

# INVESTIGATING THE LEVEL OF EFFECTIVENESS OF CLINICAL GOVERNANCE EFFORTS IN THE MANAGEMENT OF CLINICAL WASTES IN HOSPITALS IN JOS METROPOLIS, PLATEAU STATE, NIGERIA

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## Abstract

*The study investigated the level of effectiveness in clinical governance efforts in the management of clinical wastes in hospitals in Jos metropolis, Plateau State. Data were collected from three tertiary, two secondary and one primary health institutions and analysed. Simple frequency counts and percentages were used to discuss the data. Results of analysis indicated that health workers in health institutions in Jos have a high level of awareness of clinical wastes and the risks they pose to human health and environmental safety. However, there is a high level of ineffectiveness in clinical governance concerning clinical wastes. About 67% of health workers who participated in the research indicated they have had accidents with clinical wastes especially sharp objects. Most respondents also claimed that upwards of five persons reported accidents with clinical wastes in the hospitals on a weekly basis. Also about 86% of respondents are not aware of or familiar with the clinical waste management plan of the hospitals they work at. Clinical wastes are also disposed of by non-medical professionals, cleaners and ward attendants, who generally have the least education and training to handle such hazardous materials. A large amount of the wastes are also disposed of at the municipal landfill or buried within the hospital grounds, which have serious implications for environmental safety. About 77% of respondents also observed that containers for clinical waste disposals are either damaged or inadequate. These issues point to ineffective clinical governance in regards of clinical wastes. The study recommends adequate and regular training of staff in the best practices of clinical wastes handling.*

**Keywords: Clinical wastes, Hospital, Healthcare worker, Waste disposal**

## INTRODUCTION

Clinical wastes, also referred to as health care wastes (HCW), are defined as discarded (untreated) materials from health-care of human or animals. These include discarded materials or equipment (from the diagnosis, treatment, and prevention of disease, assessment of health status or identification purposes) that have been in contact with blood and its derivatives, tissue, tissue fluids or excreta or wastes from infectious wards (WHO, 2004). Such wastes are obtained from medical, nursing, dental, veterinary laboratory, pharmaceutical, podiatry, tattooing, body piercing, brothels, emergency services, blood banks, mortuary practices and other similar practices (Australian Environmental Protection Agency, 2009).

The Torbay Council, UK (2003) classified HCW into five (5) groups: Group A includes identifiable human tissue, blood, animal carcasses, soiled surgical dressings,

swabs and other similar soiled waste; Group B comprises discarded syringe needles, cartridges, broken glass, and contaminated disposable sharp instruments; Group C consists of microbiological cultures, and potentially infected wastes from pathology departments; Group D contains items such as drugs and other pharmaceutical products; and Group E is constituted by disposable bed pans, incontinence pads, stoma bags, urine containers, and materials used for urine, faeces and bodily excretions which do not fall within Group A.

The type and examples of different categories of HCW portend different risks/hazards. Infectious and anatomical wastes such as items contaminated with blood, body fluids, stools, and laboratory specimens, body parts and fluids are a source of contracting HIV/AIDS, viral hepatitis, respiratory infections, eye and skin infections; sharps, e.g., discarded syringes, needles and

blades, knives, lancets, scalpels, broken glass, and surgical instruments cause injuries which help pathogenic organisms to enter the body;

Pharmaceutical wastes such as all kinds of outdated/expired medications are generally toxic substances; Chemical wastes such as solvents, disinfectants, laboratory reagents, mercury from thermometers, batteries are hazardous as they could be poisonous, cause burns and injuries to the eye or mucous membrane as well as headache; Radioactive wastes from unused liquids from radiotherapy, diagnostic test kits are carcinogenic and mutagenic; Pressurized containers such as aerosols, sprays, asthma inhalers, gas containers cause explosion when burned; General wastes from health care settings are similar to domestic wastes such as packaging materials, paper, plastic, and others, which are generally non-hazardous and may be recycled as agricultural compost.

HCW are made up of pathological and infectious (75%), chemical or pharmaceutical (15%), sharps (5%) and special (radioactive and cytotoxic) (5%). WHO requires the segregation of HCW into health care general waste (HCGW) and health care risk wastes (HCRW) for effective management (WHO, 2000).

