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Waste minimization, recycling, and reuse

6.1 Waste minimization

Significant reduction of the waste generated in health-care establishments and research facilities may be encouraged by the implementation of certain policies and practices, including the following:

- **Source reduction:** measures such as purchasing restrictions to ensure the selection of methods or supplies that are less wasteful or generate less hazardous waste.
- **Recyclable products:** use of materials that may be recycled, either on-site or off-site.
- **Good management and control practices:** apply particularly to the purchase and use of chemicals and pharmaceuticals.
- **Waste segregation:** careful segregation (separation) of waste matter into different categories (see section 7.1) helps to minimize the quantities of hazardous waste.

A number of examples of policies and practices that tend to minimize quantities of waste are summarized in Box 6.1.

Careful management of stores will prevent the accumulation of large quantities of outdated chemicals or pharmaceuticals and limit the waste to the packaging (boxes, bottles, etc.) plus residues of the products remaining in the containers. These small amounts of chemical or pharmaceutical waste can be disposed of easily and relatively cheaply, whereas disposing of larger amounts requires costly and specialized treatment, which underlines the importance of waste minimization.

Waste minimization usually benefits the waste producer: costs for both the purchase of goods and for waste treatment and disposal are reduced and the liabilities associated with the disposal of hazardous waste are lessened.

All health-service employees have a role to play in this process and should therefore be trained in waste minimization and the management of hazardous materials. This is particularly important for the staff of departments that generate large quantities of hazardous waste.

Suppliers of chemicals and pharmaceuticals can also become responsible partners in waste minimization programmes. The health service can encourage this by ordering only from suppliers who provide rapid delivery of small orders, who accept the return of unopened stock, and who offer off-site waste management facilities for hazardous wastes.

Reducing the toxicity of waste is also beneficial, by reducing the problems associated with its treatment or disposal. For example, the Supply Officer could investigate the possibilities of purchasing PVC-free

Box 6.1 Examples of policies and practices that encourage waste minimization

Source reduction

- Purchasing reductions: selection of supplies that are less wasteful or less hazardous.
- Use of physical rather than chemical cleaning methods (e.g. steam disinfection instead of chemical disinfection).
- Prevention of wastage of products, e.g. in nursing and cleaning activities.

Management and control measures at hospital level

- Centralized purchasing of hazardous chemicals.
- Monitoring of chemical flows within the health facility from receipt as raw materials to disposal as hazardous wastes.

Stock management of chemical and pharmaceutical products

- Frequent ordering of relatively small quantities rather than large amounts at one time (applicable in particular to unstable products).
- Use of the oldest batch of a product first.
- Use of *all* the contents of each container.
- Checking of the expiry date of all products at the time of delivery.

plastics that may be recycled or of goods supplied without unnecessary packaging.

6.2 Safe reuse and recycling

Medical and other equipment used in a health-care establishment may be reused provided that it is designed for the purpose and will withstand the sterilization process. Reusable items may include certain sharps, such as scalpels and hypodermic needles, syringes, glass bottles and containers, etc. After use, these should be collected separately from non-reusable items, carefully washed (particularly in the case of hypodermic needles, in which infectious droplets could be trapped), and may then be sterilized by one of the processes listed in Box 6.2. Although reuse of hypodermic needles is not recommended, it may be necessary in establishments that cannot afford disposable syringes and needles. Plastic syringes and catheters should not be thermally or chemically sterilized; they should be discarded.

Long-term radionuclides conditioned as pins, needles, or seeds and used for radiotherapy may be reused after sterilization.

Special measures must be applied in the case of potential or proven contamination with the causative agents of transmissible spongiform encephalopathies (also known as prion diseases). These measures, which

Box 6.2 Examples of sterilization methods for reusable items

Thermal sterilization

- *Dry sterilization*
Exposure to 160 °C for 120 minutes or 170 °C for 60 minutes in a “Poupinel” oven.
- *Wet sterilization*
Exposure to saturated steam at 121 °C for 30 minutes in an autoclave.

Chemical sterilization

- *Ethylene oxide*
Exposure to an atmosphere saturated with ethylene oxide for 3–8 hours, at 50–60 °C, in a reactor tank; the so-called “gas-sterilizer” tank should be dry before injection of the ethylene oxide. Ethylene oxide is a very hazardous chemical; this process should therefore be undertaken only by highly trained and adequately protected technical personnel (see section 8.2 for protective measures).
- *Glutaraldehyde*
Exposure to a glutaraldehyde solution for 30 minutes. This process is safer for the operators than the use of ethylene oxide but is microbiologically less efficient.

are capable of reducing or eliminating infectivity, are described in detail in a WHO document.¹

The effectiveness of thermal sterilization may be checked, for example, by the *Bacillus stearothermophilus* test and of chemical sterilization by the *Bacillus subtilis* test (see Box 8.13, page 102, for description).

Certain types of container may be reused provided that they are carefully washed and disinfected. Containers of pressurized gas, however, should generally be sent to specialized centres to be refilled. Containers that once held detergent or other liquids may be reused as containers for sharps waste (if purpose-made containers are not affordable) provided that they are puncture-proof and correctly and clearly marked on all sides.

Recycling is usually not practised by health-care facilities, apart, perhaps, from the recovery of silver from fixing-baths used in processing X-ray films. However, recycling of materials such as metals, paper, glass, and plastics can result in savings for the health-care facility—either through reduced disposal costs or through payments made by the recycling company.

In temperate climates, the heat generated by on-site incinerators may be an attractive and cost-effective option for heating hospital premises.

In determining the economic viability of recycling, it is important to take account of the costs of alternative disposal methods and not just the cost of the recycling process and the value of the reclaimed material.

¹ *Report of a WHO consultation on public health issues related to animal and human encephalopathies*. Geneva, World Health Organization, 1992 (unpublished document WHO/CDS/VPH/92.104, available on request from Department of Communicable Disease Surveillance and Response, World Health Organization, 1211 Geneva 27, Switzerland). This document was undergoing revision at the time of publication of this handbook.