



Prevailing Pattern of Waste Management in Health Care Facilities in Edo State

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Abstract: Health care services are carried out to safeguard and restore the wellbeing of people but paradoxically, they are known to generate wastes that pose obvious health risks either by direct infection of through exposure to dangerous chemicals and radiation materials. The essence of this study is to ascertain the prevailing patter of waste management in Edo State. One research question was raised to guide the study. The population for the study constituted the 1,383 health care facilities in Edo State. Sample size of 276 respondents were selected through multi-stage sampling technique. A validated dichotomous scale questionnaire format with 29 items was used and the instrument reliability was established using the test-retest method and a co-efficient of 0.68 was obtained. The study revealed that some health care facilities still do not segregate their medical waste at the source of generation despite its being a major medical waste management practice, some of the health care facilities, treatment modalities of medical waste are generally poor. The study recommended that there should be regular and proper waste management practices in these health care facilities.





Keywords: Waste, Waste management, Health, Health care facilities, Safety

1. INTRODUCTION

Health care services are avenues for safe-guiding health, restoring health and protecting lives, the environment but they also create waste of which 20% comprise hazards that are of either infectious, injurious, toxic or radio-active vulnerability. All healthcare facilities owe a duty as a result of the waste they generate and also to be certain that segregation, collection, storage, disinfection, transportation as well as dumping of such waste have no hazardous effects on the people's health or the surrounding (International Committee of Red Cross, 2011).

Segregation involves sorting wastes into their various types and then into various types of containers that have been identified or labeled with a sign. There are two important points to note when doing this. They are, first waste separation should be the duty of the facility that produces them and secondary, they should be done as near as possible to the point where the waste is generated. There is no need segregating waste that receives similar treatment procedure with the exclusion of scamps, which are always sorted at the source of production from other waste.

Table 1 International coding recommendations

Type of waste	Colour coding symbol	Type of container
0. Household refuse	Black	Plastic bag
1. Sharps	Yellow and 	Sharps container
2a. Waste entailing a risk of contamination	Yellow and 	Plastic bag or container
2b. Anatomical waste		
2c. Infectious waste	Yellow marked “highly infectious” and 	Plastic bag or container which can be autoclaved
3. Chemical and pharmaceutical waste	Brown, marked with a suitable symbol (see Annex 4, chapter 4 Labeling of chemicals). E.g.: 	Plastic bag, container

Source: WHO- UNEP/SPC, 2018

The classification of wastes as shown in the diagram includes 3-containers segregating methods. First container is for domestic waste in plastic bags colour-coded black. Second container will contain wastes that entail a risk of contamination like anatomical and infectious wastes. These will be in plastic bags colour-coded yellow and marked “highly infectious” and can be autoclaved. The third container will be in plastic bags or containers colour-coded brown with a suitable symbol as shown in the table for pharmaceutical and chemical wastes. Sharps container or box is exceptionally colour-coded yellow.

In general, non-infectious waste must be segregated and stored in black plastic bags and no medical waste except sharps must be stored in sharps container. When a one-use syringe is used, for example, the packing should be stored in the black waste bin and the used syringe in the yellow sharps box. Generally, the needle must not be detached from the syringe as a result of the danger of injury. If withdrawal of the needle is necessary, special precaution should be taken.

Suitable receptacles or plastic containers must be positioned within areas certain class of wastes are produced, specification of wastes sorting as well as colour coding must be pasted in every waste storage area to notify health care workers of the policy. Receptacles must be replaced when three-quarters full. Containers should be made of non-inflammable, non-halogen plastics. Workers should not rectify errors of separation either by placing articles in containers after dumping or putting a bag in another of separate colour. If municipal or infectious wastes are coincidentally merged, the combination is assumed infectious medical waste. In certain countries, customs and doctrines restrictions make it undesirable for pathological waste be stored in highly infectious containers. Therefore, these wastes are usually dumped in compliance with established tradition, that ordinarily dictates interment.

