International Journal of Medical Science and Clinical Invention 7(2): 4751-4756, 2020
DOI:10.18535/ijmsci/v7i02.04 **ICV: 77.2**
e-ISSN:2348-991X, p-ISSN: 2454-9576

Review Article

Importance of Compliance to Quality Management of Healthcare/Medical Waste: a Review

[1]Prof. Dr. ASM Giasuddin, [2]Dr. Natasha Khurshid, [3]Ms. Nuhad Raisa Seoty

[1]MSc PhD PGD CSciFIBMS MNYAS MPH
Professor of Biochemistry & Immunology Student of MPH Programme (Friday)
Department of Public Health, School of Health Sciences State University of Bangladesh (SUB) Dhanmondi, Dhaka-1205, Bangladesh
[2]MBBS MPH PhD
Associate Professor of Epidemiology Institute of Epidemiology, Disease Control & Research (IEDCR), Dhaka-1212, Bangladesh
Adjunct Faculty/ Teacher at Dept of Public Health State University of Bangladesh (SUB), Dhanmondi, Dhaka-1205, Bangladesh;
3BSc(Hons)MSc MPH MPhil
Associate Professor of Public Health & MPH Course Coordinator Department of Public Health, School of Health Sciences State University of Bangladesh (SUB), Dhanmondi, Dhaka-1205, Bangladesh

Correspondence Author: Prof. Dr. ASM Giasuddin
MSc (Dhaka) PhD (London) PGD (London) CSciFIBMS (UK) MNYAS (USA) MPH (SUB)
Professor of Biochemistry & Immunology and Senior Consultant
Email: asmgias@hotmail.com ; Mobile: +8801787657685
Division of laboratory Medicine, Impulse Hospital Ltd. 304/E, Tejgaon Industrial Area, Dhaka-1208, Bangladesh

Abstract
All healthcare and service provider including corporate hospital generate healthcare/medical waste during their activities, although 75-90% of the wastes. The remaining 10-26% healthcare waste are considered/regarded as hazardous and may create a variety of health risk for the healthcare workers as well as for the community and Environment as a whole unless managed properly and adequately. Therefore, Compliance to adequate & appropriate waste disposal processes should be carried out & compliance to them are vitally important from public health view point.

Healthcare Institutions
Healthcare of medical institutions include all types of health care and service providers/facilities such as hospitals, clinics, doctors offices (medical, dental, veterinary) and medical/clinical diagnostic laboratories, A significantly large hospital (institution) that provides health-care services in almost all types of health care areas, i.e. medical and surgical treatments in all the sub-specialties, nursing care, physiotherapy and diagnostic investigations (laboratory, imaging, etc) is considered as a corporate hospital.[1,2]

Healthcare/Medical Waste:
"Healthcare/Medical Waste" means any waste which is generated during the diagnosis, treatment, surgery or immunization of human-being of animals, or in study/research activities pertaining thereto or in the production or testing of a biological. About 75 to 90% of the waste produced by the health-care providers is non-risk of "general" healthcare/Medical waste, comparable to domestic waste. The remaining 10-25% health-care waste is regarded as hazardous and may create a variety of health risks.[12]

Generation of Healthcare/Medical Waste
The medical/Clinical institutions that are involved in generation of healthcare/medical waste are the

following: Government hospitals; Private hospitals; Nursing home; Physician's office/clinics; Dentist's office/clinics; Dispensaries; Primary health centers; Vaccinating centers; Medical research and training establishments; Mortuaries; Blood banks and collection centers; Animal house; Slaughter house; Laboratories; Research organizations; Biotechnology institutions/production units.

