

Medical waste management in the pandemic disease conditions

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Abstract – This paper focuses on the risk for medical waste management system in terms of an outbreak of pandemic disease. It analyzes the most important properties of infectious medical waste and recognizes the main risks. In addition, an attempt was made to identify the key linkages between the increasing the number of cases and risks associated with infectious medical waste stream.

Key words – healthcare waste, medical waste, infectious waste, pandemics, waste management.

I. Introduction

For few years it has been observed an increasing interest in security issues. This is mainly a result of increasingly emerging threats of various type and intensity – natural disasters, pandemic diseases and terrorist attacks. It is implicated to different systems and environments. Healthcare activities can lead to the generation of waste that might be infectious (or hazardous in other way) and cause effects on human health and on the environment. Medical waste, due to the where they arise and potential infectious properties, are among the most troublesome and dangerous waste groups. According to the World Health Organization (WHO), more than 23 million infections, hepatitis B and C and HIV in hospitals is caused by a worn needle-stick injuries [1]. This is just one of many risks associated with hospital waste management, however, it shows how serious the risk might entail improper handling of this specific group of waste.

II. Infectious medical waste

Infectious medical waste were considered particularly dangerous and require very careful handling [2][3]. They are also the biggest source of risk in the system of medical waste management. What is the definition of infectious waste? To define infectious waste, it is necessary first to define medical waste. Medical waste is all waste resulting from medical procedures (performed by doctors and nurses) and from research in the field of medicine [4]. In practice, it is assumed that potentially infectious are all waste that have been in contact with the tissues and body fluids of people (including tissues and fluids themselves) [1], [3]. At the legal level, the definition of medical waste, including infectious waste, is usually contained in legislation or in internal policy documents/guidelines applicable in each country. Based on the guidelines of the WHO [1], among infectious medical waste can be divided into the following groups: anatomical waste (parts of the body), infected needles and sharps, materials from laboratory work, waste from surgery and autopsies of patients with infectious

diseases (eg. Textiles, equipment that came into contact with blood or body fluids); residues from infectious patients and waste from dialysis.

Infectious waste cause risks associated with exposure for all kinds of pathogenic microorganisms. Some pathogens have the ability to live on inanimate surfaces for weeks or even months (table 1).

TABLE 1

THE ABILITY OF SURVIVAL OF SELECTED PATHOGENS [5]

Infectious agent	Observed survival time
HBV	<ul style="list-style-type: none"> – few weeks on the surface with dry air – one week on the surface at 25°C – several weeks in dried blood – 10 h at 60°C – experiencing a 70% ethanol
Infectious dose of HBV or HCV	one week in dried blood in the needle for injection
HCV	seven days in blood at 4°C
HIV	<ul style="list-style-type: none"> – deactivation in 56°C – survive 15 minutes in 70% ethanol – survive 21 days in 2 ml of blood in ambient temperature – drying reduces virus concentration of 90-99% for the next few hours

This threat applies in particular to people who have direct contact with the waste – patients, medical staff, technical staff in hospital and staff from companies engaged in waste disposal.

Infections associated with medical waste management come mainly as a result of uncontrolled cuts, stings or abrasions, that as a result cause contact of human blood with disease pathogen [6]. Particularly dangerous are waste contaminated with blood and body fluids, eg. used needles and surgical tools. Infection rates depends largely on the type of pathogen, the depth of puncture, the blood volume, the stage of infection to the patient, and the effectiveness of post-exposure procedures [3]. The probability of infection after a needle stick injury infected estimated as follows [7]:

- hepatitis B – risk level 6-30%;
- hepatitis C – risk level 2-7%;
- human immunodeficiency virus HIV – risk level 0.3 –0.5%.

Potentially infectious waste are produced in all surgeries, treatment rooms, hospital wards and all kinds of institutions related to health care (hospices, blood donation centers, dialysis centers etc.) [8].

III. Risk of a pandemics

Over the past 20 years in the world there were diagnosed cases of more than 30 new diseases (including eg. SARS and new types of avian and swine flu) [9]. Analyzing the possibility of epidemics and pandemics, due to the high risk for human health and life, there are taken into account very dangerous infectious diseases (bacterial and viral) [10][11], such as:

- bacterial: anthrax bacillus, Mycobacterium tuberculosis, Corynebacterium diphtheriae, Bordetella pertussis, Legionella bacillus, cholera, spirochete Borrelia, Yersinia pestis;

- viral: virus smallpox virus, hepatitis C virus, HIV, rabies virus, influenza virus, hemorrhagic fevers: yellow fever, Hantaan, Q, Ebola, Marburg and Lassa.

Due to globalization of life on our planet, health problems upward in one country can become problems around the globe and lead to epidemic and pandemic attacks, and thus to the rapid increase in the number of cases and hospitalizations[12]. One can distinguish the following factors facilitating outbreaks of pandemics[13]:

- global nature of transport and food trade;
- common traveling (for tourist, business);
- migration of population;
- natural disasters;
- new pathogens and diseases (including zoonotic);
- sexually transmitted diseases;
- the risk of a terrorist attack using biological agent.

Most of the dangerous infectious diseases requires treatment in hospital, some in intensive care units. Regarding the fact that the amount of medical waste generated is closely related to the number of medical services, rapid increase in of cases can lead to overload the medical waste management system. An additional problem is the way the classification of medical waste in terms of epidemic and pandemic diseases; in this case, normal procedures for classification may be insufficient to ensure the sanitary and epidemiological safety. In case of a pandemic diseases it can be expected threats to the functioning of the medical waste management system, due to:

- overload of healthcare system due to increased number of: cases, deaths and patients in intensive care units,
- lack of medical staff;
- not infectious waste may become infectious;
- availability of capacity for disposal of medical waste may not be sufficient;
- increase of costs of health care units.

Conclusion

The outbreak of infectious disease on the scale of the pandemics represents a real risk in these days of intensive migration of the population. Such situation, especially particularly if applicable to certain dangerous illnesses, can cause sudden overload of health care facilities and rapid increase in provided medical services. For this reason medical waste management system, which is directly affected by the amount of provided health services, should include procedures related to the occurrence of an pandemic infectious disease. It is one of the challenges in the medical waste management, because now spreads of a pandemics are not analyzed in the context of infectious waste. Developing plans and procedures for dealing with infectious waste in cases of

extreme conditions, is necessary to ensure the sanitary safety and the stability of both, health and waste management systems.

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