

BIOMEDICAL WASTE MANAGEMENT

Facilitator:

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Specific Learning Objectives

- At the end of session, the learner shall be able to know about:

INTRODUCTION

- Since beginning, the hospitals are known for the treatment of sick persons but we are unaware about the adverse effects of the garbage and filth generated by them on human body and environment. Now it is a well established fact that hospital waste is a potential health hazard to the health care workers, public and flora and fauna of the area.

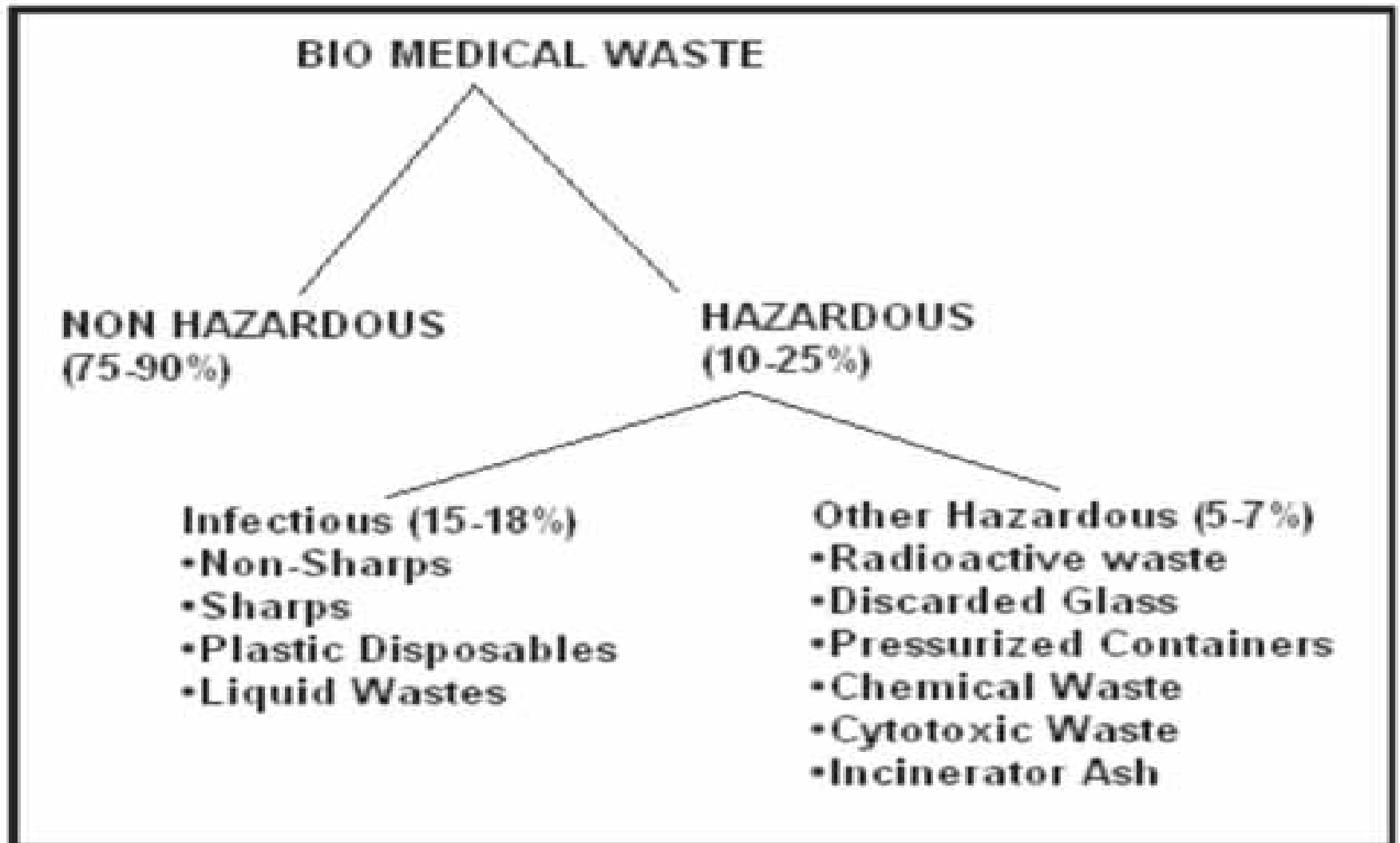


The act was passed by the Ministry of Environment and Forests in 1986 & notified **the Bio Medical Waste (Management and Handling) Rules** in July 1998. In accordance with these rules, it is the duty of every “occupier” i.e. a person who has the control over the institution or its premises, to take all steps to ensure that waste generated is handled without any adverse effect to human health and environment.

