Management of healthcare waste

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ABSTRACT

Due to risks to health and environment that improperly management and disposal of waste can lead, in the last years has been an international mobilization for implementation of waste management systems. The World Health Organization published in 2014 a document on safe healthcare waste management that offers a guide for elaboration of healthcare waste management systems. According to World Health Organization a healthcare waste management systems consist of 5 steps: segregation, storage, transport, treatment and disposal. With the global pressure the trend is the development of policies around the world and the improvement of management systems. This report covers three main aspects of healthcare waste management that are in featured in the recent literature: First, the structure of the current healthcare waste management system. Second, poor healthcare waste management systems in developing countries. Finally, the importance of National Policy on Solid Waste management for the implementation of healthcare management systems.

Keywords: Solid waste, waste generation, developing countries, healthcare waste

Manejo de resíduo hospitalar

RESUMO

Devido aos riscos para a saúde e o meio ambiente que gestão inadequada e eliminação dos resíduos podem ocasionar, nos últimos anos tem-se observado uma mobilização internacional para a implementação de sistemas de gestão de resíduos. A Organização Mundial de Saúde publicou em 2014 um documento sobre a gestão segura de resíduos hospitalares que oferece um guia para a elaboração de sistemas de gestão para resíduos hospitalares. De acordo com a Organização Mundial de Saúde um sistema de gestão de resíduos hospitalares é composto por 5 etapas: segregação, armazenamento, transporte, tratamento e disposição final. Com a pressão global a tendência é o desenvolvimento de políticas em todo o mundo para a melhoria dos sistemas de gestão. Este trabalho abrange três aspectos principais da gestão de resíduos hospitalares que estão em destaque recentemente na literatura: Primeiro, a estrutura do atual sistema de gestão de resíduos hospitalares. Segundo, os sistemas precários de gestão de resíduos hospitalares em países em desenvolvimento. Finalmente, a importância da Política Nacional de Gestão de Resíduos Sólidos para a implementação de sistemas de gestão hospitalar. .

Palavras-chave: Resíduo sólido, geração de resíduos, países em desenvolvimento, resíduo hospitalar

INTRODUCTION

The current pattern of life is leading to an enormous generation of different types of waste. Due to risks to health and environment that improperly management and disposal of waste can lead, in the last years has been an international mobilization for implementation of waste management systems (1,2,3). For example, the Basel Convention deals with transboundary movements of hazardous, but also requires of its parties an appropriate national or domestic legislation (4).

The Healthcare waste (HCW) can be characterized by the presence of both general waste and hazardous waste which represent serious risks to health if mismanaged (5). According to WHO (5) there are five types of hazardous in the HCW: presence of infectious agents; genotoxic or cytotoxic chemical composition; presence of toxic of hazardous chemicals or biologically aggressive pharmaceuticals; presence of radioactivity; and presence of used sharps. These can transmit infectious agents that can include HIV and hepatitis viruses B and C (5,6). Besides, improperly HCW management can spread resistant bacteria throughout the hospital or even the city (5,7). Furthermore, chemicals and pharmaceutical waste can cause intoxication through acute, chronic exposure or physical injuries (5). Many of the possibilities of health damage due to HCW can lead to death, a properly HCW management save lives (5). However, according to WHO (5) it is not just the about the risks, it is also an opportunity to the health care facility save money. It is because just 20% of the waste of a healthcare facility need to receive special attention and management and also because is cheaper prevent than remediate (5).

This work will cover three main aspects of HCW management that are in featured in the recent literature. First, the structure of the current HCW management system. Second, poor healthcare waste management systems (HCWMS) in developing countries. Finally, the importance of National Policy on Solid Waste management for the implementation of HCW management systems.

HEALTHCARE WASTE MANAGEMENT SYSTEMS

The World Health Organization (WHO) published in 2014 a document on safe healthcare waste management that offers a guide for elaboration of healthcare waste management systems (HCWMS). According to WHO (5) a HCWMS consist of 5 basic steps: segregation, storage, transport, treatment and disposal, each step is briefly described below. The author describes each step and the most safety procedures for each one, it is also recommended adaptations of the steps based on the local legislation or available proceeds. If there is no legislation, is recommended the use of the patterns suggested by the WHO (5). Furthermore, this system follows a waste management hierarchy: first waste minimization, reuse and then recycling.

Segregation

The objective of waste segregation is to separate the general waste of the infectious/hazardous waste which need special treatment (5). For safety reasons the hazardous waste is usually separated into two categories: used sharps and potentially infectious items. It is called "three-bin system", it is a basic system of segregation. It needs to have a system of

colour, preferably a national system, if there is not a national system to guide this, the WHO has a system of colours for that. Furthermore, the waste needs to be stored in proper containers and labelled (5). All these procedures will facilitate the disposal and also how handling each type of waste, which ensure the safety of the workers.

Collection

The WHO (5) points out that the collection of waste needs to be very well coordinated. It should happen daily, but the hazards cannot be collected together with the general waste for avoiding contamination (5). All waste should be market with hour and local of collection for facilitate the management control and the weight should be measured. It can help to find failures with the management (5).

