BIO MEDICAL WASTE MANAGEMENT
“Bio-Medical waste” is the waste that is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps, including the categories mentioned in Schedule I appended to BMW rules 2016”

“Any solid and/ liquid waste including its container and any intermediate product, which is generated during the diagnosis, treatment or immunization of human beings or animals”. 
CONTINUE


- Waste in India - 484 tonnes/day of bmw from 1,68,869 health care centres
- Average 1-2kg/bed/day.

PRESENT SENERIO

Acc. To the M.O.E.F. & CC (Ministry of Environment and Forests )-

- Gross generation of BMW in india is 484 tone/day from 1,68,869 health care facilities (hcf), out of which 447 tone/day is treated, which means that almost 38 tone/day of the wastes is left untreated & not disposed finding its way in dumps or water bodies & re-enters our system.
On 20th July 1998 Ministry of Environment and Forests (MoEF), Govt. of India, Framed a rule known as ‘Bio-medical Waste (Management and Handling) Rules,

1st Amendment Dated 06/03/2000

2nd Amendment Dated 17/09/2003

The MoEF&CC has notified the new BMW (M) Rules, 2016 on 28TH March, under the Environment (Protection) Act, 1986 to replace the earlier Rules (1998) and the amendments thereof.
Need of BMW Management

Health care waste is a risk to all, it affects us in different ways.
PERSONS AT RISK
Who’s At Risk

- Doctor’s & Nurses
- Patients
- Hospital support staff
- Support staff Waste collection & disposal staff
- General public and the Environment
MIXED HOSPITAL WASTE BEFORE PROJECT
WHO ESTIMATES

- 85% of hospital waste is non-hazardous
- 10% is infectious
- 5% is non-infectious
Bio-Medical Wastes

- Non Infectious waste 85%
- Pathological & Infectious waste, 10%
- Chemical & Pharmaceutical waste, 3%
- Sharps, 1%
- Radioactive, Cytotoxic & heavy metals, 1%
NEED FOR BMW MANAGEMENT

The hospital waste, in addition to the risk for patient & personal who handle these waste poses a threat to public health & enviroment.

<table>
<thead>
<tr>
<th>TYPE OF WASTE</th>
<th>Health HAZARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human/ Anatomical waste/ soiled waste</td>
<td>HIV, HBV, Cholera, T.B, Pneumonia Rabies e.t.c.</td>
</tr>
<tr>
<td>Sharps</td>
<td>HIV, HBV, HCV, Injuries</td>
</tr>
<tr>
<td>Cytotoxic/ radioactive</td>
<td>Cancer, Birth defect</td>
</tr>
<tr>
<td>Chemical waste</td>
<td>Poisoning, dermatitis, conjunctivitis</td>
</tr>
</tbody>
</table>
Rationale of Hospital Waste Management

- Injuries from sharps leading to infection to all categories of hospital personnel and waste handler.
- Nosocomial infections in patients from poor infection control practices and poor waste management.
- Risk of infection outside hospital for waste handlers and scavengers and at time general public living in the vicinity of hospitals.
- Risk associated with hazardous chemicals, drugs to persons handling wastes at all levels.
- "Disposable" being repacked and sold by unscrupulous elements without even being washed.
- Drugs which have been disposed of, being repacked and sold off to unsuspecting buyers.
- Risk of air, water and soil pollution directly due to waste, or due to defective incineration emissions and ash
SOURCES OF BIO-MEDICAL WASTE

Major Sources
- All Hospitals
- Labs
- Research centers
- Animal research
- Blood banks
- Nursing homes
- Mortuaries
- Autopsy centers

Minor Sources
- Clinics (Dental & Ayu.)
- Cosmetic clinics
- Home care
- Paramedics
- Funeral services
CLASSIFICATION OF BMW

- NON-HAZARDOUS (80%)
- HAZARDOUS (20%)

- INFECTIONOUS (15%)
  - Non sharp
  - Sharp
  - Plastic Dispos
  - Liquid

- OTHER HAZARDOUS (5% (injurious))
  - Radioactive
  - Broken Glasswares
  - Press Containers
  - Chemical, cytotoxic
  - Incineration ash
I. Categories of BMW
II. Color coding and type of container for disposal of BMW
III. Labels for BMW containers / bags
IV. Labels for transport of BMW bags
V. Standards for treatment and disposal of BMW
VI. Schedule for waste treatment facilities like incinerator / autoclave / microwave systems.
SCHEDULE-1
CATEGORIES OF BIO-MEDICAL WASTE

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

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, human and animal cell culture, infectious agents from research and industrial laboratories, wastes from production of biologicals, etc)

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 a 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 disinfection, as insecticides, etc.)
Life Cycle of Waste Management AND Role of Waste Handlers

