Safe Healthcare Waste Management: Chemical and Cytotoxic Waste

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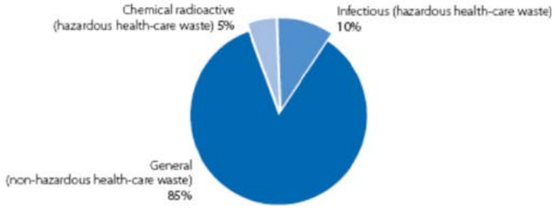
Health-care activities protect and restore health and save lives. But what about the waste and by-products they generate?

Of the total amount of waste generated by health-care activities, about 85% is general, non-hazardous waste comparable to domestic waste. The remaining 15% is considered hazardous material that may be infectious, chemical or radioactive.

Figure.1 Typical waste composition in health-care facilities



The waste produced in the course of health-care activities, from contaminated needles to radioactive isotopes, carries a greater potential for causing infection and injury than any other type of waste, and inadequate or inappropriate management is likely to have serious public health consequences and deleterious effects on the environment.

Chemical waste is waste containing chemical substances and consists of discarded solid, liquid and gaseous chemicals (e.g. laboratory reagents; film developer; disinfectants that are expired or no longer needed; solvents; waste with high content of heavy metals, e.g. batteries; broken thermometers and blood-pressure gauges). Chemical waste from health care is considered to be hazardous if it has at least one of the following properties:toxic; corrosive;flammable;reactive and oxidizing.

Chemical exposurehas health impacts on Lungs (cancer, asthma, irritation), eyes & mucous membranes (irritation, conjunctivitis, blurred vision), Skin (irritation, rashes & burns), Nervous system, Liver and kidneys, Reproductive system and Cancers.

The Safe management of chemical consists of wasteSegregation, Handling and collection, Storage, Transport, Treatment, Disposal. The WHO recommended segregation Scheme ispresented in table1.

Table1.WHO recommended segregation Scheme

Type of waste	Colour of container and markings[a]	Type of container
Highly infectious waste	Yellow, marked "HIGHLY INFECTIOUS", with biohazard symbol	Strong, leak-proof plastic bag, or container capable of being autoclaved
Other infectious waste, pathological and anatomical waste	Yellow with biohazard symbol	Leak-proof plastic bag or container
Sharps	Yellow, marked "SHARPS", with biohazard symbol	Puncture-proof container
Chemical and pharmaceutical waste	Brown, labelled with appropriate hazard symbol	Plastic bag or rigid container
Radioactive waste[b]	Labelled with radiation symbol	Lead box
General health-care waste	Black	Plastic bag

Handling and Collection

The chemical waste container label should have: name, address, telephone of the generator; Point of generation (if applicable); start date of accumulation of waste; estimated quantity; description of contents; waste classification; hazard symbols; precautionary statement; and emergency contact information.

When handling and transporting chemical waste:

Do	Don't
Use Personal Protective Equipment (PPE) when handling hazardous chemicals	Do not mix chemical waste and the incompatible wastes and store them separately
Use appropriate transferring methods (Bonding, grounding, and explosion proof devices for flammable waste)	
Designate wheeled trolleys, containers, or carts for chemical waste transport	
Designate easy to load and unload; easy to clean and Leak proof; and no sharp edges wheeled trolleys, containers, or carts for chemical waste transport.	
Store chemical waste in separate and enclosed area/ room/ building having good ventilation; easy access to safety shower and eyewash station	

Transport vehicles should meet basic requirement e.g., well maintained, bulkhead to separate driver from vehicle load, proper placards and markings including hazard symbol, spill kit, easy to decontaminate, etc.; Driver should be trained on laws, risks, safe handling methods, labeling, documentation and emergency procedures

Treatment of Chemical Waste

The chemical wastecould undergo a chemical and physical treatment (Neutralization; Detoxification; Chemical reduction or oxidation; Electrolytic oxidation; Hydrogenation, hydrolysis), a biological Treatment (biodegradation) and a thermal Treatment (High-temperature incineration with air pollution control).
The treatment of chemical waste in low-income countries could be done by encapsulation; Inertization with cement; Burial of encapsulated or inertized waste in engineered, controlled and secure landfills and could be returned to manufacturers.

Disposal of Chemical Waste

The disposal of chemical waste could be done in controlled dumping; engineered landfill and sanitary landfill; these disposal sites often lack proper facilities for hazardous waste. Health care facilities could work with other stakeholders and the local municipal authorities for safe disposal.

Do	Don't
Return some heavy metals, like silver in x-ray processing to supplier for reprocessing or disposal if possible	Burn or dispose in dumpsites chemical Wastes containing toxic metals
Store the waste safely in a medium-term storage site if no options currently exist.	Do not incinerate wastes including pressurized gas containers; large amounts of reactive chemical waste; silver salts or radiographic waste; Halogenated plastics (e.g. PVC); Mercury or cadmium and ampoules of heavy metals.

Cytotoxic waste: waste containing substances with genotoxic properties (i.e. highly hazardous substances that are mutagenic, teratogenic or carcinogenic), such as cytotoxic drugs used in cancer treatment and their metabolites.

Sources of cytotoxic wastes are contaminated materials from drug preparation and administration e.g. syringes, needles, gauzes, vials, packaging; outdated drugs, excess (leftover) solutions, drugs returned from wards and urine, faeces and vomit from patients.Some cytotoxic waste

may also carry a risk of infection, i.e. infectious cytotoxic waste.

Severity of hazards chemotherapy wastes depend on substance toxicity and duration of exposure. They are generally highly mutagenic, teratogenic and/or carcinogenic; extremely irritant with harmful local effects on skin and eyes and may cause dizziness, nausea, headache or dermatitis.

Do	Don't
Segregate cytotoxic waste carefully	Do not landfill or dispose cytotoxic wastes in dumpsites
store away cytotoxic waste from other health-care waste in a designated secure location and collect them separately	Do not discharge cytotoxic waste into the sewerage system
Do sorting of cytotoxic waste using proper PPE	Do not treat Chemotherapeutic waste, mercury, or other hazardous chemical waste and radiological waste in an autoclave.
Collect cytotoxic waste in strong leak-proof and clearly labelled containers "cytotoxic wastes"	
Use Chemical disinfection (the most suitable) for treating liquid waste (e.g. blood, urine, stools or hospital sewage) and solid Health care waste (even highly hazardous) with limitations.The encapsulation or inertization is the last resort. Neither incineration nor chemical degradation currently provide a completely satisfactory solution for treating waste items, spillages or biological fluids contaminated by cytotoxic agents.	
Exercise the utmost care in the use and handling of cytotoxic drugs.	
For chemotherapeutic Wastes Minimization segregate them through worker training and separate waste containers	
Purchase drug volumes based on need	
Return expired agents to manufacturer	
Develop spill containment and clean-up procedures that minimize waste clean-up volume	