MEDICAL WASTE MANAGEMENT - PRACTICAL APPROACH

Prof. Mihail Kochubovski MD PhD

Institute of Public Health of the Republic of Macedonia

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AIMS AND BACKGROUND

• The **objective** of the study was shift from unsafe to safe health care waste management in FYR Macedonia.
• The **aim** was to avoid potential health adverse effects from risks to health staff, employees from the Public Enterprises that are transporting and deposit the health care waste, and to the people that are doing secondary recycling, as well to reduce the impact to the environment.
Hospital sanitation is of primary importance to avoid the continuous recirculation of diseases in the community. Management of health care waste is an important public health issue since it involves major risks for the health of the people and the environment (Prüss, 1998).

Health care waste management, as well as posing technical problems, is strongly influenced by cultural, social, and economic circumstances. A well designed waste policy, a legislative framework, and plans for achieving local implementation are essential. Change will be gradual and should be technically and financially sustainable in the long term. Hospitals and other health-care establishments have a “duty of care” for the environment and for public health, and have particular responsibilities in relation to the waste they produce (Prüss, 1999).
Human and environmental hazards
INTRODUCTION

- Health care waste is a by-product of health care that includes sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials. Poor management of health-care waste exposes health-care workers, waste handlers and the community to infections, toxic effects and injuries. It may also damage the environment. In addition, it creates opportunities for the collection of disposable medical equipment (particularly syringes), its re-sale and potential re-use without sterilization, which causes an important burden of disease worldwide (WHO, 2000).

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

- The **disorganized and chaotic management** of health care wastes leads, rightly or wrongly, to the public belief that an institution is an unhealthy place and failing in its responsibilities.
- **Good management of health care waste in hospitals** means the effective segregation of waste and the separate handling and disposal of each segregated waste category. This cannot be achieved without the commitment of senior directors and the motivation of medical and support staff. Good waste segregation and hygienic practices require constant reinforcement. Staff can be reminded in various ways, such as training on recruitment, short refresher training courses and workshops in the department, posters and signs, hygiene inspections, staff newsletters and information literature (Rushbrook, 1999).
Hazards from HCW

- **Sources**
  - Patients
  - Symptomless carriers

- **Transmission**
  - Contamination of the hands of the personnel
  - Contamination of an object by blood, excreta, or other body fluids
  - Air: by sneezing or coughing

- **Examples**
  - Influenza
  - Salmonellosis
  - Staphylococcal infections
  - Helminthiasis
  - Excreta: typhoid salmonellosis
  - Hepatitis A
  - Blood: viral hepatitis B, C
  - Measles
  - Meningococcal meningitis
  - Pertussis
  - Tuberculosis
  - Malaria
  - Leishmaniasis
  - Typhus
  - Legionnaires’ disease
  - Q fever
  - Brucellosis
  - Tuberculosis
  - Giardiasis
  - Cryptosporidiosis

- **Environment**
  - Water
  - Food
  - Air
  - Waste
  - Pharmaceuticals

- **Contact of the patient with contaminated hands, objects, air, water, food, etc.**

- **Infection**
MATERIAL AND METHODS

- The case study covers a period from 1999-2016 with emphasis on public health approaches in health care waste management in Macedonia.
- It has been assessed the legislative, as well the organization scheme of HCW management, and method of final treatment of HCW.
RESULTS

• In 2000 we have started the process of redesigning the healthcare risk waste management with Manual for HCRW management according to the WHO’s recommendations.

• The process of incineration of the medical waste from the Healthcare Facilities has started in 2000.

• Since 2000-2016 there have been several training courses on safe management with medical waste.

• In 2007 has been proscribed a Rulebook for healthcare risk waste management.
RESULTS

- In 2007-2008 has been prepared a Draft National healthcare risk waste management plan.
- In 2009 has been published a Manual for safe management of medical waste.
- In 2015 was published a Manual for safe management of cytotoxic waste and it has been organized a training for responsible staff working at the Healthcare Facilities.
• Health care waste is waste produced in health care and veterinary institutions, which is generated as a product of used supplies during diagnosis, healing, treatment and prevention of humans and animals. By quantity and properties differs from communal waste and by its characteristics is close to hazardous waste (Waste Management Law\(^5\), 2007).

