



Biomedical Waste Management in Pathology laboratory - A Review

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Abstract - With the advancement of medical field, the amount of biomedical waste produced every day is growing. Segregation, storage, processing, transportation, and disposal of biomedical waste are all common practices undertaken as part of health care waste management. If biomedical waste management is done correctly, many of the problems can be avoided. Medical waste management necessitates dedication from healthcare providers at all levels. The risk and value of their “contribution” are feared in a system run by reckless and untrained personnel. Also trained medical professionals need to be taught about the rules for disposing of biomedical waste. To achieve better results, we must raise the level of training and education in biomedical waste and environmentally sustainable health care as quickly as possible, while adhering to all applicable rules and regulations.

Keywords - Bio-Medical Waste (BMW), source of BMW

Introduction

Proper management of biomedical waste is a statutory requirement as per Biomedical waste (management and handling) rules 1998, under section 6,8 and 25 of the environment protection act, 1986, of the Government of India. These regulations apply to anyone who creates, collects, receives, stores, transports, treats, disposes of or handles biomedical waste in any way. Growing medical advances and new hospital facilities have increased the amount of waste generated by healthcare facilities. It poses a health risk to healthcare staff, the general public, and the local flora and fauna. There is a need for education about the dangers of inappropriate waste disposal. Apathy against the idea of waste management is a significant impediment to waste disposal. The government of India has stressed that it shall be the duty of the occupier of an institution generating biomedical waste to ensure that such waste is handled without any adverse effect to human health and environment.

1. Definition of Bio Medical Waste

As per Gazette Notification, ‘Bio Medical Waste’ means any waste, which is generated during the diagnosis, treatment or immunization of human being or animals or in research activities pertaining thereto.

2. Classification of Biomedical Wastes

Medical waste is divided into eight categories by the World Health Organization (WHO), including General waste, Pathological, Radioactive, Chemical, Infectious to potentially infectious waste, sharps, pharmaceuticals and pressurized containers.

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3. Biomedical waste categories and their segregation, collection, treatment , processing and disposal options

Category	Types of Waste	Type of Bag or container to be used	Treatment and Disposal options
1	2	3	4
Yellow	(a) Human Anatomical Waste: Human tissues, organs, body parts and fetus below the viability period (as per the MTP Act 1971, amended from time to time)	Yellow coloured non chlorinated plastic bags	Incineration or Plasma Pyrolysis or deep burial
	(b) Solid Waste: Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and its components		Incineration or plasma pyrolysis or deep burial
	(c) Expired or Discarded Medicines: Pharmaceutical waste like antibiotics, cytotoxic drugs		Returned back to the manufacturer or supplier for incineration
	(d) Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Lab cultures, stocks or specimens of microorganisms	Autoclave safe plastic bags or containers	Pre-treat to sterilize with non chlorinated chemicals on - site as per National AIDS control organization or WHO guidelines thereafter for Incineration
	(e) Chemical liquid waste : Used or discarded disinfectants, discarded formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washing, cleaning	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other waste water.
Red	Contaminated waste (Recyclable) vaccutainers with their needles cut and gloves, syringes (without needles and fixed needle syringes), urine bags, catheters	Red coloured non chlorinated plastic bags or containers	Autoclaving or micro-waving
White (Translucent)	Waste sharps including Metals: Needles, syringes with fixed needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts	Puncture proof, leak proof, tamper proof containers	Autoclaving or dry heat sterilization
Blue	Glassware: Broken or discarded and contaminated glass	Cardboard boxes with blue coloured marking	Disinfection or autoclaving
	Metalic body implants	Cardboard boxes with blue coloured marking	

4. Management of Biomedical Waste in Pathology Laboratory

4.1 Management of Biomedical Waste in Biochemistry Laboratory

The three major kinds of Biomedical wastes generated in a Biochemistry Laboratory include the post analysis plasma/serum/blood which were sent for analysis, the containers used for sending such samples and the liquid wastes generated while performing tests/cleaning of the test tubes.

Disposal of Blood/Plasma/Sera

After the test have been conducted, results validated and dispatched, all the excess sample should be centrally collected in a large container. It is autoclaved, and the resultant material put in a burial pit.

Disposal of containers

After all the blood sample have been collected, the empty containers are put in a tune containing 10 lit of fresh hypochlorite solution (10%). After a contact period of 1 hour, the containers are segregated as reusable ones and disposable ones. Reusable containers (like penicillin vials) are washed with a detergent and reused. Disposable items are autoclaved and disposed.

Disposal of liquid waste

It has to be disinfected by chemical treatment before discharging in drain.

Disposal of Radioactive wastes

Radio-active wastes is generated in laboratories where radio immuno assay (RIA) is routinely being done. These have been profound effect into the environment and have to be treated properly. It is recommended that all the radioactive waste be centrally collected and stored in a large chamber for at least ten half-lives of the radioactive substances concerned. This can then be released into the open environment. In this regards, all RIA laboratories have to follow the guidelines laid down by the Radiation Protection Committee.

4.2 Management of Biomedical Waste from Microbiology Laboratory

All the culture plates, drug sensitivity plates, culture material with bacterial growth in liquid or solid media tubes, bottles and plates and specimens from patients should be collected in stainless steel trays which are directly loaded into autoclave.

Microscopic slides used in microbiology are also autoclaved in disposal autoclave before discarding as glass sharps and sent for recycling of glass.