Storage

According to WHO (5) the storage of waste for short-term need to be done in a way that the waste is out of reach for patients and in properly containers to avoid leaking of undesirable substances. The best way of do that is storage it in utility rooms. If it is not possible it should be storage in a location near of the medical facility, but away from patients and public access (5).

Transport

According to WHO (5) the transport is separated in two phases: onsite and offsite transport. The onsite transport needs to be based on the health care facility design and the routes and timing should be planned to ensure non contamination of workers and patients (5). The WHO (5) also describes basic procedures for transport offsite. However, WHO outlines that offsite transportation may be regulated by local, regional or national regulations, even by international regulations and agreements in case of international transport for treatment, regulated by the Basel Convention (4). Whereas there are none of these regulations can be find, international authorities may give guidance for transport of hazardous, which can be found in UN (4).

Treatment

The treatment of waste aims neutralizes or reduces the dangerous of waste for safety disposal, protecting human health and environment (5). According to WHO (5) the waste treatment choice depends on many factors, the most important are: "waste characteristics, technology capabilities and requirements, environmental and safety factors, and costs – many of which depend on local conditions" (5).

Disposal

Most part of the waste after treatment can be disposal in a controlled or sanitary landfill. Uncontrolled landfills are environmental damaged, thus gases and other toxic component that can release to the atmosphere or reach groundwater when the material start to decompose or react in contact with a different materials (5). Other types of healthcare waste cannot be disposal in landfill due to its harm characteristics, such as products which contain heavy metals or radioactive compounds (5).

POOR MANAGEMENT OF HCW

There are few journals in this area, but with the increased concern about hazardous waste management the focus of the most recent studies is the poor management of health care waste in developing countries. These cases can lead to situations where workers, patients and even citizens are in a position of risk of

contamination as in the studies presented below.

Longe & Adenuga (3) presented a study with twenty healthcare facilities in Nigeria, Lagos state. The major finds were inappropriate handling, disposal, storage, treatment and no-segregation (3). The professionals involved in the healthcare waste collection have no instructions of management or cleaning of infectious material before disposal which put their life in risk and also other professionals, patients and relatives (3). Relative to disposal and treatment Longe & Adenuga (3) reported that part of the waste does not receive any treatment before disposal, 70% practice uncontrolled open burning and 10% semi-controlled and the final disposal is done in open dumps mixed with general waste. Furthermore, according to Longe & Adenuga (3) there is no system of segregation that enhances great management practice and reduce occupational health and safety risks. This study also showed that the current method of storage is in pits mixed with general waste, it has a high risk of reach water resources and contaminate groundwater and surface water (3). The practice of waste incineration is extremely dangerous, it lead to intoxication by toxic air pollutants, and the incineration does not mean neutralization of the compounds in the waste (2,5,8,9).

A study about HCWMS in Asia showed similar results, mainly for developing countries. Ananth, Prashanthini & Visvanathan (1) analysed twelve countries, these just four countries comply with all requirements of the World Health Organization (WHO) about HCW management. According to Ananth, Prashanthini & Visvanathan (1) China, Indonesia an LAO do not have properly systems of waste segregation; Indonesia and Myanmar do not follow the WHO standards for storage and LAO, Mongolia and Thailand follow partially; Cambodia, Indonesia, LAO, Myanmar do not follow the WHO standards; all countries give some kind of treatment to the HCW; Cambodia, China, Indonesia, Mongolia and Myanmar do not follow the standards and LAO follow partially.

Those countries that do not follow the WHO standards for the transport of HCW are transporting risk HCW at the same vehicle that transport general waste, exposing the general waste to hazardous waste (10). About the treatment of HCW in Asia, such as in Nigeria, the most common treatment is incineration, most open incineration (10). As reported by Ananth, Prashanthini & Visvanathan (10), in countries economically vulnerable, where the hospitals cannot afford pay for an incinerator which follow the criteria for combating secondary pollution, the waste is burnt using makeshift combustion chambers, releasing toxic compounds to the air. Furthermore, this practice usually happens at the hospital facilities in the external areas (10).

THE ROLE OF A NATIONAL POLICY ON SOLID WASTE

Longe & Adenuga (8), Ananth, Prashanthini & Visvanathan (10) Sant'ana (14) and WHO (5) agree that a National Policy on Solid Waste is the key for countries achieve a minimum safe pattern in HCW management. Longe & Adenuga (3), Ananth, Prashanthini & Visvanathan (10), reported that the reason behind the poor management in the hospitals is the lack of National or Local legislation to guide the healthcare facilities. A HCW management system is the integration of internal and external management. The external transport and disposal are indispensable parts of a HCW management system, and if the country has not regulations for these steps of the process, it will put the public in risk independent of the internal management. WHO (5) showed some alternatives in case of a country there is no safe external

regulations for transport and disposal, but they are just provisory measures. In many cases the hazardous waste need to be send to specialized facilities that are not even in the same country and a National Policy ensuring the compliance with safe management is the first step for international cooperation (4,5).

