

HOSPITAL WASTE MANAGEMENT AND HEALTH-ECOLOGICAL RISK PROPHYLAXIS IN BULGARIA

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Abstract

The requirements of the Waste Management EU Directives, accepted also from the Bulgarian legislation in 2000-2001, establish new pathways for hospital waste treatment. With the recognition that the function of hospitals is to provide quality health care services, effectively managing wastes generated from these establishments will significantly reduce the risks of infection of hospital staff, waste collection workers and the general public, and protect the environment. The creation of a National Waste Management Plan, adopted for the whole territory of Bulgaria set the new basic responsibility profiles – improved waste management legislation, ceasing the landfilling of infectious waste, economically based waste collection and transport, and environmentally reasonable treatment methods. In the investigation were studied the main health and ecological risks connected with improper treatment of hospital wastes. Executed was health-ecological assessment of alternative methods for hospital waste treatment – incineration, autoclaving, microwave treatment. Proposed and analysed were several scenarios for environmentally sound coverage of the territory of Bulgaria with treatment facilities. Adopted were short, middle and long term priority measures and targets with determination of actions and performance indicators for the planned periods. National affordability analysis was executed with determination of average expenses of 0,1Euro/Day/ Bed for hospital waste treatment in the most suitable and cheapest scenario.

Introduction

The transposition of EU waste management Directives into Bulgarian law requires new pathways to deal with the problems associated with waste from hospitals and other medical establishments in the Republic of Bulgaria.

The principal method of disposal for health care waste (HCW) is currently landfill. Ending the use of landfill for the disposal of infectious waste is the major priority for Bulgaria. In Bulgaria, the existing installations for hospital waste incineration have been in use since the 1970 - 1980. In general, they do not meet the present legal requirements and could not be renovated/upgraded. The existing hospital waste incinerators do not allow the disposal of all hospital waste generated and about 60 % of the hospital wastes are stored in open, uncontrolled depots. The latter situation creates serious health and environment risks.

Effective changes to bring about a discontinuance of landfill of infectious waste rely upon improving waste management practices within hospitals and other health care establishments. Strengthening the normative base for segregation and disposal of HCW is imperative for reducing the risk of infection to hospital users and staff as well as the population at large (1).

The availability of alternatives to landfill in Bulgaria (incineration, autoclaving, microwaving) is currently very limited. Development of an integrated network of treatment facilities rendering infectious wastes safe, and ensuring high standards of environmental protection must be a key objective in order to promote health and environmental safety.

"It is essential that everyone concerned by healthcare waste should understand that healthcare waste management is an integral part of healthcare, and that creating harm through inadequate waste management reduces the overall benefits of health care."(2)

Methods and Results

The potential health hazards and pollution effects of wastes may be categorized as follows:

1. Infectious wastes containing micro-organisms capable of causing illness to a susceptible host. Through this path, AIDS, Hepatitis B, C and D, allergies, gastroenteric infections, respiratory infections, skin infections can be transferred.
2. Toxic chemicals that can cause poisoning when inhaled ingested or brought into contact with the skin.
3. Carcinogens (cancer-causing agents) in wastes from bio-medical research laboratories.
4. Flammable liquids and explosive gases that can cause injury to personnel or damage to the hospital structure by fire and explosion.
5. Packaged caustic materials (acids or bases) that can cause injury.
6. Physically injurious wastes that can produce punctures, cuts, or abrasions.
7. Radioactive contaminated wastes.

A priority objective must therefore be to prevent risks to patients, staff, visitors and the wider community(3). In order to achieve this, hospitals and other health care establishments must be concerned with such hazards from the point of generation to the point of final treatment and disposal. Improvement must be made in containing and confining wastes from the standpoint of preventing fire, noise, and spread of micro-organisms. At various locations, the wastes should be either reduced in volume or treated to eliminate their infectious/hazardous properties.

There are four main types of hospitals with beds in Bulgaria:

- multi-profile hospitals for active treatment (MHAT);
- specialized hospitals for active treatment (SHAT);
- psychiatry clinics;
- dispensaries.

