF BIO-MEDICAL WASTE CONTAINERS/BAGS

Day ............ Month ..............
Year ............
Date of generation ..................

Waste category No ........
Waste class
Waste description

Sender's Name & Address          Receiver's Name & Address
Phone No ........               Phone No ............
Telex No ....                Telex No ............
Fax No ...............            Fax No ...............    
Contact Person ........          Contact Person ........

In case of emergency please contact
Name & Address :
Phone No.

Note : Label shall be non-washable and prominently visible.
SCHEDULE V
(see Rule 5 and Schedule 1)

STANDARDS FOR TREATMENT AND DISPOSAL OF BIO-MEDICAL WASTES

STANDARDS FOR INCINERATORS:

All incinerators shall meet the following operating and emission standards

A. Operating Standards
1. Combustion efficiency (CE) shall be at least 99.00%.
2. The Combustion efficiency is computed as follows:
   \[
   \text{C.E.} = \frac{\% \text{CO}_2}{\% \text{CO}_2 + \% \text{CO}} \times 100
   \]
3. The temperature of the primary chamber shall be 800 ± 50 deg. C°.
4. The secondary chamber gas residence time shall be at least 1 (one) second at 1050 ± 50 C°, with minimum 3% Oxygen in the stack gas.

B. Emission Standards

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Concentration mg/Nm³ at (12% CO₂ correction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Particulate matter</td>
<td>150</td>
</tr>
<tr>
<td>(2) Nitrogen Oxides</td>
<td>450</td>
</tr>
<tr>
<td>(3) HCl</td>
<td>50</td>
</tr>
<tr>
<td>(4) Minimum stack height shall be 30 metres above ground</td>
<td></td>
</tr>
<tr>
<td>(5) Volatile organic compounds in ash shall not be more than 0.01%</td>
<td></td>
</tr>
</tbody>
</table>

Note:
- Suitably designed pollution control devices should be installed/retrofitted with the incinerator to achieve the above emission limits, if necessary.
- Wastes to be incinerated shall not be chemically treated with any chlorinated disinfectants. Chlorinated plastics shall not be incinerated.
- Toxic metals in incineration ash shall be limited within the regulatory quantities as defined under the Hazardous Waste (Management and Handling Rules,) 1989.
- Only low sulphur fuel like L.D.0dLS.H.S.1Diesel shall be used as fuel in the incinerator.

STANDARDS FOR WASTE AUTOCLAVING:

The autoclave should be dedicated for the purposes of disinfecting and treating biomedical waste,
(I) When operating a gravity flow autoclave, medical waste shall be subjected to:

(i) a temperature of not less than 121°C and pressure of 15 pounds per square inch (psi) for an autoclave residence time of not less than 60 minutes; or

(ii) a temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes; or

(iii) a temperature of not less than 149°C and a pressure of 52 psi for an autoclave residence time of not less than 30 minutes.

(II) When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following:

(i) a temperature of not less than 121°C and pressure of 15 psi per an autoclave residence time of not less than 45 minutes; or

(ii) a temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes;

(III) Medical waste shall not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reasons, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved.

(IV) **Recording of operational parameters**

Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.

(V) **Validation test**

**Spore testing:**

The autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be *Bacillus stearothermophilus* spores using vials or spore Strips; with at least 1X10⁴ spores per millilitre. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, regardless of temperature and pressure, a temperature less than 121°C or a pressure less than 15 psi.
(VI) Routine Test

A chemical indicator strip/tape that changes colour when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may be necessary to use more than one strip over the waste package at different locations to ensure that the inner content of the package has been adequately autoclaved.

