

# Chapter 23

# Health Care Waste Management

Edward Krisiunas

## Key points

- Sharps are the most likely health care waste to cause injury and/or exposure. Therefore, at a minimum, a waste management program must focus on sharps handling.
- Proper segregation using available means will reduce the risk of disease transmission and minimise the amount of potentially infectious health care waste generated.
- A range of treatment options for waste are available. Consideration should be given to those that reduce the opportunity for exposure and impact on the environment.
- Education and regular reinforcement of practices are the keys to success.

## **Introduction<sup>1</sup>**

Health care activities inevitably generate health care waste. The proper management of health care waste creates a safer environment for staff, solid waste workers, and the public. Health care waste management is dictated by professional standards, local laws and national legislation, and, most importantly, available resources.

## **Definitions**

Health care waste can be considered any waste generated in a health care setting. Most concern is focused on the hazardous aspect of waste, i.e., infectious, chemical, radioactive, or other waste as listed in Table 23.1.

In addition to sharps and pathological waste, infectious waste includes:

1. Microbiological waste - culture plates, growth media, etc.
2. Swabs, dressings, bandages contaminated with potentially infectious fluids.
3. Blood – tubes of blood, units of blood, blood and blood products, and other containers used to collect blood.

## **Sources of Health Care Waste**

Health care waste has many potential sources as outlined in Table 23.2.

## **Collection**

Waste must be collected in containers that reduce the risk of exposure to users and meet the minimum specifications outlined in Table 23.3. They should be labelled with the international biohazard symbol, and not overfilled. The biohazard label can be painted on the containers or self-adhesive labels can be used.

Health care waste should be segregated from regular garbage at all facilities. It should be placed in special collection containers at the point of generation and kept separate from other waste. Labelled containers should be placed in areas where the specific waste is generated, along with containers for general garbage. Non-infectious and non-hazardous waste should be disposed of with regular garbage, recycled, or composted, as appropriate.

**Table 23.1.** Types of health care waste

Type of Waste	Definition	Examples
Sharps waste	Used or unused sharp items	Auto-disable syringes Broken glass Hypodermic, intravenous, or other needles Infusion sets Knives Pipettes Scalpels Syringes with attached needles
Infectious waste	Waste suspected to contain pathogens	Excreta Laboratory cultures Tissues (swabs), materials, or equipment that have been in contact with infected patients Waste contaminated with blood and other body fluids Waste from isolation wards
Pathological waste	Pathological waste	Body parts Fetuses Human tissues, organs or fluids
Pharmaceutical waste, including cytotoxic waste	Pharmaceuticals that are expired or no longer needed	Cytotoxic waste containing substances with genotoxic properties, e.g., waste containing cytostatic drugs (often used in cancer therapy) Genotoxic chemicals Items contaminated by or containing pharmaceuticals

Type of Waste	Definition	Examples
Chemical waste	Waste containing chemical substances	Broken thermometers and blood-pressure gauges Disinfectants that are expired or no longer needed Film developer Laboratory reagents Pressurised containers Solvents Waste with high content of heavy metals, e.g., batteries
Radioactive waste	Waste containing radioactive substances	Contaminated glassware, packages, or absorbent paper Sealed sources Unused liquids from radiotherapy departments or laboratory research Urine and excreta from patients treated or tested with unsealed radionuclides
Non-risk general waste	Waste that does not pose a biological, chemical, radioactive, or physical hazard	

Table 23.2. Examples of health-care waste from different sources

	Sharps	Infectious and pathological waste	Chemical, pharmaceutical and cytotoxic waste	General waste
<b>Hospitals:</b>				
Medical ward	Hypodermic needles, intravenous set needles; broken vials and ampoules	Dressings, bandages, gauze, and cotton contaminated with blood or body fluids; gloves and masks contaminated with blood or body fluids	Broken thermometers and blood pressure gauges; spilled medicines; spent disinfectants	Packaging, food scraps, paper, flowers, empty saline bottles, non-bloody diapers; non-bloody intravenous tubing and bags
Operating theatre	Needles, intravenous sets, scalpels, blades, saws	Blood and other body fluids; suction canisters; gowns, gloves, masks, gauze, and other waste contaminated with blood and body fluids; tissues, organs, fetuses, body parts	Spent disinfectants	Packaging, uncontaminated gowns, gloves, masks, hats and shoe covers
Laboratory	Needles; broken glass, Petri dishes, slides and cover slips; broken pipettes	Blood and body fluids; microbiological cultures and stocks; tissue; infected animal carcasses; tubes and containers contaminated with blood or body fluid	Fixatives; formalin; xylene, toluene, methanol, methylene chloride, and other solvents; broken lab thermometers	Packaging; paper, plastic containers