Some existing waste management technologies and practices are: incinerators, burning, autoclave with and without shredding, hypochlorite treatment and shredding, pentrite lime and shredding, microwave and shredding, landfill sites, dumping, effluent disposal, and hazardous chemical waste disposal. These disposal strategies have their merits and demerits, and are thus ideally suited for particular waste types and may require supervision for effectiveness. Some types of health care wastes pose serious risks to human health as well as contaminate the environment ((Adnane *et al.*, 2013; Aseweh, 2007; Muluken *et al.*, 2013; Olaniyi *et al.*, 2018). Health care workers are therefore at risk of infections to diseases such as hepatitis B and C virus, HIV/AIDS, allergic pulmonary diseases, chronic bronchitis and other related diseases that are associated with HCW.

Beside the potential environmental hazards, the public health risk due to HCW,

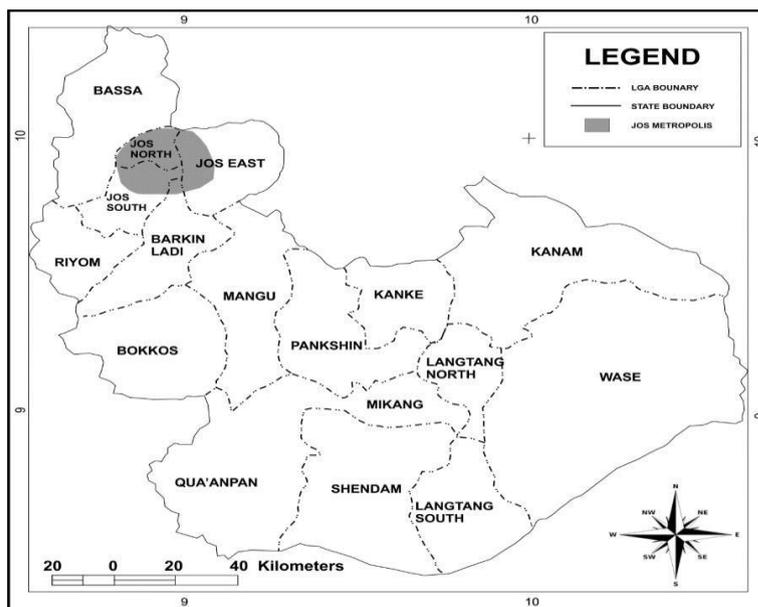
poses a greater threat and hazards than the original diseases (Awodele *et al.*, 2016). Improper HCW management includes collection, handling and disposal methods significantly increase health hazards, environmental pollution/hazards due to infectious risks, unpleasant smell of the waste, attraction of rodents and vermin etc.

In developing countries such as Nigeria, HCW management remains a major challenge in most healthcare facilities (HCF) due to technological, economic and social limitations. These problems are further compounded by inadequate training of staff responsible for waste management (Alagoz and Kocasoy, 2008). Report by WHO estimates that each year there are about 8 to 16 million new cases of Hepatitis B virus (HBV), 2.3 to 4.7 million cases of Hepatitis C virus (HCV) and 80,000-160,000 cases of HIV/AIDS due to unsafe injections disposal and mostly due to very poor waste management systems (WHO Bulletin, 1999). In developing countries such as Nigeria where the level of awareness is low and there are hardly any specific policy to address the menace of HCW some of which are hazardous may further increase public health risks and environmental hazards (Coker *et al.*, 2009). In the light of this, the study explored the level of effectiveness of clinical governance efforts in the management of clinical wastes in hospitals in Jos.

## MATERIALS AND METHOD

### Study Area

The study area is Jos metropolis, Plateau state. It comprises of Jos North, and parts of Jos South and Jos East LGAs. Jos metropolis is located between latitudes 9<sup>o</sup>50' to 10<sup>o</sup>00' N and longitudes 8<sup>o</sup>55' to 9<sup>o</sup>00' E. It is bounded by Bauchi plains and Bassa LGA to the Northeast, Bukuru to the South and Jos-East LGA to the East. Jos metropolis was estimated to have a population of 1,083,741.98 in 2016 (National Population Commission of Nigeria, 2006). The high concentration of people in Jos metropolis is attributed to the attraction of mining, industrial and commercial activities in and around Jos.



