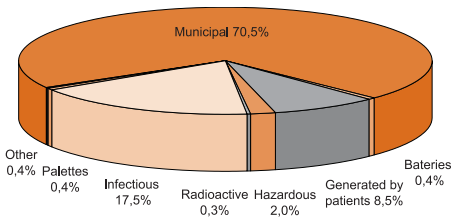
Waste reduction in health-care services

Different types of hospital waste

Healthcare establishments produce a range of various wastes, which according to the European regulations belong to five basic groups: municipal, medical, infectious medical, hazardous, and low level radioactive waste. In order for these wastes not to pose a threat to human health and the environment, they have to be properly identified, segregated and disposed of. Unfortunately, due to imperfect procedures, the wastes from the different groups get mixed together. As a result, they become hazardous wastes, which require costly methods of treatment, that result in adverse environmental impacts.

In reality, most wastes produced by the healthcare sector are simply non-hazardous municipal wastes, which can be recovered and recycled. With proper segregation in place, the amount of infectious medical wastes, hazardous wastes and radioactive wastes can be reduced to 2-25%, depending on the type of establishment and the scope of services it provides.

Graph 1. Typical breakdown of the overall health-care waste stream in Europe.[1]



Working Group on wastes

In every medical establishment, a Working Group should be formed to develop, put into practice, monitor and enhance a waste reduction program. For the program to be generally accepted within the facility, its implementation requires the knowledge and co-operation of experts from all departments within the organisation. Thus the choice and number of people involved in the Working Group will depend on the size of the establishment. It is necessary, however, that the Working Group is made up of representatives of all occupational groups. A person who is permanently involved in waste management issues within the establishment should head the Working Group.

Waste reduction program

The goal of waste minimisation is to reduce, to the greatest extent possible, the waste that is destined for ultimate disposal by means of reuse, recycling and other programs. The potential benefits of waste minimisation are: environmental protection, enhanced occupational safety and health, cost reductions, reduced liability, regulatory compliance, and improved community relations.

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The Working Group will be responsible for carrying out an analysis of the current status of waste management (an audit) within the establishment, and - based on that analysis - for setting out clear short- and long-term goals. The study should include:

- An analysis of documents: register of purchased medical products and medicines from the point of view of wastes produced, waste register, and financial documentation;
- Identification of the types, composition, basic characteristics and amounts of wastes generated in the medical establishment;
- Comparison of the data obtained with information from other, similar medical establishments - e.g. the amount of wastes generated per patient/per bed/per day (waste generation factors);
- Development of recommendations on reasonable supply management - the purchase of products, medicines and food with a view to reducing the amount and toxicity of the waste produced;
- Development of procedures for the classification, segregation and management of wastes from each individual source;
- Launching of a program for separate collection of individual groups and types of wastes, with an indication of potential customers for wastes and raw materials;
- Setting of technical parameters for facilities and premises connected with waste management;
- Estimation of costs and savings ensuing from the launching of a waste reduction program;
- Development of information materials on the principles of waste segregation and management for personnel and patients, including in emergency situations - e.g. in the case of surface contamination with wastes;
- Training for personnel, with account taken of any special characteristics of their work places.

If existing waste management practices need to undergo considerable changes, they should be introduced gradually, e.g. by verification of procedures in one selected ward. If they prove efficient, they should be applied in other wards.

Environmentally preferable purchasing

Environmentally preferable purchasing (EPP) is the act of purchasing products/services whose environmental impacts have been considered and found to be less damaging to the environment and human health when compared to competing products/services. This concerns, first, those products that may contain mercury, chlorine compounds, bromine, cadmium, lead and carbon based substances that disrupt body functions, e.g. phthalates.

EPP also includes the gradual and ongoing process by which a hospital continually refines and expands the scope of its efforts to select healthy, safe and environmentally sound products and services. A hospital's choice to implement EPP is an important part of a larger system of practices that support the integrity of both business and environmental decisions.

