

# Medical Waste Management Practices and Methods among Selected Healthcare Facilities in Port Harcourt Metropolis.

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## ABSTRACT

The purpose of this study was to assess the medical waste management practices and methods among selected healthcare facilities in Port Harcourt metropolis. Four research questions and four hypotheses guided the study. Relevant related literatures were reviewed. This study adopted cross sectional descriptive and was conducted in in selected healthcare facilities located in Obio/Akpor Local Government Area of Rivers State. The study population comprised of 50,568 healthcare workers consisting of doctors, nurses, pharmacists, medical laboratory scientists/technicians, cleaners and ward assistance out of which 397 workers were sampled. The study also utilized a structured questionnaire to elicit responses from the participants. The reliability of the instrument was determined through the Cronbach alpha method of internal consistency. The findings revealed that 191(41%) agreed that their health care facility engaged in the enumerated healthcare waste management practices, while 274(59.0%) disagreed that their health care facility engages in the following healthcare waste management practices; 167(43.0%) agreed that their health care facility engaged in the enumerated medical waste management practices and methods, while 221(57.0%) disagreed that their health care facility engages in the following medical waste management practices and methods; also, 280(71.1%) had good awareness about medical waste management among healthcare workers at the facilities in Port Harcourt metropolis, while 108(27.9%) had no awareness about medical waste management among healthcare workers at the facilities in Port Harcourt metropolis; amongst others. Based on the findings of the study, it was concluded that healthcare facilities in Port Harcourt metropolis had poor practice and methods towards medical waste management It was recommended that Publicity materials, posters on medical waste

management and other institutional supports and guidance should be provided to support and ensure that health care workers follow standard procedures in medical waste management, amongst others.

**Keywords:** medical-waste-management, healthcare-management and practice, Prevalence of Medical Waste Management Practices

## I. INTRODUCTION

The concept of medical waste management practices and methods has become a critical health issue as it poses potential health risk to health workers and damage to the environment. Over the years, the agencies and institutions whose primary responsibility are to manage municipal waste in the society have not given adequate attention to medical waste which accounts for 25% of hazardous impact to humanity and its immediate environment [9]. Medical waste is any waste matter produced from healthcare facilities such as hospitals, medical laboratories, dentistry clinic, pharmacies and any other health-related practice. Medical waste can come from both human and animal bio-product.

The issue of waste management practice and methods has continued to face serious challenges. 40% healthcare staff responsible for medical waste are inexperienced in handling the waste. Thereby they generate smells and expose themselves to the harmful nature of the waste and cause environmental pollution due to the infectious nature [11]. In a developing country like Nigeria, and Port Harcourt Metropolis in specific, health care wastes do not seem to be properly managed. Despite the government effort to manage municipal waste by establishing the Rivers State Waste Management Agency (RIWAMA), most private and public health care facilities do not comply with its standards.

The aim of this study is to assess the medical waste management practices and methods

among selected healthcare facilities in Port Harcourt metropolis.

The study will be delimited to 4 public and 7 private healthcare facilities. The study facilities include the private healthcare facilities include; Lulu Briggs Health Centre, Image Diagnostic Centre, Orange Diagnostic Center, Fountain Hospital, April Hospital, Mount Hammond Hospital, and Heigwe Memorial Hospital. On the other hand, the public healthcare facilities include; University of Port Harcourt Teaching Hospital, Rivers State University Teaching Hospital, Model Primary Health Care CenterOzuoba and Model Primary Health Care CenterRumuekini.

## II. LITERATURE REVIEW

The process of medical waste management and treatment focuses on protecting the healthcare workers and the general public and minimizing direct or indirect impacts from environmental exposures to medical waste. Considering the hazardous potential of medical waste, its management must be consistent and stringent from the point of generation to the point of final disposal. For ease and prompt implementation of management procedure, the path between these two points can be subdivided schematically into following eight steps [3].

### i. Waste Minimization

This is the first step which comes prior to the production of waste. It primarily aims at utilization of means for reducing the amount of medical waste generation to a maximum possible extent. This can be achieved by setting up an efficient purchasing policy and having a good stock management which will enable hospital to proper select and utilize materials so as to reduce medical waste production [3].

### i. Medical waste Generation

This is the functioning point where medical waste is produced. The operating of healthcare system should be planned in a way that there will be a least generation of waste, especially due to unused materials including chemicals and pharmaceuticals.