Collection

All medical personnel must be certain that waste containers are tied or fastened when three-quarters full. Small-weight containers can be tied by the edge while heavy-weight containers would need a self-locking heat sealer. Containers should not be fastened with staple pins. Full sharps containers should be tagged and in yellow infectious medical waste containers before being moved away from the ward unit or compartment. Wastes must be prevented from increasing in quantity at source of generation. A procedure for storage must be developed concerning medical waste implementation programme (WHO, 2018).

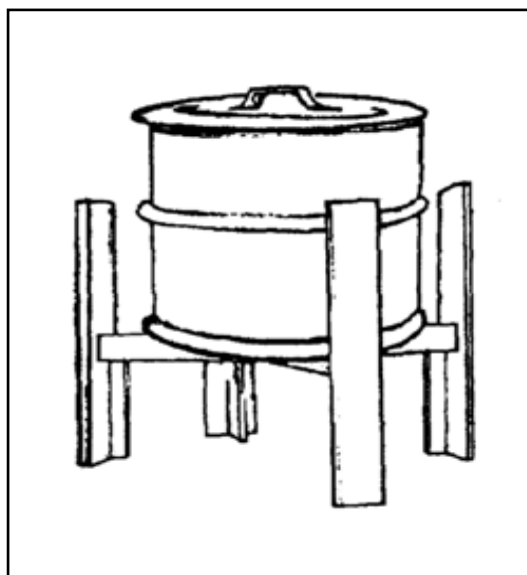


Fig.1 Cylinder-type waste container made from oil drum cut in half

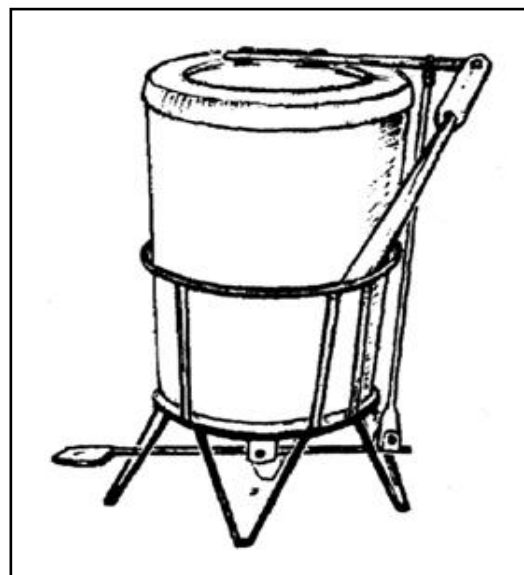


Fig.2 Cylinder-type plastic waste container with-foot-operated lid

Storage

Storage area for health care waste must be specified within the health-facility premises or laboratory amenity. Wastes stored must be deposited in a different location or apartment of an area equivalent to the volume generated as well as duration of storage (WHO, 2018). WHO (2018) recommends the following storage facilities management practices for healthcare:

- (1) The storage location should be water resistant, concrete flooring with channel; and more so must not be difficult to sanitize.
- (2) There must be adequate water provision for sanitation reasons.
- (3) Storage location must be accessible to waste handlers.
- (4) It should always be locked, and entry denied to uncertified individuals.
- (5) There should be easy entry or exit for waste-collection vehicles.
- (6) The area should be sun proof.
- (7) Vectors should be isolated from the storage area.
- (8) There must be adequate illumination and little fresh air.
- (9) The storage location must not be close to an area for uncooked food stores and kitchen.
- (10) A collection of disinfectants, personal safety equipment, as well as wastes receptacles must be readily in proximity to storage location.

Treatment of Medical Waste

There are various ways for treating medical waste but important ways for disinfecting medical waste according to Basura Medical Waste (2019) are:

- Autoclave
- Mechanical/chemical disinfection
- Microwave, and
- Irradiation

Basura Medical Waste (2019) further says that in all the disinfection modalities, the disinfected wastes can collectively be treated with non-hazardous waste in a dump site.