These establishments are expected to adopt waste disposal processes properly and adequately and compliance to them are vitally important from public health view point.[1,2]

Types of Waste

Healthcare/Medical Waste are of different categories as the following:

Infectious waste: blood and other bodily fluids (eg. from discarded diagnostic samples), cultures and stocks of infectious agents, waste from patients with infections (eg. swabs, bandages and disposable medical devices); Pathological waste: human tissues, organs or fluids, body parts and contaminated animal carcasses; Sharps waste: syringes, needles, disposable scalpels and blades, etc.; Chemical waste: solvents and reagents used for laboratory preparations, disinfectants, sterilants and heavy metals contained in medical devices (eg. mercury in broken thermometers) and batteries; Pharmaceutical waste: expired, unused and contaminated drugs and vaccines, Cyclototoxic waste: waste containing substances with genotoxic properties (i.e. highly hazardous substances that are, mutagenic, teratogenic or carcinogenic), such as cytotoxic drugs used in cancer treatment and their metabolites; Radioactive waste: Products contaminated by radionuclides including radioactive diagnostic material or radiotherapeutic materials; Non-hazardous or general waste: Waste that does not pose any particular biological, chemical, radioactive or physical hazard.3

Health Hazards Of Health Care/Medical Waste

Exposure to hazardous health-care/medical waste can result in disease or injury due to one or more of the following characteristics: (a) it contains infectious agents; (b) it contains toxic or hazardous chemicals or pharmaceuticals; (c) it contains sharps; (d) it is genotoxic; and (e) it is radioactive.3 An estimated 16 billion injections worldwide are administered every year. Not all needles and syringes are disposed of safely, creating a risk of injury and infection and opportunities for reuse. Injections with contaminated needles and syringes in low- and middle-income countries have reduced substantially in recent years, partly due to efforts to reduce reuse of injection devices. A person who experiences one needle Stick injury from a needle used on an infected source patient has risks of 30%, 1.8% and 0.3% respectively of becoming infected with HBV, HCV and HIV. In 2015, a joint WHO/UNICEF assessment found that only just over half (58%) of sampled facilities from 24 countries had adequate systems in place for the safe disposal of health care waste.[3,4]

Types/Categories of Persons at Risk

All individuals exposed to such hazardous healthcare/medical waste are potentially at risk, including those who generate the waste or those who either handle such waste or are exposed to it as a consequence of careless management. The main groups at risk area medical doctors, nurses, healthcare auxiliaries and hospital maintenance personnel; patients in health-care establishments; visitors to healthcare establishments; workers in support service allied to healthcare establishments such as laundries, waste handling and transportation; and workers in waste disposal facilities such as land-fills or incinerators including scavengers.[3,4]

Waste Disposal Process

[1] a. Generation of waste; b. Segregation of waste (Colored bins); c. Collection of waste; d. Storage of waste; e. Transportation of waste; f. Treatment & disposal of waste i.e. Incineration/different types, Chemical disinfection, Wet & dry thermal treatment, Microwave irradiation, Land disposal, Inertization, etc;

[2] (General waste should be dumped at municipal dumping site; Sanitation officer should be responsible for proper coordination between municipal and hospital; (iii) Use of label/symbol is useful in identifying waste for treatment e. g: Risk of corrosion, Danger of infection, Toxic hazards, Glass Hazards, Radioactive materials etc.[4,5,6]

[3]

