Biomedical Waste Management
Let the wastes of “the sick” not contaminate the lives of “the healthy”.

-Dr. K. Park
Definition

According to Bio-Medical Waste (Management & Handling) Rules, 2016 of India, Bio-medical waste means-

“means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps, including the categories mentioned in Schedule I appended to these rules.”
Bio-medical Waste

HOSPITAL WASTE

INFECTIVE
- SOLID
- LIQUID

NON-INFECTION
- SOLID
- LIQUID
Healthcare waste characterization

WHO

- Healthcare Waste
  - 85% Non-infectious
  - 10% Infectious
  - 5% Hazardous
**SCHEDULE I, Part-1**

Biomedical wastes categories and their segregation, collection, treatment, processing and disposal options

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<td>Puncture proof, Leak proof, tamper proof containers</td>
<td>Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.</td>
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Classification of Bio-Medical Waste

- Infectious Waste
- Pathological Waste
- Sharps
- Pharmaceutical Waste
- Genotoxic Waste
- Chemical Waste
- Wastes with High Content of Heavy Metals
- Pressurized Containers
- Radioactive Waste
Classification of bio-medical Waste

Infectious waste:
Waste suspected to contain pathogens e.g. laboratory cultures, waste from Isolation wards, tissue(swabs), materials or equipments that have been in contact with infected patients, excreta.

Pathological waste:
Human tissues or fluids e.g. body parts, blood and other body fluids, foetuses.
Classification of bio-medical Waste

Sharps:
Sharp waste e.g. needles, infusion sets, scalpels, knives, blades, broken glass

Pharmaceutical wastes:
Waste containing pharmaceuticals e.g. pharmaceuticals that are expired or no longer needed, items contaminated by or containing pharmaceuticals (bottles, boxes)
Classification of bio-medical Waste

Geno toxic waste: waste containing substances with genotoxic properties e.g. waste containing cytotoxic drugs (often used in cancer therapy), genotoxic chemicals.

Chemical waste: Waste containing chemical substances e.g. laboratory reagents, film developer, disinfectants that are expired are no longer needed, solvents.

Wastes with high contents of heavy metals: Batteries, broken thermometers, blood pressure gauges etc.
Classification of bio-medical Waste

Pressurized containers:
Gas cylinders, gas cartridges, aerosol cans.

Radioactive waste:
Waste containing radioactive substances e.g. unused liquids from radiotherapy or laboratory research, contaminated glassware, packages, or absorbent paper, urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources.
Sources of Biomedical or Health care waste

- Government Hospital
- Private Hospital
- Nursing Homes
- Physician’s Office/clinics
- Dentist Office/clinics
- Dispensaries
- Primary health centres, 
- Medical research & training establishments
- Mortuaries
- Blood Bank and collection centres
- Animal Houses, Slaughter houses
- Laboratories
- Research Organizations
- Vaccinating centres
- Bio- technology institutions/ Production units
Need for BMW Management

• Nosocomial infections in patients from poor infection control practices and poor waste management.
• 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.
• Risk of infection outside hospital for waste handlers and scavengers, other peoples.
Need of BMW Management in Hospitals???

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

IMPROPER DISPOSAL

COLLECTED BY ULB

SMALL SCRAP DEALERS (KAWARIWALLAH)

CONSUMER

RECYCLE FACTORY UNITS

WHOLESALE DEALER OR LARGE SCRAP DEALER

RAG PICKERS

LANDFILLS OR DUMPING GROUNDS

WHOLESALE DEALER OR LARGE SCRAP DEALER

LANDFILLS OR DUMPING GROUNDS
Routes of transmission

- Intact or non-intact skin, mucous membranes
- Inhalation of dust particles containing germs
- By ingestion (contaminated unwashed hands, contaminated food stuffs, water etc)
Categories of persons exposed to risk of infection

- Patients + Visitors
- Medical & Paramedical staff
- Sanitation workers
### Problem associated with BMW