STANDARD FOR LIQUID WASTE:
The effluent generated from the hospital should conform to the following limits:

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>PERMISSIBLE LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td>6.3-9.0</td>
</tr>
<tr>
<td>Suspended solids</td>
<td>100 mg/l</td>
</tr>
<tr>
<td>Oil and grease</td>
<td>10 mg/l</td>
</tr>
<tr>
<td>BOD</td>
<td>30 mg/l</td>
</tr>
<tr>
<td>COD</td>
<td>250 mg/l</td>
</tr>
<tr>
<td>Bioassay test</td>
<td>90% survival of fish after 96 hours in 100% effluent.</td>
</tr>
</tbody>
</table>

These limits are applicable to those hospitals which are either connected with sewers without terminal sewage treatment plant or not connected to public sewers. For discharge into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 shall be applicable.

STANDARDS OF MICROWAVING

1. Microwave treatment shall not be used for cytotoxic, hazardous or radioactive wastes, contaminated animal carcasses, body parts and large metal items.

2. The microwave system shall comply with the efficacy test/routine tests and a performance guarantee may be provided by the supplier before operation of the limit.

3. The microwave should completely and consistently kill the bacteria and other pathogenic organisms that is ensured by approved biological indicator at the maximum design capacity of each microwave unit. Biological indicators for microwave shall be Bacillus Subtilis spores using vials or spore strips with at least $1 \times 10^1$ spores per milliliter.

STANDARDS FOR DEEP BURIAL

1. A pit or trench should be dug about 2 meters deep. It should be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.

2. It must be ensured that animals do not have any access to burial sites. Covers of galvanised iron/wire meshes may be used.
3. On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes.

4. Burial must be performed under close and dedicated supervision.

5. The deep burial site should be relatively impermeable and no shallow well should be close to the site.

6. The pits should be distant from habitation, so as to ensure that no contamination occurs of any surface water or ground water. The area should not be prone to flooding or erosion.

7. The location of the deep burial site will be authorised by the prescribed authority.

8. The institution shall maintain a record of all pits for deep burial.

**SCHEDULE VI**
(see Rule 5)

**SCHEDULE FOR WASTE TREATMENT FACILITIES LIKE INCINERATOR/ AUTOCLAVE / MICROWAVE SYSTEM**

A. Hospitals and nursing homes in towns with population of 30 lakhs and above  
by 30th June, 2000 or earlier

B. Hospitals and nursing homes in towns with population of below 30 lakhs

(a) With 500 beds and above  
by 30th June, 2000 or earlier

(b) With 200 beds and above but less than 500 beds  
by 31st December, 2000 or earlier

(c) With 50 beds and above but less than 200 beds  
by 31st December, 2001 or earlier

(d) With less than 50 beds  
by 31st December, 2002 or earlier

C. All other institutions generating bio- medical waste not included in A and B above  
by 31st December, 2002 or earlier
FORM I
(see rule 8)

[APPLICATION FOR AUTHORISATION / RENEAL OF AUTHORISATION]
(To be submitted in duplicate.)

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

1. Particulars of Applicant
   (i) Name of the Applicant
       (In block letters & in full)
   (ii) Name of the Institution:
        Address:
        Tele No., Fax No. Telex No.

2. Activity for which authorisation is sought:
   (i) Generation
   (ii) Collection
   (iii) Reception
   (iv) Storage
   (v) Transportation
   (vi) Treatment
   (vii) Disposal
   (viii) Any other form of handling

3. Please state whether applying for fresh authorisation or for renewal:
   (In case of renewal previous authorisation-number and date)

4. (i) Address of the institution handling bio-medical wastes:
   (ii) Address of the place of the treatment facility:
   (iii) Address of the place of disposal of the waste:

5. (i) Mode of transportation (in any) of bio-medical waste:
   (ii) Mode(s) of treatment:

6. Brief description of method of treatment and disposal (attach details):

7. (i) Category (see Schedule 1) of waste to be handled
(ii) Quantity of waste (category-wise) to be handled per month

8. Declaration

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

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

Date: __________________________ Signature of the Applicant

Place: __________________________ Designation of the Applicant
FORM II

ANNUAL REPORT
(see rule 10)

(To be submitted to the prescribed authority by 31 January every year).

1. Particulars of the applicant:
   (i) Name of the authorised person (occupier/operator):
   (ii) Name of the institution:
       Address
       Tel. No
       Telex No.
       Fax No.