Autoclaves

Autoclaves are pressure chambers that require high temperatures to eliminate microbes from medical equipment (Basura Medical Waste, 2019). This organization further holds that autoclaves are used to eliminate all causative agents that may be present in health care waste before disposal in compressed in ways such as shredding, after disinfection so that it cannot be identifiable and recycled for other uses.

Microwave disinfection

Microwave is an effective treatment modality of medical waste that ensures high level of disinfection for highly infectious biomedical wastes. The benefit of microwave equipment is that it heats materials from within, resulting in an extra-ordinarily high-level treatment. The technology guarantees complete and safety procedure, (Madison Environmental Resourcing Incorporated, 2018). The treated waste is usually prepared for general waste dump site or recycling plant as its quantity has been decreased by up to 80%.

Chemical methods

This method is somewhat simple as 1% chlorine solution can be used as chemical disinfectant (Mathur, 2017). According to International Committee for Red Cross (2016), disinfectants are frequently used in medical establishments to eliminate or inhibit microbes; hospital equipment can so be used for the disinfection of healthcare waste. This kind of disinfection is appropriate for liquid hazardous wastes such as body fluids, faeces or health care waste matter.

Irradiation method

Irradiation method involves sterilizing medical waste by exposing it to gamma rays. These rays are fatal to bacteria but are often less used than other methods due to the high costs involved.

Transportation

WHO (2018c) further says that hospital waste should be transported on-site or off-site by methods of four wheeled carts, receptacles or wagons because they meet these set standards:

- (1) Simple to load as well as off load.
- (2) No edged objects that can destroy waste receptacles while packing and offloading.
- (3) Simple to clean.
- (4) Can be easily disinfected with suitable chemicals.

The health-care wastes generator is in charge of storage and required to tag wastes transported outside the facility as well as seek permission to other destination.