• Health care waste is divided according the EU classification and Rulebook on the manner of handling health care waste (Rulebook on HCW6, 2007) to:
  • body parts and organs, including blood bags and reserves (pathological waste);
  • infectious waste;
  • sharps;
  • chemicals which are consisting of dangerous substances;
  • pharmaceuticals, citotoxic and citostatic drugs;
  • pressurized cylinders;
  • radioactive waste.
RESULTS

• Health care waste presents a risk to those producing, packing, storing, transporting, treating and disposing it. Possibility of infection by: Hepatitis B and C, AIDS, TBC, cholera, diphtheria etc., and their spreading in hospitals because of negligence in handling with HCW, should be presented to all staff in the health care and other facilities, and to organize suitable hygienic management and disposal, in order to minimize the risk.

• With a goal to prevent or to reduce as much as possible the health risk to the health staff the managers of the Health care Facility should implement programme for response to injuries, such as:
  • immediate first aid measures;
  • immediate reporting;
  • identify source of injury;
  • obtain additional medical care;
  • maintain medical surveillance;
  • blood tests if required;
  • record the incident in full;
  • investigate the causes and report;
  • implement preventive measures for similar incidents.
Unsafe disposal of HCW – practical examples
Incinerator for HCW on the Sanitary landfill “Drisla”
Figure 1. Management with Health care Waste in Macedonia since 2005

Managerial institutions

- **Ministry of Health**
  - Sector for primary and preventive health care

- **Institute of Public Health of the Republic of Macedonia**
  - Sector of Environmental Health (expert-metodological management)

Control institutions

- **Ministry of Health**
  - State Sanitary and Health Inspectorate
    - (in the yard of Health Institutions - separation, selection, collection and database)

- **Ministry of Environment and Physical Planning**
  - State Inspectorate for the Environment
    - (from the Central Storage Point - collection, transport, burning and disposal)
    - (monitoring of emission from the incinerator in the ambient air and monitoring of imission)

Executive institutions

- **Healthcare Institutions**
  - (producers of health care waste)

- **PE “Komunalna Higiena-Skopje”**
  - (collection, transport, burning and disposal of waste)
• **Government from the Budget** of the country for 2001-2004, has financed monthly costs for safe collection, transport, incineration and disposal of solid HCW from the Health care Institutions in Skopje. A cost for 2000 has been covered by the WHO (through Humanitarian Assistance Office in Skopje). For 2001-2004 these costs have been 6,000,000 denars/year (100,000 Euro/year).

• For 2005 from the Budget of FYR Macedonia according to the **Programme for Preventive Health Care** (Official Gazette of RM No.25/04) has been covered 3,000,000 denars (50,000 Euro/year) until the end of June 2005.
RESULTS

• Since **July 2005** management is according to the article 73 from the Waste Management Law, Official Gazette of RM No.68/04 where it is proscribed how to manage with HCW (payment by kg/HCW, and it is about **1 Euro/kg HCW**). Each **Health care Institution** sign a Contract with the Public Communal Enterprise and should pay by kilogram produced HCW.

• The Government, Ministry of Environment and Physical Planning in September 2005 issued a **National plan for solid waste management (2006-2012)**. In the plan have been defined amounts of solid health care waste (HCW), authorities and vision until 2012. The Plan was revised in 2015.

