

Health care-waste in Greece. Management issues

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Abstract

The wastes produced in the course of a health care activity carry a higher potential for infection and injury than any other type of waste.

Inadequate and inappropriate handling of health care waste may have serious public health consequences and a significant impact on the environment.

Sound management of health care waste is thus a crucial component of environmental health protection.

Effective health care waste management programmes require multisectoral cooperation and interaction at all levels.

Establishment of a national policy and a legal framework training of personnel and raising public awareness are essential elements of successful health care management.

Increasingly, managers and medical staff are expected to take more responsibility for the wastes they produce from their medical care and related activities. Initially those who are directly involved in the creation and handling of health care wastes are: Medical staff, health care facility directors, ancillary health workers, infection control officers and waste workers.

The indiscriminate and erratic handling and disposal of waste within health care facilities is now widely recognised as a source of avoidable infection and is synonymous with public perception of poor standards of health care.

In Greece the new Ministerial Decree KYA 146163 (ΦΕΚ 1537/Β/2012) under the title “The management of Hospital wastes” was issued in the year 2012 and there are many efforts made from the licensing public authorities and the parties involved i.e. the producers of the waste (health care units), the transporters and the waste treatment plants, for the thorough implementation of the legislation.

Regulation

In Greece a first Ministerial Decree since the year 2003 was issued under the title “The management of medical wastes”, *H.Π. 37591/2031*, signed by the Minister of Health

The European Directive 2008/2009 “Environmental Crime” was transposed to Greek Law with the introduction of the Law N4042/2012 under the title “Framework of production and management wastes”, aiming at attaching to the existing prohibitions some criminal sanctions.

There are today more than 200 directives in the field of environment in force. However there are still many cases of severe non observance of Community Environmental Law. That is the reason that the Commission proposed a directive to provide for criminal sanctions provided for environmental offences in the Member States. The directive does not create a list of new illegal acts. For legal persons the sanctions can be of a non criminal nature.

So there has been an amendment in the existing regulation of hospital wastes with the issue of the new Ministerial Decree KYA 146163/2012 (ΦΕΚ 1537/Β/2012) under the title “The management of Hospital wastes”

So the management of wastes requires the ranking of the actions in the following hierarchical order

1. Prevention of creation
2. Preparation for reuse
3. Recycle
4. Recovery of raw materials or energy
5. Disposal

It is forbidden to abandon or reject the wastes in an unsupervised manner.

The Law contains the Annex with the European Wastes Catalogue (EWC) which is a hierarchical list of waste description established by Commission Decision 2000/532/EC.

The catalogue is divided into 20 main chapters each of which has a two digit code between 01 and 20 , most of the chapters are related to the industry but some are based on materials and processes. Individual wastes within each chapter are assigned a six digit code. Hazardous wastes are signified by entries where the code is followed by an asterisk. Absolute entries followed by the letter A in red colour, for the others the hazardous depends on the threshold of any dangerous substance present.

Hazardous health care wastes (directive 91/689/EEC)

According to European Catalogue of Waste No 18:

“wastes arriving from the care treatment of humans or animals and/or from relative research”

- 18 01 Wastes arriving from the birth delivering care, diagnosis, therapy or prevention of diseases in humans
 - 18 01 01 Sharp tools (except those in 18 01 03)
 - 18 01 02 parts and organs of bodies including the sacks of blood and preserved blood (except those in 18 01 03)
 - 18 01 03* wastes that collection and disposal are due to special requirements in relation to prevention of contamination

Categories of health care wastes

1. *Hazardous health care waste*

Sharps wastes: Used or unused sharps (e.g. hypodermic, intravenous or other needles, syringes, infusion sets, scalpels, pipettes, knives, blades, broken glass)

Infectious wastes: Waste suspected to contain pathogens and that poses a risk of disease transmission (e.g. waste contaminated with blood and other body fluids, laboratory cultures and other material that have been in contact with patients infected with highly infectious diseases in isolation wards)

Pharmaceutical waste, cytotoxic waste: Pharmaceuticals that have been expired or no longer needed, items contaminated by or containing pharmaceuticals.