	Sharps	Infectious and pathological waste	Chemical, pharmaceutical and cytotoxic waste	General waste
Pharmacy			Expired drugs; spilled drugs	Packaging, paper, empty containers
Radiology			Silver; fixing and developing solutions; acetic acid; glutaraldehyde	Packaging, paper
Chemotherapy	Needles and syringes		Bulk chemotherapeutic waste; vials, gloves and other material contaminated with cytotoxic agents; contaminated excreta and urine	Packaging, paper
Environmental Services	Broken glass		Disinfectants (glutaraldehyde, phenols, etc.); cleaners, spilled mercury, pesticides	Packaging, flowers, newspapers, magazines, cardboard, plastic and glass containers, yard waste
Engineering			Cleaning solvents, oils, lubricants, thinners, asbestos, broken mercury devices, batteries	Packaging, construction or demolition waste, wood, metal

	Sharps	Infectious and pathological waste	Chemical, pharmaceutical and cytotoxic waste	General waste
Food services				Food scraps; plastic, metal and glass containers; packaging
Minor sources:				
Physicians' offices	Needles and syringes, broken ampoules and vials	Cotton, gauze, dressing, gloves, masks and other materials contaminated with blood or other body fluids	Broken thermometers and blood pressure gauges; expired drugs; spent disinfectants	Packaging, office paper, newspapers, magazines, uncontaminated gloves and masks
Dental offices	Needles and syringes, broken ampoules	Cotton, gauze, gloves, masks and other materials contaminated with blood	Dental amalgam; spent disinfectants	Packaging, office paper, newspapers, magazines, uncontaminated gloves and masks
Home health care	Lancets and insulin injection needles	Bandages and other material contaminated with blood or other body fluids	Broken thermometers	Domestic waste

**Table 23.3.** Specifications for Collection Containers

Type of Waste	Specifications for Container or Bag	Examples
Sharps	<ul style="list-style-type: none"> <li>• Container should be puncture-resistant, leak-proof on the sides and bottom, and durable.</li> <li>• Container should have the biohazard label.</li> <li>• Container should be closable for transport.</li> </ul>	<ul style="list-style-type: none"> <li>• Empty bleach bottle with a biohazard label.</li> <li>• Thick, rigid, puncture-resistant cardboard box with a biohazard label.</li> <li>• Rigid plastic container with a biohazard label.</li> </ul>
Non-sharps biomedical solid and semi-liquid waste	<ul style="list-style-type: none"> <li>• Plastic bag that is leak-proof; designed to prevent ripping, tearing, or bursting under normal use. The plastic bag should be placed inside a rigid container.</li> <li>• Rigid container should be leak-proof, durable, labeled with the biohazard symbol, and red or yellow in colour.</li> </ul>	<ul style="list-style-type: none"> <li>• Red or yellow plastic bags should be used.</li> <li>• When coloured bags are not available, plastic bag with the biohazard label can be placed in a red or yellow-painted garbage can or dust bin.</li> </ul>
Non-sharps biomedical liquid waste	<ul style="list-style-type: none"> <li>• Container should be leak-proof and durable.</li> <li>• Container should be marked with the biohazard label if it will be used to transport waste.</li> <li>• Container should be designed to be transported without spillage.</li> </ul>	<ul style="list-style-type: none"> <li>• Bottles, vials, plastic containers, canisters, pails marked with biohazard labels.</li> </ul>

## **In-House Transport**

Waste transporters should wear gloves. Any cart for transporting health care waste within a facility should be fully enclosed. Health care waste carts should be used only for that purpose and not for regular garbage. They should be cleaned and disinfected regularly.

## **Storage**

If storage of waste is necessary, the storage area (skip, shed, etc.) should meet the following parameters:

- Be protected from water, rain, or wind;
- Minimise the impact of odours, or putrescent waste (waste that can decompose and produce odours after several days). Do not store for more than 3 days; putrescent waste should be transported to the landfill immediately and buried in special trenches;
- Be accessible to authorised employees and lockable to prevent unauthorised access;
- Be protected from animals and not provide a breeding place or food source for insects and rodents; and
- Kept clean and free at all times of any loose debris and standing water. It should be disinfected weekly and whenever a spill occurs.

