Health Care Waste Management

at a glance

Health care waste management (HCWM) is a process to help ensure proper hospital hygiene and safety of health care workers and communities. It includes planning and procurement, construction, staff training and behavior, proper use of tools, machines and pharmaceuticals, proper disposal methods inside and outside the hospital, and evaluation. Its many dimensions require a broader focus than the traditional health specialist or engineering point of view.

Advantages of good HCWM

The need for proper HCWM has been gaining recognition slowly. It can:

- help control nosocomial diseases (hospital acquired infections), complementing the protective effect of proper hand washing;
- reduce community exposure to multi-drug resistant bacteria;
- dramatically reduce HIV/AIDS, sepsis, and Hepatitis transmission from dirty needles and other improperly cleaned/disposed medical items;
- control zoonoses (diseases passed to humans through insects, birds, rats and other animals);
- cut cycles of infection;
- easily and cost-effectively address health care worker safety issues, including reducing risk of needle sticks;
- prevent illegal repackaging and resale of contaminated needles;
- avoid negative long-term health effects; eg, cancer, from the environmental release of toxic substances such as dioxin, mercury and others.

HCW can be subdivided into various categories (Table 1). Segregation of different waste categories is critically important to enable proper disposal. Approximately 80% of all HCW can be disposed of through regular municipal waste methods. The other 20% can create serious health threats to health workers and communities if not disposed of properly. Disposal methods vary according to type of waste, local environment, available technology, costs and financing, and social acceptance

Table 1: WHO categories of health care waste

Waste category	Description and examples
infectious waste	waste suspected to contain pathogens, eg laboratory cultures, waste from isolation wards, tissues (swabs), materials or equipment that have been in contact with infected patients, excreta
pathological waste	human tissues or fluids, eg body parts, blood and other body fluids, fetuses
sharps	sharp waste, eg needles, infusion sets, scalpels, knives, blades, broken glass
pharmaceutical waste	waste containing pharmaceuticals, eg pharmaceuticals that are expired or no longer needed, items contaminated by or containing pharmaceuticals (bottles, boxes)
genotoxic waste	waste containing substances that are capable of causing damage to DNA, eg waste containing cytostatic drugs (often used in cancer therapy), genotoxic chemicals
chemical waste	waste containing chemical substances, eg laboratory reagents, film developer, disinfectants that are expired or no longer needed, solvents
wastes with high content of heavy metals	Batteries, broken thermometers, blood-pressure gauges, etc.
pressurized containers	gas cylinders, gas cartridges, aerosol cans
radioactive waste	waste containing radioactive substances, eg unused liquids from radiotherapy or laboratory research, contaminated glassware, packages or absorbent paper, urine and excreta from patients treated or tested with unsealed radionuclides, sealed sources

(due to religion, customs, etc). Each facility or health authority must assess local conditions and decide on appropriate HCW solutions; there is no single best method or method mix. Table 2 summarizes currently available disposal methods and some of their advantages and disadvantages.

HCW handling and disposal

The stages in HCWM are: production of waste within a hospital ward, segregation of waste, ward storage, onsite transportation and treatment (if any), onsite central storage, offsite transportation, treatment, and final disposal. Dealing with such a comprehensive subject which impacts the construction and functionality of health facilities, can be daunting. Several agencies (WHO, the World Bank) and NGOs (Health Care Without Harm) have developed useful guidelines on the topic (see resource list on p4).