We made a survey of the total number of beds for each type of hospital in the capital Sofia. The quantity of wastes generated per occupied bed has indicated that the quantities of potentially infectious and hazardous hospital wastes averages around 0.4 kg/bed/day. The likely quantity of wastes per day for different types of hospitals in Bulgaria was estimated through extrapolation of these data, factoring in a bed occupancy rate of 75%.

The results indicated, that 261 hospitals with total number of 57083 beds are producing average of 22800 kg hazardous hospital wastes per day for the whole country.

Available indices for hospitals' activities are expenditures/per day /per bed. These data are presented in Table 1 below:

Table 1: Average expenditures per day for a hospital bed in Bulgaria

Year	Expenditures/day/bed (Bg leva)	Expenditures/day/bed EUR*
1992	179.50	92
1993	292.80	150
1994	436.6	224
1995	163.20	82
1996	114.35	59
1998	319.00	155
1999	222.10	115

- calculated at the rate of 1 Bulgarian Lev = 0.51 Euro

Budgets for HCW management nowadays represent a small percentage (~0,1-0,2%) of total expenditure. Required budgets are determined independently for each hospital, and records are not available.

The investigation and a Questionnaire within the hospital staff revealed that all hospitals face a wide range of practical constraints in implementing improved waste segregation, handling and storage systems, including:

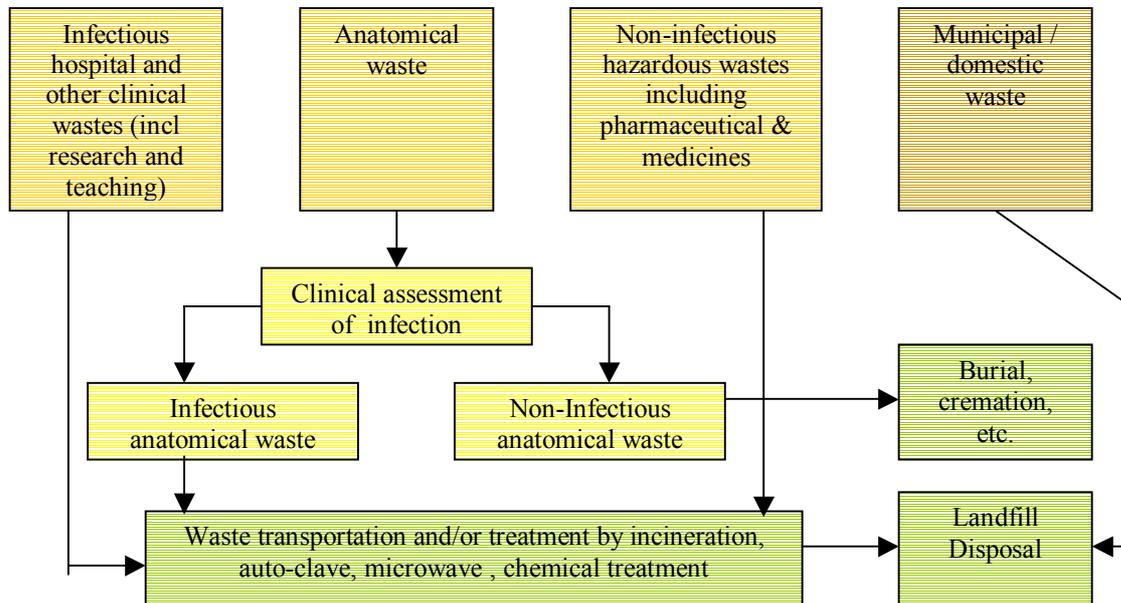
- Low level of attention and lack of clear understanding of requirements and options within hospital managers;
- Space constraints within treatment rooms and wards;
- Availability of elevators to safely move waste around hospital premises;
- Lack of space for secure temporary storage of infectious waste;
- Lack of adequate ventilation in storage areas;
- Lack of refrigerators for low temperature storage of waste;
- Availability of appropriate bins and packaging;
- Constraints on purchasing high quality equipment due to public procurement procedures; and
- Lack of materials/equipment suppliers in Bulgaria.

