

Review of Biomedical Waste Handling Rules and Disposal Methods

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ABSTRACT

Bio-medical waste (BMW) management is highly important precaution for human health and environmental concern. There are several disposal treatment followed by medical practitioners in medical waste management. Here, a few disposal treatment is considered to be an alternatives. When assessing, it is necessary to evaluate and assume that all disposal treatment methods are safe and hygienic. In this way, every alternative assessment is evaluated based on the social acceptance, technology and operation, environmental protection, cost, noise and health risk. The modern mankind lives in an environment which is greatly polluted mostly because of their own torturous activities on the environment and the pollution created by the mankind is again a threat to themselves. The industrialization has already enlightened the rate of pollution and therefore waste management emerges as a concern of the hour. This article deals with the basic issues of biomedical waste disposal and management of biomedical waste. The purpose of this paper is to spread knowledge among the human resources concerned in health care services to prevent transmission of the diseases in the society and to protect physical condition of public and the surroundings. Knowledge regarding the significance of biomedical waste, its relationship with the ecosystem, the environmental toxins used in health care industry and the impact of callousness on public health, remain very minimal. For better result we need to increase the level of training and education regarding biomedical waste and environment-friendly health care with optimum priority, under rules and legislation.

Keywords: *Biomedical Waste (BMW); Hazardous; Diseases; Condition; Environmental Physical Condition*

INTRODUCTION

Biomedical waste is “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”. Common producers of biomedical waste contain hospitals, nursing homes, clinics, laboratories, offices of physicians, dental, and veterinarians, house health care, and funeral homes. It must be properly managed to avoid the harm for the general public, specifically healthcare and sanitation workers who are continuously uncovered to biomedical waste as an occupational hazard. So that very little infection transmission from medical waste has been studied.

Correct method helps protect health care personnel, patients and the local society. Any type of waste generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining there to or in production or testing of biological and other activities by hospitals, pathological practices and health camps etc. Concerning healthcare facilities either solid or liquid containing harmful materials called biomedical wastes [1]. Only about 10%–25% of BMW is hazardous, and the remaining 75%– 95% is nonhazardous. The hazardous part of the waste presents physical, chemical, and/or microbiological risk to the general population and health-care workers associated with handling, treatment, and disposal of waste[2]. These wastes consists of mainly human tissues, infected blood, body parts, cadaver fluids, useless and residuals of medicines, drugs, unhygienic cotton, dressings, and sharps like glasses, needles, blades, scalpels, lancets [3]. Collection and disposal of biomedical waste has greatest risk to healthcare, cleanliness workers and the general community. The hazardous biomedical waste without proper sterilization leads to various infective diseases for example Hepatitis B & C, Acquired Immune Deficiency Syndrome (AIDS), Severe Acute Respiratory Syndrome (SARS), Tetanus, Psychosocial distress etc [4].

Scientific disposal of Biomedical Waste through segregation, collection and treatment in an environmentally sound manner minimises the adverse impact on health workers and on the environment. The hospitals are required to put in place the mechanisms for effective disposal either directly or through common biomedical waste treatment and disposal facilities. The hospitals servicing 1000 patients or more per month are required to obtain authorisation and segregate biomedical waste in to 10 categories, pack five colour backs for disposal.

BMW Management Rules, 2016

- The ambit of the rules has been expanded to include vaccination camps, blood donation camps, surgical camps or any other healthcare activity;
- Phase-out the use of chlorinated plastic bags, gloves and blood bags within two years;
- Pre-treatment of the laboratory waste, microbiological waste, blood samples and blood bags through disinfection orsterilisation on-site in the manner as prescribed by WHO or NACO;
- Provide training to all its health care workers and immunise all health workers regularly;
- Establish a Bar-Code System for bags or containers containing bio-medical waste for disposal; Report major accidents;
- Existing incinerators to achieve the standards for retention time in secondary chamber and Dioxin and Furans within two years;

- Bio-medical waste has been classified in to 4 categories instead 10 to improve the segregation of waste at source;
- Procedure to get authorisation simplified. Automatic authorisation for bedded hospitals. The validity of authorization synchronised with validity of consent orders for Bedded HCFs. One time Authorisation for Non-bedded HCFs;
- The new rules prescribe more stringent standards for incinerator to reduce the emission of pollutants in environment;
- Inclusion of emissions limits for Dioxin and furans;
- State Government to provide land for setting up common bio-medical waste treatment and disposal facility;
- No occupier shall establish on-site treatment and disposal facility, if a service of `common bio-medical waste treatment facility is available at a distance of seventy-five kilometer.
- Operator of a common bio-medical waste treatment and disposal facility to ensure the timely collection of bio-medical waste from the HCFs and assist the HCFs in conduct of training.

