



## MEDICAL WASTE MANAGEMENT: A WAY TO PUBLIC HEALTH

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### **Abstract**

*In order to fulfill the medical ethic to "first do no harm," health care providers have a responsibility to manage waste in ways that protect the public and the environment. Medical Waste Management helps healthcare organizations to adopt sustainable strategies that optimize profitability without compromising quality of care. The proper management of medical waste depends on good organization, sufficient funding and active participation of informed and trained personnel. The safe management of healthcare waste may be achieved by ensuring care in dealing with the healthcare waste. Hence it is the ethical responsibility of management of hospitals and health care establishments to have concern for public health.*

### **Introduction**

Health care service is now become a basic need for people irrespective of their age, gender and culture due to increasing pollution levels and changing lifestyles associated with rapid civilization. Health care units (HCUs) generate huge amount of waste, while rendering health care service to mankind. The management of health care waste is of great importance due to its infectious and hazardous nature that can cause undesirable effects on human health and the environment. Government regulations and growing public awareness regarding health care waste issues have forced health care units to adopt suitable strategies for managing this waste. Biomedical waste management has recently emerged as an issue of major concern not only to hospitals, nursing home authorities but also to the environment. The bio-medical wastes generated from health care units depend upon a number of factors such as waste management methods, type of health care units, occupancy of healthcare units, specialization of healthcare units, ratio of reusable items in use, availability of infrastructure and resources etc.

The management of biomedical waste is still in its infancy all over the world. There is a lot of confusion among the generators, operators, decision makers and the general community about the safe management of biomedical waste. Biomedical waste management is a special case wherein the hazards and risks exist not just for the generators and operators but also for the general community. Biomedical waste management is a complex problem with detrimental effect and one has to implore the intricacies of management and practices by health care personnel. The proper management of biomedical waste has become a worldwide humanitarian topic today. Although hazards of poor management of biomedical waste have aroused the concern world over, especially in the light of its far-reaching effects on human, health and the environment.

### **Medical Waste**

According to Biomedical Waste (Management and Handling) Rules, 1998 of India "Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological. The Government of India (notification, 1998) specifies that Hospital Waste Management is a part of hospital hygiene and maintenance activities. This involves management of range of activities, which are mainly engineering functions, such as collection, transportation, operation or treatment of processing systems, and disposal of wastes.

### **Classification of Biomedical Waste**

These wastes includes all types of waste generated by health centers including hospitals, clinics, doctor's office, dental office, veterinary facilities and other medical facilities. The World Health Organization (WHO) has classified the biomedical waste into 8 categories they are General waste, Pathological waste, Radioactive waste, Chemical waste, Infectious waste, Sharps, Pharmaceutical waste & Pressurized waste.

In developing countries for practical purpose, WHO has reduced this list to 5 Categories, which is given below:

1. General non-hazardous waste
2. Sharps
3. Chemical & Pharmaceutical waste
4. Infectious waste and
5. Other hazardous waste



### Categorisation of Bio-Medical Wastes

Bio-Medical waste have been categorized into ten different categories as mentioned in the table below :-

Option	Waste Category	Waste Content
Category No.1	<b>Human Anatomical</b>	human tissues, organs, body Wastes parts
Category No.2	<b>Animal Wastes</b>	animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, discharge from hospitals, animals houses
Category No.3	<b>Microbiology &amp; Biotechnology waste</b>	waste from laboratory cultures, stocks or specimens of micro- organisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, waste from production of biologicals, toxins, dishes and devices used for transfer of cultures
Category No. 4	<b>Waste Sharps</b>	Needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps.
Category No. 5	<b>Discarded Medicines</b>	Waste comprising of outdated contaminated and discarded medicines.
Category No. 6	<b>Solid Waste</b>	items contaminated with blood, and body fluids including cotton, dressings, solid linen, plaster casts, linen, beddings, other material contaminated with blood
Category No. 7	<b>Solid Waste</b>	Wastes generated from disposable items other than the waste sharps such as tubings, catheters, intravenous sets etc.
Category No. 8	<b>Liquid Waste</b>	waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities
Category No. 9	<b>Incineration Ash</b>	ash from incineration of any bio-medical waste
Category No.10	<b>Chemical Waste</b>	chemicals used in production of biologicals, chemicals used in disinfection, as insecticides, etc.