### ii. Waste Segregation

When properly segregated, 85% or more of medical wastes are general waste with the same risk as domestic solid waste. Medical waste is segregated to reduce the amount of waste that must be treated as hazardous waste, reduce risks of exposure to hazardous medical waste for workers and to lower the cost of treatment and disposal of medical waste

**Table 1: Colour Coding, Waste Category and Treatment Options**

Colour Coding	Waste Category	Treatment Options
Yellow	Plastic bag Cat.1, Cat.2, Cat.3 and Cat. 6	Incineration/ Deep burial Autoclaving/
Red	Disinfected container/ Plastic bag Cat.3, Cat.6 and Cat.7	Autoclaving/ Microwaving/ Chemical treatment
Blue/ White Plastic	Bag/ puncture proof. Translucent Cat.4, Cat.7	Autoclaving/ Microwaving/ Chemical treatment and Destruction/ Shredding Disposal
Black	Plastic bag Cat.5 , Cat.9 and Cat.10 (solid)	Disposal in secured landfill

(Priya et al., 2013)

**Table 2: Classification of Medical waste based on Categorization with examples of Wastes. (Priya, Nandini, & Selvamani, 2013) [8]**

Waste Category	Examples
Infectious waste	Laboratory cultures; waste from isolation wards; tissues (swabs), materials, or equipment that have been in contact with infected patients; excreta
Pathological Waste	Anatomical body parts; blood and other body fluids; fetuses
Sharps	Needles; infusion sets; scalpels; knives; blades; broken glass

Pharmaceutical Waste	Pharmaceuticals that are expired or no longer needed; items contaminated by or containing pharmaceuticals (bottles, boxes)
Genotoxic Waste	Waste containing cytostatic drugs (often used in cancer therapy); genotoxic chemicals
Chemical Waste	Laboratory reagents; film developer; disinfectants that are expired or no longer needed; solvents
Wastes with high content of heavy metals	Batteries; broken thermometers; blood-pressure gauges; etc.
Pressurized Containers	Gas cylinders; gas cartridges; aerosol cans
Radioactive Waste	Waste containing radioactive substances e.g. unused liquids from radiotherapy or laboratory research; contaminated glassware, packages, or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources

**Table 3: Classification Medical wastes Based on Risks. (Priya, Nandini & Selvamani, 2013) [8]**

Waste Type	Waste Classification	Risk Classification
Sharp Waste	Biological	High
Pathological Waste	Biological	High
Infectious Waste	Biological	High
Pharmaceutical Waste	Chemical	Medium
Chemical Waste	Chemical	Medium
Radioactive Waste	Chemical	Medium
General Waste	Non-hazardous	Low

### Treatment and Final Disposal of Medical waste

The Medical waste especially infectious waste can be disposed-off with different treatment options. Many HCC-like hospitals and laboratories have their own in-house resources for internal waste treatment. This not only reduces the volume of the medical waste but also decontaminates infectious waste so that it can be disposed-off as non-infectious. Methods used commonly for waste treatments are generally classified as on-site medical waste treatment and off-site waste treatment. The on-site medical waste treatment includes autoclaving, chemical treatment, microwave treatment and radioactive waste disposal. The off-site medical waste treatment includes incineration and land disposal [1].

### Most Prevalently used Medical Waste Management Methods

[2] mentioned that the incinerator is the most prevalently used method for waste management. The majority of health care establishments particularly the public and private sector lacked functional and efficient waste management units and facilities, such as

incinerators, vehicles for transportation of wastes, dumpsite etc. The bulk of human exposure to dioxins, furans and coplanar polychlorinated biphenyls takes place through food intake. Even in high-temperature incinerators (over 800°C) there are cooler pockets at the beginning or the end of the incineration process where dioxins and furans can form. Optimization of the process can reduce the formation of these substances if it is ensured, for example, that incineration takes place only at temperatures above 800°C and if the formation of combustion gas is prevented at temperatures of 200 - 400°C [11]. The incineration of metals or of materials with a high metal content (especially lead, mercury and cadmium) can result in metals being released into the environment. In some cases, particularly when wastes are incinerated at low temperature (less than 800°C) or when plastics containing polyvinyl chloride (PVC) are incinerated, hydrochloric acid (which causes acid rain), dioxins, furans and various other toxic air-borne pollutants are formed. They are found in emissions but also in residual and other air-borne ash and in the effluent gases released through incinerator chimneys. Exposure to dioxins, furans

and other coplanar polychlorinated biphenyls can have effects that are harmful to public health. Short-term exposure to high doses can cause skin lesions and impaired liver function. The International Agency for Research on Cancer (IARC) classes dioxins as known human carcinogens. Mercury is highly toxic. There is no threshold under which it does not produce any undesirable effect. Mercury can cause fatal poisoning when inhaled. It is also harmful in the event of transcutaneous absorption and has dangerous effects on pregnancy [10].