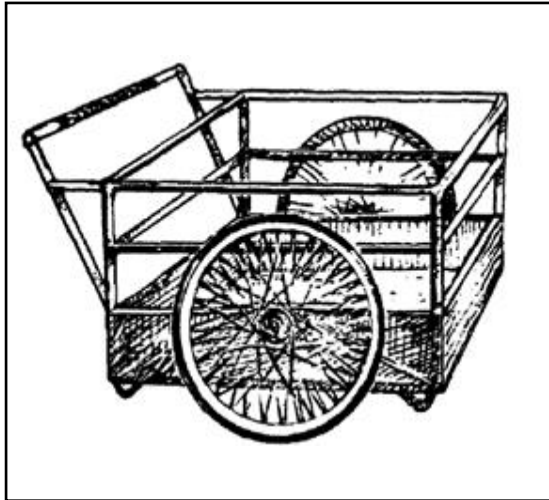


Fig.3 waste vehicle with opaque floor and partly opaque sides

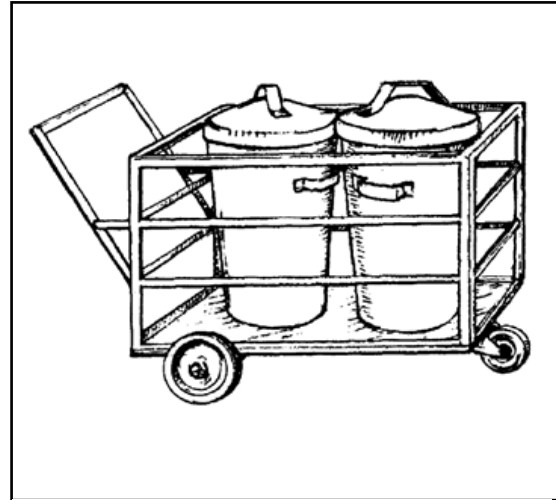


Fig.4 waste vehicle that can be loaded with either containers or plastic bag

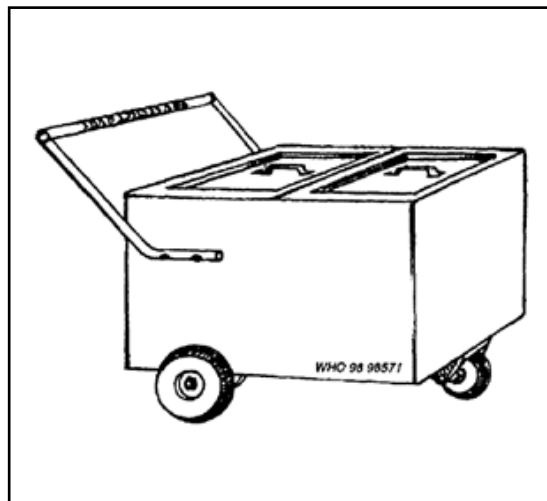


Fig.5 waste vehicle with opaque side and compartments to load waste or waste bag

Disposal Methods of Medical Waste

The following are the various methods to dispose of medical waste.

Open burning method

Open burning of waste is a process in which undesired products or by products are incinerated in an uncontrolled manner. This is used to reduce the volume of waste. It is a cost-effective way to minimize waste. Most of the open waste burning occurs in dump sites that have been filled beyond their maximum capacity.

Sanitary landfill method

This method involves the digging of a trench down to an acceptable level with some precautions, and access must be restricted, controlled and designed to prevent contamination of soil, surface and ground water in order to reduce air pollution.

Open dumping method

Open dumping is regarded as a landfill disposal method through which solid wastes are disposed off in an unsanitary way that does not support the environment. They are liable to open burning and vulnerable to scavengers, animals and insects which make them hazardous.

Incineration

Incineration is the act of controlled burning of health care waste in a device known as waste incinerator. The advantage of incineration is reduction in the volume of waste materials while its disadvantage is the potential pollution from emissions generated during incineration. Incineration is regarded as one of the increased heat waste treatment methods known as thermal treatment which converts the waste materials into emissions (Environmental Protection Agency (2018). There seems to be arguments from experts against the use of incineration as their use are rapidly increasing in developing countries and also being phased out in industrialised countries (Wikipedia, 2021c).

2. METHOD

The basis for the research was to determine the medical wastes disposal policy implementation in health care facilities in Edo State. Eight research questions were provided to guide the study. The descriptive survey method was utilised in this study to examine the variables under the study. The population of the study is 1,383 health care facilities in Edo State. The sample size is 276 respondents. The multi-stage sampling technique was used for the study. The instrument used is the validated dichotomous scale format questionnaire with 29 items. Sample reliability was established using test-retest method of estimating reliability and a co-efficient benefit of 0.68 was achieved after correlation. Data generated for this study was scrutinized using descriptive statistics of frequency count, percentage and inferential statistics of binomial test and chi-square.

Research Question 1: What are the prevailing practices of medical waste management in health care facilities in Edo State?

3. RESULT

Results obtained from processing data on prevailing medical waste management practices in health care facilities in Edo State. In Table 2 shows the analysis of research question 1 which sought to establish the prevailing patterns of medical waste management in health care facilities in Edo State.

Table 1 Pattern of utilization of waste management methods in health care facilities in Edo State

S/N	Practices	Frequency	% Of total	Level of utilization	
1.	Waste segregation	231	83.7	Medium	
2.	Sorting	245	88.8	Medium	
3.	Segregation	Sorting waste as close as possible to the site where the wastes are produced	235	85.1	Medium
4.	Sorting sharps at source of waste generation	244	88.4	Medium	
5.	Keeping sorted waste in separate containers or plastic bags	247	89.5	Medium	