### Medical Waste Management

Medical waste management includes all activities involved in waste generation, segregation, transportation, storage, treatment and final disposal of all types of waste generated in the healthcare facilities, stages of which require special attention. This will ensure that inputs (funds, equipment and facilities), activities and outputs (safe workplaces, healthy environment, healthy workers) for the safe handling and disposal of healthcare waste are in place. The management of healthcare waste is of great importance due to its potential environmental hazards and public health risks. The safe management of healthcare waste may achieved by ensuring care in dealing with the healthcare waste. Hence it is the ethical responsibility of management of hospitals and health care establishments to have concern for public health.

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### Need of Biomedical Waste Management in Hospitals

The reasons due to which there is great need of management of hospitals waste such as:

1. Injuries from sharps leading to infection to all categories of hospital personnel and waste handler.
2. Nosocomial infections in patients from poor infection control practices and poor waste management.
3. Risk of infection outside hospital for waste handlers and scavengers and at time general public living in the vicinity of hospitals.
4. Risk associated with hazardous chemicals, drugs to persons handling wastes at all levels.
5. “Disposable” being repacked and sold by unscrupulous elements without even being washed.
6. Drugs which have been disposed of, being repacked and sold off to unsuspecting buyers.
7. Risk of air, water and soil pollution directly due to waste, or due to defective incineration emissions and ash.

### Medical Waste Management Process

Health care waste is a heterogeneous mixture, which is very difficult to manage as such. But the problem can be simplified and its dimension reduced considerably if a proper management system is planned. The health system is under pressure to



dispose of medical waste in such a way as to avoid unnecessarily high levels of environmental damage. Health care facilities worldwide are beginning to subscribe to the social goals of a cleaner and safer environment. For attaining this objective hospital must dispose waste in a systematic and scientific way. Following are the important step involved in medical waste management.

1. Waste collection
2. Segregation
3. Transportation and storage
4. Treatment & Disposal
5. Transport to final disposal site
6. Final disposal

### Disposal Methods

Different methods are used for the disposal of bio medical waste and are discussed below:

- **Incineration**  
It is a controlled combustion process where waste is completely oxidized and harmful microorganisms present in it are destroyed under high temperature.
- **Autoclaving**  
Autoclaving is a low-heat thermal process where steam is brought into direct contact with waste in a controlled manner and for sufficient duration to disinfect the wastes. For ease and safety in operation, the system should be horizontal type and exclusively designed for the treatment of medical waste. For optimum results, pre-vacuum based system is preferred against the gravity type system. It shall have tamper-proof control panel with efficient display and recording devices for critical parameters such as time, temperature, pressure, date and batch number etc.
- **Microwaving**  
Microbial inactivation occurs as a result of the thermal effect of electromagnetic radiation spectrum lying between the frequencies 300 and 300,000 MHz Microwave heating is an inter-molecular heating process. The heating occurs inside the waste material in the presence of steam.
- **Hydroclaving**  
This is similar to autoclaving except that the waste is subjected to indirect heating by applying steam in the outer jacket. The waste is continuously tumbled in the chamber during the process.
- **Shredder**  
Shredding is a process by which waste are deshaped or cut into smaller pieces so as to make the wastes unrecognizable. It helps in prevention of reuse of bio-medical waste and also acts as identifier that the wastes have been disinfected and are safe to dispose of. A shredder is to be used for shredding in medical waste with minimum requirements.