### Protection Motivation Theory

The study is anchored on the protection motivation theory. This theory was propounded by PiyapongJanmaimool [7]. This theory explains individuals' engagement in sustainable waste management behaviours (SWMBs) based on the application of protection motivation theory (PMT). SWMBs include waste avoidance, green purchasing, reuse and recycle, and waste disposal behaviours. PMT is primarily applied to explain people's decisions to partake in health risk mitigation behaviours and disaster prevention. A number of researchers have also applied PMT to explain pro-environmental behaviours. [4], for instance, found that individuals' intention to engage in pro-environmental behaviours was significantly influenced by many PMT attributes, including the perceived severity of the consequences associated with climate change, perceived response efficacy, and self-efficacy. [6] investigated how residents' perception of air pollution problems and threats to human health affected their engagement in pro-environmental behaviours, and the results showed that people in general tend to be involved in environmental behaviours that require minimal physical effort to carry out (e.g., driving fewer miles and avoiding idling) more than those requiring greater physical effort (e.g., riding a bicycle and walking). [5] also applied PMT to explore farmers' pro-environmental behaviours during a drought, and

they found that a number of variables related to PMT (e.g., farmers' response efficacy, perceived severity, response costs, perceived vulnerability, and self-efficacy) as well as income and the social environment significantly predicted farmers' engagement in biodiversity conservation, environmental pollution reduction, soil and water resource protection, and the reduction of pressure on land and energy resources.

### III. METHODOLOGY

This research adopted a cross sectional descriptive design approach. The study was conducted amongst selected healthcare workers in Obio/Akpor Local Government Area of Rivers State, Nigeria. The population of the study comprised a total of Three Hundred and Ninety-Seven (397) respondents drawn from Seven (7) selected private health-care facilities and Four (4) public health-care facility within the selected Local Government of interest after an initial pilot examination. Standard research questionnaire was adopted titled: **Assessment of Medical Waste Management Practice & Methods among Selected Health-care Facilities in Port Harcourt Metropolis AMWMPMSHFPHM** with the aid of a modified five-point Likert scale. Cronbach Alpha reliability coefficient test was conducted to ensure method for measuring internal consistency of instrument. Fifty(50) respondents which were not part of the sample were used in testing the reliability and a reliability coefficient of 0.926 was obtained which shows strong reliability. Data collected was analyzed quantitatively using the Statistical Package for Social Science (SPSS) computer software version 20 and results presented in tables and charts as frequencies and percentages.

### IV. RESULTS AND DISCUSSIONS

**Research Question 1:** What is the practice towards medical waste management among selected healthcare facilities in Port Harcourt metropolis?

**Table 4: Practice towards medical waste management among selected healthcare facilities in Port Harcourt metropolis**

SN	Items	True T (%)	False F (%)
<b>My health care facility engages in the following healthcare waste management practices</b>			
1	Reduced waste production	211(54.4)	177(45.6)
2	Waste recycling	72(18.6)	316(81.4)
3	Waste Disposal	353(91.0)	35(9.0)
4	Waste Storage	35(9.0)	353(91.0)
5	Water Treatment	177(45.6)	211(54.4)
6	No waste management practice	70(18.0)	318(82.0)

Average	191(41.0)	274(59.0)
Table 4 showed the practice towards medical waste management among selected healthcare facilities in Port Harcourt metropolis. The result showed that overall, 191(41%) agreed that their health care facility engaged in the enumerated healthcare waste management practices, while 274(59.0%) disagreed that their health care facility engages in the following healthcare waste management practices. Hence, the practice towards medical waste management among selected healthcare facilities in Port Harcourt metropolis is poor. Specifically,	211(54.4%) each agreed that their health care facility engages in reduced waste production as a healthcare waste management practice, and only 35(9.0%) agreed that their health care facility engaged in waste storage as a healthcare waste management practice.	

**Research Question 2:** What is the prevalent medical waste management practices and methods at the selected healthcare facilities in Port Harcourt metropolis?

**Table 5: Prevalent medical waste management practices and methods at the selected healthcare facilities in Port Harcourt metropolis**

SN	Items	True T (%)	False F (%)
<b>My healthcare facility engages in the following waste management methods</b>			
1	Autoclaving	33(8.5)	355(91.5)
2	Microwaving	37(9.5)	351(90.5)
3	Incineration	215(55.4)	173(44.6)
4	Landfilling	281(72.4)	107(27.6)
5	Cementing	315(81.2)	73(18.8)
6	Chemical treatment	250(64.4)	138(35.6)
7	No waste management methods	35(9.0)	353(91.0)
	Average	167(43.0)	221(57.0)

Table 5 showed the prevalent medical waste management practices and methods at the selected healthcare facilities in Port Harcourt metropolis. The result showed that overall, 167(43.0%) agreed that their health care facility engaged in the enumerated he medical waste management practices, while 221(57.0%) disagreed that their health care facility engages in the following medical waste management practices and methods. Hence, the practice towards medical waste management among selected healthcare facilities in Port Harcourt metropolis is poor.

