

Review Article

Biomedical Waste and its Management Protocol – A Comprehensive Review

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ABSTRACT:

The development of waste management policies, plans, and protocols are strongly recommended, in addition to establishing training programs on proper waste management for all healthcare workers. Fewer waste treatment facilities such as plasma pyrolysis, encapsulation, inertisation have been introduced, and we have to do away with older facilities such as incineration as toxic fumes (dioxins and furans) are produced which are harmful to both health and environment. Health care professionals should be aware regarding safe disposal of biomedical waste to minimize biohazards to the environment.

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INTRODUCTION

The topic of biomedical waste management and handling has been presuming cumulative implication for the past couple of years. The duty of medical administrators as regards proper handling and disposal of this category of waste has now become a constitutional requirement with the promulgation of Government of India gazette notification no. 460 dated 27 Jul 1998. It is important that all service medical, dental, nursing officers, other paramedical staff and waste handlers such as safaiwalas be well oriented to the basic requirements of handling and management of biomedical waste. It is with this objective of providing such basic information that the present article has been composed.⁴

DEFINITION

Any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals, or in research activities pertaining thereto, or in the production or testing of biological is defined as Bio-medical waste.⁴

When patient care activities are carried out in a healthcare setting, certain waste is produced which has the potential to cause harm to human beings and environment. Such waste includes soiled cotton, bandages, hypodermic needles, syringes, tubings such as intravenous sets, and urinary catheters etc. Such waste is commonly called as bio-medical waste (BMW)

in India, though it is also known by various other names such as clinical waste, medical waste and health-care waste in different parts of world. Such waste constitutes merely 15 to 25% of total waste generated in a hospital, the remaining being general waste such as waste paper, wrapper of drugs, cardboard and left-over food etc. The general waste is treated by local municipality in same way as house-hold waste, but special precautions and treatment modalities are required for BMW, so that it does not cause any harm to human beings and environment. Though as many as 40 pathogens have been documented to be transmitted by BMW, its well documented propensity to cause transmission of 3 pathogens namely Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) makes it essential that due care is exercised while handling and disposing it.⁵⁻⁷

The enacted legislations in various countries have made it mandatory for a healthcare facility to manage its waste properly. In India, the legislation governing BMW management is called as Bio-Medical Waste (Management and Handling) Rules, 1998 and has been promulgated under Environment (Protection) Act, 1986.⁸

Health care waste is a heterogeneous mixture, which is very difficult to manage as such. A major issue related to present biomedical waste management is that many hospitals dispose their waste in an improper, haphazard and indiscriminate manner which contributes to spread

of serious diseases like hepatitis, human immunodeficiency virus etc. Biomedical waste management has been brought into focus recently in India, particularly with the notification of biomedical waste rules, 1998 which was brought out by Union Ministry of Environment and Forests under the provision of Environment [protection] act, 1986. These rules apply to all those persons which are connected with generation, collection, receiving, storage, transportation and handling of biomedical waste in any form.⁷

BIOMEDICAL WASTE MANAGEMENT IN INDIA

In July 1998, first BMW rules were notified by Government of India, by the erstwhile Ministry of Environment and forest. In India, BMW problem was further compounded by the presence of scavengers who sort out open, unprotected health-care waste with no gloves, masks, or shoes for recycling, and second, reuse of syringe without appropriate sterilization.¹⁴ During 2002–2004, International Clinical Epidemiology Network explored the existing BMW practices, setup, and framework in primary, secondary, and tertiary health care facility (HCF) in India across 20 states. They found that around 82% of primary, 60% of secondary, and 54% of tertiary HCFs in India had no credible biomedical waste management (BMW) system. In 2009, around 240 people in Gujarat, India contracted hepatitis B following reuse of unsterilized syringes. This and many more studies shows that despite India being among the first country to initiate measures for safe disposal of BMW, there is an urgent need to take action for strengthening the existing system capacity, increase the funding and commitment toward safe disposal of BMW.⁹

BIOMEDICAL WASTE MANagements

The principles of biomedical waste management are as follows:-

a. General principles of hygiene and sanitation.

Observance of general principles of hygiene and sanitation such as cleanliness, good house keeping, adequate supply of safe water, sanitary facilities and proper ventilation are essential components of a good bio-medical waste management plan.





b. Waste minimization

It is essential that every waste generated from the hospital should be identified and quantified. Hospitals should endeavour to reduce waste by controlling inventory, wastage of consumable items and breakages etc. Waste can also be minimized by recycling certain waste such as glassware, plastic material etc after proper cleaning and disinfection.

c. Waste segregation

Segregation of waste at source and safe storage is the key to whole hospital waste management process.^{9, 10}

Table 1: Colour coding biomedical waste¹¹

| Category | Type of bag/container used | Type of waste | Treatment/disposal options |
|---|---|---|--|
| Yellow  | Non-chlorinated plastic bags | Human anatomical waste Animal anatomical waste Soiled waste Expired or discarded medicines Chemical waste Chemical liquid waste Discarded linen, mattresses, beddings contaminated with blood or body fluids microbiology, biotechnology and other clinical laboratory waste | Incineration/plasma pyrolysis/deep burial |
| Red  | Non-chlorinated plastic bags or containers | Contaminated waste (recyclable) tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes) and gloves | Autoclaving/microwaving/hydroclaving and then sent for recycling. Not to be sent to landfill |
| White  | Puncture, leak, tamper proof containers (Translucent) | Waste sharps including Metals, Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps. | Autoclaving or dry heat sterilisation followed by shredding or mutilation or encapsulation |
| Blue  | Cardboard boxes with blue coloured marking | Glassware: Broken or discarded and contaminated glass including medicine vials and ampoules except those containing cytotoxic wastes Metallic body implants | Disinfection or autoclaving/microwaving/hydroclaving and then sent for recycling |

Responsibilities of a hospital do not end up with medical treatment only. In broader perspectives, service towards sustenance of the “good” health of the society is a default duty of any healthcare setup. In this context, proper management of biomedical wastes is of utmost public health importance. Continuous surveillance of segregation practices by hospital infection control committee and encouraging prompt reporting and also ensuring appropriate medical care for the accidental exposures among nurses could further enhance the segregation efficiency by virtue of “Hawthorne effect” (i.e., improved performance of the participant on continuous or frequent observations by the investigator). A study conducted by Kumari et al. underpins the same and explains the steps of establishing a dedicated biomedical waste management committee in tertiary care hospitals.^{12, 13}

CONCLUSION

BMW should be a shared teamwork with committed government backing, good BMW practices followed by both health-care workers and HCFs, continuous monitoring of BMW practices, and strong legislature. Hence; a combined effort from all health care professional is required for betterment of the nature and working environment.

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