DEFINITIONS

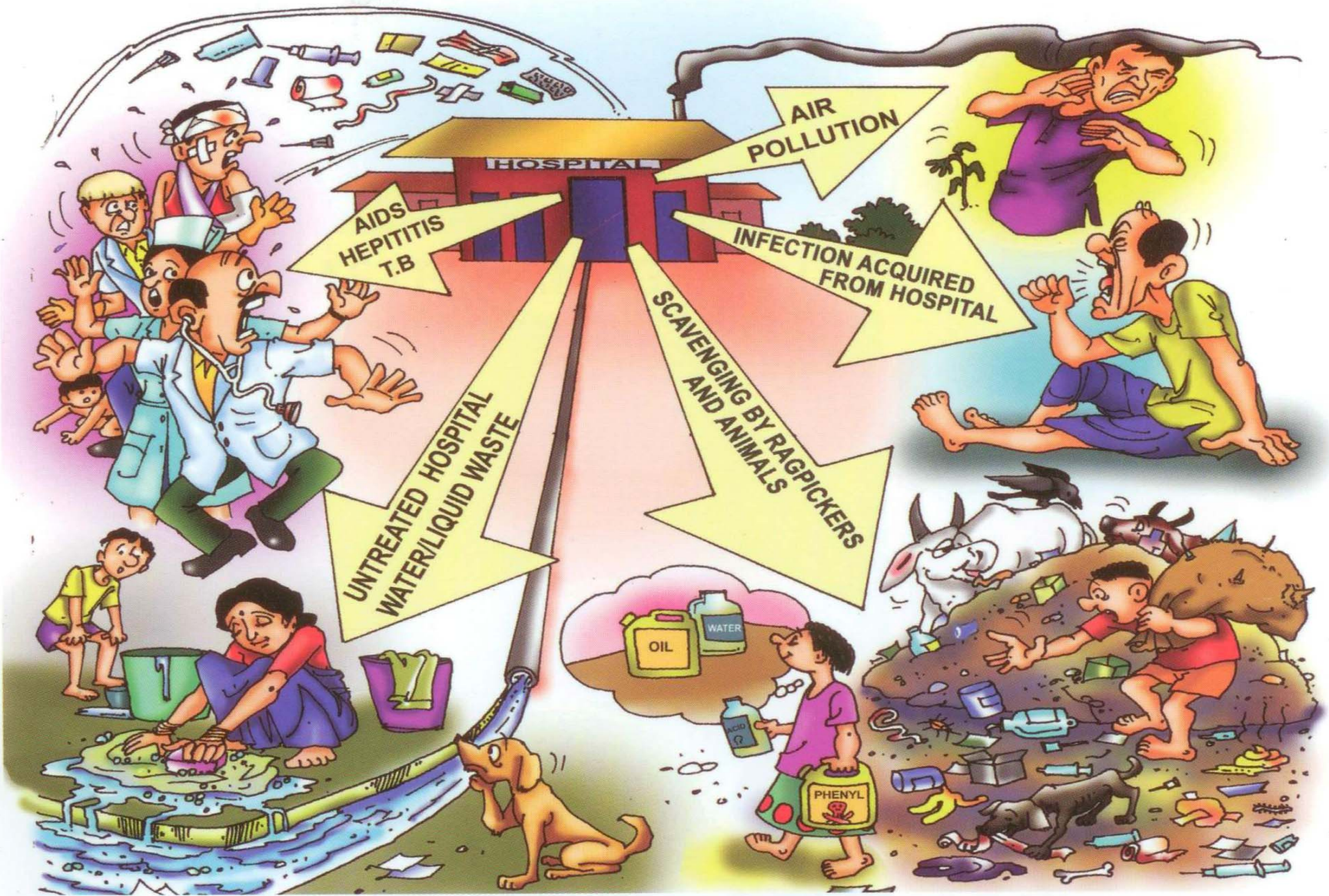
- **Hospital waste** refers to all waste, biological or non-biological that is discarded and not intended for further use.
- **Bio-medical waste** means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals, and including categories mentioned in Schedule I.
- **Infectious waste:** The wastes which contain pathogens in sufficient concentration or quantity that could cause diseases. It is hazardous e.g. culture and stocks of infectious agents from laboratories, waste from surgery, waste originating from infectious patients.