		Collection of different types of waste in separate containers	241	87.3	Medium
6.	Collection	Regular collection of waste	263	95.3	High
7.		Immediate replacement of waste bags	249	90.2	High
8.		Collection of waste bags when they are two-third full	241	87.3	Medium
		Designated area for sorting of medical waste	245	88.8	Medium
9.	Storage	Open storage of infected waste	130	47.1	Low
10.		Prevention of rodents	194	70.3	Low
11.		Waterproof with good drainage	230	83.3	Medium
12.		Colour coded containers	241	87.3	Medium
13.		Shredding as a method of treatment used	161	58.3	Low
14.		Disinfection as a method of treatment used	196	71.0	Low
15.	Treatment	Autoclave as a method of treatment used	129	46.7	Low
16.		Microwave as a method of treatment used	156	56.5	Low
17.		Irradiation as a method of disposal used	130	47.1	Low
18.		Vitrification as a method of treatment used	155	56.2	Low
19.		Wheelbarrow usage in transportation	109	39.5	Low
20.	Transport	Trucks and lorries usage in transportation	208	75.4	Medium
21.		Tractor trucks usage in transportation	194	70.3	Low
22.		Cart usage in transportation	200	72.5	Low
23.		Sanitary landfill as a method of disposal used	154	55.8	Low
24.	Disposal	Open burning as a method of disposal used	126	45.7	Low
25.		Open dumping as a method of disposal used	131	47.5	Low
26.		Incineration as a method of disposal used	192	69.6	Low

The analysis on table 2 and graphical representation in figure 10 show that out of a total of 276 health care facilities in Edo State, 263 and 248, representing 95.3% and 90.2% respectively, have a high level of utilization in their practice of regular collection and immediate replacement of waste bags. Additionally, the table shows that out of a total of 276 health care facilities in Edo State, 231(87.3%), 245(88.8%), 235(85.1%), 244(88.4%), 247(89.5%), 241(87.3%), 241(87.3%), 245(88.8%), 230(83.3%), 241(87.3%), and 208(75.4%), have medium level of utilization with respect to the pattern of segregation, sorting, sorting location, sorting sharps, sorting of plastic bags, collection in separate containers, immediate replacement of two-third full bags, designated area of storage, colour-coded containers, trucks and lorry usage. Furthermore, the table shows that out of a total of 276 medical centers in Edo State, 130(47.1%), 194(70.3%), 109(39.5%), 194(70.3%), 200(72.5%), 161(58.3%), 196(71%), 129(46.7%), 156(56.5%), 130(47.1%), 155(56.2%), 155(56.2%), 126(45.7%), 154(55.8%), 131(47.5%), and 192(69.6%), have low level of utilization with respect to the pattern of open storage of infected waste, restriction from unauthorized persons, wheelbarrow usage, cross-border transportation, transportation during break time, treatment of medical waste, disinfection method, autoclave method, controlled incineration method, irradiation method, vitrification method, sanitary landfill in treatment, open burning, sanitary landfill method, open dumping, and incineration usage.