Specifically, 315(81.2%) each agreed that their health care facility engages in cementing as a medical waste management practice, and only 33(8.5%) agreed that their health care facility engaged in autoclaving as a medical waste management practices and methods.

**Research Question 3:** What is the level of awareness towards medical waste management among healthcare workers at the facilities in Port Harcourt metropolis?

**Table 6: Level of awareness towards medical waste management among healthcare workers at the facilities in Port Harcourt metropolis**

SN	Items	Yes T (%)	No F (%)
1	Do you know about the medical waste management practices?	316(81.4)	72(18.6)
2	Are you conversant with the waste management methods?	316(81.4)	72(18.6)
3	Does your facility conduct medical waste management at training/workshop for staff?	243(62.6)	145(37.4)
4	Are you conversant with the Nigeria medical waste management regulations and protocols?	244(62.9)	144(37.1)

Average	280(71.1)	108(27.9)
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Table 6 showed the level of awareness towards medical waste management among healthcare workers at the facilities in Port Harcourt metropolis. The result showed that overall, 280(71.1%) had good awareness about medical waste management among healthcare workers at the facilities in Port Harcourt metropolis, while 108(27.9%) had no awareness towards medical waste management among healthcare workers at the facilities in Port Harcourt metropolis. Hence there is a good level of awareness towards medical waste management among healthcare workers at

the facilities in Port Harcourt metropolis. Specifically, 316(81.4%) knew about medical waste management practices, and 243(62.6%) knew about medical waste management training/workshop conducted by their facilities for staff.

**Research Question 4:** What are the common healthcare challenges experienced by healthcare workers due to poor medical waste management practices and methods at the facilities in Port Harcourt metropolis?

**Table 7: Common healthcare challenges experienced by healthcare workers due to poor medical waste management practices and methods at the facilities in Port Harcourt metropolis**

SN	Items	True T (%)	False F (%)
1	Do you agree that non application of medical waste management could cause adverse health conditions	388(100.0)	0(0)
<b>Which of the following conditions do you agree could be caused by noon application of medical waste management in your facility</b>			
2	Respiratory infections	175(45.1)	213(54.9)
3	Dermal infections	318(82.0)	70(18.0)
4	Optical infections	35(9.0)	353(91.0)
5	Tetanus	242(62.4)	146(37.6)
6	Human Immune Deficiency Virus	177(45.6)	211(54.4)
7	Bacterial Haemorrhagic Fever	178(45.9)	210(54.1)
8	Viral Hepatitis A, B or C	212(54.6)	176(45.4)
	Average	216(55.6)	173(44.4)

Table 7 showed the common healthcare challenges experienced by healthcare workers due to poor medical waste management practices and methods at the facilities in Port Harcourt metropolis. The result showed that overall, 216(55.6%) agreed that the enumerated ailments are amongst the common healthcare challenges experienced by healthcare workers due to poor medical waste management practices and methods at the facilities in Port Harcourt metropolis, while 173(44.4%) disagreed that the enumerated ailments are amongst the common healthcare challenges experienced by healthcare workers due to poor medical waste management practices and methods at the facilities in Port Harcourt metropolis. Hence, there is good knowledge level on common healthcare challenges experienced by healthcare workers due to poor medical waste management practices and methods at the facilities in Port Harcourt metropolis. Specifically, 318(82.0%) agreed that dermal infections were amongst the common healthcare challenges experienced by healthcare workers, whilst 35(9.0%) agreed that

optical infections were amongst the common healthcare challenges experienced by healthcare workers

## V. CONCLUSION

Medical wastes are important components of the health care delivery system, and hence should be properly handled. When this is not the case, it may result to environmental pollution which may lead to disease outbreak. Based on the findings of the study, it was concluded that healthcare facilities in Port Harcourt metropolis had poor practice and methods towards medical waste management. They however have good level of awareness towards medical waste management.

## VI. RECOMMENDATIONS

Based on the findings of the study the following recommendations were made:

1. Health facilities should have a budget for medical waste management as this would help to improve practice towards medical waste

- management among selected healthcare facilities in Port Harcourt metropolis.
2. Publicity materials, posters on medical waste management and other institutional supports and guidance should be provided to support and ensure that health care workers follow standard procedures in medical waste management, which will hence, increase the level of awareness towards medical waste management among healthcare workers at the facilities in Port Harcourt metropolis
  3. Records of medical waste management of a health facility should be documented and archived for future references
  4. Health facility management should provide essential medical waste management equipment for her health facility, especially colour coded receptacles for waste segregation so as to reduce the challenges experienced by healthcare workers due to poor medical waste management practices and methods at the facilities in Port Harcourt metropolis.
  5. Provisions should be made within the health facility for disposal of medical wastes, and waste recycling, as this would improve the prevalent medical waste management practices and methods at the selected healthcare facilities in Port Harcourt metropolis.

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