Classification of Bio-Medical Waste



SOURCES OF BIO MEDICAL WASTE

- Hospitals
- Nursing homes
- Clinics
- Medical laboratories
- Blood banks
- Mortuaries
- Medical research & training centers
- Biotechnology institution/production units
- Animal houses etc.
- Such a waste can also be generated at home if health care is being provided there to a patient (e.g. injection, dressing material etc.)



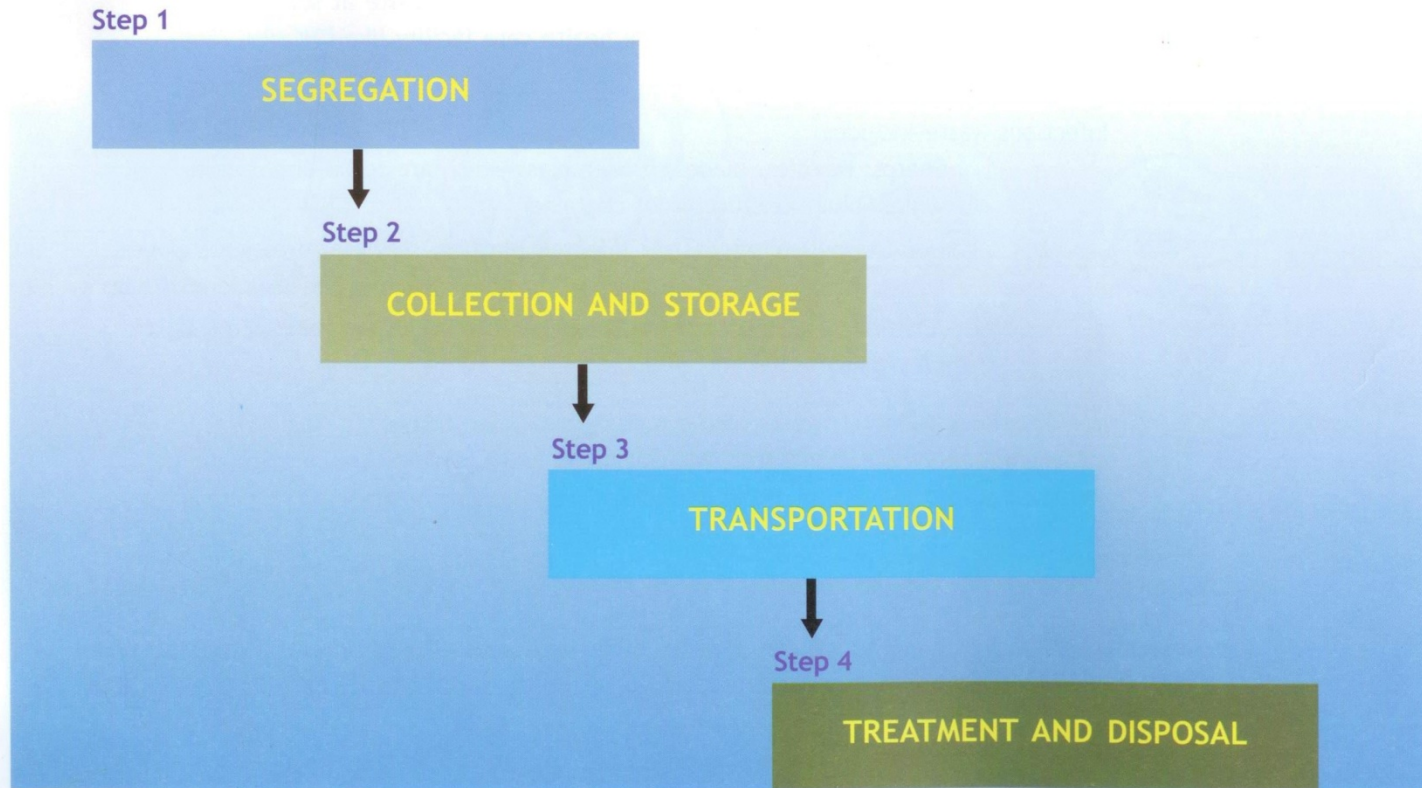
Health care waste is a risk to all, it affects us in different ways

