11. The key for waste management – Waste segregation

11.1 Segregation at the place of origin – The background idea

Segregation means the separation of the entire waste generated in a hospital in defined, different waste groups according to the specific treatment and disposal requirements. Only a segregation system can ensure that the waste will be treated according to the hazards of the waste and that the correct disposal routes are taken and that the correct transportation equipment will be used.

Occupational safety can only be maintained if the risks from the materials are defined, identifiable and the resulting counter measures are taken. By this, the risk of injury and incidents can be minimized in a cost effective waste.

Recycling can be only carried out if recyclable materials are separated from the hazardous waste (contaminated materials are excluded from any recycling activity and must be treated as mixed hazardous waste). To guarantee a high quality of the recycling materials it must be collected in a sort pure way. Mixed waste will decrease the possible income.

The separate handling, treatment, and disposal of different kind of hazardous and non-hazardous waste in different ways will reduce dramatically costs. Only the different kind of hazardous waste will be treated and disposed in a costly way instead of the entire waste stream in a hospital.

Segregation is the key to any effective waste management !

Without effective segregation system, the complete waste stream must be considered as hazardous !

11.1.1 The principles of segregation

The correct segregation is the clear responsibility of every waste generator, independent of the organisational position of the generator (Duty of care principle).

In case of doubts regarding the waste group, the precautionary principle must be followed, that means if a classification of the waste unclear or not recognizable, the waste must be classified in the highest to be expected risk group.

The segregation should be carried out by the producer and close as possible to the place of generation, that means segregation must take place at source, e.g. on the ward, at the bedside, operation theatre, laboratory, etc. and must be carried out by the person generating the waste e.g. nurse, physician (proximity principle).

The segregation must be applied from the point of generation, during collection, transport, storage and final disposal.

Every place of generation should have the necessary equipment for the types of wastes that are generated at that place like bags, bag holder, container, etc.

Segregation and identification instructions should be placed at each waste collection point.

Segregated waste should not be mixed during transport and storage. If hazardous and non hazardous wastes are mixed, the entire mixture must be considered and treated as hazardous waste.

Correct segregation will only be achieved through a rigorous training of all hospital staff and waste generators inside the hospital (this includes patients and visitors).

The segregation should be carried out first under the "polluter pay" principle and second under the "precautionary" principle. This means the generator must segregate as good as possible and shall only in unclear situation follow the precautionary principle.

11.1.2 The planning of segregation – General aspects

For the planning of the segregation, some necessary information's and facts must be investigated, to ensure a proper waste management in the health care facilities:

- Which kinds of waste are generated in each department (because different departments are generating different kinds of waste) - to find out which kinds of bags/containers must be used for the segregation (depending on the waste hazard, treatment, and disposal.)

- Where are the different kinds of waste generated? Who generates the different kinds of waste? - to fix the segregation points as near as possible to the point of generation.

- How many of the different kinds of waste and how much are generated? - to calculate the needed size and quantity of bags and container to ensure a proper supply of bags/containers.

- Are peak times of generation existing? - to ensure the supply of bags and container during the peak times.

The quality of the segregation system will depend on the quality of the segregation concept and quality of the implementation of the concept!

11.1.3 Colour coding of the segregated waste

Color coding means to combine different waste groups with “similar” hazards in one main group and to identify this main group in a fast and easy way by a fixed color.

The different waste groups have different colours for the containers and bags for the identification according to the hazards and applied throughout the complete disposal chain (segregation, collection, storage, transport, disposal):

- Warning colors for hazardous waste (Red, yellow, orange)
- Positive colors for recycling (Blue, green, etc.)
- Neutral colors for normal waste (Black, etc.)

The colour coding makes the process understandable even for low-skilled workers with language and read problems.

11.1.4 The packaging of the segregated waste

Different kind of waste need a different packaging due to the different risks created by the waste. The chemical characteristic of the waste must be obtained! Some chemical solution may can solute plastic bags and must be collected in metal containers or glass bottles For the packaging of infectious waste, plastic bags should be used in a good quality and from strong material. For bags, closable bag holder or bins with a lid are recommended. The containers for hazardous waste must be puncture proof and sealable. For the identification of the risks, the United Nations packaging symbols should be used.