Requirement of Biomedical Waste Management

Improper management of waste generated in health care services causes a direct health hazards on the society, the health care workers and on the surroundings and environment. There is a requirement for the management and supervision of biomedical waste to minimize the risk of contamination outside the hospital for waste handlers, scavengers and those living in the vicinity of hospitals. Biomedical waste Management is also needed due to the risk of air, water, and soil pollution, or due to improper incineration emissions and ash. It plays an important role in disposal of the discarded drugs that can be repacked and sold off [5]. The government is committed to protect the environment and health of the population. Biomedical waste management is very essential to control and disposal of hazardous and solid wastes. These are regulated under the Environment (protection) Act, 1986. Rules for management, regulation, handling and disposal of hazardous wastes and solid waste have been framed by the central government as per the provisions of the Environment (protection) Act, 1986.

The Central Government exercising the powers as conferred in the sections 6, 8 and 25 of the Environmental (Protection) Act, 1986 has enacted the Bio-Medical waste (Management and Handling) Rules 1998. They laid out 14 different rules and 6 schedules which were made effective from July 27, 1998 and saw additional amendment in 2016. These Rules mostly focal point to apply a licensing system followed by a reporting mechanism on bio-medical waste generated by hospitals and other health care organization. All persons and organizations that generate, collect, receive, store, transport, treat, dispose or handle and take all steps to ensure that such waste is properly channeled bio-medical waste in any form come under of these rules.

Various methods to be adopted for disposal of bio-medical wastes are: -

- a) Incineration
- b) Deep burial
- c) local autoclaves
- d) Micro-waving

- e) Mutilation
- f) Disposal in landfills
- g) Disinfection
- h) Chemical treatment

The methods of disposal of wastes mainly depend on the nature of the category. Segregation, storage and safe disposal of the waste is the key to the effective management of biomedical waste in a workplace [6,7].