CATEGORIES OF BIO-MEDICAL WASTE





Option	Waste Category	Treatment & Disposal
Category No. 1	Human Anatomical Waste (human tissues, organs, body parts)	incineration/deep burial
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)	incineration/deep burial
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)	local autoclaving/microwaving/incineration
Category No 4	Waste sharps (needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps)	disinfection (chemical treatment/autoclaving/microwaving and mutilation/shredding

Category No 5	Discarded Medicines and Cytotoxic drugs (wastes comprising of outdated, contaminated and discarded medicines)	incineration@/destruction and drugs disposal in secured landfills
Category No 6	Soiled Waste (Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts, lines, beddings, other material contaminated with blood)	Incineration/ autoclaving/microwaving
Category No. 7	Solid Waste (wastes generated from disposable items other than the waste sharps such as tubings, catheters, intravenous sets etc).	disinfection by chemical treatment/autoclaving/ microwaving and mutilation/ shredding
Category No. 8	Liquid Waste (waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities).	disinfection by chemical treatment and discharge into drains
Category No. 9	Incineration Ash (ash from incineration of any bio-medical waste)	disposal in municipal landfill
Category No. 10	Chemical Waste (chemicals used in production of biologicals, chemicals used in disinfection, as insecticides, etc.)	Chemical discharge into drains for liquids and secured landfill for solids