2. Categories of waste generated and quantity on a monthly average basis:

3. Brief details of the treatment facility:
   In case of off-site facility:
   (i) Name of the operator
   (ii) Name and address of the facility:
       Tel. No., Telex No., Fax No.

4. Category-wise quantity of waste treated:

5. Mode of treatment with details:

6. Any other information:

7. Certified that the above report is for the period from………………………………………….

   Date .................................. Signature ..............................

   Place................................. Designation..........................

FORM III

ACCIDENT REPORTING
(see Rule 12)

1. Date and time of accident:

2. Sequence of events leading to accident

3. The waste involved in accident:

4. Assessment of the effects of the accidents on human health and the environment,

5. Emergency measures taken

6. Steps taken to alleviate the effects of accidents

7. Steps taken to prevent the recurrence of such an accident ……………………………

   Date ............................... Signature ..............................

   Place................................. Designation..........................
FROM IV
[see rule 8(4)]

(Authorisation for operating a facility for collection, reception, treatment, storage transport and disposal of biomedical wastes.)

1. File number of authorisation and date of issue .................................................................

2. ................................................................of ................................................................. is hereby granted an authorisation to operate a facility for collection, reception, storage, transport and disposal of biomedical waste on the premises situated at .................................................................

3. This authorisation shall be in force for a period of ...........Years from the date of issue.

4. This authorisation is subject to the conditions stated below and to such other conditions as may be specified in the rules for the being in force under the Environment (Protection) Act, 1986.

Signature..............................

Date............................

Designation............................

Terms and conditions of authorisation*

1. The authorisation shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.

2. The authorisation or its renewal shall be produced for inspection at the request of an officer authorised by the prescribed authority.

3. The person authorised shall not rent, lend, sell, transfer or otherwise transport the biomedical wastes without obtaining prior permission of the prescribed authority.

4. Any unauthorised change in personnel, equipment or working conditions as mentioned in the application by the person authorised shall constitute a breach of his authorisation.

5. It is the duty of the authorised person to take prior permission of the prescribed authority to close down the facility.

* Additional terms and conditions may be stipulated by the prescribed authority
FORM V
[see rule 13]

Application for filing appeal against order passed by the prescribed authority at district level or regional office of the Pollution Control Board acting as prescribed authority or the State/Union Territory level authority.
1. Name and address of the person applying for appeal:
2. Number, date of order and address of the authority which passed the order, against which appeal is being made (certified copy of order to be attached)
3. Ground on which the appeal is being made
4. List of enclosures other than the order referred in para 2 against which appeal is being filed.

Date: ___________________
Signature ___________________
Name & Address ___________________

[F. No. 23(2)/96-HSMD]
V. RAJAGOPALAN, Jt. Secy.

Note: -- The Principal rules were published in the Gazette of India vide number S.O. 630 (E) dated 20-7-98, and subsequently amended vide S.O. 201(E) dated 6-3-2000.

Source: Ministry of Environment and Forests

[F.No.23-2/96-HSMD]
VIJAY SHARMA, Jt.Secy.
Reference:

3. Training Manual- Training for workers in the management of sharps waste, version 1, October 2005 by USAID and PATH
4. www.nursingworld.org/occupational environment American nurses association,  safe needle safe life
5. Injection safety and Indian Medical Association  PATH
7. www.env-health.org
8. Www.noharm.org
10. The US Environmental Protection Agency's Clean Up Instructions:
12. Environment Canada's Cleaning Up Small Mercury Spills:
15. Adapted by HCWH from United States Environmental Protection Agency's Guidelines on cleaning up mercury spills. See more at www.epa.gov/mercury/disposal
17. F:\BMW\International Council of Nurses [Fact Sheet - First Do No Harm Auto-Disable Syringes for Immunization Safety].html
18. Occupational safety: Where Ignorance is not bliss- A fact sheet on the safety of healthcare workers in India
19. Guideline for Common Bio-Medical Waste Treatment Facility by Central Pollution Control Board.