Biomedical waste management vis-a-vis risks to handlers

M.K. MISHRA, S.K. LIKHAR and K.S. LIKHAR

Department of Community Medicine, Department of Pathology, People's College of Medical Sceince & Research Centre, Bhanpur, Bhopal - 462 010 (India).

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ABSTRACT

Biomedical wastes management vis-à-vis risks to waste handlers The characters of the health care waste that make it a health risk are, for it contains infectious agents, toxic chemicals, flammable, genotoxic, cytotoxic and radioactive substances. Hence, the risks from the Health Care Waste are not only from the pathogens but also from the chemical and pharmaceutical properties of the wastes components. Safe management of Health Care Waste is the process to ensure proper hospital hygiene and safety of health care workers and communities. It is the legal and financial liability of the institution for safe and environmentally sound disposal of the waste generated. The principle of the HCW management includes activities such as segregation at source, colour coding and storage within and outside the health care setting, collection, transportation and final disposal.

Key words: Biomedical waste, management, risks.

INTRODUCTION

"Bio-Medical Waste" according to Biomedical Waste (Management and Handling) Rules, 1998 of India, means 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 biologicals.

Safe management of Health Care Waste is the process to ensure proper hospital hygiene and safety of health care workers and communities. Towards achieving this two underlying critical aspects needs to be understood. The following paragraphs provide an overview of the risks and the underlying principles of safe management of health care waste.

Risks Associated with Health Care Waste

The characters of the health care waste that make it a health risk are, for it contains infectious agents, toxic chemicals, flammable, genotoxic, cytotoxic and radioactive substances. Hence, the risks from the Health Care Waste are not only from the pathogens but also from the chemical and pharmaceutical properties of the wastes components. Never the less, while considering the risks from the Health Care Waste, dosage, quality, vectors and inherent properties of each of the components must be considered separately.

The risks from the Health Care Waste are to:-

- (a). Medical, paramedical staff.and house keeping personnel at the Health Care Institutions.
- (b). Patients and their attendees and visitors to the institution.
- (c). Workers in Bio-medical waste handling & treatment facility, recycling plant, laundry, transportation, landfills etc.
- (d). Scavengers and rag pickers.
- (e). Public.

Risk from infectious and pathological wastes

The pathogens in the waste can enter the body by absorption through puncture, abrasion, opening or cut in the skin; absorption through the mucous membranes; inhalation, and ingestion. (6) However, except for the highly infectious wastes, concentration of the indicator micro organisms in other types of health care waste is generally no higher than that found in the domestic wastes³. Table 1 below gives the infections that have the potential to spread through the infectious Health Care Waste³.

Risk from SHARPS

Sharps can cause puncture or cuts, which can further be infected by concentrated culture of pathogens. Thus, the dual risk of injury and disease transmission makes the sharps very hazardous. Another potential risk is the sources of generation are diverse and persons at risk to exposure of sharps are of varied job categories. Many authorities like CDC (Centre for Disease Control and Prevention) has issued issue guidelines for managing needle stick injuries^{7,8}.

Risk from Pharmaceutical and Chemical Wastes

The health risk from these categories of the health care waste can be either due to acute or chronic exposure. The most commonly documented injury is burns from corrosive, flammable and reactive properties of the chemicals like disinfectants, which are often used in large quantities in health care settings. Intoxication from the absorption of the pharmaceutical wastes through such and mucous membrane increases the risk of teratogenicity, further, risks from highly reactive secondary products, air suspension particulate matter and wide spread contamination of the health care environment should also be considered, in view of epidemiological studies having found excess fetal malformations and miscarriages, hepatitis and cancer in operating room personnel⁹.

Risk to the Community Health and Environment

Urbanization which often unplanned and rapid, is associated with health hazards like substandard housing, overcrowding, air pollution, in sufficient or contaminated drinking water, inadequate sanitation and solid waste disposal services, vector born diseases, industrial waste, increased motor vehicle traffic, stress associated with poverty, unemployment and environmental degradation¹⁰. The Health Care Waste, whose source are the Health Care setting, which incidentally are being mushroomed in the urban areas, further increases this strain on community health and environment. The risk from the Health Care Waste to the community and environment includes intentional and unintentional exposure. Intentional exposure is from the reuse of disposable materials, resulting in transmission of HIV, HBV, HCV and also certain infection, spread through media or caused by more resilient agents. Unintentional exposure is through inadequately disposed waste, resulting in the possible pollution of the air, water and soil¹¹. It also includes the use of strong disinfectants and chemicals having a strong impact on environment.