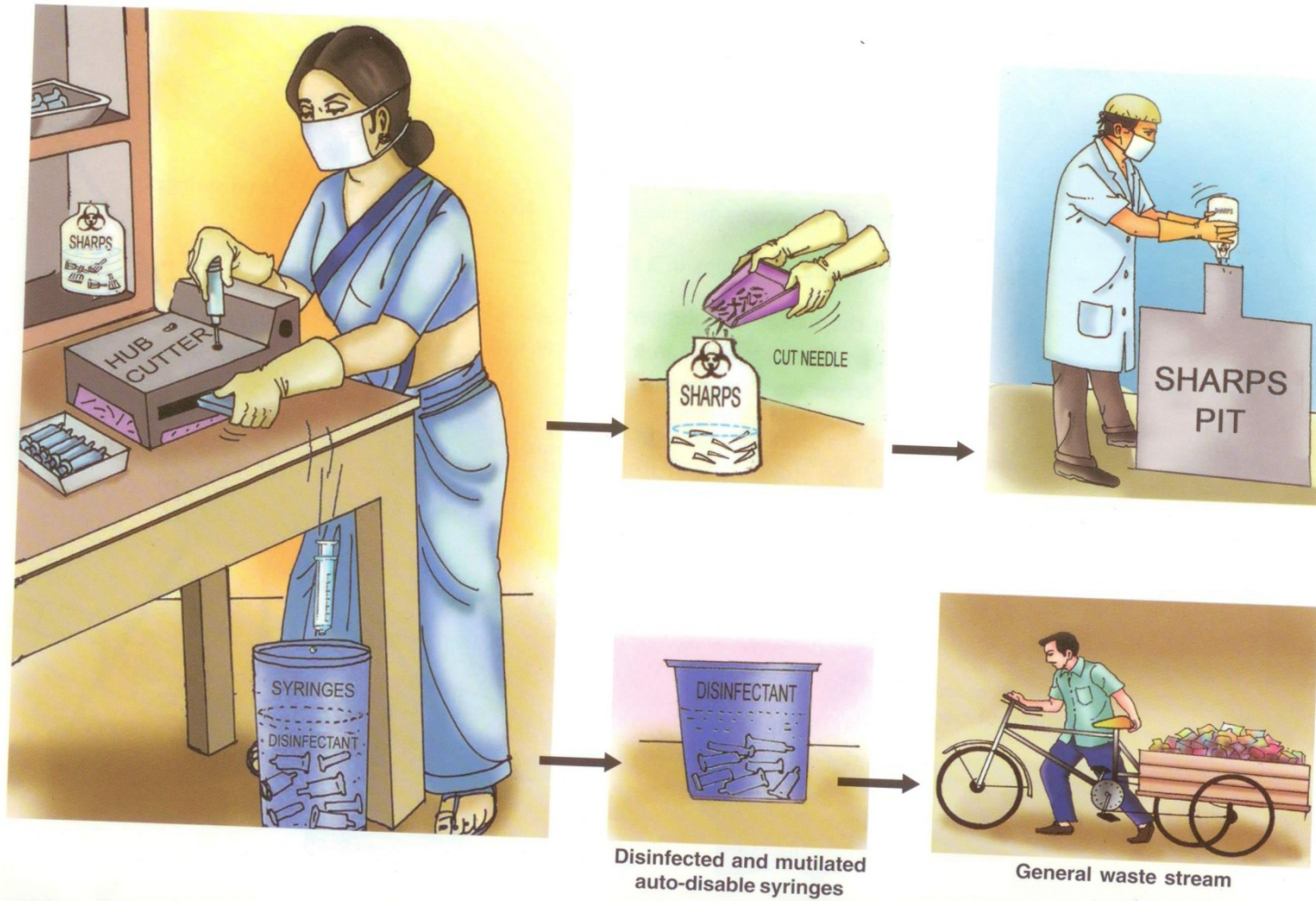
1. Steps For Waste Management



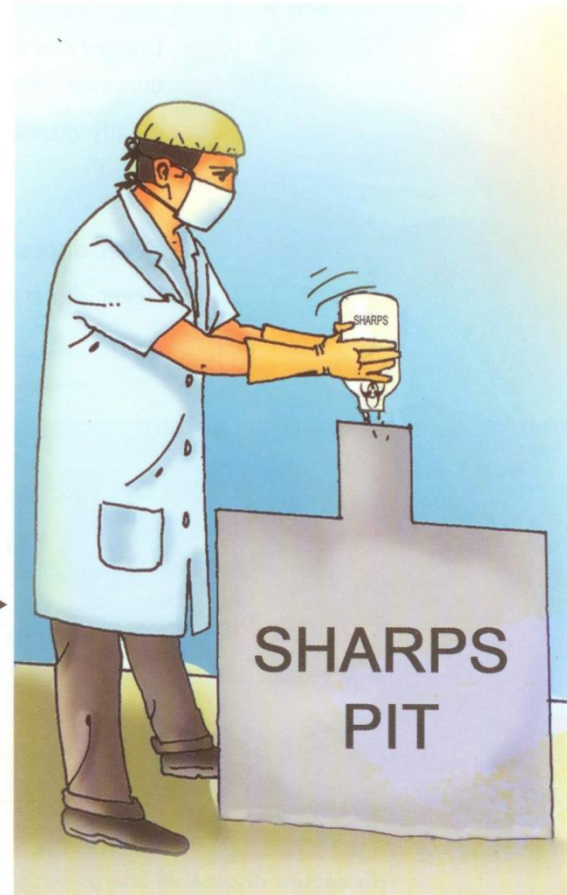
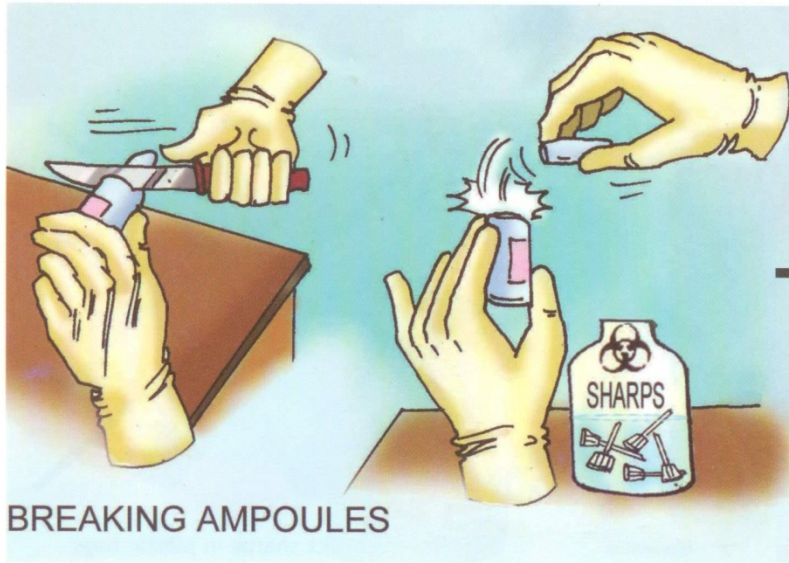
Rule 1998 schedule II