Cytotoxic waste containing substances with genotoxic properties (e.g. waste containing cytostatic drugs- often used in cancer therapy, genotoxic chemicals)

Chemical waste: Waste containing chemical substances (e.g. laboratory reagents, film developer, disinfectants that are expired or no longer needed, solvents, waste with high content in heavy metals (e.g. batteries, broken thermometers and blood pressure gauges)

Radioactive waste : Waste containing radioactive substances (e.g. 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)

2. *Non hazardous or general health care waste*

Waste that does not pose any particular biological, chemical, radioactive or physical hazard

In some countries as in GB but not in Greece a further category is described that is called “offensive wastes”.

Offensive waste: is non clinical wastes that is not infectious and does not contain pharmaceutical or chemical substances but may be unpleasant to anyone who comes into contact with it,

for example

- outer dressings and protective clothing masks, gowns and gloves that are not contaminated with body fluids
- hygiene waste and sanitary protection e.g. nappies and incontinence pads
- sterilised laboratory waste

Developing a health care waste management plan

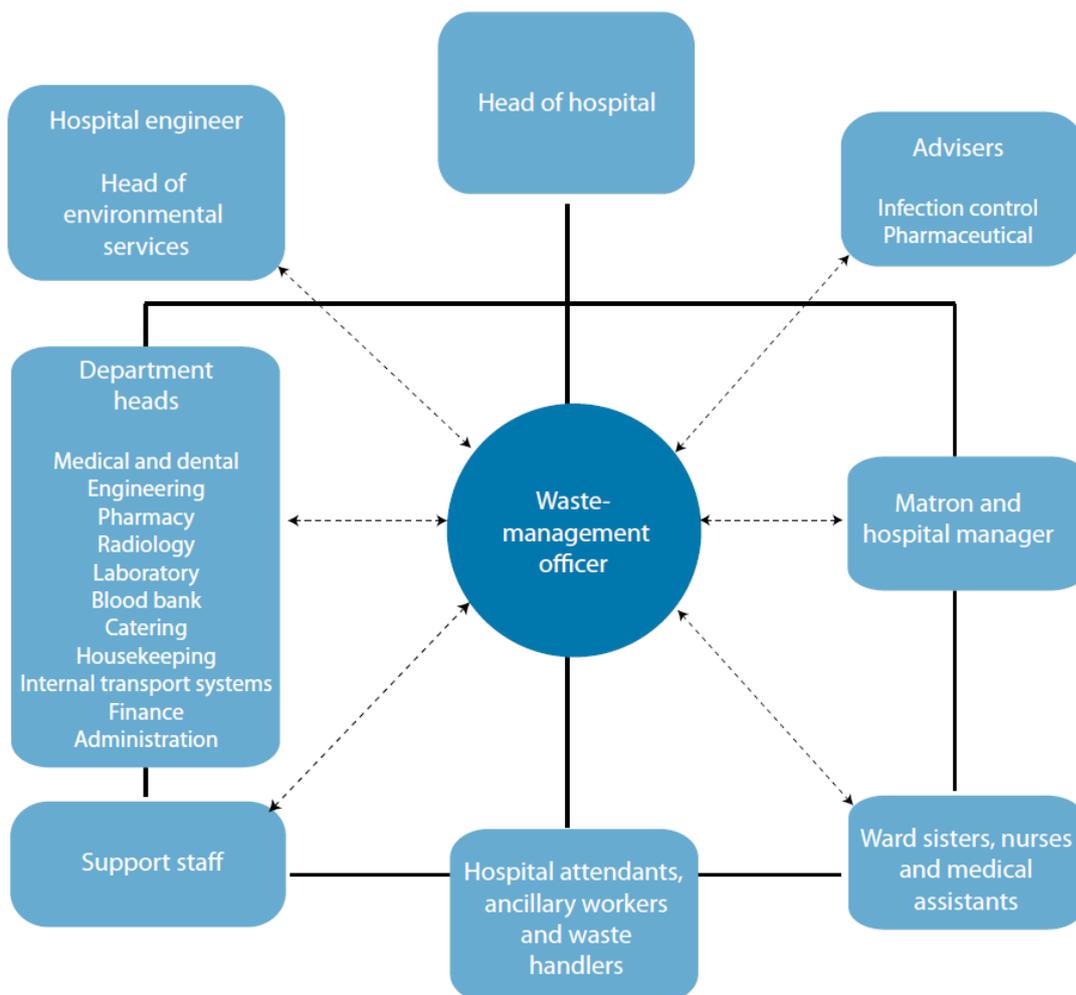
In the course of developing a health care waste management plan the following requirements should be fulfilled:

- Waste management licensing and permitting
- Legislation and healthcare wastes
- Definitions and classifications of healthcare wastes
- Waste minimisation, segregation, colour coding and storage

- Managing compliance: Policy content for ownership, responsibility, audit and pre acceptance requirements, staff training, transfer documentation, protective equipment and incident reporting
- Transport packaging and operations: Different classifications, packing, marking and labelling and documentation requirements for the compliant transport of healthcare wastes
- Treatment and Disposal

According to the Greek regulation that is compatible to the instructions of international Institutions such as the W.H.O., an internal structure for managing the health care waste should be established within the establishment which would describe and assign the exact tasks of the personnel involved in an hierarchical order within the Health care unit as follows:

a. Management structure within the Health care Unit



Note: Liaison paths are represented by dotted lines. Line-management paths are represented by solid lines.
Source: Adapted from WHO WPR (1994)

- b. The hazardous health care wastes has to be soundly handled, labelled, collected and stored in appropriate compartments



In order for the hospital waste to be accepted for treatment they have to be packaged according the class number UN and their dangerous characteristics listed in the following Table

Table for labelling hazardous substances (Πίνακας σήμανσης)

Class UN	Number H	Characteristics (Χαρακτηριστικά)
1	H1	Explosive (Εκρηκτικό)
3	H3	Explosive liquids (Εύφλεκτα Υγρά)
4.1	H4.1	Explosive solids (Εύφλεκτα Στερεά)
4.2	H4.2	Self explosive substances (Ουσίες ή απόβλητα που υπόκεινται σε αυτανάφλεξη)
4.3	H4.3	Ουσίες ή απόβλητα που σε επαφή με το νερό εκπέμπουν εύφλεκτα αέρια
5.1	H5.1	oxidising substances (Οξειδωτικά)
5.2	H5.2	organic oxidisers (Οργανικά υπεροξειδία)
6.1	H6.1	deleterious substances (Δηλητηριώδεις ουσίες)
6.2	H6.2	Infectious substances (Μολυσματικές ουσίες)
8	H8	Corrosive (Διαβρωτικά)
9	H10	Emission of toxic gases with air (Εκλυση τοξικών αερίων κατόπιν επαφής με τον αέρα)
9	H11	Toxic substances (Τοξική ουσία βραδείας ή χρόνιας επενεργείας)
9	H12	Ecotoxic substances (Οικοτοξική ουσία)
9	H13	Material that after disposal produces any of the above characteristics (Υλικό ικανό να παραγάγει, μετά τη διάθεση, άλλο υλικό, π.χ. έκπλυμα, που διαθέτει κάποιο από τα ανωτέρω χαρακτηριστικά)