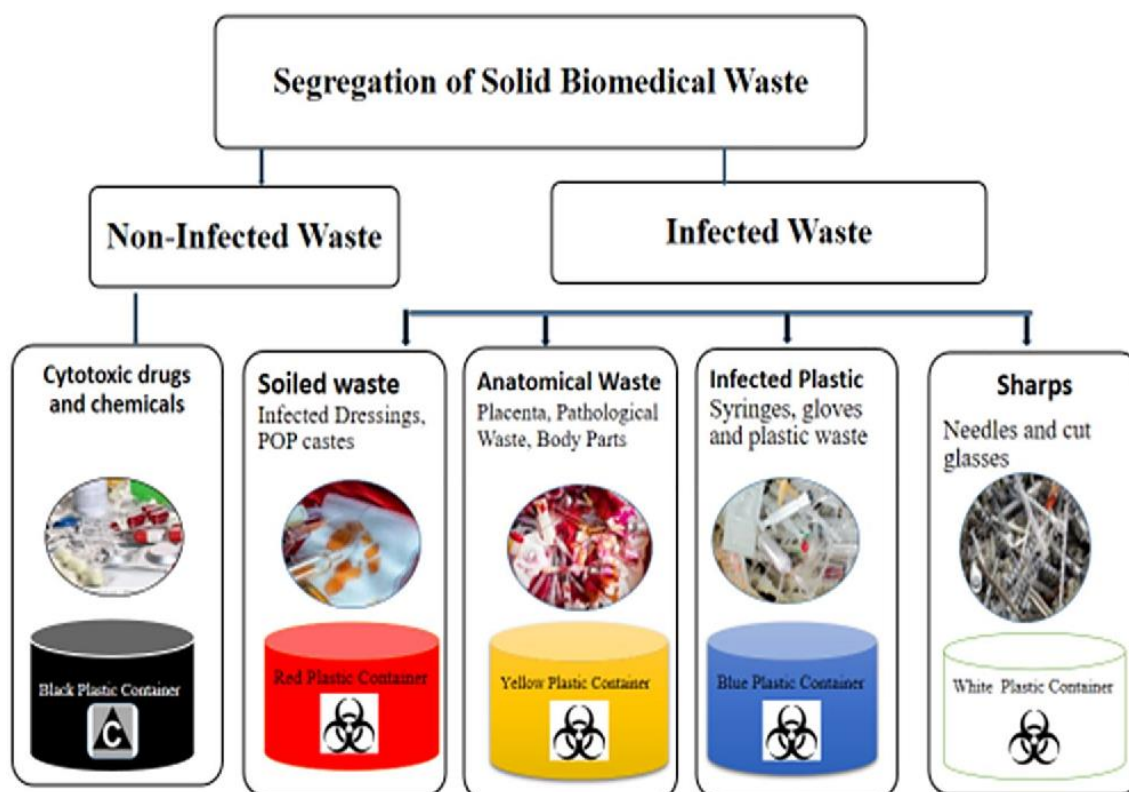


Figure 1. Segregation Biomedical Waste

Steps and Methods of Biomedical Waste Management

Segregation: Segregation of waste is very important and plays a major role for improved biomedical waste management. It is important to reduce the volume of infectious waste otherwise the quantum of waste will go beyond the control of management [8]. As per Rule 6, different colored plastic bags have to be used for collection of bio medical wastes and labeled. Such wastes shall be transported only on authorized vehicles. Rule 6 further requires that no untreated bio-medical waste shall be kept beyond 48 hours without the permission of the competent authority.

a. **Red Bag:** Recyclable contaminated waste such as bottles, intravenous tubes, catheters, urine bags, syringes and gloves.

b. **Yellow Bag:** Human and animal anatomical waste, soiled waste including items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs, expired or discarded medicines, chemical waste (liquid), discarded linen, mattresses, beddings contaminated with blood or body fluid, microbiology, biotechnology and other clinical laboratory waste.

- c. **Black Bag:** Incineration ash and chemical waste (solid).
- d. **White bag:** Waste sharps including needles, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts.
- e. **Blue Bag:** Metallic body implants and glassware such as medicine vials, ampoules.

As per the Rule the institution/ hospital generating such wastes shall be duty bound to maintain a proper record regarding the generation collection, reception, storage, transportation, treatment and disposal of bio-medical waste.

Transportation of Biomedical Waste:

Following guidelines shall be applicable for transportation of bottles/containers containing BMW packaged for utilisation purpose as per the procedure given under section 5;

- Industry/vendor may make own arrangement for transportation of BMW or may engage professional transportation agency.
- A spill kit containing absorbent material, a disinfectant, a leak proof waste disposal container and heavy duty reusable glove should be kept in the transport vehicle.
- All the vehicles used for collection of bio-medical waste from the health care facilities should have symbol of BMW.
- The industry/vendor utilizing biomedical waste shall be responsible for transportation and the risks and liabilities associated with transportation.
- Only covered vehicles should be used for transportation of bio-medical waste

Storage & Accumulation of Biomedical Waste: Waste accumulation and storage is basically done in the areas and steps between the point of waste generation and location of waste treatment and disposal. Though accumulation refers to the temporary holding of small quantities of waste near the point of generation, storage of waste is categorized by longer holding periods and large waste volume. Storage areas are generally located near where the waste is treated. Any offsite holding of waste is also considered storage. Different types of containers are used for collection of waste[9].

- The containers or bins should be positioned in such a way that 100 % gathering is achieved.
- Sharps must be kept in puncture-proof containers to keep away injuries and infection to the employees handling them.
- Once collection has done, then biomedical waste is stored in a appropriate place.
- Segregated wastes of dissimilar categories need to be collected in individual containers or bins.
- The period of storage should not more than 8-10 hrs in big hospital and 24 hrs in nursing homes.
- Each container or bin should be clearly labelled to show the ward or room where it is kept. The reason for this labelling is that it may be required to trace the waste back to its source.
- Besides this, storage site should be noticeable with a caution sign.

