

Biomedical Waste Management for Nursing Professionals

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Introduction

All human activities produce waste. Whether it is home, office, industry workshop, hotel or hospital; in all these places some amount of waste is generated. Some of it may be dangerous. As we already know that Industrial waste can pollute water, soil and air and it can be dangerous to the human being or to the environment. Waste coming out from our houses, includes sewage, dirty water, dust, kitchen waste, paper etc. Sewage need safe disposal otherwise it can pollute water supply and lead to cholera, hepatitis, and other life threatening diseases. Similarly, hospital and other health care facilities generate lots of waste which can transmit infection particularly HIV, Hepatitis B & C and tetanus to the people who handle it or come in contact with it. Infected waste generated in hospital is risking the health of the hospital staff, patients and their relatives who are visiting or attending them. There are reports that some of the infected wastes, such as syringes, needles and intravenous drip sets, are recycled without proper treatment. In municipal dustbins, one can find small children as rag pickers and scavengers like cow, dog, cat birds etc. All can get infected or can transmit infection to others because they are the part of community.

What is Bio-medical waste?

Any waste, which is generated during the diagnosis treatment, including operation, or immunization of human beings or animals or in research activities including production of biologicals, etc. is termed as biomedical waste. (2) In some countries, it is also known as regulated waste or hospital waste or health care waste. (1)

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Why should we bother much about Bio-medical waste?

To protect the environment and community health, the Ministry of Environment & Forest has notified, "Bio-medical Waste (Management & Handling) Rules 1998" (2). All hospitals, clinics, nursing homes, slaughterhouses and laboratories have to produce a certificate of safe disposal and environmentally sound management of waste produced by them. They should make all arrangements as specified in the Rules for proper disposal of bio-medical waste. The Head of the health care facility for example Medical Superintendent of the hospital, Director, owner of Nursing home health care facility have to safeguard the health of workers involved in handling, transportation, and disposal of bio-medical waste besides ensuring safety to the community and environment. Any violation of the norms given in Rules by any person is punishable with fine or imprisonment under the Environment Protection Act, 1986. (3)

Besides this many Indian newspapers and magazines have reported re-use of disposable syringes, catheters, bags, drug vials, and bottles; throwing highly infected hospital and human parts in municipal dustbins or landfill site; air pollution due to incinerators used for burning of hospital waste including plastic waste; and foul smelling of hospital waste dumped in residential areas pose disease threat to the community and waste handlers. To avoid bad name to the hospital and medical profession many measures need to be undertaken. (4,5,6)

What includes in Bio-medical waste?

According to the Rules, (2) bio-medical waste can be classified into ten categories these are as follows:

1. Human parts-tissues, organs, placenta, amputated parts.

2. Animal waste
3. Microbiological and Biotechnological waste-culture plates, culture media, vaccines etc.
4. Waste sharps-scalpel, blades and needles, broken glasses etc.
5. Discarded medicines, and cytotoxic drugs.
6. Soiled contaminated waste: infected bandages, gauge pieces, swabs, dressings, linen, etc.
7. Solid waste: Disposable items-tubes, plastic syringes, catheters, urobags, etc.
8. Liquid waste-dirty waters.
9. Incineration Ash- Ash generated in the incineration plant.
10. Chemical waste-Chemical used in laboratory diagnosis, disinfectants, antiseptics, etc.

Approximately 1.45kg waste is generated per patient per day in Indian hospitals whereas it is as high as 4.5 Kg in developed countries. (9,10,11) According to western figures, approximately 15-20 percent of this total waste is hazardous. Whereas, it would be much higher in India where proper waste segregation does not exist.

Waste Segregation and use of colour code

Waste Segregation is the process of keeping waste separated apart according to its composition and characteristics. It is essential that hazardous bio-medical waste should not get mixed with non-hazardous general waste. This is the responsibility of all staff. Our centre has proposed a simplified colour coded system of hospital waste management.

A. Yellow bag/bin that needs to incinerate or deep buried may contain: (i) human anatomical, (ii) animal waste (iii) pathological waste, (iv) Animal waste, (v) Microbiological waste, (vi)

Sharps waste, (Packed in punctured resistant container) (vii). Discarded medicine, cytotoxic drugs, and (viii). Solid waste.

B. Red bags/bins that need to be autoclave, disinfected with chemical, or microwaved used for plastic waste, disposable item, like tubes, catheter, blood or urine bags, gloves etc.

C. Black bags/bins that used to be sent for secure landfill/burial, used for chemical solid waste and incinerated ash. General waste can be disposed in this bag. All bags must have appropriate symbols:

When disposing of *cytotoxic* materials the pharmacy or medical staff should place the wastes in specially labelled containers that display the Cytotoxic symbol that is **C** in a triangle.

How can you manage Sharps?

Sharp can be defined as objects that are capable of puncturing or cutting and include syringes, needles, scalpels, blades, pipettes, and broken glass or plastic. Sharps create their own portal of entry and always pose a risk factor to many infectious pathogens. During procedures in the wards and operation theater Nurses get a large number of injuries due to sharps. (8) This leads to higher chances of getting HIV and Hepatitis B & C infections. (7) For this reason, self-sheathing syringes, self-blunting blood collection needles, and even needle-less syringes are gaining popularity.

