

HOSPITAL WASTE MANAGEMENT

Introduction

- The solid wastes produced in hospitals and clinics are called hospital/biomedical wastes.
- Hospital wastes contain chemical, biological and sometimes radiological wastes that pose a substantial danger, immediate or over a time to human and classified as hazardous wastes.
- About 10 -15 percent of hospital wastes in Bangladesh are hazardous and remaining 85 to 90 percent are similar to general municipal (residential) wastes.

Classification of Hospital Wastes

Hospital Wastes in Bangladesh can be classified into following categories for management purpose:

- **General Wastes (about 85%)**
 - Kitchen(food) wastes
 - Paper, cans
 - Cardboard boxes
 - Non-infectious plastics
- **Hazardous Wastes (about 15%)**
 - Sharps (Needles, blades, knife, broken glass)
 - Infectious Wastes (Pathological waste , soiled cotton & dressing, patient's excreta, organs, placenta, lab wastes, cytotoxic wastes, chemical wastes)
 - Infectious Plastic and containers (containers, syringes, catheters, cannulas, clips, valves etc.)
 - Radioactive wastes

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Management of Hospital Wastes

Management of hospital waste need internal and external management of the waste generated in the hospital.

The steps in the internal management of hospital wastes include:

- Identification of the type of waste (Hazardous and non-hazardous)
- Separation of wastes
- Internal Collection and storage

Training of ward boy/girl and nurses is required on classification, safe handling, proper storage of hospital wastes.

The steps in the external management of hospital wastes include:

- Collection of wastes
- Transportation of wastes
- Treatment and final disposal

Identification of Wastes

Identification of the waste is the first and important aspect of internal management of hospital wastes. It is important to identify the type of waste into hazardous and non hazardous wastes for separation and storage. The common hazardous wastes generated in the hospital were listed before.

Separation

Hospital wastes contains general solid wastes and hazardous wastes. At the generation point the wastes are to be separated into hazardous and non hazardous waste for safety and economy in handling, treatment and final disposal.

The main sources of infectious or contaminated wastes in the hospitals are:

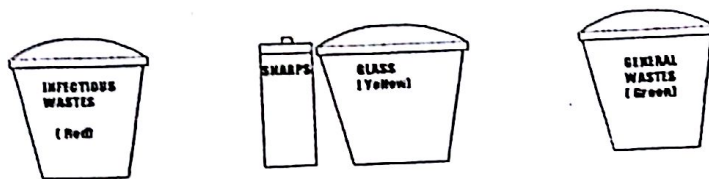
- Wards and Cabins
- Operation Theatre
- Pathology and laboratories
- Stores and Pharmacy
- Emergency
- Work areas of Doctor and Nurses

Storage

Hospital wastes is required to be separated into different categories and collected in containers or bags of different colors for easy identification. The following three colored containers are recommended for the collection of three major categories of hospital wastes:

- General Wastes in green colored containers
- Sharps in yellow containers
- Infectious wastes in red containers.

The containers are shown in the Figure below. An additional hard container with device for separation of infected needles from syringe is provided for safe storage of used needles. The sharp blades and broken glasses can be stored in a separate yellow container.



The storage bins are located area-wise, not far from the generation points. The infectious hospital wastes are to be collected every day for processing and safe disposal.

Collection and Transportation

- Hazardous hospital wastes are to be collected from the locations where it is located and transported in closed containers separately for intermediate processing and treatment.
- The general wastes can be collected separately and dumped in the municipal bin for collection . Installation of bins at different locations in the hospital or clinics is not required, which become a focus of pollution.

Treatment and Disposal

The general modes of treatment and disposal of the most common hazardous wastes from hospital is shown in Table 1.

Table 1: Processing, Treatment and Disposal of Hospital Wastes

Types of Waste	Treatment and Disposal
Human Anatomical Waste -Human tissue, organ, body parts	Incineration/deep burial
Animal Wastes	Incineration/deep burial
Microbiology and Biotechnical Wastes	Autoclaving/microwaving/incineration
Sharp wastes	Disinfection (Chemical treatment/ autoclaving/ microwaving) and mutilation/shredding
Discarded Medicine and Cytotoxic Drug	Incineration/destruction and drug disposal in a secured landfills
Solid Wastes - items contaminated with blood and body fluid etc.	Incineration/autoclaving/microwaving

Table 1: Continued.....