## **Treatment and Off-Site Transport**

A variety of methods are available to treat health care waste. A number of variables will dictate the treatment method, the primary one being economic resources. On-going research by organisations, such as the United Nations Global Environment Fund (GEF), World Health Organization, and PATH, has provided a number of treatment technology options.

The World Health Organization does not recommend use of campfire-style open-pit burning, burning in a cement firebox, burning in drums, or open-burn cement-block incinerators, which should be discontinued. These methods are inefficient at destroying pathogens and release high levels of toxic pollutants. Use the low-cost interim options shown in Table 23.4. Small in-house incinerators, the local crematorium, and newer large-scale medical waste incinerator need to meet strict air pollution control requirements and, where possible, should be replaced by cleaner, state-of-

the-art non-burn treatment technologies.

These treatment methods can be used in combination. Health care waste from outlying areas could be transported to a centralised facility. The waste should be contained in sealed plastic bags and/or sharps containers and placed in hard corrugated cardboard boxes or reusable plastic bins for transport every few days (sooner for putrescent waste) or whenever sufficient waste has accumulated. The containers should have biohazard labels or be colour coded, e.g., red or yellow or as dictated by local legislation.

Health centres may decide to bury blood-soaked material, small tissues, and placentas in small burial pits and transport sharps for disposal in special landfill trenches. This reduces the amount of waste being transported to the landfill and avoids the problem of storing putrescent waste for extended periods. Another approach is to use sharps disposal burial pits for needles, syringes, and items that may injure waste pickers and transporters; other waste such as blood-soaked material, can be picked up and disposed in special landfill trenches.

## **Management**

All health care facilities should have a person or group responsible for health care waste and waste management plans. Waste management should be incorporated into policies, procedures, and programmes to minimise the risk of spreading infection in and from the health care facility, thereby protecting patients, healthcare workers, and the public.

A number of resources are available for developing a waste management programme using a Rapid Assessment Tool available from the World Health Organization. This tool can provide an overview of the strengths and weaknesses of a waste management program and provide direction for further planning and implementation stages:

[http://www.who.int/entity/injection\\_safety/toolbox/en/Healthcarewastemanagementtool.xls](http://www.who.int/entity/injection_safety/toolbox/en/Healthcarewastemanagementtool.xls)

Various programs from the Safe Injection Global Network (SIGN) offer useful guidance especially "Procuring Single-use Injection Equipment and Safety Boxes". See web sites at the end of the chapter.

**Table 23.4.** Waste Treatment and Disposal Options

Type of Waste	Methods	Notes
All infectious wastes <i>except</i> cultures and anatomical parts	Packaging, transport, and treatment by incineration or non-burn technology. When no technology is available, burial in special landfill trenches	This method should be used by large facilities (e.g., hospitals).
	Small on-site burial pits	This method could be used in health centres away from coastal areas and local wells, in areas that do not flood, and where the water table is at least 1.5 metres deeper than the bottom of the pit.
Cultures	Small on-site autoclaves or pressure cookers.	Preferably in the laboratory.
Anatomical parts	Interment at burial grounds or cemeteries.	This is the basic method for body parts.
	Cremation.	Perhaps use a local crematorium.
Placenta waste and small-tissue waste	Small on-site burial pits or interment at burial grounds or cemeteries.	These are acceptable methods.
	Composting method.	This is an acceptable method.
Free-flowing blood and body fluids	Sanitary sewer. When sanitary sewers are not available, known infectious blood and body fluids should be decontaminated with the addition of disinfectant such as sodium hypochlorite.	This method applies to all health facilities with sanitary sewers.

## Training

A training programme should be used to present the elements of a plan and begin its implementation. Initial training could emphasize safe health care waste management practices and address issues related to the comprehensive, long-term plan. Practical training should be provided to all those involved in handling, packaging, transporting, and disposing of health care waste.

## Summary

Health care waste is an inevitable part of health care. Infection prevention and control staff must use their experience and understanding of the chain of infection when developing a practical approach to waste management. If one focuses on the true risks of health care waste, a safe and effective program can be achieved, even where resources are limited.

## References

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## Web Sites

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