No loose sharps are to be disposed off into plastic bags, as the bag can be punctured or cut by the sharp, offering the potential for injury to waste handlers, or the leakage or spillage of the contents of the bag during manual handling or transfer operations. Either sharps should be placed in a punctured resistant container or mutilated at the point of generation by needle destroyers.

How waste is stored?

According to the rules, infectious waste cannot be stored for more than 48 hours. Bags should not leak; place safely and don't permit any manipulation after packing. Nurses should take extra precaution while placing bins and bags in the ward because, neither it should be close to the patient nor in their duty room. Waste may be stored off-site before treatment and final disposal. All storage sites must be concrete and should be designed to allow wash down water, split water and rain water.

How waste is transported?

Wastes are to be deposited and collected from clear sign pasted and designated collection points in hospital wards. Where open trolley is used to collect bags of waste from bins. Each bin and trolley must be thoroughly cleaned and disinfected with a hypochlorite solution (1%) at least once a week whether or not it appears clean. The vehicle used for the waste transport should not be used for any other purpose. Such vehicle should be labeled and designated for the purpose by the hospital authority. There should not be any leakage while transporting waste.

How waste is treated and disposed ?

There are many methods of waste treatment. The common methods are mentioned here:

- 1) **Chemical disinfection:** Syringes, needles, and gloves after use should always be disinfected with freshly prepared bleaching powder solution (Hypochlorite 1%) or autoclaved before mutilation or shredding.
- 2) **Autoclave:** Wherever autoclave with shredder is available, system of segregation, collection and transport can be modified in such a way that needs no chemical treatment and waste can directly be sent for autoclaving. Autoclave is the method of sterilizing material with steam pressure (15 psi, pressure square inch) and heat (121 deg. C

for 45 minutes or 134 deg. C for 30 minutes). After autoclaving this waste is no longer considered infectious and can be disposed off as general waste. Incineration has been found to be the most effective method overall for destroying infection and toxic material, volume reduction, and weight reduction in the medical waste stream.

- 3) **Incineration:** Waste is burnt at a high temperature of approximately 1000° C in a specialized plant. Incinerator has been found to be the most effective method overall for destroying infection and toxic material, volume reduction, and weight reduction in the medical waste stream. No chlorinated plastic material or product such as syringes, tubes, plastic bags should be burnt because they liberate toxic gases that pollute environment and affect human and animal health. There is an increased risk of generating undesirable chlorine compounds known as dioxin(s) and furans. These compounds are liberated more when waste is burnt on low temperature. There are reports that these compounds are associated with skin problems, cancer and lowering of immune system. (13,14) That is why, many researchers have advocated installing the incinerator away from residential areas.

- 4) **Microwave:** Microwave irradiation (2450 MHz producing temperature of 97-100 deg. C for 30 minutes) is another method of sterilizing infected waste. However, we can't use microwave for human organs or tissue waste. This technique does not reduce the volume of waste also.
- 5) **Landfill or burial:** Landfill site should always be away from residential areas as it could be dangerous for the community health and can lead to congenital anomalies in exposed population. (15)

What is the need of Waste Minimization?

Individual efforts should be to minimize the use of disposals and performing only necessary procedures. Reduction in waste could be beneficial for the environment. A durable (reusable) item should be promoted besides adopting safe and health practices.

What measures should be taken for health and safety of Nurses?

Health and safety of the Nursing staff is cardinal feature of biomedical waste management. Medical Superintendent or head of the institute has to adopt all measures ensure safety of health care workers. Besides this, Nurses should take responsibility of safe practices in the hospital so that risk to their health can be utilized. Following practices are certainly helpful for safety and their health.

1. Observing universal precaution.
2. Use protective equipment: wearing glove, mask shoes and eye glasses if risk of eye splash exists.
3. Don't recap needles: if there are frequent needle-stick injuries, report to the hospital authority.
4. Don't pipette with mouth any blood or chemicals.
5. Avoid skin contact and inhalation of Cytotoxic. Pregnant workers in first trimester should seek medical consultation if Cytotoxic handling becomes unavoidable. The handling of anti-neoplastic drugs could lead to mutagenic changes in Nurses.
6. Cytotoxic and other chemicals splashes of eyes should be washed with ample amount of water for 10-15 minutes.
7. Receiving full vaccination for hepatitis B, and tetanus.
8. Training is must for Nurses. It should emphasize safe work practices, proper handling of needles and other sharps,

chemicals and Cytotoxic drugs besides providing practical aspect of biomedical waste management (16).

Community Awareness

People visit hospital from all sections of society, from very poor to very rich and illiterate to highly educated people. Many of them have no knowledge about the risk involved in the hospital environment. Families need to stay in hospital with their patients who also generate waste. If they are not aware of the system then it would be difficult to practice biomedical waste management by health care staff alone.

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