Treatment: Biomedical waste treatment refers to the processes to eradicate the toxic effects of the waste. There are several treatment options which maximize safety during handling and disposal of the waste. It also minimizes environmental hazards.

Most common methods used for treatment and decontamination of biomedical waste are.

- a) Incineration
- b) Autoclaving
- c) Irradiation
- d) Chemical treatments
- e) Disposal of Biomedical Waste

Incineration: It is a treatment process used to convert pathological and pharmaceutical waste into ash, flue gases and heat. Operating temperature for incineration should be in the range of 800-1400°C. It decreases the mass of waste by 90-95% and thus reduces adverse effects on the environment [10].

Autoclaving: It is a process of steam sterilization and is the most common alternative to incineration. Autoclaving requires a temperature of 121°C and pressure of about 15 pounds per square inch (psi) for 20-30 minutes. This treatment is applied to inactivate the transmittable agents and to sanitize the equipment used in medical services. It is less costly and carries no documented health impacts [11].

Irradiation: These systems are currently being used in waste treatment operations which include gamma, electron-beam, ultraviolet and X-rays. Irradiation sterilizes waste in an enclosed chamber by exposing it to a radioactive cobalt-60 which gives out gamma rays that are mortal to micro-organisms. It is very costly as compared to other methods and safety measures must be taken to protect workers from harmful effects of radiations such as cancer, radiation sickness or even death [12].

Chemical Treatment: This action is often used to disinfect liquid waste, so that it can be disposed of locally. It makes use of several techniques such as oxidation, reduction, precipitation and pH neutralization to convert waste into less hazardous substances. Chlorine, Sodium hydroxide or Calcium oxide can be used according to the nature of waste [13].

Disposal of Biomedical Waste: Land disposal is typically used for remediation of waste which is decontaminated by above applicable treatment methods. This method is generally used in developing countries which involves the dumping of waste into a landfill. Land-filling should be done at locations where groundwater level is low and which are far from flooding sources. Radioactive wastes are generally dumped in the oceans far away from human habitations. Every state and local administration has its personal rules and regulations for disposal of germ-free waste [14-17].

Advisory Committee

The Government of every State/Union Territory shall constitute an advisory committee with the 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 organizations [18-20].

Importance of BMW Management

Planning the waste management and recycling for all of the waste generated in the health care facilities is a crucial task which plays an exceptionally important role in the worldwide cleanliness, public health, conservation of resources and sustainability of the ecosystem. Recycling medical waste minimizes utilization of raw material and reduces the amount of the waste materials that must be disposed in a landfill. It reduces the hazards and risks to the community which can be acquired by hospital [21-24]. Reduction in the occurrence of HIV/AIDS, sepsis, hepatitis, and other diseases transmitted by infectious medical equipments takes place by proper waste management [25]. Prohibited trading of used syringes, injection needles and medical tools can also be prevented by proper management strategies. Awareness about hazards of biomedical waste and its proper disposal is required for a safe and healthy future [26].

CONCLUSION

Biomedical waste management is as important as treatment plan for medical professionals. Awareness programmes should be conducted for all health care personnel and auxiliary personnel of various health care institutes to keep side by side with the current knowledge of scientific biomedical waste management system and its importance and benefits to the patients, staff and the community as an entire. On-going education and training, continuing medical education and update should be held at regular intervals. The current BMW 2016 rules are an improvement over earlier rules in terms of improved segregation, transportation, and disposal methods, to decrease environmental pollution and ensure the safety of the staff, patients, and public. People must be sensitized to the issues related to biomedical waste and should participate in the programs planned for waste minimization. The medical employees must be trained to create awareness and foster responsibilities for prevention of exposure and unsafe disposal to the waste. Medical personnel should strictly follow all the rules and regulations implemented by concerned governing bodies. Furthermore, more use of non-PVC medical devices and development of newer novel and eco-friendly systems for disposal of BMW should be encouraged. All participants in BMW Management should oath to guarantee a cleaner and greener environment.

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