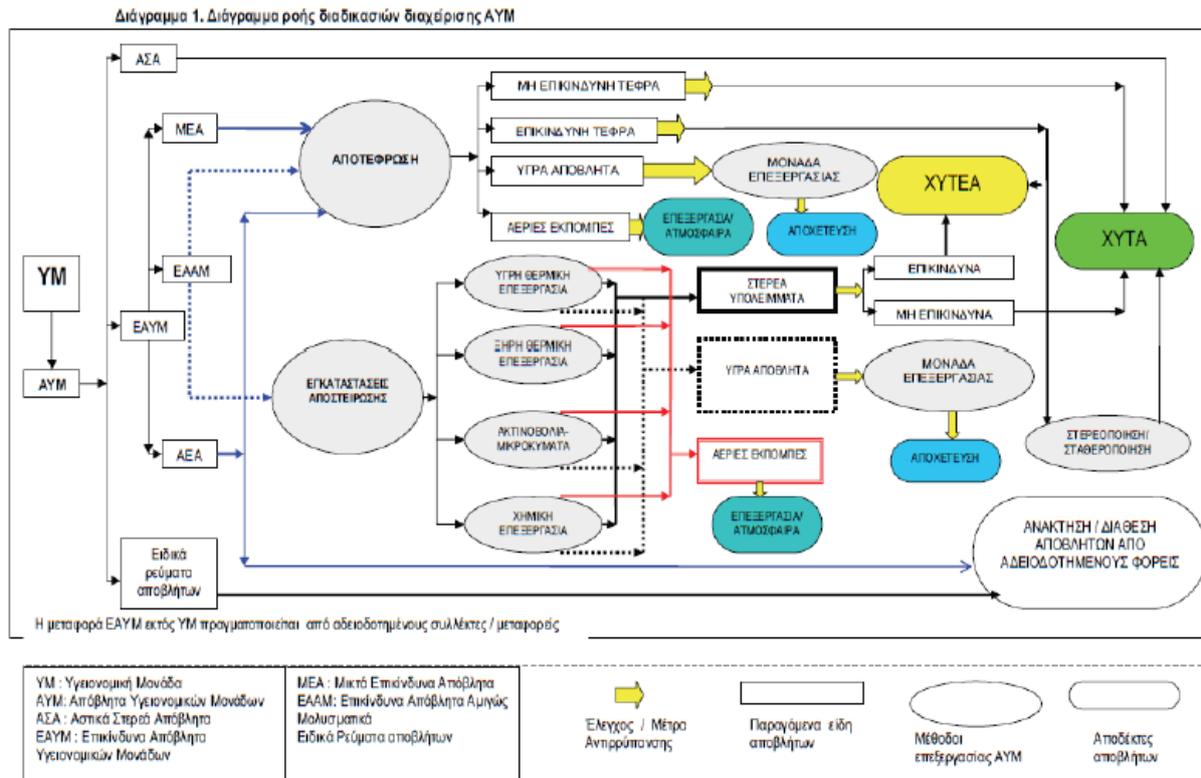
Number UN (Κωδικός)

e.g. (1H2/Y1/S/02/GB/4532)

- 1^{ος} κωδικός = μέσο συσκευασίας (1 κάδος, 2 βαρέλι, 3μπιτόνι, 4 δοχείο, 5 σακούλα)
- υλικό κατασκευής A= ατσάλι, H=πλαστικό
- Y = συσκευασία πακεταρίσματος, 1= 1Kg
- S= στερεά, περιεχόμενο πακεταρίσματος
- 02= χρόνος κατασκευής
- GB=χώρα αδειοδότησης
- 4532= αριθμός της έγκρισης

c. Treatment methods of the health care wastes

Table 1. Diagram showing the required action for the treatment of health care waste according to their composition and the method of treatment



According to the Greek legislation all hazardous health-care wastes can be treated by incineration with an operating temperature at 1200⁰C and the infectious wastes can be treated by the method of sterilisation/disinfection

The sterilization process for treatment of the infectious waste is obligatory to comply with the following:

- To produce a specific documentation of function that will state maximum temperature, steam pressure, type of packaging, time that the waste was under the temperature for sterilization, acceptable moisture content, maximum load that the specific installation can treat for every cycle
- Control and daily recording in every working cycle of the sterilization of the nature and the quantity of the waste for sterilization, of the diagrams temperature and pressure and time spent under maximum temperature
- Perform yearly quality controls of the thermometers, manometers and the rest of recording equipment
- Also it should comply with the specifications of ΕΛΟΤ 12347/97 standards (classification, cleanability, sterizability, leaktightness). The user shall have documentation on the classification and its verification available