Introduction of EPP procedures is key to reducing the amount and toxicity of waste. Source reduction should have a higher priority than recycling or reuse. It should be remembered that all purchased products will eventually become burdensome and costly wastes.

One of the simplest, but very efficient criteria is that of product weight. This is applicable to all products purchased by the establishment. Comparing the weight of the same product and its packaging from various suppliers, the product with the lowest weight is selected.

Product	Weight	Packaging weight
Syringe 10 ml	7,1	1,3
Syringe 10 ml	6,5	1,4

Another criteria, applying primarily to packaging and products that do not have direct contact with pathogens, is the potential for their recovery, reuse and/or recycling.

If possible from a hygienic and sanitary point of view, disposable products should be eliminated. Even though reusable products

require cleaning, and thus the consumption of energy, water and disinfectants, as a rule the total spending on their purchase and application is lower than in the case of single-use products. Analyses carried out in hospitals have shown that the following disposable products can be substituted without reducing the quality of services, and to the benefit of both the environment and hospital finances:

- Single-use mugs for drug administration,
- Bottles for feeding infants,
- Tongue depressors,
- Colostomy pouches,
- Oxygen masks,
- Intubation tubes,
- Redon bottles,
- Paper towels,
- Linen bags.

Proper waste classification and segregation

The aim of segregation is to separate wastes depending on the level of threat they pose, and - in the case of municipal wastes - according to the type of material they are made of. Classification and segregation procedures should be specific enough to ensure that:

- Infectious and other hazardous wastes do not get mixed with municipal waste;
- Only those wastes that were in direct contact with people suffering an infectious diseases and those contaminated with pathogenic micro-organisms sufficient to transmit infection are counted as infectious;
- Non-infectious hazardous wastes are separated according to substances contained therein;
- Any wastes that do not pose an epidemiological or chemical threat are counted as municipal wastes. This primarily concerns those products which are predominant in the waste stream:

Waste type	EWC Code
Ampoules from non hazardous pharmaceutics	15 01 07
Biowaste from non infectious patients	20 01 08
Blister and sterile packaging	15 01 05
Infusion fluid bottles and bags	15 01 02
Nappies from non infectious patients	18 01 04
Non-contaminated lignin, i.e. from ultra sound examination	18 01 04
Non-contaminated gloves	18 01 04
Packaging from non hazardous pharmaceuticals: glass paper plastic	 15 01 07 15 01 01 15 01 02
Paper towels	18 01 04

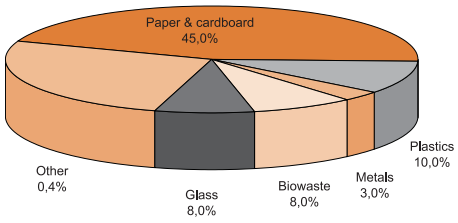
- Non-contaminated materials that can undergo recovery or recycling are segregated separately: wood, metals, paper, glass, plastics;
- The hazardous waste segregation system must be adapted to the waste treatment technology applied. It is not possible to dispose of cytostatics, chemicals, batteries, mercury-containing wastes etc., in a single technology, hence such wastes have to be collected and managed separately.

Containers for separate collection of wastes should be located where the waste is generated, in locations that do not stand in the way of personnel's everyday duties and in the places where a lot of waste is generated.
To avoid accidental mixing of wastes, containers for infectious waste should not be placed next to those intended for secondary raw materials, municipal and hazardous waste.

Above the containers, detailed information should be posted on the adopted principles of waste segregation. On the containers and the bags inside should be information on the waste type and place of origin in order to facilitate the gathering of statistics and monitoring of proper waste separation.

Recycling

Graph 2. Typical breakdown of the municipal solid waste stream.[2]



More than half of all wastes generated in health-care establishments is simply various kinds of packaging.
Most of this waste does not have any direct contact with infectious agents or hazardous substances. Thus, it can be subject to recovery and recycling and should not be mixed with infectious or hazardous wastes.