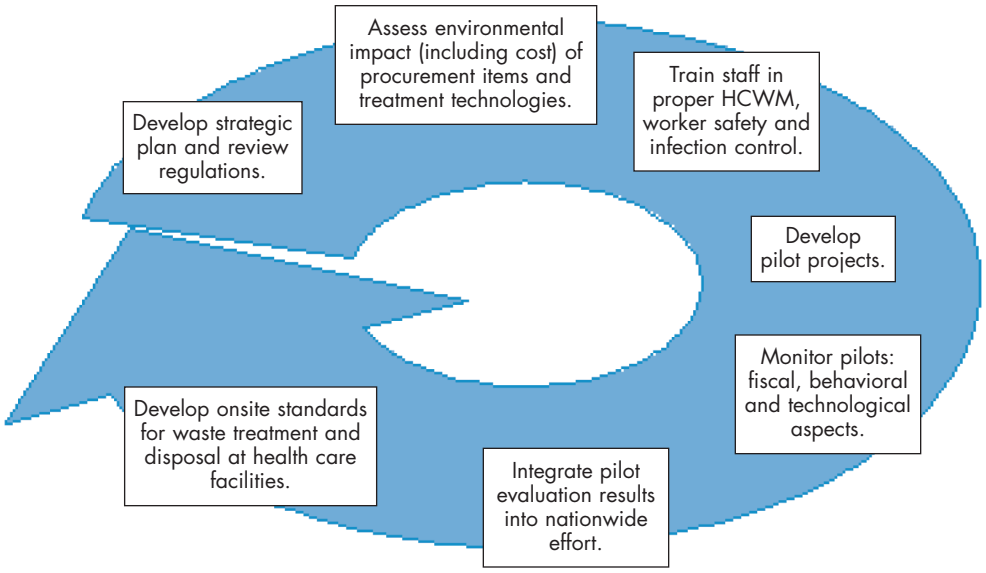
HCWM is most effective when proper methods are employed at each step, from planning and procurement through disposal. The first step should be determining realistic options for HCWM given the budget, technology, and local community preferences. Different aspects of health care waste must be considered when choosing the appropriate treatment technology (such as volume, temperature, whether the waste is liquid or solid, hazardous or infectious).

Once procurement is initiated, staff must be trained to work within a system of accountability, from correctly segregating waste and labelling every bag/container, to proper storage at each point of the cycle and safe transportation and disposal of HCW. Most importantly, management staff must be trained to monitor activities at each point in the cycle and maintain standards.

Table 2: Factors influencing the effectiveness of treatment technologies

Type of treatment & disposal method	Factors that influence effectiveness	Concerns
burial, encapsulation (simple, inexpensive)	– depth of groundwater – depth, size of trench/pit – lining of burial pit (non-porous) – sealing method/material	– no disinfection – can handle small volumes only – potential of being unburied (if pit is only soil covered, or waste not encapsulated) – presents a danger to community if not properly buried
incineration (disinfects and greatly reduces volume, produces secondary waste streams)	– turbulence/mixing – waste moisture content – combustion chamber filling – temperature/residence time – maintenance/repair	– may produce emissions and hazardous ash containing dioxins, metals and furans depending on the type of waste burned – may require pollution control equipment to meet local environmental regulations – public acceptance of incineration tends to be low – expensive to build, operate and maintain
steam autoclave (disinfects only, little reduction of volume unless used with shredder, produces secondary waste stream)	– temperature and pressure – steam penetration – waste load size – treatment cycle length – chamber air removal – model (many available)	– mostly for reusable materials & instruments, and to sterilize disposable sharps before disposal. – can only treat some types of HCW – some models cannot handle high volumes – requires electricity and water – some models have high capital, maintenance and operation costs
microwave (disinfects, some reduction of volume, produces secondary waste stream)	– waste characteristics – waste moisture content – microwave source strength – microwave exposure duration – waste mixture extent	– expensive, needs good infrastructure – requires training and oversight for medium to high effectiveness – effectiveness very dependent on type of technology used
chemical/mechanical treatment (disinfects, no volume reduction, volume can increase, produces secondary waste streams)	– chemical concentration, temperature & pH levels – chemical contact time – waste/chemical mixing – recirculation or flowthrough option	– can increase the volume of waste – worker safety issues prominent – personnel intensive – may not adequately disinfect AD syringes, disinfection process needs to be verified

Health care waste management project cycle



HCW worker safety and procurement issues

To ensure worker safety, it is normally necessary to procure plastic bags, trash bins, 'sharps' containers, and sometimes even special trucks. It is sometimes advisable to ensure access to disposable gloves and other protective equipment for staff (eg boots, aprons, thick rubber gloves), needles and syringes, laboratory equipment, cleansing agents, and tubes/hoses/other items associated with diagnostic and intensive care machines. Disposable items increase the amount of HCW each hospital or health care facility produces, and have cost implications.