• **Waste Management Strategy** has been adopted in **2008**. According to this Plan total amount of HCW yearly produced from the Health care Institutions of the Republic of Macedonia has been assessed to approximately **1,000 tons**, and 400 tons/year is produced in Skopje (Table 1).
Table 1. Assessment of the solid infectious health care waste produced in Macedonia

<table>
<thead>
<tr>
<th></th>
<th>Number of beds*</th>
<th>Tons/year</th>
<th>Number of doctors**</th>
<th>Tons/year</th>
<th>Health care staff**</th>
<th>Tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macedonia</td>
<td>9699</td>
<td>996</td>
<td>4573</td>
<td>927</td>
<td>6533</td>
<td>934</td>
</tr>
<tr>
<td>Skopje</td>
<td>3896</td>
<td>400</td>
<td>1974</td>
<td>400</td>
<td>2797</td>
<td>400</td>
</tr>
</tbody>
</table>

* Institute of Public Health of the Republic of Macedonia
** State Statistics Institute
RESULTS

- **HCW generation** in Macedonia **3.6 kg/bed/day** is very close to the data of HCW in Western Europe (3-6 kg/bed/day) published in the International Health care waste network ([www.healthcarewaste.org](http://www.healthcarewaste.org)).

- Figures presented in the Table 1 have been similar to data provided by weighing of HCW from Health care Institutions in **Skopje** (Filjanski, 1996).

- Regarding the aspect of safe management with HCW and prevention of potential health risk from outbreaks of contagious diseases in health staff, auxiliary staff (hygienists) and staff from the Public Communal Enterprises authorized for collection, transport and final disposal of waste, as well persons that are performing secondary recycling, **Ministry of Health** in cooperation with the **IPH** and **State Sanitary and Health Inspectorate** performed lot of activities during the period 1999-2016.
Figure 2. Hospital waste management structure

- **Head of Hospital or health care establishment**
- **Advisors**
  - Control of infection
  - Pharmaceutical
  - Radiation
- **Waste Management Officer (WMO)**
- **Matron and Hospital Supervisor**
- **Ward sisters, nurses and medical assistants**
- **Support staff**
- **Department Heads**
  - Medical and dental Engineering
  - Pharmacy
  - Radiology
  - Laboratory
  - Blood bank
  - Catering
  - Administration
  - Finance
- **Hospital engineer**
  - Head of environmental services
- **Hospital attendants and ancillary workers**

**Liaison paths**
- **Line management paths**
Figure 3. Basic steps in health care waste management in minimal programmes

- **Head of Hospital or Health care establishment**
  - Assign responsibilities

- **Train personnel and waste workers**
- **Classify and assess waste generation**
- **Ensure workers safety**
  - Ensure safe storage

- **Identify reuse options**
- **Adequately treat and dispose of wastewater**
  - Improve chemicals and pharmaceuticals stock management

- **Recycling of selected materials**
  - Return to the supplier (of outdated drugs or chemicals)

- **Waste segregation**
  - General waste joins the municipal waste stream

- **Treatment and disposal of hazardous healthcare waste**
  - **Treatment**
    - Incineration, on-site or off-site
    - Open air-burning, Chemical disinfection
    - Autoclaving of highly infectious waste
    - Encapsulation, Disinfection of Cholera patients’ stools

  - **Final disposal, Municipal landfill**
  - Burying inside premises
  - Discharge into sewer
In order to prevent a risk from **Hepatitis B** in 2005 has been introduced **obligatory vaccination of the health staff** which is directly exposed to risk of infection because of the work conditions.

**BENA’s Training Center for Environmental and Health professions** had been established in the Medical Faculty premises in Skopje in January 2003, fully supported by the Ministry of Foreign Affairs of Greece. Till 2004 have been trained 49 graduated students in three courses on the topic “**environmental and health aspects of the solid waste management**”, with a special focus on **HCW management**.
In December 2007 has been proscribed the Rulebook for handling of HCW, labelling, and forms for management of HCW, as well the types of HCW which treatment is forbidden. Rulebook is prepared under the article 73 paragraph 2 of the Waste Management Law, Official Gazette of RM No.68/04 and 71/04. Rulebook is prepared by the working group from the IPH, State Sanitary and Health Inspectorate from the Ministry of Health in coordination with the Ministry of Environment and Physical Planning.