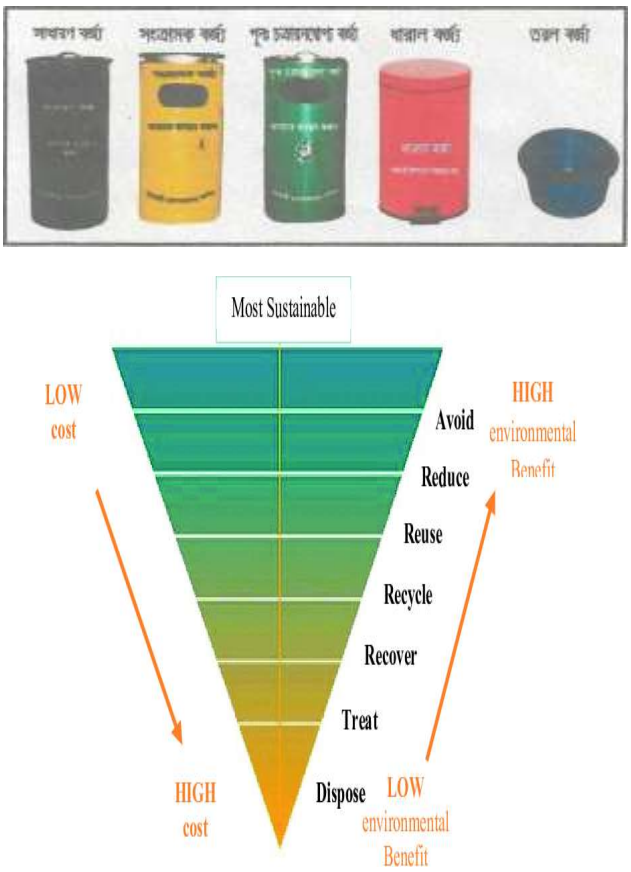

Figure: Five cate gories of colored containers to keep healthcare/medical wastes according to their types i.e. general (Black), infective (Yellow), recyclable (Green), Sharps (Red) and Liquid (Blue).6

Environmental Impact of Waste Disposal

The medical waste disposal processes have potential implications on public health through environmental
impact as noted down: (i) Treatment and disposal of healthcare/ medical wastes may pose health risks indirectly through the release of pathogens and toxic pollutants into the environment. The disposal of untreated healthcare wastes in landfills can lead to the contamination of drinking, surface and ground waters if those landfills are not properly constructed; (ii) The treatment of healthcare wastes with chemical disinfectants can result in the release of chemical substances into the environment if those substances are not handled, stored and disposed in an environmentally sound manner; (iii) Incineration of waste has been widely practiced, but inadequate incineration or the incineration of unsuitable materials results in the release of pollutants into the air and in the generation of ash residue; (iv) Incinerated materials containing or treated with chlorine can generate dioxins and furans, which are human carcinogens and have been associated with a range of adverse health effects; (v) Incineration of heavy metals or materials with high metal content (in particular lead, mercury and cadmium) can lead to the spread of toxic metals in the environment; (vi) Only modern incinerators operating at 850-1100°C and fitted with special gas-cleaning equipment are able to comply with the international emission standards for dioxins and furans; (vii) Alternatives to incineration such as autoclaving, microwaving, steam treatment integrated with internal mixing, which minimize the formation and release of chemicals or hazardous emissions should be given consideration in settings where there are sufficient resources to operate and maintain such systems and to dispose of the treated waste.[1,4,5]

The Waste Hierarchy

The waste hierarchy is a set of priorities for the efficient use of resources; The waste hierarchy is
(i) avoidance including action to reduce the amount of waste generated by households, industry and all levels of government; (ii) resource recovery including re-use, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources; (iii) disposal including management of all disposal options in the most environmentally responsible manner.

Finally, the waste hierarchy recognizes that some types of waste, such as hazardous chemicals or asbestos, cannot be safely recycled and direct treatment or disposal is the most appropriate management option. Avoiding and reducing waste has the highest priority. Avoiding and reducing the generation of waste, encourages the community, industry and government to reduce the amount of virgin materials extracted and used. The goal is to maximize efficiency and avoid unnecessary consumption. The second priority, resource recovery, maximizes options for re-use, recycling, reprocessing and energy recovery. Some materials may be inappropriate to re-use recycle or recover for energy and instead require treatment to stabilize them and minimize their environmental or health impacts. Finally, the waste hierarchy recognizes that some types of

waste, such as hazardous chemicals or asbestos, cannot be safely recycled and direct treatment or disposal is the most appropriate management option.1,7

Waste Management: Reasons for Failure

Lack of awareness about the health hazards related to health-care waste, inadequate training in proper waste management, absence of waste management and disposal systems, insufficient financial and human resources and low priority given to the topic are the most common problems connected with healthcare/medical waste. Many countries either do not have the appropriate regulations or do not enforce them.8