It is wise to ensure proper hygienic methods for cleaning reusable items within a health facility, such as linens, laundry, reusable tools (surgical etc), and foodstuffs. **Availability and costs of associated utility systems** such as sewerage, hot and/or cold water, electricity, sources of heating, etc, must be considered. Sometimes new equipment is procured without considering available utilities, recurrent costs and repairs, and then stands unused because it is not connected to the municipal system (eg sewerage) or because recurrent costs are too great.

Training all health care workers in techniques associated with newly procured items and medical equipment **is crucial** to proper HCWM. All workers in the facility need some training on the importance of proper HCWM, and their roles and responsibilities. Information about cleaning techniques and protocols should be prominently displayed. Appropriate vaccinations and barrier mechanisms such as gloves and masks should be made available to all staff coming in contact with HCW, including cleaning staff and engineers.

Who is responsible for HCWM?

Normally nurses and cleaning staff, inspectors, engineers, and drivers are responsible for day to day HCWM. Budgetary, procurement, regulatory, and training aspects are overseen by facility management/administration. Hospitals could hold department heads responsible for proper management and disposal of waste generated in their departments. HCWM should have high priority, and involve the highest authorities at each facility. In general, rural and urban areas differ greatly, even within regions or countries, so it is important to check the management aspects in both areas.

Proper HCWM extends beyond the hospital to the disposal site. Traditionally, there has been a disconnect of accountability between what occurs on the premises of a health care facility and what occurs after HCW leaves the facility. More and more, this is no longer the case as NGOs and local communities have been very active in organizing against facilities that do not monitor the results of waste disposal

offsite. Project managers are well advised to follow the route of HCW until its ultimate disposal and inquire after the secondary waste streams that might be created.

Do's and Don'ts

DO ensure that a good system is in place for segregating different types of waste and that each type is disposed of in an appropriate and safe way.

DO train all levels of health care staff (administrators, doctors, nurses, cleaning staff, lab. technicians and engineers) to help ensure that the materials and methods chosen are used correctly and consistently.

DO vaccinate all workers who come into contact with HCW against hepatitis B virus.

DO monitor costs throughout project implementation in order to determine whether projections are correct and to provide data for better future cost estimates.

DO make reasonable adjustments to the project when monitoring progress and costs.

DO be realistic. Many countries want the very best and latest technology but don't have the necessary resources for sustained use. Proper HCWM can be viewed as a step-wise process, with gains made every few years. The most important goal is to ensure the health and safety of health care workers and the local community. WHO is an excellent resource for the various options available (see Key References).

DON'T forget to engage hospital staff in HCWM decisions. Normally, as a HCWM project progresses, staff will begin offering serious and substantive advice and ideas for improvement within local constraints.

DO consider and consult with the local community. **Project acceptability within the local community is key** and project managers need to get early advice and understand socio-economic factors and local concerns. Communities can become surprisingly emotional about HCWM, especially if it touches on cultural biases regarding various types of waste. It is important to address these issues seriously and resolve any concerns quickly: a project that might be viewed as a success internally could be viewed negatively by the community.

Key References

World Health Organization
www.healthcarewaste.org *Includes a database on different types of treatment technologies and links to WHO documents on HCWM.*

www.noharm.org Healthcare Without Harm
This focuses on treatment technologies other than incineration. It is a very good source for all stages of HCWM.

www.pqmd.org The Partnership for Quality Medical Donations *Focuses on chemical and pharmaceutical waste after drug donations. A new drug donation strategy aims to reduce waste and increase information flow.*

http://melissa.org/cwg/ *Home page of the Collaborative Working Group (CWG) for the promotion of Solid Waste Management (SWM) in lower- and middle-income countries. Scroll down to recent SWM publications, see especially No. 5, a technical guide to planning, design and operation of solid waste landfills in middle- and lower-income countries, and No. 4, a summary Decision-Makers' Guide to Solid Waste Landfills.*

www.worldbank.org/hnp The World Bank HNP group *Click on "Tools and Guidelines" to find The Health Care Waste Management Guidance Note.*

www.worldbank.org/phataglance Safe Injection at a glance

www.injectionsafety.org Safe injection global network (SIGN)

Key Contacts

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Expanded versions of the "at a glance" series, with e-linkages to resources and more information, are available on the World Bank Health-Nutrition-Population web site: www.worldbank.org/hnp