

HEALTH CARE BIOMEDICAL WASTE MANAGEMENT

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ABSTRACT

Healthcare waste (HCW), hazardous and non-hazardous is a reservoir of potentially harmful micro-organisms which can infect hospital patients, health-care workers and the general public. The waste produced in the course of health-care activities carries a higher potential for infection and injury than any other type of waste. Wherever it is generated, safe and reliable methods for its handling are therefore essential. Sound management of health-care waste is thus a crucial component of environmental health protection. Safe and effective management of waste is not only a legal necessity but also a social responsibility. This review article encompasses the proper waste management techniques according as per Bio Medical Waste (Management & Handling) Rules, 1998 (Rule 6- schedule II).

HEALTH CARE BIOMEDICAL WASTE MANAGEMENT

Over the period of time there has been tremendous growth and upgradation of waste disposal methods. However, with the recent development the health and safety of the humans and environment has been threatened. Improper management of the waste disposal methods have posed a huge risk to the health care workers as well as the to the people who are concerned with waste disposal.¹ Biomedical waste is considered as the total waste generated from healthcare facility centres constitute 75- 90 percent of domestic waste and 25-30 percent is considered as precarious or harmful waste that requires special treatment. This part is also known as healthcare general waste (HCGW)/non-hazardous waste ². The threat associated with the health care workers who deal with management of waste disposal methods is termed as healthcare risk waste (HCRW) which can jeopardize the human and environment.³The contagious and virulent by products produced through the remedial activities carried out in the health sector, may cause catastrophic effect on any individual. Negligent handling of bio medical waste products may have serious implications and a dangerous effect on the surroundings. Proper care of health-care waste is thus a definitive aspect of wellbeing of community and nation.⁴

Classification of Bio Medical Waste Management

By products generated in the health care facility is sorted into two groups – 1. Harmful waste and 2. Domestic waste. Non-Hazardous waste does not cause any infection, disease neither does it inflict and harm to human beings. Harmful waste is further classified into (i) Infectious waste (ii) Noninfectious waste.

1. Infectious Waste

All wastes that cause diseases through the pathogens in sufficient number or concentration are called infectious waste. ⁵

2. Human Waste

Human waste include human organs or blood related wastes.

3. Hazardous Pharmaceutical Waste and Chemical Waste

Chemical and pharmaceutical waste include pharmaceutical products, chemicals, vaccines that are expired, spilled, unused, or contaminated or even the bottles, vials, or syringes that are harmful to humans.

Rejected chemicals that are generated which might give rise to toxic fumes, erodible in nature or even flammable are stated as chemical wastes.⁵

5. Pressurized Containers

Metal or aerosol containers that consist of pressurized liquids, gas or powdered materials⁴.

6. Sharps

Sharps are the objects that have cutting or infiltrating capacity into human skin causing wound. They include needles, hypodermic spikes, scalpel, knives, or that can cause inflict injuries^{1,4}

7. Highly Infectious Waste

Pathological waste from medical facilities is considered as infectious wastes.

8. Genotoxic or Cytotoxic Waste

The medications that are used to treat precancerous lesions or conditions are considered as cytotoxic wastes^{4,5}. They are highly mutagenic and cytotoxic in nature.

9. Radioactive Waste

Radioactive materials like cobalt, technetium, iodine etc. are the most common source for causing radioactive emissions are regarded as radioactive waste.

10. Heavy Metals Wastes

The elements used in the medical equipment are lethal. Mercury and cadmium are included in category of chemical waste and requires special handling protocols^{3,6}.

Management of Infectious, Pathological and Chemical Wastes

The management of biohazardous waste is to identify these wastes which have the potential for causing infections during manipulating, storing, and disposing^{2,7}, for which special precautions are necessary. Two most commonly recommended treatment methods are autoclaving (steam sterilization), chemical disinfection and incineration³.

Steam Sterilization

In the above said sterilization technique, a pressure of 105 kPa is maintained for an hour. This technique of autoclaving is adapted to treat human and animal waste which includes human blood, organs and body fluids. The decontamination process is solely dependent on the training of personnel, the steam pressure and requires follow up of adequate time protocol of 60 minutes.⁸⁻¹¹

Chemical Decontamination

Chemical wastes are useful for decontamination of human blood, microbial blood waste and body fluid waste. The four most common chemicals that are implemented in the decontamination of clinical and biological wastes are a) Alcohol b) Chlorine c) Quaternary ammonium compounds d) Chlorine and e) Iodine¹²

INCINERATION

Incineration or burning is the most widely conducted procedure to dispose of solid, liquid and gaseous waste. It is the most simplified and as easiest method for disposal of hazardous waste materials. However, it is considered as ambiguous and controversial method of waste disposal, causing emission of toxic pollutants¹³.