Key Elements in Improving Waste Management

Some of the key elements in improving Healthcare/medical waste management are stated below: Promoting practices that reduce the volume of wastes generated and ensure proper waste segregation; Developing strategies and systems along with strong oversight and regulation to incrementally improve waste segregation, destruction and disposal practices with the ultimate aim of meeting national and international standards; Where feasible, favouring the safe and environmentally sound treatment of hazardous healthcare wastes (eg. by autoclaving, microwaving, steam treatment integrated with internal mixing, and chemical treatment) over medical waste incineration'; Building a comprehensive system, addressing responsibilities, resource allocation, handling and disposal and this is a long-term process, sustained by gradual improvements; Raising awareness of the risks related to healthcare waste and of safe practices; and selecting safe and environmentally-friendly management options, to protect people from hazards when collecting, handling, storing, transporting, treating or disposing of waste; Government commitment and support are needed for universal and long-term improvement, although immediate action can be taken locally.8,9 Ideally, appropriate and adequate strategic plan of action be developed, implemented, evaluated and monitored its effectiveness regularly adopting PDCA (Plan, Do, Check, Act) cycle.10

Medical Waste Management Situation In Bangladesh

(a) PRISM Bangladesh

Bangladesh, a developing country defining trend for its economy and society is the rapidly growing urban population. But the facilities for medical waste disposal from healthcare establishments (HCEs) cannot coup with the growing demands. PRISM has established a medical waste treatment plant at Matuail, outside Dhaka with collaboration of Dhaka City Corporation (DCC) and support from other international organizations. Programme runs through: (i) In-house management, (ii) Out-house management and (iii) Institutional support. Programme started with 17 HCEs in the DCC area and now the number of the HCEs under the programme was 484. Recently the programme started in Savar Pouroshova, Dhaka with 25 HCEs from 01 July 2013 as reported in 2018.11

(b) Government of Bangladesh (GOB)

The Directorate General of Health Services (DGHS), Ministry of Health and Social Welfare (MOHFW), Government of Bangladesh (GOB), Dhaka has developed a guide-line regarding disposal of "healthcare/medical waste" produced daily in all the healthcare services institutions/corporate hospitals in the country. The booklet is available from the office of the Director of Hospital Services Management, DG (Health) Office, Mohakhali, Dhaka-1212 Bangladesh.5,6

(c) Present Situation in Bangladesh

The present situation in Bangladesh regarding medical waste management is at a vulnerable stage as it has been overloaded over the years. The picture is alarming for many divisional cities, excluding the capital 'Dhaka city'. Medical wastes are not like other wastes and they can infect through the skin as well as through inhalation or ingestion. Hepatitis B, Hepatitis C and possibly HIV present the greatest risk from such wastes. Besides, antibiotic resistant germs (superbugs) and other potentially dangerous germs can spread from these medical wastes. At a time when safe disposal of medical waste is a nationwide concern, some waste treatment devices (Hydroclave imported from Canada) have been lying idle since 2015. This has been due to technical reasons (deficiencies) as

A woman picks up a blood bag, with the blood inside still visible, at a dumping ground where medical waste is disposed with other wastes in Parairchawk of Sylhet. Such mixing of medical wastes with other rubbish in a violation of the rules, but it is done all around the country. The photos were taken recently.

well as administrative difficulties in the DGHS office, MOHSW, Dhaka, Bangladesh. As a result, untreated medical wastes are accumulating in landfills in several divisional cities posing serious threat to public health. Often, we observe public health hazards such as cholera, typhoid or else and we discus about only sewerage, not about medical wastes, which may in fact be sourced from medical wastes.

