

Health Care Waste Management: Challenges and Solutions

Halldorsdottir S¹.

¹ School of Health Sciences, University of Akureyri, Iceland

e-mail: sigridur@unak.is

Abstract

Limited attention has been paid to health-care waste management despite an increase in public concern about the management of such waste on a global basis. The objective of this study was to analyse the issues and challenges of health-care waste management as well as possible solutions. It is estimated that about 50% of the world's population is at particular risk from improperly treated health-care waste. In most countries wastes from hospitals and other health-related facilities are not required to be treated to remove the thousands of high-volume health-care chemicals. Incomplete removal can lead to formation of transformation products which in some cases may be more toxic than the parent compounds. Uptake of contaminants by earthworms and plants may contribute to biomagnification in terrestrial food web, and thus, their food-chain effects need attention. Humans can be exposed to chemicals through the consumption of contaminated water and food. Stewardship and green pharmacy have the potential to deliver positive environmental health. The whole life cycle of a compound or health-care product has to be considered when making risk management and risk reduction decisions. Such life-cycle assessment can be made by various stakeholders in the health-care chain, including manufacturers, doctors, pharmacists, and patients.

Keywords: Health-care waste management; Sustainable practices; Protection of the environment; Environmental pollution; Infectious waste.

1. Introduction

Health-care waste management is of great importance due to its hazardous nature that can cause undesirable effects on human and the environment. It is of great importance to manage health-care waste in a proper manner to avoid health risks and damage to flora, fauna, and the environment (Yong et al., 2009). Improper health-care waste management may lead to transmission of diseases like typhoid, cholera, and hepatitis through injuries from sharps contaminated with human blood (Abdulla et al., 2008). Approximately 15-25% (by weight) of health-care waste is considered infectious (Shinee et al., 2008). Health-care waste is a special category of waste because it poses potential health and environment risks, typically including sharps, human tissues or body parts and other infectious materials (Baveja et al., 2000). The problematic areas are similar for all health-care units and at all stages of management, including segregation,

collection, packaging, storage, transport, treatment and disposal (Tsakona et al., 2007). In most countries the wastes from hospitals and other health-related facilities are not required to be treated to remove the thousands of high-volume chemicals. At best incomplete removal can lead to formation of transformation products which in some cases may be more toxic than the parent compounds (Boxall and Kookana, 2018; Olivera, 2018). Management of the physical environment is one of the pillars that underpin the contribution to sustainable development (Williamson et al., 2006) and the effective management of health-care waste through minimisation, recycling and reuse is one strategy via which sustainability can be achieved (Tudor et al., 2008). The outbreak of severe acute respiratory syndrome (SARS) in 2003 as well as other causes has called for authorities to take more serious steps in managing health-care waste (Cheng et al., 2008). It is estimated that about 50% of the world's population is at risk from improperly treated health-care waste (Wolff, 2018).

2. Issues and Challenges

Public concern has been aroused about the generation, storage, treatment, transportation and disposal of health-care wastes (Birpinar et al., 2009). In many developed countries, specific rules and regulations have been implemented for hospital waste management systems and thus, these systems are more effective than those in many developing countries (Yong et al., 2009). Some of the weaknesses of health-care waste management, include: lack of strategic waste minimisation planning involving long-term scrutiny of the waste issue; lack of senior management targets set for reducing waste arising; a lack of recycling initiatives for a wide range of items, for example redundant furniture and equipment; inadequate staff training and information provision; poorly developed partnerships with other agencies, statutory bodies, and suppliers, to help facilitate resolving the waste issue (Tudor et al., 2005). Furthermore, uptake of contaminants by earthworms and plants may contribute to biomagnification in terrestrial food web, and thus, their food-chain effects need attention (Bean and Rattner, 2018; Carter and Kinney, 2018). Humans can also be exposed to chemicals through the consumption of contaminated water and food (Boxall, 2018). In many countries, hazardous health-care wastes are still handled and disposed together with domestic wastes, thus creating a great health risk to municipal workers, the public and the environment. Practices in many healthcare facilities

do not comply with the principles stated in Best Practice legislation (Silva et al., 2005). Finally, there is a great potential to emit air toxic pollutants from incinerators if improperly operated and managed, because health-care waste typically contains a variety of plastic materials such as polyvinyl chloride (PVC). Waste minimization and recycling, control of toxic air emissions at health-care waste incinerators, and alternative treatment methods to incineration are regarded to be the major challenges in the future (Jang, et al., 2005).