Scope of this Rulebook address waste that is produced in the Health care Institutions (Hospitals, Health Centres, Ambulatories, Dental Institutions, Research Laboratories/Institutes, Veterinary Stations etc.), that is produced as a result of used supplies during diagnosis, healing, treatment and prevention of diseases in humans and animals, as well legal entities whom produce, store and trade pharmaceutical products.
RESULTS

• Control of producing, separation, packaging and disposal is regulated by the article 4 paragraphs 12 from **Law for Sanitary and Health Inspectorate** ”Official Gazette of RM” No.37/06.

• After finishing of a **Feasibility Study on HCW management** Ministry of Environment and Physical Planning in 2009 opened an international tender for a new environmentally friendly Incinerator relating to HCW that should fulfil the requirement of the **Directive on the Incineration of Hazardous Waste 94/67/EC**. Only modern incinerators are able to work at **800-1100°C**, with special emission-cleaning equipment, and can ensure that no dioxins and furans (or only insignificant amounts) are produced.

• From **2000-2016** more than **500 staff** from **HCF** have been trained on **HCW management**.
Incinerated HCRW in Drisla-Skopje

- Incinerated in Drisla-Skopje: 995.8 tons
Track for collecting of HCRW of EKO Club Bitola
Track for collecting of HCRW of EKO Club Bitola
Incinerator for HCRW of EKO Club Bitola
Autoclave with shredding of EKO Club Bitola
<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disinfection temperature:</td>
<td>160 Degrees Celsius</td>
</tr>
<tr>
<td>Disinfection time:</td>
<td>10 minutes</td>
</tr>
<tr>
<td>Vapor</td>
<td>0.5 MPa (5 bar)</td>
</tr>
<tr>
<td>Shredding velocity:</td>
<td>60 rpm</td>
</tr>
<tr>
<td>Electric power consumption:</td>
<td>40 KW/h, enough for 4.4 m3 waste</td>
</tr>
</tbody>
</table>
Centralized Scenario for Incineration of HCW

Scenario 1 & 2
KOSOVO

Total amount 1,200 t/y
An essential problem with HCW in Bulgaria is that 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 resulting in serious health and environmental risks. Incineration used to be the method of choice for most special HCW and is still widely used (PHARE, 2002).

Pharmaceuticals are ideally disposed of by high temperature (i.e. above 1,200ºC) incineration. Such incineration facilities, equipped with adequate emission control, are mainly to be found in the industrialized world (WHO, 1999).
CONCLUSION

- From the above mentioned could be seen the public health approach for solving of potential health risk, respectively prevention from contagious diseases with special concern to health staff, employees from the communal sector, as well persons that are coming into direct or indirect contact with improper disposed solid HCW.

- The absence of waste management, lack of awareness about the health hazards, insufficient financial and human resources and poor control of waste disposal are the most common problems connected with health care wastes. Many countries do not have appropriate regulations, or do not enforce them, but the Government has paid a lot of efforts into approximation of the EU legislation and WHO recommendations. An essential issue is the clear attribution of responsibility of appropriate handling and disposal of HCW that is ongoing since 2000.
CONCLUSION

• Government commitment and support was needed to reach an overall and long-term improvement of the situation, although immediate actions have been taken locally.

• Health care waste management is an integral part of health care, and creating harm through inadequate waste management reduces the overall benefits of health care.
RECOMMENDATION

• Securing government commitment and support for safe and sustainable health care waste management is very important to provide good health to that entire area coming into contact with HCW, as well to protect the environment.

• Raising awareness among those responsible for regulating, generating and handling waste and provide training in safe and sound practices in each Health care Institution.

• Monitoring and evaluation of health care waste management activities and their impact.
RECOMMENDATION

• **Resource allocation by Health care Institutions** is necessary for long-term and sustainable HCW management in order to protect people from hazards when collecting, handling, storing, transporting, treating or disposing of waste.

• **Trainings according to the Manual for safe HCW management** is assisting managers in fulfilling the obligations in accordance to the legislation.
Recommended protective cloth for persons that transport HCW

- Защитни ракавици
- Защитна маска
- Кошула со долги ракави
- Пластична кецела
- Панталони
- Чизми

Thank you