11.1.5 The labelling of the segregated waste

The labelling of the waste is absolutely necessary, for the identifying, monitoring, controlling and record keeping of the different waste groups along the entire waste stream.

At least all yellow and red waste bags or containers should be labelled with the basic information on their content and on the waste producer. The labels should be clearly, legibly and durably marked with the following information:

- Name of the Producer, if applicable department
- Waste classification, date of production
- Special remarks
- Waste volume-waste destination

11.2 The to be followed, new general code system according to the new hospital waste regulation

Group A: Healthcare waste with similar composition to household and municipal waste

Colour Code: Black

Packaging: Black Plastic bags of good quality

Symbol: None

Profound segregation: The national introduced colours for the to be recycled materials should be used, the international recycling sign should be placed on the bags

Group B: **Biomedical and infectious healthcare waste**

Colour Code: Yellow

Packaging: None-reusable puncture-proof container. If a separate collection of sharps in special sharp containers is introduced, plastic bags not less then 90 microns can be used for other infectious waste.

Symbol: International bio-hazard symbol in black and wording “Bio-hazardous waste” and “Danger – Handle with care – contains sharp items”

Group C: Sharps

Colour Code: Yellow

Packaging: None-reusable puncture-proof container

Symbol: International bio-hazard symbol in black and wording “Bio-hazardous waste” and “Danger – Handle with care – contains sharp items”

Group D: Pathological waste

Colour Code: Brown (depend on each hospital)

Packaging: Water tight and sealable strong brown plastic bags or containers

Symbol: None, wording “Anatomical waste - Handle with care”

Group E: Cytotoxic pharmaceutical waste

Colour Code: Red

Packaging: Sealable, robust containers, appropriately for their content and for normal conditions of handling and transportation.

Symbol: Cell in telophase, wording: “Cytotoxic waste”

Group F: Radioactive waste

Colour Code: Red

Packaging: Sealable, robust containers, appropriately for their content and for normal conditions of handling and transportation.

Symbol: International radioactive symbol, wording: Radioactive waste

Group G: Chemical waste

Colour Code: Red

Packaging: Sealable, robust containers, appropriately for their content and for normal conditions of handling and transportation. Hazardous chemical waste of different types should never be mixed.

Symbol: Depend on the type of the waste, such as: oxides, corrosive, mixed hazards, environmental polluting materials etc.

Group H: Disposal syringes and injectors not polluted by blood or fluid, including injectors without return blood or syringes without serious return blood