Color coding	Type of container	Waste categories
Yellow 	Plastic bags	Cat 1 human anatomical waste Cat 2 Animal Waste Cat 3 Microbiological Waste Cat 6 Solid Waste
Red 	Disinfected container plastic bags	Cat 3 Microbiological Cat. 6 Soiled Dressing
Blue/white 	Plastic bags, puncture proof containers	Cat. 4 Waste sharp Cat.7 Plastic disposable
Black 	Do	Cat. 5 Discarded medicine Cat. 9 Incineration ash Cat 10 Chemical Waste

Auto-Disable Syringes



Broken Glasses



TRANSPORTATION AND STORAGE

- The waste may be temporarily stored at the central storage area of the hospital and from there it may be sent in bulk to the site of final disposal once or twice a day depending upon the quantum of waste. During transportation following points should be taken care of:
- Ensure that waste bags/containers are properly sealed and labeled.
- Bags should not be filled completely, so that bags can be picked up by the neck again for further handling. Hand should not be put under the bag. At a time only one bag should be lifted.
- Manual handling of waste bags should be minimized to reduce the risk of needle prick injury and infection.
- BMW should be kept only in a specified storage area.
- After removal of the bag, clean the container including the lid with an appropriate disinfectant.
- Waste bags and containers should be removed daily from wards / OPDs or even more frequently if needed (as in Operation Theatres, ICUs, labour rooms). Waste bags should be transported in a **covered wheeled containers or large bins in covered trolleys**.
- **No untreated bio-medical waste shall be kept stored beyond a period of 48 hours**



TRANSPORT TO FINAL DISPOSAL SITE

- Transportation from health care establishment to the site of final disposal in a closed motor vehicle (truck, tractor-trolley etc.) is desirable as it prevents spillage of waste on the way.
- Vehicles used for transport of BMW must have the “**Bio-Hazard**” **symbol** and these vehicles should not be used for any other purpose.



CYTOTOXIC HAZARD SYMBOL



HANDLE WITH CARE

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



DISPOSAL OF BIOMEDICAL WASTE

- ***Deep burial:***
 - Category 1 and 2 only
 - In cities having less than 5 lakh population & rural area.

- ***Autoclave and microwave treatment***
 - Standards for the autoclaving and microwaving are also mentioned in the Biomedical waste (Management and Handling) Rules 1998.
 - All equipment installed/shared should meet these specifications.
 - Category 3, 4, 6 and 7 can be treated by these techniques.

- ***Shredding:***

- The plastic (I.V. bottles, I.V. sets, syringes, catheters etc.), sharps (needles, blades, glass etc) should be shredded but only after chemical treatment/microwaving/autoclaving.
- Needle destroyers can be used for disposal of needles directly without chemical treatment.

- ***Land disposal:***

- ***Open dumps***
- ***Secured/Sanitary landfill: advantages.***
- The incinerator ash, discarded medicines, cytotoxic substances and solid chemical waste should be treated by this option.