Risk during final treatment and disposal

The commonly employed technologies for the treatment of the Health Care Waste are landfills

Transmission Vehicles	Pathology	Examples of Associated Pathogens
Faeces and /or vomitus	Gastro enteric infectious	Enterobacteria Ex Salmonella, Shigella, Vibrio cholerae
Inhaled secretions, saliva	Respiratory infections	<i>M.tuberculosis</i> , Measles virus, Strept. Pheumoniae
Eye secretions	Occular Infections	Herpes virus
Genital secretions	Genital infections	Neisseria gonorrhoeae
PUS	Skin Infections	Streptococcus
Blood, Sexual secretions	AIDS	HIV (Human immuno deficiency virus)
Blood	Septicemia	Staphylococus Spp.
Faeces	Hepatitis A	Hepatitis A virus
Blood and Body fluids	Heapatitis B and C	Heapatitis B and C viruses

Table 1: Biomedical waste; infections and their mode of transmission

incinerators, autoclaving, microwaving, hydroclaving, waste water treatment, disinfection and shredding. The treated health care wastes are further disposed to secure or municipal land fills, sewer or dumped as such in nature. Ironically, the health care waste can be made to take a more risky shortcut to be mixed directly with municipal waste.

Medical incinerators are major sources of dioxin (polychlorinated diabenzodioxins) PCDDS. Which accumulate in the food chain and through food supply and human milk have an effect on reproduction, development, immune system function and carcinogenesis. PVC polyvinylchloride plastic in the health care waste is the source of the dioxins and health professionals have a responsibility to reduce the contamination of the segregated incinerable wastes with PVC plastic¹².

In addition, the medical waste incineration has high content of heavy metals emission (mercury, lead, arsenic, cadmium, nickel, manganese etc). Which can be minimized by phasing out the use of heavy metals like mercury in instruments? Evidences show significant increased risk of adult and childhood cancers around 3 km - 7 km of municipal and medical incineration sites^{13,14}.

The liquid wastes are either treated by disinfection, or (2) treated in waste effluent plant or (3) drained without any treatment to the public sewers. There are evidences to show that the liquid wastes contains significant culture of pathogens to cause infection. Increased single and multiple antibiotic resistant bacterial species in hospital sewers is often found. This development of resistant microbes has great clinical, pharmacological, economical and social importance^{15,16}.

Every year world wide, a total 8 to16 million hepatitis B, 2.3 to 4.7 million hepatitis C and 80,000 to 160000 HIV infections are estimated to occur from reuse of syringe, needles without proper sterilization. The risk could be avoided by proper disposal of used syringes¹³. Thus, solution is simple but for it to be a reality needs much of background logistics to be worked out.

Principles in safe management of Health Care Waste (2-4)

The following concepts and principles constitute the core for management of health care waste.

- Polluter pays principle- It is the legal and financial liability of the institution to ensure safe and environmentally sound disposal of the waste generated.
- 2. Precautionary Principle-When risk from a particular activity is unknown than the risk is assumed as significant and safety and health protection measures should be designed accordingly. This principle is particularly important in view of current epidemiological studies not conclusively establishing the risk attributes of the health care waste to the staff in the health care settings, health care waste treatment facility and transport personnel or the public, except for the risks from the waste needle sharps to cause infections.
- Duty of care principle-The person handling or managing hazardous substances or related equipment is ethically responsible for applying the utmost care.
- 4. Waste reduction, recycling and reuse principle- The principle of the 3 R's includes activities such as segregation at source, colour coding, and storage within and outside the health care setting, collection and transportation.
- 5. Environmentally sound treatment and disposal of waste principle-The principle is to adopt

(a) Safer, ecofriendly treatments which can minimizes/eliminate the harmful effects of health care wastes.

(b) Disposal techniques which considered both short term and long term effects of introduction of treated or untreated or mixture of both kinds of HCW, to the community and environment.

6. Proximity principle-As much technically and environmentally possible, the treatment and disposal of HCW should be nearer to the point of generation of the waste. The above principles are generally considered when notifying legislations and implementing health care waste management plans. These very from region to region. Accordingly the practices and extent of segregation, containment, storage, transportation and disposal of HCW are different in different regions.

CONCLUSION

Finally to conclude health care waste is a health risk to medical, paramedical staff.and house keeping personnel involved in handling & treatment

facility, patients their attendees and visitors at the Health Care Institutions. The principle of the 3 R's includes reduce, recycle & replace the most hazardous waste to non-hazardous or less hazardous activities such as segregation at source, colour coding, storage within and outside the health care setting, collection and transportation. Treatment and disposal of HCW should be nearer to the point of generation of the waste. The legal and financial liability for the safe disposal of HCW lies with owner of the Health care institution.

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