### Challenges to Waste Management Practices in Indian Health Care Sector

The public outcry against health care waste disposal practices and several public interest litigations (PILs) filed in various courts, exerted tremendous pressure on Government of India to enact a law governing health- care waste management (HCWM). Finally, in view of the serious situation involving biomedical waste management, the Ministry of Environment and Forests, Government of India created the Biomedical Waste (Management and Handling) Rules, which came into effect on 20th July, 1998 .Despite these rules and initiations, a lot of challenges to health care waste management practices are faced by Indian health care sector. The major challenges are

- **Lack of Segregation Practices**  
Segregation practice prevents non-infectious waste to get mixed with infectious waste. Lack of segregation practices significantly increases the quantity of infectious medical waste as mixing of infectious component with the general non-infectious waste, makes the entire mass potentially infectious. Poor segregation practice of the waste starting from generation to disposal is observed in Indian hospitals. In some hospitals though better segregation practices are followed at the point of generation, waste handlers are found mixing it together during the collection and results in loss of ultimate value of segregation.
- **Improper Waste Management Operational Strategy**  
Operational plans should include the location and capacity of the storage containers, frequency of collection for various types of wastes and schedule of activities. Infectious wastes are to be stored in the designated colour-coded leak-proof containers for safe handling and can be disinfected / sterilized by the available facility in the hospital. Transportation of waste within the hospital is to be carried out in closed handcarts to avoid spillage of waste to a disinfection or treatment facility. After disinfection/sterilization the waste is transported to a common treatment



facility, such as an incinerator or controlled landfill. Studies show Indian HCUs has poor operational strategies as personnel responsible for these activities are mainly ward attendants and other supporting staff, and absence of documented waste management and disposal policy. Moreover there are no waste management committees are present in Indian hospitals which should essentially be consist of the head of the establishment, all the departmental heads, hospital superintendents, nursing superintendents, hospital engineers with a waste management officer along with an environmental control advisor and an infection control advisor.

- **Insufficient Support from Government Agencies**

Support and guidance from regulatory authorities in the areas of waste management, regulations in the form of waste reduction and recycling targets, carbon credit earnings, development of minimum energy efficiency standards for equipments are necessary for prevention of pollution and reduction of environmental load on sustained basis. Lack of proactive environmentalism and low priority accorded to green procurement initiatives by the governments' acts as a significant barrier to Waste Management. No agency in India has been assigned the task of spreading awareness. Therefore Rules have not been publicized as widely as required. Hence, smaller HCUs may not be fully aware of them. Additionally a number of issues have not been dealt with in detail, such as standards of collection and storage devices, equipment, etc.

- **Lack of Green Procurement Policy**

Personnel responsible for procuring health care products and services (materials managers or purchasing agents) come from varying backgrounds. Environmental background or training is not a prerequisite for the individuals responsible for securing health care products and services. Waste minimisation can be achieved by purchasing reusable items made of glass and metals which can be disinfected and reused. For example, a polyolefin intravenous (IV) bag does not contain chlorine, so it has less potential to produce dioxins through incineration than an IV bag containing polyvinyl chloride (PVC). Similarly mercury thermometers can be replaced with mercury free thermometers. Health care units should stimulate the purchase of environmentally preferable products by mandating certain practices in their purchasing policy.

- **Unauthorized Reuse of Health Care Waste**

Reuse of plastic syringes and other plastic material used in the health care is a thriving business of billions of Indian Rupees. More than one million people are engaged in rag picking (more than 100,000 in Delhi alone). The estimated figure of business on this score in Delhi alone is more than 50 million Indian Rupees per year. Lucrative monetary returns and lack of awareness about the problems associated with biomedical wastes encourage waste-picking and reusing activities. The waste collection and transportation workers in the hospital segregate the recyclable material for sale. In a similar way, all disposable plastic items, needles and glass are segregated by the waste pickers, from where the waste is deposited either inside the hospital grounds, or outside in the community bin. It thereafter goes to the waste handlers, then to the rag pickers, to the packaging outlets situated in a decrepit area of a 'basti (slum)', to the medical shop, and finally sold to the unsuspecting patients or their relatives.