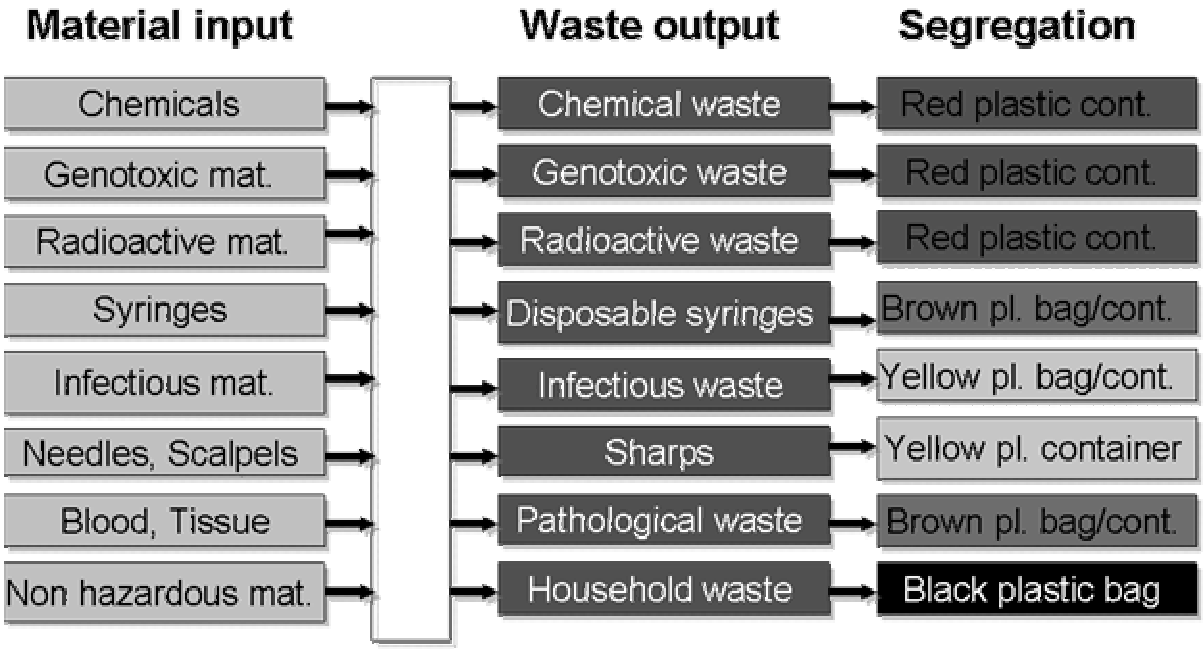
Colour Code: Brown

Packaging: Water tight and sealable strong brown plastic bags or containers

Symbol: Depend on the type of the waste, such as syringes and injectors

11.3 Planning of segregation points – Detail planning

After the carrying out of the division and sub-division of the hospital in different sectors, in each sector segregation points must be installed. As example in the research laboratories, nearly all kind of hazardous waste and non-hazardous waste will be created quite regularly. For this, segregation points must contain possibilities to collect nearly all waste groups.



(Waste streams of a research laboratory)

Definition of "Segregation point": Point, where waste generators can place the separated different kinds of waste in different waste bags. For each regularly generated waste group, a different receptacle can be found. The choice, which kind of waste will be collected will depend on the processes, carried out in the specific sector. Depending on the size of the sector, one or more segregation points must be installed.

In every sector, segregation and identification instructions should be available to the generators to help them to decide how the waste must be segregated. Additionally, above the segregation point, an easy to understand short instruction should be put.

11.3.1 Needed information

As said above, the calculation and planning of the segregation points will be based on the already carried out waste analysis of every sector. In generally, following information will be needed:

- What kind of waste will be generated at the point?
- How is the waste generated (proceedings)?
- How much waste will be generated per day?
- How often will the collection take place?

- What kind of segregation equipment is available?
- Where to place the containers, bins, bags?

The Master plan of the points must be recorded
The results should be recorded in a waste management manual. Based on the results, an analysis can be carried out. The analysis should show up at least the following points:

- Non hazardous waste: Which kind (e.g. domestic waste, paper, plastic)
- Hazardous waste: Which kind (e.g. infectious waste, Sharps, cytotoxic waste)
- Waste generation according to official proceedings: XX kg/day of Group A, etc. (or: Waste generation is unknown, as there are 5 x 3 = 15 beds about 20 kg are expected (= about 100 litres))
- Collection: Cycle time (e.g. non-hazardous twice, hazardous once per day)
- Equipment: Available equipment for this sector (e.g. black and yellow plastic bags, used disinfection containers, no red bags, no orange bags)
- Segregation point strategy: Where is which kind of waste collected? (e.g.: Hazardous waste at the nurse station, domestic also in the patient rooms)

Important: Hazardous waste and non-hazardous waste should not be collected together at one segregation point. Hazardous segregation points should be out of reach of patients and visitors. Based on the above information and analysis, the detailed planning can be carried out. A sample shall explain the way of working:

- Waste point D-3: Ontological department, ward 3

- Detail Planning:
  - Each patient room gets a small black bag in a container which will be emptied in a big black bag at the nursing station once per day. Size: Small - 20 litre, Big 2 x 60 litre. Medical disposables will be collected in a cardboard box (with big orange marks by a pen).
  - Hazardous waste will be collected in the nursing station: 1 container for infectious waste (20 litre), 1 container (used fixing bath container) for sharps (collected twice per week), Pharmacy will take back pharmaceutical waste once per day and will for this supply the needed collection equipment.
  - Needed equipment per week: 5x7=35 small black waste bags, 2x2x7=28 big black bags, 1x7=7 yellow bags, 2 containers, 2 cardboards.

The detail planning should be recorded in the waste management manual. The theoretical calculation must be adjusted on the practical need. For this, an inspection of the segregation points should be regularly carried out. If necessary, the plan must be adjusted.