Empty packaging can be used to collect other wastes, reducing both the costs involved in the purchase of waste containers and the amount of wastes generated:

- Sharps, needles and syringes can be collected in containers made of hard plastics, such as disinfectant containers;
- Cardboard packaging will be useful for the collection of waste paper and newspapers.

Through the use of EPP procedures, one should strive for a maximum reduction of multi-layer (multi-material) packaging, which in the graph above constitutes the main stream of non-recyclable wastes.

Waste treatment and neutralisation

Before going to the disposal site, infectious wastes must undergo such treatment processes as: autoclaving, thermal disinfection, microwave sanitation or incineration.
Hospital personnel should strive to eliminate, or at least restrict to the maximum possible extent, the amount of wastes undergoing incineration.
This is because gaseous and solid residues from the incineration process release highly toxic, persistent and accumulative substances into the environment, including dioxins, furans, and heavy metals. The more chlorine-containing products (such as PVC or vinyl plastic, disinfectants, bleached dressing materials etc.), mercury and chemical agents there are in infectious wastes, the more toxic by-products and emissions will be released by incineration.
Incineration is also the most costly method of waste treatment, taking into account both investment outlay and day-to-day operating costs.
No technology offers a panacea to the problem of medical waste disposal. In general, however, non-incineration technologies appear to emit fewer pollutants. Most non-incineration technologies generate solid residues that are not hazardous.

Verification of the program

Any program of waste reduction should be subject to periodic verifications through:

- Checking the efficiency of EPP procedures;
- A review of products available on the market;
- Carrying out a survey among employees, verifying whether the procedures introduced are understandable when applied and do not hamper the discharge of other obligations;
- Checking the contents of containers for individual groups and types of wastes from the point of view their proper separation.

Use of Microwave Technology for Minimising Hazardous Medical Waste, Empress Elisabeth Hospital, Austria[3]

A team comprising of hygiene technicians, the director of hospital maintenance and the director of hospital management agreed in 1999, after analysing waste disposal statistics, to obtain information about alternative methods of medical waste treatment. In the course of their investigation, thermal disinfection devices from the company Meteka were inspected. As a consequence two items were purchased at the end of 1999 and these have been in use since the beginning of 2000 (operated by the hospital disinfection technician).

Since 2001, most medical waste (excluding, in particular, cytostatic, explosive substances, or body parts) has been collected in so-called "blue bins" and subsequently thermally disinfected at the hospital. This process, which lasts just under one hour, causes the waste to lose, on average, one third of its volume. It is no longer infectious and can, therefore, be disposed of as category II waste (= ward waste, orange bag).

Thermal disinfection has reduced category I waste to less than one-fifth of its previous quantity (from 34,000 kg to 4-6,000 kg). Since disposal costs have also been reduced to about a third or a quarter of their previous rate since the beginning of the reorganisation, the two HF thermal disinfection devices will be amortised within four to five years.

Bethesta Hospital in Essen, Germany[4]

Since the 1980s, a number of analyses and projects were carried out in German health care facilities, with a goal of optimising product procurement policies, material flows and waste reduction at the source.

One of the pioneers of those actions was the Bethesta Hospital in Essen (400 beds), which since 1986 has been included in the "Health Promoting Hospitals" environmental protection programme carried out under the auspices of the World Health Organisation. Over a 6 year period, the amount of infectious wastes generated by the hospital was reduced by 15 times, while the total amount of wastes generated dropped by 50%. In 1994, the hospital generated about 640 tons of wastes/year (4.3 kg/bed/day). The amount of infectious wastes was about 2% and annual savings amounted to approximately €510,000. Moreover, the uses of disinfectants and disposable products, especially PVC plastic, have been reduced. The number of hospital infections and the use of antibiotics has also been lowered.

University Hospital Freiburg, Germany[5]

The University Hospital in Freiburg has one of the most advanced and comprehensive environmental protection programmes in the health care field.

