



Hazards and Public Health Impacts of Hospital Waste

KEYWORDS

Health Hazards, Hazardous Waste, Hospital Waste, Biomedical Waste, Health Impact

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ABSTRACT

All individuals exposed to hazardous hospital waste are potentially at risk, including those within health-care establishments that generate hazardous waste, and those outside these sources who either handle such waste or are exposed to it as a consequence of careless management. Careless and indiscriminate disposal of this waste by healthcare establishments and research institutions can contribute to the spread of serious diseases such as hepatitis and HIV among those who handle it and also among the general public.

INTRODUCTION

Hospital waste includes a large component of general waste and a smaller proportion of hazardous waste. The hazardous nature of hospital health-care waste may be due to one or more of the following characteristics¹:

- It contains infectious agents
- It is genotoxic
- It contains toxic or hazardous chemicals or Pharmaceuticals
- It is radioactive
- It contains sharps

Quite apart from fear of health hazards, the general public is very sensitive about the visual impact of anatomical waste that is recognizable human body parts including fetuses².

The main groups at risk from hospital waste are the following

- medical doctors, nurses, health-care auxiliaries, and hospital maintenance personnel
- patients in health-care establishments or receiving home care
- visitors to health-care establishments
- workers in support services allied to health-care establishments, such as laundries, waste handling, and transportation
- Workers in waste disposal facilities including scavengers.

Hazards from infectious waste and sharps

Pathogens in infectious waste may enter the human body by a number of routes

- Through a puncture, abrasion, or cut in the skin
- Through the mucous membranes
- By inhalation
- By ingestion

There is particular concern about infection with human immunodeficiency virus and hepatitis viruses B and C, for which there is strong evidence of transmission via health-care waste. These viruses are generally transmitted through injuries from syringe needles contaminated by human blood³.

Sharps may not only cause cuts and punctures but also infect these wounds if they are contaminated with pathogens. Because of this double risk—of injury and disease transmission—sharps are considered as a very hazardous waste

class. Hypodermic needles constitute an important part of the sharps waste category and are particularly hazardous because they are often contaminated with patients' blood⁴.

Table (i) Infections caused by exposure to health care waste⁵

Type of infection	Examples of causative organisms	Transmission vehicles
Gastroenteric infections	Enterobacteria, e.g. Salmonella, Shigella; Vibrio Cholerae; helminthes	Faeces and or vomit.
Respiratory infections	Mycobacterium tuberculosis; measles virus; Streptococcus pneumoniae	Inhaled secretions; saliva
Ocular infection	Herpesvirus	Eye secretions
Genital infections	Neisseria gonorrhoeae; herpesvirus	Genital secretions
Skin infections	Streptococcus spp.	Pus
Anthrax	Bacillus anthracis	Skin secretions
Meningitis	Neisseria meningitides	Cerebrospinal fluid
Acquired immunodeficiency syndrome (AIDS)	Human immunodeficiency virus (HIV)	Blood, sexual secretions
Haemorrhagic fevers	Junin, Lassa, Ebola, and marburg viruses	All bloody products and secretions
Septicaemia	Staphylococcus spp.	Blood
Bacteraemia	Coagulase-negative Staphylococcus spp. Staphylococcus aureus; Enterobacter, Enterococcus	Blood
Candidaemia	Candidia albicans	Blood
Viral hepatitis A	Hepatitis A virus	Faeces
Viral hepatitis B and C	Hepatitis B and C viruses	Blood and body fluids.

Impacts of infectious waste and sharps

Pathogenic microorganisms have limited ability to survive in the environment. This ability is specific to each microorganism and is a function of its resistance to environmental conditions such as temperature, humidity, ultraviolet irradiation, availability of organic substrate material, presence of predators, etc.

The hepatitis B virus is very persistent in dry air and can survive for several weeks on a surface; it is also resistant to brief exposure to boiling water. It can survive exposure to some antiseptics and to 70% ethanol and remains viable for up to

10 hours at a temperature of 60 °C. The Japanese Association for Research on Medical Waste found that an infective dose of hepatitis B or C virus can survive for up to a week in a blood droplet trapped inside a hypodermic needle.

By contrast, HIV is much less resistant. It survives for no more than 15 minutes when exposed to 70% ethanol and only 3-7 days at ambient temperature. It is inactivated at 56°C. Results of a number of studies have shown that the concentration of indicator microorganisms in health-care waste is generally no higher than in domestic waste, and that survival rates are low.

For serious virus infections such as HIV and hepatitis B and C, health-care workers—particularly nurses—are at greatest risk of infection through injuries from contaminated sharps. Those engaged in waste picking and recycling handle and collect dangerous medical wastes, and in the process, suffer injuries and infections⁸.