4.3 Management of Biomedical Waste Generated in Haematology Laboratory

The vacutainers containing blood are treated for disinfection with hypochlorite. Blood smear slides covered with oil should be boiled with detergent and washed and reused in clinical pathology and blood bank. ESR should be performed in disposable polystyrene westergreen tube as far as possible and discarded in red polythene bags which are sent for incineration. Prickers and capillaries used for bleeding time and clotting time should be discarded in blue colored puncture proof containers and disposed off as sharp as mentioned in sample collection section.

4.4 Management of Biomedical Waste Generated at clinical pathology laboratory

Urine and stool should be flushed in toilet and the containers decontaminated with hypochlorite before washing for reuse. The polypropylene tubes used for centrifuge urine samples are decontaminated with hypochlorite before washing and reusing.

4.5 Management of Biochemical Waste in the Blood Bank

The discarded units from the blood bank are disposed by autoclaving them. After autoclaving, the blood should be sent for manure making and plastic material should be treated.

Lancets or prickers used for rapid blood group screens and the needles of donor are discarded in blue capped puncture proof containers.

After blood collection, sample remaining in the tubing is aliquoted in plain and citrate tubes for infectious disease screening and cross match.

The needles containing portion cut and added to sharp disposal containers. All sharps are collected centrally, autoclaved and disposed in secured needle pit.

The glass tubes and plastic toothpicks for mixing blood and reagents for blood grouping are discarded in through containing hypochlorite. The tooth picks are subsequently discarded as plastic waste while glass slides are washed and reused.

The blood donor sets, after removing the needles is disposed by autoclaving (incineration produces toxic fumes and hence not recommended).

5. Handling and Transport

Biomedical wastes must be processed and transported in such a way that they pose no risk to human or environmental health. Immediately after the waste is produced, it must be separated into containers or bags that are colour coded. Handling these wastes requires minimizing the risk of needle prick injury and infection. Biomedical waste should not be combined with any other form of waste. The following factors must be considered when transporting BMWs.

1. Separate cabins should be provided for the vehicle carrier and the biomedical waste containers.
2. Checking the leak-proof consistency of the waste cabin floor.
3. The waste cabin should be designed in such a way that it is easy to clean with disinfectants and that storing waste containers in tiers is simple.
4. Minimize water stagnation; the cabin's inner surface should be sufficiently smooth.
5. Enough rear openings and/or sides should be provided for the fast loading and unloading of waste containers.
6. The BMW symbol must be shown on the vehicle.

6. Technologies for waste treatment

Some of the technologies, which are being promoted in India are:

1. Autoclave

An autoclave is an instrument, which uses steam at high temperature to kill all microbes.

2. Microwave

A microwave system uses high frequency waves. These waves cause the molecules within the waste material to vibrate. This generates heat within the matter itself. The heat generated is high enough to ensure that all microbes are killed.

3. Chemical Disinfection

In this form of disinfection, a chemical is used to destroy the pathogens. Not all medical waste should be treated in this way. Only plastic, rubber and metals should be disinfected.

Chemical - Disinfection

- a. Antiseptics - chemical that kill microorganisms on living skin or mucous membranes.
- b. Bactericidal - chemical agents capable of killing bacteria. Similarly agents that are virucidal, fungicidal or sporicidal are agents capable of killing these organisms.
- c. Bacteriostatic - Chemical agents that inhibit the growth of bacteria but do not necessarily kill them.

4. Incineration

It is the process of burning the solids at very high temperature in a furnace. The temperature in these furnaces is usually high enough to burn even the metals.

Waste Disposal Practice for smaller Laboratory Setups

The smaller laboratory setups which are catering to patient load of less than 1000 per month, need no authorization for biomedical waste but they are supposed to follow the guidelines of biomedical waste rules.

All the needle sharp should be mutilated and handed over to common central biomedical waste management facility. In absence of common facility, the sharp could be discarded in metal container which can be disinfected in oven/autoclave and sent to secured landfill.

The blood/body fluids soaked cotton/gauze could be discarded in coloured polythene bag, autoclaved and then the material sent as general non infectious waste.

Carefully decant infectious waste like blood and body fluid samples into a metal kettle and then disinfect the containers containing small amount of liquid waste by immersion in 1 % hypochlorite before washing. The kettles containing blood/body fluids could be autoclaved before discarding the waste as non infectious material. The gloves used in the laboratory could also be disinfected with hypochlorite before mutilating and disposal.

Wash histopathology specimens with water to remove formalin and then send them in yellow polythene bags to central common facility for incineration. The most important infectious material in bacteriology waste in form of cultures/damples and needs to be autoclaved before washing/disposal.

Conclusion

1. Safe and effective management of waste is not only a legal necessity but a social responsibility. Lack of concern, motivation, awareness and cost factor are some of the problems faced in the proper hospital waste management. Clearly there is a need for education as to the hazards associated with improper waste material.
2. Lack of apathy to the concept of waste management is a major stymie to the practice of waste disposal. An effective communication strategy is imperative keeping in view the low awareness level among different category of staff in the health care establishments regarding biomedical waste management.
3. Proper collection and segregation of biomedical waste is important. At the same time, the quantity of waste generated is equally important. A lesser amount of biomedical waste means a lesser burden on waste disposal work, cost-saving and a more efficient waste disposal system. Hence, health care providers always try to reduce the waste generation in day-to-day work in the clinic or at the hospital.

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