A multilevel research and introduction of waste minimisation measures have brought total annual savings of around €321,000. The savings were achieved through the phase-out of single-use products such as paper towels, dishes, babies bottles, plastic shoe protectors, special containers for sharps, and superfluous packaging. Larger, returnable containers have replaced small packaging for disinfectants and dialysis concentrate. Decontamination and reuse programme covers i.e. 100 ml syringes for intestinal nourishment, and angiographic catheters.

Municipal solid waste recovery and recycling increased by 740 tonnes per year, while the amount of infectious waste dropped by 3.2 tonnes. Phase-out and reuse programmes reduced waste by over 577 tonnes.

Waste Reduction in the Polish Health Service Sector[6]

Since 1999, the Waste Prevention Association (WPA) "3R", in co-operation with the international network Health Care Without Harm, has been

running a long-term project to reduce the amount and toxicity of wastes generated in the health care sector. Within the framework of the project, Waste Prevention Association "3R" provided two cycles of trainings in seven regions. Participants of these trainings included 210 larger hospitals, 18 Sanitary and Epidemiological Inspections and seven other institutions.

As a result, over 57 hospitals have introduced new and advanced waste management programmes. Fourteen hospitals that sent detailed information in the first year of the programme reduced infectious waste by 119.5 tonnes, achieving an annual saving of disposal costs of around €86,861. Eighteen hospitals have started a programme for mercury thermometer elimination and 19 introduced environmentally preferably purchasing criteria.

The savings of €86,861 reported by the 14 hospitals are nearly twice the total costs of training (€46,000).

WPA also developed two waste reduction programmes in the County Hospital in Wolomin (330 beds), and the Hospital of the Brothers of St. in Krakow (135 beds). The main focus of these programmes has been the improvement of waste classification and separate collection of secondary raw materials. There has been an annual increase of recovery and recycling of municipal waste in the County Hospital of 30 tonnes, and 1 tonne in Krakow. The infectious waste stream was cut by 16 tonnes in Wolomin, and over 11 tonnes in Krakow. Both hospitals achieved substantial savings on disposal costs: €11,400 and €7,892 respectively. Further development of these two programmes shall continue to improve current results.

University College London Hospitals NHS Trust (University College Hospital And The Middlesex Hospital), UK[7]

A reduction in clinical waste disposal costs of Ł40,000 a year has been achieved after the volume of clinical waste was cut from 60 tonnes a month to 45, within three months.
Results were achieved through training staff in the correct use of clinical waste bags and shifting attitudes toward waste management. Staff were shown videos, articles were placed in the Trust newsletter and posters were placed next to clinical waste bins.

Efficient waste segregation has made it possible to target other waste streams for action.
All cardboard is baled, with between 40 and 60 bales taken for recycling each week.
This reduces the amount of waste taken at landfill but the Trust does have to pay for the cardboard to be removed.

There are also smaller-scale recycling programmes for cans, fluorescent tubes, paper and glass, and the Trust also pays for these items to be collected.

Discarded pallets are sold to a contractor who removes them from site.

Sources:

[1] Based on analysis carried by the Waste Prevention Association, Bethesta Hospital, University Hospital Freiburg, and Ecodas.
[2] Ibid.
[3] XCHANGE - Project Database: http://www.greeninghealthcare.net
[4] Suder S. "Klasyfikacja, zbieranie i utylizacja odpadów szpitalnych na przykładzie doświadczeń niemieckich" IV Międzynarodowa Konferencja: Unieszkodliwianie i Utylizacja Odpadów Medycznych, ABRYS, 17-18 kwietnia, Poznań, 1997.
[5] Qualitätsmaßige Untersuchung der Kanülenentsorgung und die Brauchbarkeit vom gebrauchten Kanistern als "sharps" Behälter, UKL Freiburg, M. Kowalska, 2001.
[6] Waste Prevention Association "3R", 2004.
[7] Health Care Waste Minimisation - A Compendium of Good Practice, NHS Estates, 2000.

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You can find more information about the issue of medical waste at Health Care Without Harm website (http://www.noharm.org/medicalWaste/issue).

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