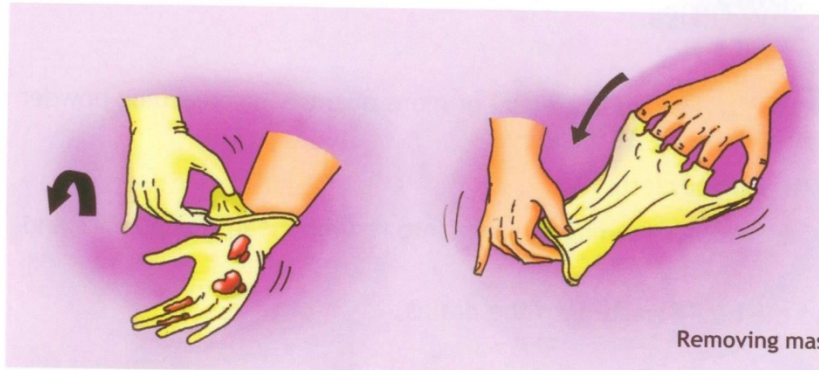
Incinerator



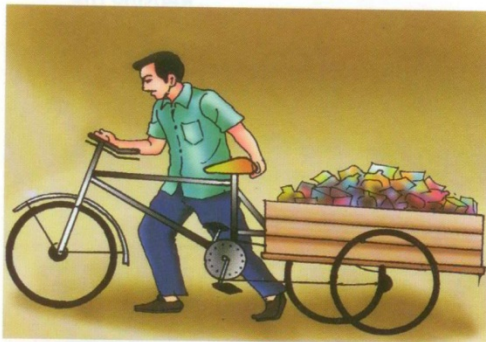
Autoclaves



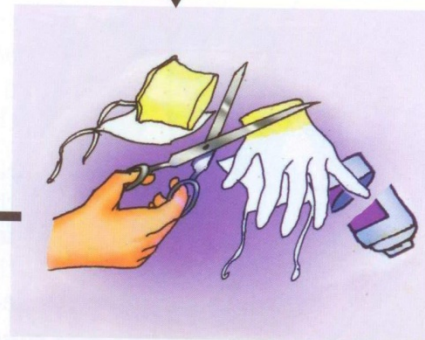
Plastic Waste



Removing mask and gloves

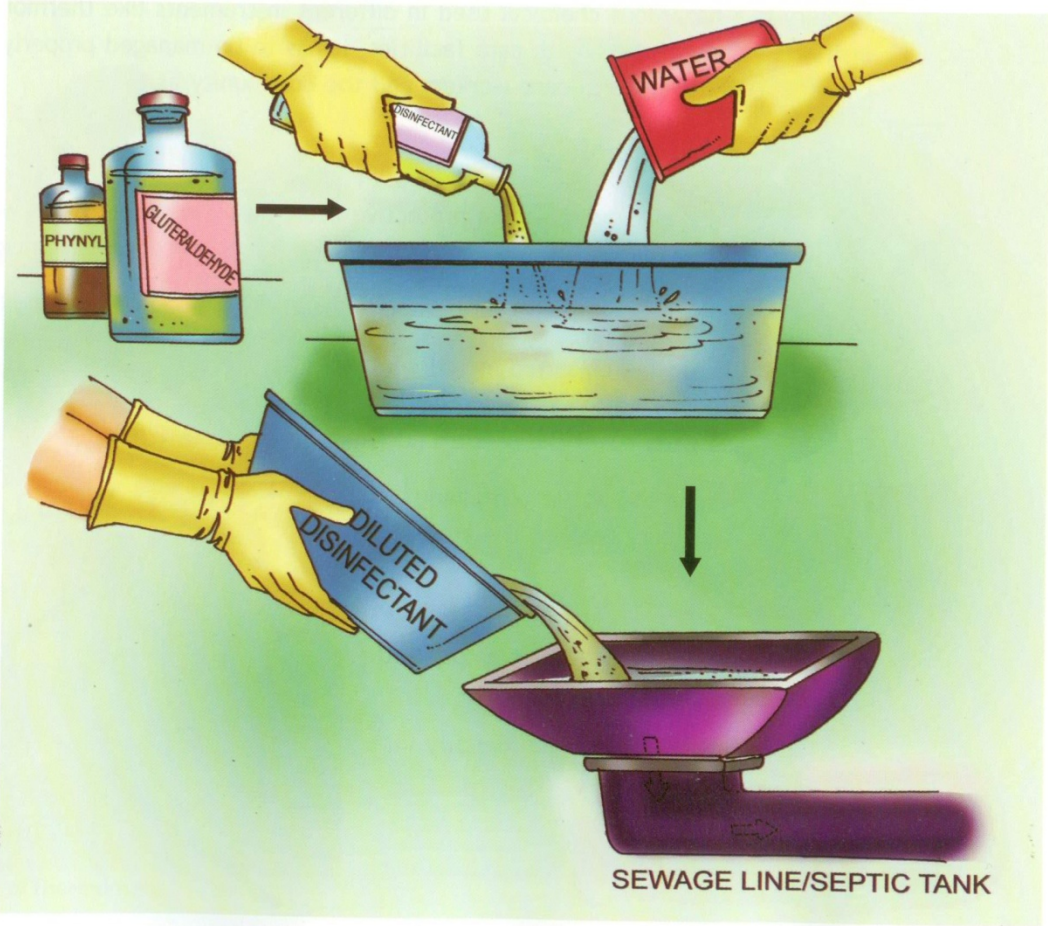


General waste stream



Mutilation

Disposal of Disinfectants



Incineration

- A high temperature dry oxidation process, which reduces organic and combustible waste to inorganic incombustible matter.
- Usually used for the waste that can not be reused, recycled or disposed of in landfill site.
- The incinerator should be installed and made operational as per specification under the BMW rules 1998
- Certificate may be taken from CPCB/State Pollution Control Board
- Category 1, 2, 3, 5, and 6 can be incinerated.

- Characteristics of **waste suitable for incineration** are:
 - Low heating volume
 - above 2000 Kcal/Kg for single chamber incinerators and
 - above 3500 Kcal/Kg for pyrolytic double chamber incinerators.
 - Content of combustible matter above 60%.
 - Content of non combustible matter below 50%.
 - Content of non combustible fines below 20%.
 - Moisture content below 30%.

- **Waste types not to be incinerated** are:
 - Pressurized gas containers.
 - Large amount of reactive chemical wastes.
 - Silver salts and photographic or radiographic wastes.
 - Halogenated plastics such as PVC.
 - Waste with high mercury or cadmium content such as broken thermometers, used batteries.
 - Sealed ampoules or ampoules containing heavy metals.

1. Double chamber pyrolytic incinerators
2. Single-chamber furnaces
3. Rotary kilns

Safety measures

- All the generators of biomedical waste should adopt universal precautions and appropriate safety measures while handling the bio-medical waste.
- It should be ensured that:
 - drivers, collectors and other handlers are aware of the nature and risk of the waste.
 - written instructions provided regarding the procedures to be adopted in the event of spillage/ accidents.
 - protective gears provided and instructions regarding their uses are given.
 - workers are protected by vaccination against tetanus and hepatitis B.

2. Personal Protective Equipments

1. Always wear personal protective gears while handling waste
2. Wearing head gears, eye covers (glasses), mask, apron, gloves and boots these constitute the barrier for transmission of infections