-The effectiveness of the installation and of the process of sterilization to be proved by using the appropriate biological indicators (at least one in every 200 lt of useful volume of the sterilization chamber, with the minimum of three indicators, EL0T EN 866-97)

-The managing body shall keep approved records by the Department of Environment

The handling of Chemicals in a health care unit

- A number of chemicals may be used , disinfectants, hand gels, iodine, airfresheners, diagnostic kits, eye strains, possible photochemicals
- key points Hazardous chemicals should not be disposed of to foul sewer or surface drains
- Empty chemical containers are likely to contain sufficient residue to remain hazardous chemical waste unless rinsed
- Rinsing may only be undertaken after consideration of the hazards present and agreement with the local water authority. Alcohol hand gels that do not contain siloxanes (which cause significant damage to plant and equipment used in the sewage treatment process) and whose safety data sheet (SDS) does not prohibit discharge to the sewer may be rinsed out and the packaging recycled or placed into the domestic waste stream. Chemicals should not be disposed of in the clinical waste stream due to chemical releases and worker exposure issues
- Hazardous chemicals is prohibited to be placed in the domestic waste stream
- Some chemicals may react to produce fire or toxic gases. These incompatible chemicals should be disposed of and stored separately. Flammable, corrosive and oxidising chemicals are of particular concern in healthcare
- Aerosols may also need to be segregated for specialist disposal or recovery
- Guidance on the storage of chemicals should be given

Wastes containing mercury or cadmium should never be incinerated because of the risk of atmospheric pollution with toxic vapours and should never be disposed in municipal landfills as they may pollute the groundwater. Industry specialising in recovery of heavy metals, mercury or cadmium can recover the valuable materials.

d. Cost related to health care waste management

Table 2. *In the following diagram facts about the managing of public hospital hazardous wastes in the three main out of the seven health regional authorities in Greece for the year 2013-2014 are given.*

Ενδεικτικά στοιχεία διαχείρισης από τις ΥΠΕ
(στοιχεία από την Γεν. Γραμματεία Δημόσιας Υγείας και την Δ/νση
Υγειονομικής Μηχ/κής & Υγιεινής Περ/ντος, Υπ. Υγείας)

ΥΠΕ	Αριθμός ΥΜ	Συνολικός Αριθμός Κλινών	Αποτέφρ ωση (kg/έτος)	Αποστείρ ωση (kg/έτος)	Συνολική ποσότητα επεξεργα σίας (kg/έτος)	Συνολικό κόστος διαχείρισ ης (ευρώ)
1η ΑΤΤΙΚΗΣ	25	8.377	5.036.422	405.424	5.441.846	2.837.764
2η ΠΕΙΡΑΙΩΣ ΚΑΙ ΑΙΓΑΙΟΥ	21	6.143	432.912	491.295	924.207	2.010.110
4η ΜΑΚΕΔΟΝ ΙΑΣ ΚΑΙ ΘΡΑΚΗΣ	17	5.142	18.428	1.123.091	1.141.519	1.434.615

(Research made from the General secretary of Public Health and the Department of Public Health Engineering of the Ministry of Health of Greece)

In the horizontal axis (lines) the three main health regional authorities (Attica, Piraeus and Aegean, Macedonia and Thrace)

In the vertical axis (columns) 1) the number of public hospitals 2) the total number of beds 3) the amount in Kg/yr of hazardous wastes that has been incinerated 4) the amount of infectious wastes in Kg/yr that has been sterilised 5) the total amount in Kg/yr that has been treated 6) The total cost in Euro for the treatment of the hazardous waste of the health region.