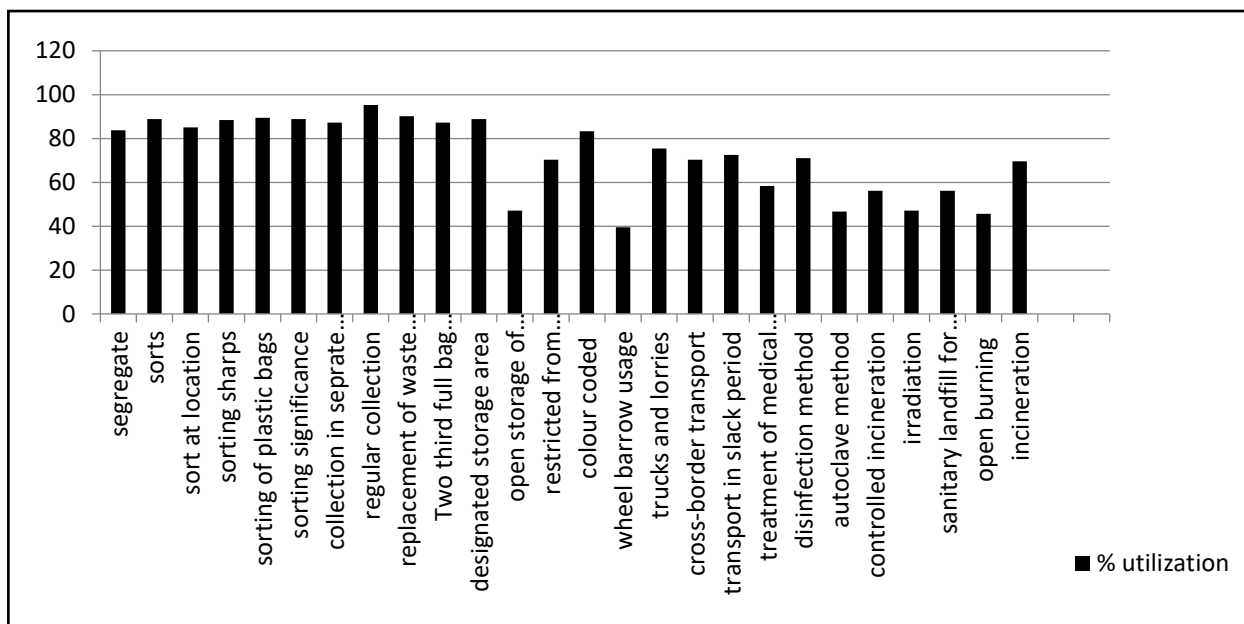


Fig 6 Patterns of medical waste management among health care facilities in Edo State

A graphic analysis of research question one in which it can be observed that regular collection and immediate replacement of waste bags have the highest bars representing 95.3% and 90.2% respectively. These are followed by the bars representing segregation, sorting, sorting location, sorting sharps, sorting of plastic bags, collection in separate containers, immediate replacement of two-thirds full bags, designated area of storage, colour-coded containers, trucks and lorry usage which have medium level of utilization. The lowest bars in the graph are those representing prevention of rodents, waterproof floor with good drainage, wheelbarrow usage, tractor trucks transportation, cart transportation, shredding, disinfection method, autoclave method, microwave method, irradiation method, vitrification in treatment, open burning, sanitary landfill method, open dumping, and incineration, which have a low level of utilization. This result implies that regular collection and immediate replacement of waste bags, segregation, sorting, sorting location, sorting sharps, sorting of plastic bags, collection in separate containers, immediate replacement of two-thirds full bags, designated area of storage, colour-coded containers, trucks and lorry usage are the most common waste management practices among health care facilities in Edo state.

4. DISCUSSION AND CONCLUSION

Findings revealed that despite the advantages inherent in the employment of proper health care waste management, some medical facilities in Edo State still do not fully comply with the dictates of approved practices. Specifically, the findings reveal that:

1. Some health care facilities still do not segregate their medical waste at the source of generation despite its being a major medical waste management practice.
2. Some health care facilities still employ incineration method which is now being discouraged in emerging countries in an attempt to reduce the volume of pollution.
3. The use of waterproof floor with good drainage is low in some of the health care facilities.

4. In some of the health care facilities, treatment modalities of medical waste are generally poor. It was however established that there should be regular and proper waste management practices in these health care facilities.
5. There is no absolute difference between the waste management practices by the health care facilities in the urban setting compared to those on the rural setting.

In the light of the findings of this study, it is the conclusion of the researcher that the immense gains accruable from proper waste management should be fully utilized by compliance with the approved practices in the implementation of health care wastes management within the areas of generation, collection, segregation, storage, transportation, treatment and disposal. This will help avert the possibility of accident and disease outbreak that could result in loss of life and property. To this end, all health care facilities owe it a duty to protect the public and the environment. They should take essential responsibilities in the disposal of waste they generate in a sanitary manner, thereby reducing infections and illnesses. There should be awareness campaign for proper waste management.

5. PRACTICAL APPLICATION

Consequent upon the findings of the study, the following recommendations are made:

1. That health care facilities in Edo State should improve practices of waste management.
2. That there should be efficient segregation of different categories of medical waste at the point of generation as it is critical to establishing a good medical wastes management of these health care facilities.
3. That medical waste should be effectively stored in water proof floor with good drainage in these health care facilities.
4. That there should be strict compliance with treatment modalities of medical waste in these healthcare facilities, especially disinfection of waste.
5. That transportation of medical waste should be secured if the benefits of segregation are to be realized in these health care facilities and that
6. There should be enabling laws and strict enforcement of these laws.

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