Proposition for HCW Treatment Scenarios

A basic principle in all waste management schemes is to segregate wastes as early as possible in the waste stream and to find the simplest solution for each type of waste. The first step in treatment and disposal is to ensure that all wastes similar in type and composition to municipal waste, and posing no health risks, is managed separately. The remaining wastes (infectious and other hazardous HCW) have characteristics that need particular treatment and disposal(4).The basic pathways for HCW treatment are presented in Figure 1.

The possibilities for treatment of hazardous HCW in Bulgaria will need to be a balance between two principal options. These are the construction of new incinerators for HCW (which meet EU standards of emissions control) and the application of other treatment methods(5). The most commonly applied alternative treatment methods are autoclaving and microwaving, however other technologies are available and should be considered. The residues from waste treatment must be disposed at a controlled landfill.

Figure 1: Treatment pathways for HCW and domestic waste in Bulgaria



As a result of the executed analysis of the HCW treatment possibilities in Bulgaria, a range of development scenarios for implementing improved HCW management practices, and complying with legal requirements, have been projected. The scenarios have been evaluated for their economic and financial performance.

The following development scenarios have been projected and assessed:

- Scenario 1: Development of autoclave or microwave treatment facilities (and supporting collection infrastructure) in each of the 27 administrative regions by 2005, and replacement with similar facilities in year 2013;
- Scenario 2a: Development of autoclave treatment facilities (and supporting collection infrastructure) for 9 groups of administrative regions by 2005, and replacement with autoclaves in year 2013;
- Scenario 2b: Development of autoclave treatment facilities (and supporting collection infrastructure) for 9 groups of administrative regions, and replacement with autoclaves and incineration facilities in year 2013.

An economic model was prepared and according to it the estimated average incremental cost for the 'least cost' scenario analysed (Scenario 2a) is Euro 429 per tonne of waste or Euro 40 per hospital bed per year. This represents an average cost of Euro 0.11 (BGL 0.22) per bed per day. These costs are comparable (and lower) than those of similar systems in other European countries.

The range of costs/bed-year for the least-cost option (Euro 54-73) represents 1.5% – 2% of current expenditures per bed. Although it is understood that hospitals face significant financial constraints, the amounts involved are relatively small.

Theoretically it was proved, that regional facilities offer significant benefits:

- They are more cost effective through economies of scale;
- They allow optimum capacity to be provided for the wastes being generated;
- Future modification or expansion is less expensive;
- Operations are more efficient;
- Monitoring and supervision are easier than for dispersed facilities;

- Environmental monitoring and control are easier;
- Healthcare facility administrators can devote their full attention to the primary activities of the healthcare facility.

Conclusions

1. This scientific survey for treatment options for hospital waste sets out a comprehensive framework for improving waste management practices in health care establishments across Bulgaria.
2. The investigation proves that although it is recognized that the function of hospitals is to provide quality health care services, effectively managing wastes generated from these establishments will significantly reduce the risks of infection of hospital staff, waste collection workers and the general public, and protect the environment.
3. Precise actions can be determined at the local and regional levels. In the survey is proved that by focusing on stopping the landfill of infectious waste, reducing health risks, minimizing emissions from waste treatment facilities and providing least cost solutions, practices can be transformed over a period of 10 years.
4. An economic model has been prepared to assess the costs and to compare the affordability implications of the scenarios.
5. The assessment of the development scenarios identifies that the regionally located waste treatment facilities offer advantages over those at individual healthcare facilities in treating HCW.

References

1. L.M Johannessen et al. World Bank Working Document "Healthcare Waste Management Guidance Note", (May 2000)
2. Guiding Principles of the Department for Protection of Human Environment, WHO, (1999)
3. Cointreau-Levine, Sandra. Occupational and Environmental Health Issues of Solid Waste Management: Special Emphasis on Developing Countries. World Health Organization Publication. (1999)
4. Analysis of Priority Waste Streams HealthCare Waste. Commission of the European Communities, Brussels and MRM Partnership, Bristol.(1993)
5. Connett, Paul. Medical Waste Incineration: A Mismatch Between Problem and Solution.Waste Not. The Weekly Reporter for National Resource Management, No. **372**. (1996).