Management of Pharmaceutical and Chemical Waste

Appropriate Donations

The drugs or the pharmaceutical products should be delivered to the recipients on time without time decay and should mention the needs of the desired recipient. The date of expiration on arrival should be within a year, and clear competence should be procured that they have the ability to disperse the expired drugs efficiently.

Approval

Permissions and approval of the concerned authorities should be taken for the sanctioning of the hazardous drugs for disposal^{14, 15}.

Planning

Detailed planning of the procurement, storage, ledger maintenance, human resources, finance, time, facility of storage and proper equipment needed for disposal of wastes should be planned before disposition of the waste that is made.

Health and Safety of Work Teams

Proper safety protocols should be followed for the safety of the personnel with proper training and drills to ensure the health of the workers.

Sorting

Sorting of the wastes should be maintained before disposing the waste products into hazardous waste and nonhazardous waste products.

Disposal Methods

Return to Donor or Manufacturer

Pharmaceutical drugs, cytotoxic drugs, or the products that are unused or passed the expiry date should be returned to the manufacturer for the proper disposal or treatment so they do not contaminate the environment or pose threat to human kind¹⁶.

Transfer of Pharmaceutical Waste

Protocols and permissions for cross over the state borders might take several months to complete¹⁷. So, the process should be speed up to prevent the leak or decay of harmful chemicals or drugs which might be released into the environment in the eventuality of spills or leaks.

Landfill

One of the primitive methods used since the ancient times which involves burial of waste into the ground away from civilization and the land is used as the dumping ground¹⁸.

Open Unscientific Method of Dumping

Unscientific dumping ground technique is the routine method implied in the third world or developing countries which might be not be considered safe due to the high risk of toxicity it might produce in the soil and the adjacent land or water reservoirs if the waste is not treated before dumping.

Engineered Landfill

Pharmaceutical waste is treated and disposed into the landfills. Direct disposal of the pharmaceutical waste may be considered only after it meets with specific treatment to reduce or remove the toxicity of the pharmaceutical waste rendering it non-hazardous.

Highly Engineered Sanitary Landfill

Such landfills are constructed with proper care so that the toxic municipal or chemical or pharmaceutical wastes do not mix with the nearby water reservoirs and is above the water tables.^{10, 18}

Management of Pressurized and Unpressurized Containers

Polyvinyl chloride (PVC) plastic container should either be recycled if the need be. However, if the (PVC) containers contain harmful pharmaceuticals, and burnt, they might give rise to lethal harmful fumes that might be bio hazardous in nature. The containers manufactured of paper and cardboard by be incinerated if the recycling procedure is not done. The aerosol cans which are empty are considered as scrap metal recycling constituents and may be disposed as trash.

Chemical Decomposition

Landfill decomposition of the harmful chemicals should be done based on the protocols laid down by the manufacturers. If the chemicals do not possess the risk of getting converted into an air pollutant, the chemicals should be incinerated in appropriate incinerators.¹⁹

Management of Sharp Waste

Sharps are considered as any items that have the ability to puncture human skin or inflict injury to the human body. It constitutes one percent of total waste from hospital industry in the globe.³ Any instrument causing rupture through the skin is called sharp. According to waste management policies of India, any substance that has the cutting edge like blades, scalpels needles, broken glass with infectious agents should be collected in blue or white colored bags and should be sent for proper incineration.⁸

Handling and Management of Sharp Wastes with the Use of Needle Cutters.

Manual needle cutters are the safest to use rather than electrically operated needle cutters for separating the needles from the syringes that contain infectious products. Wait for some time by holding detached syringe in the needle cutter so that drops of any body fluids/vaccines etc. inside the syringe barrel wipe out into the sharp's container attached below the needle cutter. The syringes are then disposed or collected in red container with bio hazard and categorized into infectious plastic waste. After transportation of the sharps, they are finally incinerated and the waste disposal of sharps are conclusively taken care of.¹⁹

Management of Radioactive Waste

- Dilution and Dispersion
- Time decay

Diluted radioactive solid waste which is less than 1.35 microcuries (50 KBq) is be discarded as hospital refuse. Similarly, runny ionizing chemicals with activity less than minimum radiation level can be drained into the hygienic sewerage with systematic disposal method.

Time Decay

Radioactive material should be allowed to decay with minimum 10 half-life with minimum of 0.1 percent of residue. The discard is then watched upon for remnants and if it is low, it is appropriately disposed.

CONCLUSION

Biomedical waste disposal methods form an integral and important aspect of the environmental preservation campaign. Bio medical waste disposable methods contribute to the environmentally friendly society and ensures the safety of the human race. Categorization and safe disposal methods ensure the wellbeing of the society but also contributes to the upliftment of the global health care which ensures safety and progress of the nations. Its implementation in the health care facilities should not be a distant call if the bio medical waste management guidelines are followed with strict protocols and guidelines¹⁶.

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