3. Possible Solutions

Pre-sorting and segregation of waste has been shown to significantly reduce uncontrolled emissions, reduce ash volume and its toxicity. It has also been estimated that disposal savings of between 40%-70% could be realized through the implementation of a health-care waste reduction program (Tudor et al., 2005). Golog and Bartlett (2007) made an interesting comparison of Slovenia and Australia indicating that national culture is a driver. So, it is clearly important to look at the culture in each country. Stewardship and green pharmacy have the potential to deliver positive environmental health and financial outcomes (Helwig, 2018). Environmental citizenship is an outcome of education for sustainability related to changing people's attitudes, providing access to knowledge and developing skills which combine to influence behavior. It is comprised of several discrete but related concepts including information sharing, awareness building, concern, attitudes/beliefs, education and training, knowledge, skills, literacy and responsible behavior (Hawthorne and Alabaster, 1999; Tudor et al., 2008). In their study in England and Wales, Tudor et al. (2008), found that adopting a holistic approach, employing social enterprise and developing wide-ranging networks were important constructs in realizing the effective implementation of Corporate Social Responsibility (CSR) and Environmental Citizenship within their case study organizations. Lynes and Andrachuk (2008) point out that corporate social and environmental responsibility (CSER) is gaining popularity with some studies attempting to escape narrow definitions of corporate responsibility. They claim that numerous studies have examined motivations for environmental responsibility as well as the motivations of social responsibility and that there is an increasing trend in looking at corporate social and environmental responsibility in unison. The whole life cycle of a compound or a health-care product must be considered when making risk management and risk reduction decisions (Boxall and Kookana, 2018). Such life-cycle assessment can be made by various stakeholders in the health-care chain, including manufacturers, doctors, pharmacists, and patients (Kümmerer, 2018). Fortunately, within the past decades several environmental policies have emphasized the need for greater environmental responsibility and the development of strategies that encourage more sustainable practices at the international level (Boxall and Kookana, 2018).

Table 1. Issues, challenges and possible solutions regarding health-care waste management

Issues and challenges	Possible solutions
Limited attention in developing countries	Global awareness and stewardship
Improper waste management can lead to diseases such as typhoid, cholera and hepatitis	All stages of management, including segregation, collection, packaging, storage, transport, treatment and disposal must be attended to
Thousands of high-volume health-care chemicals improperly treated. Uptake of contaminants by earthworms and plants may contribute to biomagnification in terrestrial food web, and thus, their food-chain effects need attention	The whole life-cycle of a compound or health-care product must be considered. Such life-cycle assessment can be made by various stakeholders in the health-care chain, including manufacturers, doctors, pharmacists, and patients.
Estimated 50% of the world's population at risk	Stewardship, corporate responsibility and green pharmacy

4. Conclusions

The management of health-care waste is an emerging issue which is magnified by a lack of training, awareness, and financial resources to support solutions. The collection and disposal of this waste is of great importance as it can directly impact the health risks to both public and environmental health. In this paper some issues and challenges of health-care waste management have been considered as well as possible solutions. All stages of health-care waste management must be considered, including segregation, collection, packaging, storage, transport, treatment and disposal. Thousands of high-volume health-care chemicals are improperly treated. Uptake of contaminants by earthworms and plants may contribute to biomagnification in terrestrial food web, and thus, their food-chain effects need attention. The whole life-cycle of a compound or health-care product must be considered. Such life-cycle assessment can be made by various stakeholders in the health-care chain, including manufacturers, doctors, pharmacists, and the public. Management of the physical environment is one of the pillars that underpin the contribution to sustainable development. What is needed in health-care waste management is the effective management of health-care waste through minimisation, recycling and reuse where social and environmental responsibility are in unison. This is one strategy via which sustainability can be achieved as well as with global awareness, stewardship and green pharmacy.