1. Generation of Waste
2. Segregation
3. Collection
4. Treatment of waste
5. Transportation
6. Terminal Disposal

Interim Storage
Segregation of Bio medical waste

- The segregation of Biomedical waste is the key to successful Biomedical waste management.
- BMW should not be mixed with any other kind of waste.
- It should be separated/segregated at the point of generation before storage or transport. The container should be labeled according to the schedule.
SCHEDULE- 3
LABEL FOR BIO-MEDICAL WASTE CONTAINERS/BAGS (PART- A)

BIO HAZARDS SYMBOL

CYTOTOXIC SYMBOL

BIO HAZARDS WASTE WITH CARE

NOTE - LABEL SHALL BE NON WASHABLE & PROMINANTLY VISIBLE
SCHEDULE- 4 (PART- B)

Day .......... Month .............. Year ...........
   Date of generation ..................
Waste category No ........
Waste class Waste description

Sender's Name & Address
Phone No.......... Telex No .... Fax No ...............

Receiver's Name & Address
Phone No ........ Telex No .......... Fax No .............

Contact Person ........ In case of emergency
TRANSPORTATION

- Each health care facility should have a health care waste management plan which should include collection points and routes of waste transport.
- A time table of the frequency of collection should also be set up.
- Untreated BMW should only be transported in a vehicle as may be authorized for the purpose by the competent authority.
- No untreated BMW should be kept stored beyond a period of 48 hrs.
- If it need to be stored beyond this period then the authorized person should take permission from the competent authority.
TRANSPORTATION

- Untreated bio medical waste should be transported in specially designed vehicles.
- Trolley or in covered wheel barrows.
- Manual loading should be avoided as far as possible.
- The bags/container containing biomedical waste should be tied/lidded before transportation.
- Before transportation, signed document by doctor/nurse maintaining date, shift, quantity & destination.
- Special vehicle must be used to prevent access direct contact with the transportation operators, the scavengers & the public.
- The transport containers should be properly enclosed.
- Driver must be trained regarding the procedures followed during the accidental spillage.
- Wash the interior of the containers thoroughly.
- Biohazard symbol should be painted on the trolley.
If you are not measuring it, you are not managing it.
Bags to be filled with only 2/3rd capacity
Bags should be sealed/labelled from Source of Generation

- Date of Production
- Place of Production
- Waste Category
BAD - Don’t carry waste in open bags & never carry it through crowded areas

GOOD - Always carry the waste in secure sealed container/bags
Transportation of biomedical waste is away from patient care units.
HANDLING DEVICES

- Trolleys
- Wheelbarrows
PACKAGING INFECTIOUS WASTE

✓ Selection of packaging materials that are appropriate for the type of waste handled:
  - Plastic bags for many types of solid or semisolid infectious waste.
  - Bottles, flasks, or tanks for liquids.
✓ Use of packaging that maintains its integrity during storage and transport,
✓ Closing the top of each bag by folding or tying as appropriate for the treatment or transport
✓ Place liquid wastes in capped/ tightly stopped bottles.
✓ Do not compact infectious wastes before treatment.
## Treatment or Disposal

<table>
<thead>
<tr>
<th>Category no. 1</th>
<th>Incineration /deep burial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category no. 2</td>
<td>Incineration/deep burial</td>
</tr>
<tr>
<td>Category no. 3</td>
<td>Local autoclaving/deep burial</td>
</tr>
<tr>
<td>Category no. 4</td>
<td>Disinfection (chem. treatment/autoclaving) and mutilation/shredding</td>
</tr>
<tr>
<td>Category no. 5</td>
<td>Incineration</td>
</tr>
<tr>
<td>---------------</td>
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</tr>
<tr>
<td>Category no. 6</td>
<td>Incineration/autoclaving</td>
</tr>
<tr>
<td>Category no. 7</td>
<td>Disinfection by chem. treatment, autoclaving</td>
</tr>
<tr>
<td>Category no. 8</td>
<td>Disinfection by chem. Method and discharge into drains.</td>
</tr>
</tbody>
</table>
## Treatment or Disposal

<table>
<thead>
<tr>
<th>Category no. 9</th>
<th>Disposal in municipal landfills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category no. 10</td>
<td>Chem. Treatment and discharge into drains for liquids and landfills for solids.</td>
</tr>
</tbody>
</table>
SCHEDULE - 5

- Standards for T/t & disposal of bio medical wastes standards for incinerators.

SCHEDULE - 6

- Schedule for waste T/t facilities like incinerator/ autoclave/ microwave system.
Thermal Processes

- Sterilize or destroys medical waste.
- Two categories: low heat systems & high heat systems
- Low heat systems: use steam, hot water or electromagnetic radiation to heat & decontaminate the waste.
- High heat systems: combustion, pyrolysis & high temp. plasmas to decontaminate & destroy the waste.
INCINERATION

- Incineration fundamentals:
  - Incineration comes from a Greek word meaning burn to ashes.
  - Initially, incinerators were just uncontrolled single chamber fire boxes provided with smoke stocks.
  - Now modern incineration systems are well engineered, well designed, well controlled, well monitored
Incineration is a high temperature thermal process employing combustion of the waste under controlled condition for converting them into inert material & gases.