Types of Waste	Treatment and Disposal
Solid wastes -Wastes generated from disposable items such as tubings, catheters, intravenous sets etc	Disinfection/autoclaving/microwaving and mutilation/shredding
Liquid Wastes -Waste from laboratories, washing, cleaning, house keeping, disinfecting activities etc	Disinfecting and discharge into drains
Incineration Ash	Disposal in secured landfills
Chemical Wastes	Chemical treatment and discharge into drains for liquids and secured landfills for solids

Autoclaving

Autoclaving or steam sterilization is a low-heat process designed to provide direct contact of the waste with steam in a controlled manner in order to disinfect the waste materials. Three types of autoclaves are commonly used viz Gravity Type, Pre-vacuum type and Retort type.

Standards for Autoclaving

- a. When autoclaving in a gravity flow autoclave, the medical waste is subjected to :
 - A temperature of not less than 121°C and a pressure of 15 psi for an autoclave residence time of not less than 60 minutes or
 - A temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes or
 - A temperature of not less than 149°C and a pressure of 52 psi for an autoclave residence time of not less than 30 minutes
- b. When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following:
 - A temperature of not less than 121°C and a pressure of 15 psi for an autoclave residence time of not less than 45 minutes.
 - A temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes.
- c. Biomedical waste shall not be considered to be properly treated unless the time, temperature and pressure indicators indicate that the proper time, temperature and pressure were reached during the autoclave process. If not, the entire load of medical waste must be autoclaved again until the proper time temperature and pressure and resident time are achieved.

Incineration

Incineration is the controlled burning of waste at temperatures required for complete destruction of the waste.

Standard for Incinerators

All incinerators shall meet the following standards

- The combustion efficiency (CE) shall be at least 99%. The combustion efficiency is computed as follows:

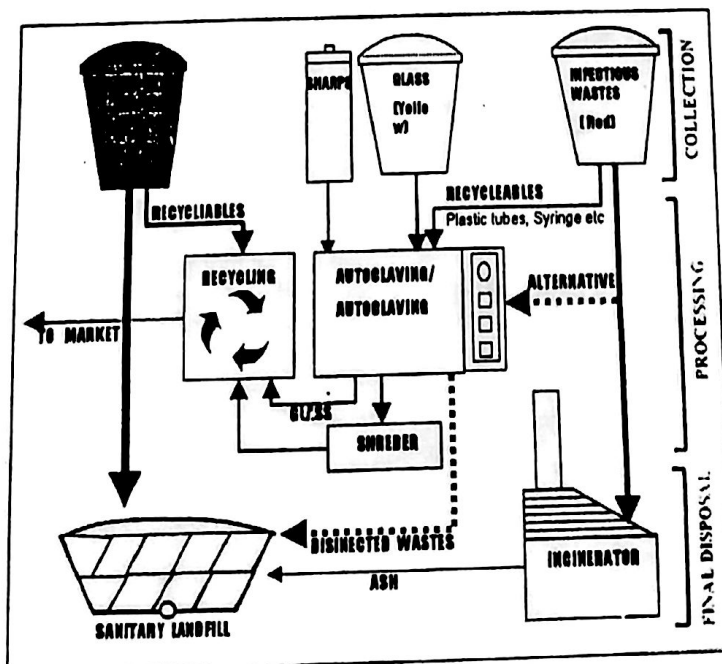
$$CE = 100 (\%CO_2) / (\%CO_2 + \%CO)$$
- The temperature of primary combustion shall be $800 \pm 50^\circ C$
- The secondary combustion gas residence time shall be at least 1 (one) second at $1050 \pm 50^\circ C$ with at least 3% oxygen in the stack gas.
- The minimum stack height shall be 30m above ground or as recommended by regulation
- Volatile organic compound in the gas shall not be more than 0.01%
- Suitably designed pollution control device shall be installed/retrofitted with the incinerator to achieve the emission standard of the country.
- Waste to be incinerated shall not be chemically treated with any chlorinated disinfectants.
- Chlorinated plastics shall not be disinfected.
- Toxic metals in incineration ash shall be limited within the regulatory quantities and disposed off as defined under hazardous waste regulation.
- Only low sulfur fuel shall be used as fuel for incineration.

Deep Burial

Standard for Deep Burial

- The deep burial site should be at distant location from human habitation and sited so that no contamination occurs of any surface or ground waters. The area should not be prone to flooding or erosion
- The deep burial site should be relatively impermeable and no shallow well should be closed to the site
- The location of the deep burial site will be authorized by the relevant authority.
- The pits or trenches for deep burial should be made at least 2 meter deep.
- On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes
- A layer of minimum 30 cm lime cover should be provided before final cover by at least 30 cm soil is provided to complete a pit.
- It must be ensured that the animals do not have any access to the burial site. Covers of galvanized iron/wire meshes may be used.
- Burial must be performed under close and dedicated supervision
- The hospital must maintain a record of all pits made for deep burial.

A general flow diagram of hospital waste management is shown in the Figure below.



Hospital Waste Management