References

- Bean, T.G. and Rattner, B.A. (2018), Environmental contaminants of health-care origin: Exposure and potential effects in wildlife. In A.B.A. Boxall and R.S. Kookana (Eds.), *Health Care and Environmental Contamination* (pp. 87-122). Elsevier: Cambridge, MA.
- Birpinar, M.E., Bilgili, M.S. and Erdogan, T. (2009), Medical waste management in Turkey: a case study of Istanbul, *Waste Management*, **29**, 445-448.
- Boxall, A.B.A. (2018), Pharmaceuticals in the environment and human health. In A.B.A. Boxall and R.S. Kookana (Eds.), *Health Care and Environmental Contamination* (pp. 123-136). Elsevier: Cambridge, MA.
- Boxall, A.B.A. and Kookana, R.S. (2018), *Health Care and Environmental Contamination*. Cambridge, MA: Elsevier.
- Carter, L.J. and Kinney, C.A. (2018), Terrestrial ecotoxicity. In A.B.A. Boxall and R.S. Kookana (Eds.), *Health Care and Environmental Contamination* (pp. 69-85). Elsevier: Cambridge, MA.
- Cheng, Y.W., Sung, F.C., Yang, Y., Lo, Y.H., Chung, Y.T. and Li K.-C. (2008), Medical waste production at hospitals and associated factors, *Waste Management*, **29**, 440-444.
- Golog, U. and Bartlett, J.L. (2007), Communicating about corporate social responsibility: a comparative study of CSR reporting in Australia and Slovenia, *Public Relations Review*, **33**, 1-9.
- Hawthorne M. and Alabaster, T. (1999), Citizen 2000: Development of a model of environmental citizenship, *Global Environ Change*, **9**, 25-43.
- Helwig, K.P.M. (2018), Stewardship approaches to reducing health-care contaminants. In A.B.A. Boxall and R.S. Kookana (Eds.), *Health Care and Environmental Contamination* (pp. 199-223). Elsevier: Cambridge, MA.
- Jang, Y-CC., Lee, C., Yoon O-S. and Kim, H. (2006), Medical waste management in Korea, *Journal of Environmental Management*, **80**, 107-115.
- Kümmerer, K. (2018), Management of environmental contaminants from health care: sustainable pharmacy. In A.B.A. Boxall and R.S. Kookana (Eds.), *Health Care and Environmental Contamination* (pp. 225-238). Elsevier: Cambridge, MA.
- Lynes, J. K. and Andrachuk, M. (2008), Motivations for corporate social and environmental responsibility: A case study of Scandinavian Airlines, *Journal of International Management*, **14**, 377-390.
- Oliveira, T.S. (2018). Environmental contamination from health-care facilities. In A.B.A. Boxall and R.S. Kookana (Eds.), *Health Care and Environmental Contamination* (pp. 8-21). Elsevier: Cambridge, MA.
- Silva, C.E., Hoppe, A.E., Ravanello, M.M. and Mello, N. (2005), Medical wastes management in the south of Brazil, *Waste Management*, **25**, 600-605.
- Tudor, T.L., Bannister, S., Butler, S., White, P., Jones, K., Woolridge, A.C., Bates, M.P. and Phillips, P.S. (2008), Can corporate social responsibility and environmental citizenship be employed in the effective management of waste? Case studies from the National Health Service (NHS) in England and Wales, *Resources, Conservation and Recycling*, **52**, 764-774.
- Tudor, T.L., Noonan, C.L. and Jenkin, L.E.T. (2005), Healthcare waste management: A case study from the National Health Service in Cornwall, United Kingdom. *Waste Management*, **25**, 606-615.
- Williamson, D., Lynch-Wood, G., and Ramsay, J. (2006). Drivers of environmental behaviour in manufacturing SMEs and the implications for CSR, *Journal of Business Ethics*, **67**(3), 317-330.
- Wolff A. (2018). Management of waste from the health-care sector. In A.B.A. Boxall and R.S. Kookana (Eds.), *Health Care and Environmental Contamination* (pp. 167-198). Elsevier: Cambridge, MA.
- Yong, X., Gang, X., Guanxing, W., Tao, X. and Dawei, J. (2009), Medical waste management in China: A case study of Nanjing, *Waste Management*, **29**, 1376-1382.