This can be oil fired/electrically powered/ combination.
Validation test: 
Spot testing by Bacillus stearothermophilus spores on a spores strip with at least $1 \times 10^4$ Spores/ml.

Routine test: 
Chemical indicator strip/tape
AUToclave

Principle:

- When water is heated in a closed vessel under pressure, the boiling point of water rises above 100 degree.
- Water is heated at 2 atmospheric pressure and the boiling temperature will be 121 degree or at 3 atmospheric pressure and the boiling temperature will be 134 degree.
AUTOCLAVING IS HIGHLY EFFICIENT BCOZ

- High temperature.
- High penetrating power of the steam under pressure.
- When steam condenses on the articles, it liberates latent heat to the articles to be sterilized.
- Non toxic
- Not time consuming.
Microwave Treatment

- Radiations produced by the microwave are involved to break apart molecular chemical bonds & thus disinfect infectious waste.
- Temp-97°-100°C
- Cycle time-40-45 min.
- Advantage of disinfecting the waste
- No hazardous emissions.
- Can not be used to treat body parts & tissues.
ADVANTAGES:

- Absence of harmful air emissions - environment friendly.
- Absence of liquid discharges.
- Non-requirement of chemicals.
- Reduced volume of waste (due to shredding & moisture loss)
- Operator safety-worker friendly
- However, the investment costs are high at present.
Chemicals are added to waste to kill or inactivate the pathogens it contains, this treatment usually results in disinfection rather than sterilization. Chemical disinfection is most suitable for treating liquid waste such as blood, urine, stools or hospital sewage. However, solid wastes including microbiological cultures, sharps etc. may also be disinfected chemically with certain limitations.
CHEMICAL PROCESSES

- Most chemical waste treatment systems use a disinfectant solution in combination with shredding to provide decontamination & disfigurement.

- 1% hypochlorite solution with a minimum contact period of 30 min.

- Pre-shredding of the waste is desirable for better contact with the waste material.
PIT FOR DEEP BURRIAL

- Depth 2 meter
- Waste fill 1 meter from bottom
- Cover of lime - 50 cm
- Galvanized iron/ wire mesh at the top
- Secure the area
Deep Burial Pit
ROLE OF NURSE IN BIOMEDICAL WASTE MANAGEMENT

- Regular visit to all wards and high risk units.
- Ensuring that samples (blood, stool, urine etc) are collected and dispose safely.
- Monitoring and supervising the staff weather they are doing safe disposal of wastes colour coded.
- Prevention of hospital acquired infections by following universal precautions.
Continue......

- Code coding of bags should be done as per regulation.
- Needles, syringes and other sharp instruments and objects should be placed in a puncture-resistant plastic/metal container at the workstation.
- Alternatively, sharp waste may be transported to a central site for treatment and container may be reused, but after cleaning and disinfecting.
- 50% of needle stick injuries are as a result of reheating. Therefore, do not recap the waste.
- Chemical disinfectant prior to disposal is required for sharp, disposal infectious plastic/rubber, and infectious glassware and blood fluids by 1% hypochlorite or equivalent disinfectant. Always ensure that the right concentration of the disinfectant is used.
Immunization/ Hepatitis B /tetanus/typhoid

PPE: PERSONAL PROTECTIVE EQUIPMENT

- Head Cap
- Face Mask
- Apron
- Safety Shoes
ROLE OF NURSE IN BIOMEDICAL WASTE MANAGEMENT

- Avoid needle stick injuries.
- Collect waste when the bin is 3/4\textsuperscript{th} full.
- Avoid using common lift to move waste.
- Avoid spillage.
- Clean spills with disinfectant.
STAFF TRAINING

✓ Training should include an explanation of the infectious waste management plan and assignment of roles and responsibilities for implementation of the plan.

✓ Training programs should be implemented:
  ▪ When the infectious waste management plan are first developed and instituted.
  ▪ When new employees are hired, and
  ▪ When infectious waste management practices change.

✓ Continuous education is also an important part of staff training.
CONCLUSION

➢ It is just not the law abide compliance but the Social RESPONSIBILITY of every Health Care Establishment to say…

NO TO HAZARD OF BIOMEDICAL WASTE

➢ It will only take..
  Proper planning.
  Spread Awareness.
  Involvement everyone.
  Segregation, Pre-treatment at first stage.
  Appropriate Storage
  Timely Disposal.
  All Records…
  And.................................. ALL CLEAN.
RESPONSIBILITY

Infection control is everyone's business.

You are not only protecting yourself, but also those around you.