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<th>DISEASES CAUSED</th>
<th>RELATED WASTE ITEM</th>
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<td><strong>BACTERIA</strong></td>
<td>Typhoid, Cholera, Tetanus Wound infections, septicemia, rheumatic fever, endocarditis, skin and soft tissue infections</td>
<td>Human excreta and body fluid in landfills and hospital wards, Sharps such as needles, surgical blades in hospital waste.</td>
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<td>Salmonella typhi, Vibrio cholerae, Clostridium Tetani, Pseudomonas, Streptococcus</td>
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<td><strong>PARASITES</strong></td>
<td>Cutaneous leishmaniasis, Kala Azar, Malaria</td>
<td>Human excreta, blood and body fluids in poorly managed sewage system of hospitals.</td>
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<td>Wucheraria Bancrofti, Plasmodium</td>
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Begin a system
Make it effective
Work for its success
BMW Management

OBJECTIVES

• To minimize the production/generation of infective waste.
• Recycle the waste after treating to the extent possible.
• Treat the waste by safe and environment friendly/acceptable methods.
• Adequate care in handling to prevent healthcare-associated infections.
• Safety precautions during handling the BMW.
STEPS IN THE MANAGEMENT OF BIOMEDICAL WASTE

Survey of waste generated.

Segregation of hospital waste.

Collection & Categorization of waste.

Storage of waste. (Not beyond 48 hrs.)

Transportation of waste.

Treatment & Disposal of waste.
WASTE DISPOSAL

- Swab stick: decontaminated
- Dressing
- Bandages
- SWABS: soiled linen, contaminated gowns, drapes
- Pathology waste
- Human anatomical waste: placenta

YELLOW BIN
WASTE DISPOSAL

- All infectious, non-sharp plastic waste
- Plastic culture plates & tubes
- Drains
- Urine bag
- I/V sets
- RED BIN
DISPOSAL OF SHARPS

1. Destroy needle

2. Cut syringe tip

3. Decontaminate in twin bucket having 1% bleach

4. SHARPS including catheter guide wires
Inspection & Re-segregation
Label for Bio-medical waste containers/bags

Note: Label shall be non-washable and prominently visible.
Treatment and disposal of BMW

As per biomedical waste management rules, 2016:
Bio-medical waste shall be treated and disposed of in accordance with Schedule I, and in compliance with the standards provided in Schedule-II by the health care facilities and common bio-medical waste treatment facility.
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<td><em>(c)</em> Soiled Waste: Items contaminated with blood,</td>
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<td>body fluids like dressings, plaster casts, cotton</td>
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<td>swabs and bags containing residual or discarded</td>
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<td>or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy</td>
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<td>blood and blood components.</td>
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<td><em>(d)</em> Expired or Discarded Medicines: Pharmaceutical</td>
<td>Yellow coloured non-chlorinated</td>
<td>Expired `cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the</td>
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<td>waste like antibiotics, cytotoxic drugs including</td>
<td>plastic bags or containers</td>
<td>manufacturer or supplier for incineration at temperature &gt;1200 0C or to common bio-medical</td>
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<td>all items contaminated with cytotoxic drugs along</td>
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<td>with glass or plastic ampoules, vials etc.</td>
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<td>incineration at &gt;12000C Or Encapsulation or Plasma Pyrolysis at &gt;12000C. All other discarded</td>
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<td>Non-chlorinated yellow plastic bags or suitable packing material</td>
<td>Non-chlorinated chemical disinfection followed by incineration or Plazma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or Plazma Pyrolysis.</td>
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<td><strong>(h) Microbiology, Biotechnology and other clinical laboratory waste:</strong> Blood bags, Laboratory cultures, stocks or specimens of microorganisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.</td>
<td>Autoclave safe plastic bags or containers</td>
<td>Pre-treat to sterilize with nonchlorinated chemicals on-site as per National AIDS Control Organisation or World Health Organisation guidelines thereafter for Incineration.</td>
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Treatment & disposal technologies for Bio-medical waste

- Incineration
- Chemical disinfection
- Wet and dry thermal treatment
- Microwave irradiation
- Land disposal
- Inertization
Incineration:

• High temperature dry oxidation process that reduce organic and combustible waste into inorganic incombustible matter. Resulting in significant reduction in waste volume and weight.