As shown in the picture above, a woman picks up a blood bag, with the blood inside still visible, at a dumping ground where medical wastes were disposed with other wastes in Parairchawk of Sylhet.12 Such mixing of medical wastes with other rubbish is a violation of the rules, but it had been done all around the country. City Corporations are responsible for all types of waste management, while the Department of Environment (DOE) is responsible for monitoring and overseeing management including medical wastes. A big question remains: Whether they are doing their responsibility properly or not. It is high time that there should be a standard medical waste management system in place in all the city corporations all over the country before serious disasters occur. Ideally, appropriate and adequate strategic plan of action be developed, implemented, evaluated and monitored its effectiveness regularly adopting PDCA (Plan, Do, Check, Act) cycle.10

Conclusions

The waste produced in the course of healthcare/medical activities carries a higher potential for infection and injury than any other type of waste. Therefore, it is essential to have safe and reliable method for its handing. Improper handling of health-care/medical waste may have serious public health consequences and a significant adverse impact on the environment. Appropriate management of health-care waste is thus a crucial component of environmental health protection, and it should become an integral feature of health-care services and thus protecting the health of patients, health workers and the general Public. Regarding situation in Bangladesh, Quality management of healthcare/medical waste is still a long way to go, although GOB has been trying its best.

Healthcare/medical Institutions must appreciate the importance of compliance to quality management of healthcare/ medical waste. Ideally, appropriate and adequate strategic plan of action be developed, implemented, evaluated and monitored its effectiveness regularly adopting PDCA (Plan, Do, Check, Act) cycle. Finally, it can be concluded with a special statement: Let the healthcare/medical wastes of "the sick" not contaminate lives of "the healthy".

Acknowledgements

The authors would like to thank the authority of the Department of Public Health (DPH), School of Health Sciences (SHS), State University of Bangladesh (SUB) for their kind permission to publish this work (review article). This review article was based on class presentation by Prof. Dr. ASM Giasuddin (ID: PG11-41-17-010) on 03 August 2018 during course on "Environmental Health (Course Code: 2053)" under MPH (Friday) Programme at State University of Bangladesh (SUB), Dhanmondi, Dhaka-1205, Bangladesh.

References

1. Wikipedia. Waste Hierarchy. Available from: https://en.wikipedia.org/wiki/Waste_hierarchy (Accessed 02 Oct 2019 at 3.10 pm).
2. Park K. (Editor). Hospital Waste Management. Park's Textbook of Preventive Medicine, Twenty-Fourth Edition; Jabalpur, India: M/S Banarsidas Bhanot Publishers; 2017: 826-831.
3. Health-care waste. Available from: www.who.int/news-room/fact-sheets/detail/health-waste. (Retrieved 19.06.2018).

4. Environmental Compliance Training-Medical Waste Management-Training. Training 4 Today Copyrighted@2000. Available from: https://www.mail.goole.com/mail/u/oMinbox/1649918e&bc5b?projector=1.4massagepartid=0.1 (Retrieved 12.07.2018). Available from:
5. World Bank. Environmental Safeguard Assessment Report, HNPSDP, Bangladesh; May 2014.
6. Hospital Services Management. Medical Waste Management Guideline, DG (Health) Office, MOHFW, Government of Bangladesh, Dhaka1212; Dhaka: RG Associates; 2015-2016: 01-118.
7. The waste hierarchy. Available from: https://www.epa.nsw.gov.au/your--environment/recycling-andreuse/warr-strategy/the-waste-hierarchy (Retrieved 18.07.2018)
8. WHO/UNICEF. Water, sanitation and hygiene in health care facilities: status in low-and middle-income countries; Geneva: World Health Organization; 2015
9. Khan JI. Hospital waste management issues and steps taken by the government of Pakistan, October 2006. Available from: https://www.mail.goole.com/mail/u/ohtinbox/1649918e8cbc5b?projector=1.4masagepartid=0.2 (Retrieved 12.07.2018).
10. United Nations Industrial Development Organization (UNIDO). Control the Implementations of policies. A Roadmap to quality, Volume 01; Vienna: UNIDO; 2007: 15-19.
11. PRISM Bangladesh. Medical waste management programme. https://www.mail.goole.com/mail/u/ohtinbox/1649918e&bc5b?projector=1.4massagepartid=0.2 (Retrieved 12.07.2018).
12. Sujan MA. Untreated medical waste: A serious threat to public health. The Daily Star (Dhaka, Bangladesh), 28 October 2019, p.01