Chapter 24

Healthcare Waste Management

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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[1]

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

Table 24.1. 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	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
Human waste	Urine, faeces, and vomitus that is normally not suspected to be infectious	Bedridden patients who use a bedpan, urine bottles, and kidney dish
Pathological waste	Pathological waste	Body parts Foetuses 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
Chemical waste	Waste containing chemical substances	Broken thermometers and blood-pressure gauges Disinfectants that are expired or no longer needed X-ray film fixer/ 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	

Definitions

HC 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 24.1.

Sources of Health Care Waste

Health care waste has many potential sources as outlined in Table 24.2.

Healthcare Waste Management components

Segregation and Collection

Waste must be segregated and collected in containers that reduce the risk of exposure to users and meet the minimum specifications outlined in Table 24.3. 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.

HC waste should be segregated from regular general waste or garbage at all facilities. It should be placed in special collection containers at the point of generation and kept separate from other non-hazardous 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.

In-House Transport

Waste transporters should wear personal protective equipment (PPE) such as rubber gloves. Any cart for transporting health care waste within a facility should be fully enclosed. HC 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;
- Kept clean and free at all times of any loose debris and standing water. It should be disinfected weekly and whenever a spill occurs; and
- Separated from clean items

Table 24.2. Examples of health-care waste from different sources

	Sharps	**Infectious and pathological waste**	**Chemical, pharmaceutical and cytotoxic waste**	**General waste**
Hospitals				
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 Filled Bedpans , urine-bottles, and kidney dishes	Broken thermometers and blood pressure gauges; spilt 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 or body fluids; tissues, organs, foetuses, 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 fluids	Fixatives; formalin; xylene, toluene, methanol, methylene chloride, and other solvents; broken lab thermometers	Packaging; paper, plastic containers
Pharmacy			Expired drugs; spilled drugs	Packaging, paper, empty containers
Radiology			Fixer and developer solutions; acetic acid	Packaging, paper
Chemotherapy	Needles and syringes	Bedpans and urine bottles from patients with chemotherapy	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
Food services				Food scraps; plastic, metal and glass containers; packaging

Table 24.2. Examples of health-care waste from different sources

	Sharps	**Infectious and pathological**	**Chemical, pharmaceutical and**	**General waste**
Minor sources				
Physicians' offices	Needles and syringes, broken ampoules and vials	Cotton, gauze, dressings, gloves, masks, and other materials contaminated with blood or 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	Broken thermometers	Domestic waste

Table 24.3. Specifications for Waste Collection Containers

Type of Waste	Specifications for Container or Bag	Examples
Sharps	Container should be puncture-resistant, leak-proof on the sides and bottom, and durable. Container should have the biohazard label. Container should be closable for transport.	Empty bleach bottle with a biohazard label. Thick, rigid, puncture-resistant cardboard box with a biohazard label. Rigid plastic container with a biohazard label.
Non-sharps biomedical solid and semi-liquid waste	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. Rigid container should be leak-proof, durable, labelled with the biohazard symbol, and red or yellow in colour.	Red or yellow plastic bags should be used. 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.
Non-sharps biomedical liquid waste	Container should be leak-proof and durable. Container should be marked with the biohazard label if it will be used to transport waste. Container should be designed to be transported without spillage.	Bottles, vials, plastic containers, canisters, or pails marked with biohazard labels.
Containers for human waste	Bedpans/urine-bottles and kidney dishes must be transported and disposed under the most sanitary and least offensive conditions.	Reusable bedpans must be cleaned and disinfected promptly after use.

Treatment and Off-Site Transport

A variety of methods are available to treat HC 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 Facility (UNGEF), World Health Organization, and PATH, has provided a number of treatment technology options. Health Care Without Harm (HCWH) has developed a web database on treatment technologies that was released in February 2015. The web site (link is at the end of this chapter) is the most current listing of treatment technologies for different types of healthcare waste for countries of all levels of economic capabilities.

The UNGEF web site presents the experiences of several countries over the past 5 years in establishing various types of programs in HC waste management. Countries that participated include Argentina, Latvia, Lebanon, Senegal, Tanzania, India, Vietnam, and the Philippines. Link to the web site is at the end of this chapter.

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; they should be discontinued. These methods are inefficient at destroying pathogens and release high levels of toxic pollutants (dioxins and furans). Use the low-cost interim options outlined in Table 24.4. Small high temperature 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. Treatment methods can be used in combination.

HC 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.

Table 24.4 Waste Treatment and Disposal Options

Type of Waste	Methods	Notes
All infectious wastes *except* cultures and anatomical parts	Packaging, transport, and treatment by incineration or non-burn technology. When no technology is available, burial in special land-	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.
	Small on-site autoclaves or pressure cookers.	Preferably within the laboratory.
Anatomical	Interment at burial grounds or cemeteries.	This is the basic method for body parts.
	Cremation.	? use a local crematorium.
Placenta waste and	Small on-site burial pits or interment at burial grounds or cemeteries.	These are acceptable methods.
small-tissue waste	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 emphasise safe HC 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 HC waste.

Healthcare Waste Management - Healthcare Facility Responsibilities

All HC facilities should have a person or group responsible for HC 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. The HC waste management programme should include, when possible, waste prevention and waste minimisation strategies, as well as periodic auditing of practices.

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 programme and provide direction for further planning and implementation stages. Go to:

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.

Sustainability is also being touted in HC around the globe. Hospitals willing to pursue this challenge can find more information at http://greenhospitals.net/en/

Summary

HC waste is an inevitable part of HC practices. 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 HC waste, a safe and effective programme can be achieved, even where resources are limited.

Reference

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Further Reading/Web Sites

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