In Greece the following public health care units are operating in the year 2014 ()

- 97 public hospitals with 37.000 beds and 1700 special care units
- 204 primary health centres
- Multi-unit peripheral medical centres, diagnostic centres, medical research centres etc

Also there are numerous private care units such as private clinics, private medical practices, dental practices, private diagnostic centres, private multi-unit medical centres etc.

e. Waste production and composition of health care wastes

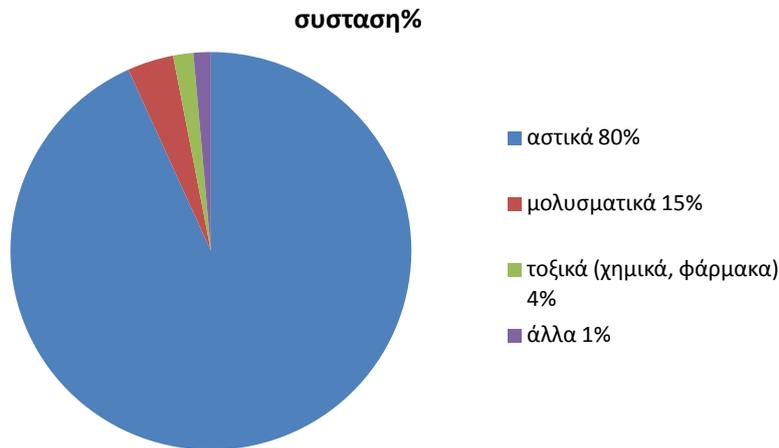
The official report for hazardous wastes production in Greece for the year 2008 (report from the Ministry of Environment),

for the health sector is 133.000 tons of hospital waste that can be analysed as follows:

- 115.000 tons of Non hazardous or general health care waste

- 14.000 tons of infectious wastes
- 3.500 tons of mixed (toxic plus infectious wastes)

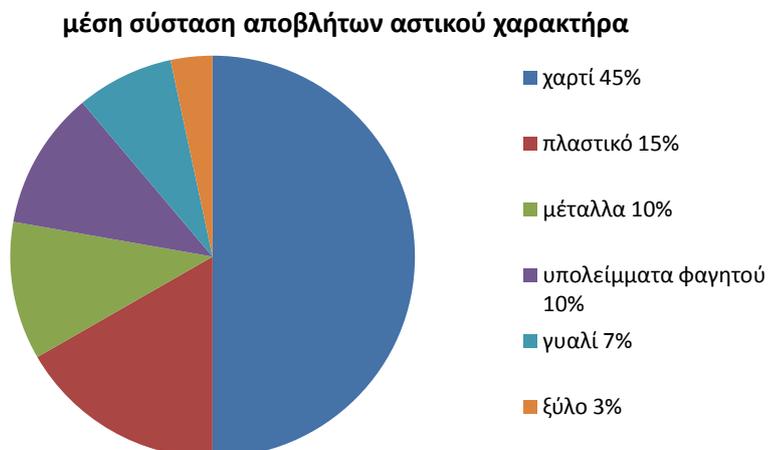
Μέση σύσταση αποβλήτων υγειονομικών μονάδων



In this pie the composition of the hazardous characteristics of hospital wastes have been studied by a study group of the Technical Chamber of North Greece for a region in North Greece:

- General waste 80%
- Infectious waste 15%
- Toxic (chemical , pharmaceuticals) 4%
- Others 4%

Μέση σύσταση αποβλήτων αστικού χαρακτήρα στις υγειονομικές μονάδες



In the same study the characteristics of general waste produced in the health care activities studied have been classified as follows:

Paper 45%

Plastic 15%

Metals 10%

Food remains (organics) 10%

Glass 7%

Wood 3%

Conclusions

1. The management of the health care waste in Greece is regulated in compliance with EC directives and national laws and most of the health care units are in conformance with it.
2. There is a need of compliance with the regulation from the private primary sector where the local authorities can play a major role
3. There is a need of establishing more treatment units especially in the remote areas of Greece as for example in the islands where costs of transportation to the mainland for treatment exceed many times the cost of their treatment
4. The health care units are a large concentrated source for recycling material especially for the non hazardous waste streams for organic wastes (food waste) plastic glass and metal.
5. The health care units are a concentrated source for recovering valuable materials such as heavy metals.

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