Worldwide, according to World Health Organization study, 8 to 16 million hepatitis- B, 2.3 to 4.7 million Hepatitis-C and 80,000 to 160,000 HIV infections are estimated to occur from reuse of syringe needles without sterilization. A portion of these syringes comes from waste⁷.

Hazards from chemical and pharmaceuticals waste

Many of the chemicals and pharmaceuticals used in health-care establishments are hazardous. These substances are commonly present in small quantities in health-care waste. They may cause intoxication, either by acute or by chronic exposure, and injuries, including burns. Intoxication can result from absorption of a chemical or pharmaceutical through the skin or the mucous membranes, or from inhalation or ingestion.

Chemical residues discharged into the sewerage system may have adverse effects on the operation of biological sewage treatment plants or toxic effects on the natural ecosystems of receiving waters. Similar problems may be caused by pharmaceutical residues, which may include antibiotics and other drugs, heavy metals such as mercury, phenols, and derivatives, and disinfectants and antiseptics.

Hazards from genotoxic waste

The severity of the hazards for health-care workers responsible for the handling or disposal of genotoxic waste is governed by a combination of the substance toxicity itself and the extent and duration of exposure. Experimental studies have shown that many antineoplastic drugs are carcinogenic and mutagenic; secondary neoplasia is known to be associated with some forms of chemotherapy.

Many cytotoxic drugs are extremely irritant and have harmful local effects after direct contact with skin or eyes. They may also cause dizziness, nausea, headache, or dermatitis⁶.

Hazards from radioactive waste

The type of disease caused by radioactive waste is determined by the type and extent of exposure. It can range from headache, dizziness, and vomiting to much more serious problems. Because radioactive waste, like certain pharmaceutical waste, is genotoxic, it may also affect genetic material.

The hazards of low-activity waste may arise from contamination of external surfaces of containers or improper mode or duration of waste storage.

PUBLIC HEALTH IMPACT OF HEALTH-CARE WASTE

Impacts of chemical and pharmaceutical waste

While there is no scientifically documented incidence of widespread illnesses among the general public due to chemical or pharmaceutical waste from hospitals, many examples may be found of extensive intoxication caused by industrial chemi-

cal waste. Pharmacists, anaesthetists, and nursing, auxiliary, and maintenance personnel may be at risk of respiratory or dermal diseases caused by exposure to such substances as vapours, aerosols, and liquids. To minimize this type of occupational risk, less hazardous chemicals should be substituted whenever possible and protective equipment should be provided to all personnel likely to be exposed.

Impacts of genotoxic waste

To date there are few data on the long-term health impacts of genotoxic health-care waste. This is partly because of the difficulty of assessing human exposure to this type of compound. Numerous published studies have investigated the potential health hazard associated with the handling of antineoplastic drugs, manifested by increased urinary levels of mutagenic compounds in exposed workers and an increased risk of abortion.

A recent study has demonstrated that exposure of personnel cleaning hospital urinals exceeded that of nurses and pharmacists; these individuals were less aware of the danger and took fewer precautions.⁸

Impacts of radioactive waste

Several accidents resulting from improper disposal of nuclear therapeutic materials have been reported, with a large number of persons suffering from the results of exposure.

In Brazil, one case of carcinogenic impact on the general population linked to exposure to radioactive hospital waste has been analysed and fully documented. While moving, a radiotherapy institute left a sealed radiotherapy source in its old premises. An individual who gained access to these premises removed the source and took it home. As a consequence, 249 people were exposed, of whom several either died or suffered severe health problems⁹.

CONCLUSION

Very few data are available on the health impacts of exposure of health-care waste, particularly in the case of developing countries. Better assessment of both risks and effects of exposure would permit improvements in the management of health-care waste management and in the planning of adequate protective measures¹⁰.

Unfortunately, the classical application of epidemiology to the problem is difficult because of methodological complications and uncertainties regarding evaluation of both exposure and health outcome. The great diversity of hazardous wastes that can be involved and of circumstances of exposures is a particularly problematic feature of all such evaluations. It prevents not only the development of a unified analytical approach to the assessment of exposure and health outcome but also the generalization of any statistical inferences drawn about a specific waste-exposed population. Nevertheless, suspected cases of adverse health effects of health-care waste should be adequately documented, with precise descriptions of exposure, exposed individuals or populations, and outcome¹¹.

Within health-care establishments, the surveillance of infection and record-keeping are important tools that can provide indications of inadequate hygiene practices or of contamination of the immediate environment. Surveillance allows an outbreak of infection to be recognized and investigated and provides a basis for introducing control measures, for assessing the efficacy of those measures and of the routine preventive measures taken by the establishment, and for reducing the level of avoidable infection¹².

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