- **Lack of Top Management Commitment**

Governments and the health care providers have gone in for one type of option for treatment of the waste. No health care provider wants or has undertaken a base line survey to collect data regarding quantum of waste and its type being generated, nor about the waste generation points in its premises. Budgetary support is poor in the government run hospitals, the corporate hospitals and the nursing homes. Therefore they find it convenient to ignore the rules for monetary consideration. Top management in most of Indian hospitals is showing inertia in dealing with the waste problem. The wastes are therefore instead of being segregated, discharged in a mixed condition to the site of disposal, separating only the saline bottles, which are sent for auctioning.

- **Lack of Adequate Facilities**

Efforts to provide facilities for storage, collection, treatment and disposal of health care wastes as well as appropriate technologies have so far been limited in India. Additionally, adequate and requisite number of sanitary landfills is lacking in India. Therefore, the biomedical waste are openly dumped into the open bins on the road sides, low lying area or they are directed into the water bodies; through which severe disease causing agents are spread into the air, soil and water. Self contained onsite treatment methods may be desirable and feasible for large healthcare facilities but are impractical or uneconomical for smaller institutes. An acceptable common system should be in place which will provide free supply of colour coded bags, daily collection of infectious waste, and safe transportation of waste to offsite treatment facility and final disposal with suitable technology. Moreover available disposal techniques are neither able to meet disposal requirements nor innovations in disposal options are in pace with the evolution of complexity of health care waste streams.

- **Financial Constraints**

With dedicated systems being installed in most of the HCUs, financial provision is necessary for capital and recurring expenditure including funds for sufficient manpower, disinfectants, devices and equipment. Normally, a



separate allocation of funds for waste management is not found in Indian hospitals. Additionally funds are required for conducting training and awareness programs for health care staffs. Smaller HCUs ignore waste management practices due to financial constraints .

- **Inadequate Awareness and Training Programs**

Awareness of appropriate handling and disposal of health-care wastes among health personnel is a priority; it is essential that everyone should know the potential health hazards. Regular programs will help prevent exposure of health-care wastes and related hazards. Poster exhibition, proper labeling, and explanation by staff are effective methods. Seminars and workshops, and participation in training courses are also essential. Management in most of Indian hospitals is not aware of cost savings achieved due to good waste management practices. It has also been estimated that disposal savings of between 40% and 70% could be realized through the implementation of a healthcare waste reduction program.

- **Reluctance to Change and Adoption**

General resistance to change is often a barrier to new programs. Employee's commitment to change programs is crucial given that they actually execute implementation activities. Though now alternative technologies are permitted as per the Biomedical Rules, in India still it takes a long time to change the mindset of the people. Even now most of the health care providers and decision making authorities talk of incinerator only although autoclaves and other advanced waste handling equipments are available. Indiscriminate throwing of the waste is still seen in most of the hospitals and the waste handlers still are without protective clothing and gears. There is hardly any change in the applied knowledge and awareness seen in Indian hospitals.

### **Benefits of Proper Medical Waste Management**

Environmentally sound management involves taking all practical steps to protect human health and the environment from hazardous wastes, like medical waste. Benefits of proper medical management are discussed as follows:

- Minimizes the spread of infections & reduces the risk of accidental injury to staff, patients, visitors & the community,
- Reduces the likelihood of contamination of the soil or ground water with chemicals or micro-organisms,
- Attracts fewer insects and rodents and does not attract animals,
- Helps to provide an aesthetically pleasing atmosphere.

### **Conclusion**

Medical wastes should be classified according to their source, typology and risk factors associated with their handling, storage and ultimate disposal. The segregation of waste at source is the key step and reduction, reuse and recycling should be considered in proper perspectives. We need to consider innovative and radical measures to clean up the distressing picture of lack of civic concern on the part of hospitals and slackness in government implementation of bare minimum of rules, as waste generation particularly biomedical waste imposes increasing direct and indirect costs on society. The challenge before us, therefore, is to scientifically manage growing quantities of medical waste that go beyond past practices. If we want to protect our environment and health of community we must sensitize ourselves to this important issue not only in the interest of health managers but also in the interest of community.

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