• Process is selected to treat waste that cannot be recycled, reused or can be disposed in land.

Types if Incinerators:

• Double chamber pyrolytic (for infectious waste)
• Single chamber furnaces with static grade (if double chamber not affordable)
• Rotatory Kilns (for genotoxic substances & heat resistant chemicals)
Incineration
Bio-medical wastes destruction by double chambered incinerator
Incinerator ash disposal
Chemical disinfection:
- Commonly Used for treatment of liquid infectious waste e.g. blood, urine, stool and hospital sewage
- Chemicals are added to waste to kill or inactivate the pathogen it contains.
Bio-medical plastic wastes disinfection by Sodium hypochlorite
Wet and Dry thermal treatment:

- Wet thermal treatment/steam disinfection is based on exposure of shredded infectious waste to high temperature, high pressure steam and is similar to process of autoclaving. This is inappropriate for treating anatomical waste, chemical and pharmaceutical waste.

- Screw feed technology: Dry thermal treatment in which waste is shredded and heated in rotating auger. 80% volume and 20-35 weight is reduced, suitable for infectious waste and sharps.
Thermal processes
Microwave irradiation:
- Microwave of frequency 2450MHZ and wave length 12.24cm used to destroy the microorganism. Water contained in the waste is rapidly heated by microwave and infectious components are destroyed by heat conduction.
Land disposal:
A. Open Dumps:
   Risk for public health.
   Health care waste should not be deposited on or around open dumps.
B. Sanitary landfills:
   designed and constructed to prevent contamination of soil, surface, ground water and direct contact with public.
Land disposal facility for cities & towns with population less than 5 lacs
Inertization:

- Process of mixing waste with cement and other substances before disposal in order to minimize the risk of toxic substance migrating into surface water or ground water and to prevent scavenging.

- Proportion of 65% waste, 15% lime, 15% cement, and 5% water is used.
Sharp storage & disposal
BIO-MEDICAL WASTE MANAGEMENT IN INDIA, Rules


• This rule applied to those who generate, collect, receive, store, dispose, treat or handle bio-medical waste, types of waste and treatment and disposal options under Rule 1998.

• Thus bio-medical waste should be segregated into containers/bags at the point of generation of waste.
Amendments in the rule 1998

- 1st Amendment Rules vide S.O.201(E) Dated 06/03/2000
- 2nd Amendment Rules vide S.O.1069(E) Dated 17/09/2003

THE AUTHORIZATION IS REQUIRED FOR

- Generation/Collection/Reception/Storage
- Transportation
- Treatment/Disposal
- or any other form of handling.
New BIO-Medical Waste Management Rules


• Published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (i)] New Delhi, the 28th March, 2016

• They shall come into force on the date of their publication in the official Gazette.
Application:
These rules are applicable to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, ayush hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs.
These new Rules are more

• Ccomprehensive in nature
• These contain important features of BMW (M & H) Rules, 1998
• Several new provisions have been added in the new Rules.
• Contain:
  Rules-18
  Schedule-01 to 04
  Form-01 to 05

<table>
<thead>
<tr>
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<th>1998</th>
<th>2016</th>
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<tbody>
<tr>
<td>1</td>
<td>Occupiers with more than 1000 beds required to obtain authorisation</td>
<td>Every occupier generating BMW, Including health camp or ayush requires to obtain authorisation</td>
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<tr>
<td>2</td>
<td>Operator duties absent</td>
<td>Duties of the operator listed</td>
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<tr>
<td>3</td>
<td>Biomedical waste divided in ten categories</td>
<td>Biomedical waste divided in 4 categories</td>
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<tr>
<td>4</td>
<td>Rules restricted to HCEs with more than 1000 beds</td>
<td>Treatment and disposal of BMW made mandatory for all the HCEs</td>
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<td>5</td>
<td>No format for annual report</td>
<td>A format for annual report appended with the rules</td>
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<tr>
<td>6</td>
<td>Shudule I, II, III, IV, V</td>
<td>Change of Shudule I, II, III, IV</td>
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CONCLUSION

Let's make this world a better place to live in.

Plz Manage waste properly.
Thank You!