3. Taking immunization against Hepatitis B and Tetanus are important universal precautions



Training

- Every hospital must have well planned awareness and training programme for all category of personnel.
- Training should be conducted in appropriate language/medium and in an acceptable manner.
- All the medical professionals must be made aware of Bio-medical Waste (Management and Handling) Rules 1998.

Management and Administration

- Each hospital should constitute a **hospital waste management committee**
 - chaired by the head of the Institute and having wide representation from all major departments.
- This committee should be responsible for making Hospital specific action plan
 - for hospital waste management and its supervision, monitoring and implementation.
- The annual reports, accident reports, as required under BMW rules should be submitted to the concerned authorities as per BMW rules format.

Measures for waste minimization

- As far as possible, purchase of reusable items made of glass and metal should be encouraged.
- Select non PVC plastic items.
- Adopt procedures and policies for proper management of waste generated, the mainstay of which is segregation to reduce the quantity of waste to be treated.
- Establish effective and sound recycling policy for plastic recycling and get in touch with authorized manufactures.

Coordination between hospital and outside agencies

- **Municipal authority :**
- As quite a large percentage of waste (in India up to **85%**), generated in Indian hospitals, belong to general category (**non-toxic and non-hazardous**), hospital should have constant interaction with municipal authorities so that this category of waste is regularly taken out of the hospital premises for land fill or other treatment.

- **Co-ordination with Pollution Control Boards:**

- To search for better methods technology, provision of facilities for testing, approval of certain models for hospital use in conformity with standards laid down.
- To search for cost effective and environmental friendly technology for treatment of bio-medical and hazardous waste.
- To search for suitable materials to be used as containers for bio-medical waste requiring incineration/autoclaving/microwaving.

V-BMW