A study in Brazil shows the importance of a National Policy on Solid Waste: Guimarães, Sabagh & Fialho (11) studied the HCWMS of The National Institute of Quality Control in Health (INCQS). They have a computerized system that allows them track down the waste, register the time that the waste remain at the institutions, date, quantity generated, and it also allows them make comparative surveys and improve the quality of their management system (11). Guimarães, Sabagh & Fialho (11) reported that the segregation of waste has been successful, the INCQS follow the national standards and regulations, a system of colours is present and there is a properly system of labelling and symbology. Guimarães, Sabagh & Fialho (11) also found the safety handling and transport are also following the national standards. Furthermore, the waste is receiving treatment before final disposal, sterilization or incineration. Guimarães, Sabagh & Fialho (11) reported that the incineration process is being undertaken following safety standards by the Environment Agency, the toxic gases from the incineration process may undergo filtration. As for the final step, that is disposal, the waste has been deposited in landfills (11).

A similar situation was reported in Mongolia, where a National System has been improving the HCWM in the country and facilitating the shift to environmentally friendly technology like non- incinerating technology (12). A study in Bolivia also highlights the improvement in the healthcare waste management after the introduction of an Integral system by the Ministry of Health. only this way is possible achieve an adequate and sustainable management (13).

CONCLUSION

In conclusion, the current system of HCW management is focused on security harder than sustainability even considering principles of minimization, reutilization and recycling. This system follow five basic steps, the compliance with the five steps is essential for neutralizing the risks for health and environment. Furthermore, the studies in the developing countries showed clearly that the most medical facilities are not complying with the first step that is segregation. It creates a chain reaction, since each step depend upon the good development of the previous step.

Besides, the success of HCW management systems is related with the presence of laws and regulations. The role of a national policy on solid waste is to protect the people and environment, providing control and increasing awareness about the risks people are being submitted in places where the standards are not being followed. Moreover, the World Health Organization has been performing a clearly role in the incentive to the creation of national laws and regulations, to the assistance to medical facilities to improve or to implement safety measures regard to HCW management systems and rising international awareness as well.

Finally, HCW management systems depend upon national laws and regulations and however, some developing countries are facing difficult in the implementation for lack of national regulation the WHO provide guidance and provisory options to comply with the safety patterns. With the global pressure the trend is the development of national policies around the world and the improvement of HCW management systems.

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REFERENCES

(1) EL-FADEL, M, FINDIKAKIS, AN & LECKIE, JO. Environmental Impacts of Solid Waste Landfilling. **Journal of Environmental Management**, vol. 50, no. 1, May, pp. 1-25. 1997.

(2) HESTER, RE & HARRISON RM. Environmental and health impact of solid waste management activities. **Royal Society of Chemistry**. 2002.

(3) LONGE, E & ADENUGA, I. The challenge of healthcare waste management in Ogun state, Nigeria: A case study from twenty selected primary health centres. **International Solid Waste Association** (ISWA). 2013.

(4) UNEP n.d. Basel Convention: on the control of transboundary movements of hazardous wastes and their disposal, <http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf> . Viewed: 25 Set, 2014.

(5) WORLD HEALTH ORGANIZATION (WHO). Safe management of wastes from health-care activities, 2n edition. 2014..<http://apps.who.int/iris/bitstream/10665/85349/1/9789241548564_eng.pdf?ua=1>. Viewed: 21 Jan, 2016.

(6) STEVENS, M & DICKINSON D. Needlestick injuries in an era of HIV: technical and personal aspects. **African Journal of AIDS Research**, vol. 6, no. 1, pp. 41-48. 2007.

(7) NOVAIS C, COQUE, TM, FERREIRA, H, SOUZA, JC & PEIXE LUISA. Environmental contamination with vancomycin-resistant enterococci from hospital sewage in Portugal. **Applied and Environmental Microbiology**, vol. 71, no. 6, June, pp. 3364–3368. 2005.

(8) BATTERMAN, S. Findings on an Assessment of Small-Scale Incinerators for Health-care Waste, Water, Sanitation and Health Protection of Human Environment World Organization, Geneva. 2004

(9) GAUTAM, V. Biomedical waste management: Incineration vs. environmental safety. **Indian Journal of Medical Microbiology**, vol. 28, no. 3, pp. 191-192. 2010

(10) ANANTH, AP, PRASHANTHINI, V & VISVANATHAN, C. 2010. Healthcare waste management in Asia. **Waste Management**, vol. 30, no.1, January, pp. 154-161. 2010.

(11) GUIMARÃES, ACR, SABAGH, F & FIALHO, M. Waste Management of Health Care Service at INCQS/Fiocruz – Brazil. International Solid Waste Association. 2012.

(12) BATMUNKH, T. Current Situation of HCW in Mongolia, International Solid Waste Association. 2013.

(13) NABHOLZ, M. Integral Management of Solid Healthcare Waste in Bolivia. **International Solid Waste Association**. 2012.

(14) SANT'ANA, LP. Hazardous Waste Management in Japan A report. **Unisanta BioScience**, v. 4, n. 4, p. IV, 2016.