**Figure1** Plateau State showing Jos metropolis (Study area)

### Methodology

Data was obtained from the Ministry of Health, Plateau State, on number, names and addresses of registered health care facilities in

Jos. The list contained 52 names and addresses of hospitals that ranged from primary to tertiary health care facilities.

According to WHO (1999), the tertiary (Teaching and Specialist hospitals) and secondary (General hospitals) health care facilities generate the largest amount of HCW. They also have the largest number of health care workers. This means that the risk of exposure of health care workers to health care wastes is higher in these health care facilities. Six (6) health care facilities were therefore purposively selected to reflect the

levels of risks. Consequently, the three tertiary health care facilities (JUTH, BUTH and Plateau Specialist) were selected, along with two secondary health care facilities (Our Lady of Apostles (OLA), Jos, and Dee Medical Hospital Bukuru) and one (1) primary health care hospital (ECWA Clinic, Bukuru). JUTH is a Federal government health care institution, while the Plateau Specialist Hospital belongs to the Plateau State government. BUTH, OLA and ECWA Clinic are owned by Churches, while Dee Medical Hospital is a private-owned facility.

The data obtained from these facilities include the type and amount of health care waste generated per bed per day in each of the hospitals, methods of health care waste collection and disposal, and the effectiveness of health care waste management practices in the health care facilities. Data collected from health workers include knowledge of healthcare waste, quantity of healthcare waste generated, hazards of clinical/health care waste, healthcare waste management and training of healthcare workers which were key factors in assessing the hazard level that healthcare workers are exposed to amount of waste generated per bed per day in each of the hospitals and the nature of healthcare waste, methods of healthcare waste collection and disposal, the effectiveness of health care waste management practices in the health facilities. Structured questionnaires were used to collect these data from health workers in the selected health care facilities.

Other data collected from literature and documents include maps and World Health Organization (WHO) standards for health care waste generation and management. Descriptive and inferential statistics were used to analyze the data collected and results were presented using tables, frequencies, percentages and graphical methods.

The data obtained from these

## RESULT AND DISCUSSION

### Socio-Demographic Characteristics of Respondents

The result for the socio demographic characteristics of respondents is presented on table 1. Results on table 1 show that out of 162 respondents, the majority (66%) were female, while 34% were male. This gender distribution in health care services is similar to the observation made by Adams *et al* (2016), which reported that men are generally underrepresented in the healthcare sector probably because women play a primary role in making health care decisions for their families and are regarded as an effective workforce. Data on age shows that 70% of the respondents are below 40 years old. This shows that most workers are youth, in their prime and most productive years

In terms of job designations, 64% of respondents are medical professionals, while

36% are non-medical staff, which suggests a preponderance of non-professionals in healthcare services. This is a potential source of concern regarding exposure to health care wastes and its management. According to Gupta and Dal Poz (2009); skill level and skill specialization is required to carry out tasks and duties of occupations professionally or well trained workers should be obliged to improve healthcare management performance. They also fulfil a strategic role in planning and successfully implementing all manner of duties in supporting healthcare activities. The findings from the present study showed that the basic educational background required for healthcare management activities exist within the system. Importantly, most of the respondents (83%) have been only 10 years or less in the medical services sector. This shows some degree of inexperience in the sector that may have adverse implications for effectively managing health care wastes.

**Table 1** Socio-demographic characteristics of respondents

VARIABLE	CLASS	FREQ	(%)
Gender	Male	55	34
	Female	107	66
Age	1-20 years	39	24
	20-39 years	91	56
	40-49 years	28	17
	>50 years	4	3
Marital Status	Single	94	58
	Married	66	41
	Widowed	2	1
Nature of your work	Doctor	6	4
	Nurse	73	45
	Administration	37	23
	Others (CHEW/JCHEW)	6	4
	Others (Lab. Sc/Tech/Asst.)	17	11
	Others (Cleaners/Messenger)	4	2
	Others (Med. Records)	5	3
	Others (Student Nurse)	6	4
Educational Status	Others (Social Workers)	4	2
	Others (Maintenance Staff)	4	2
	Primary	1	1
	Secondary	13	8
Year of Service	Tertiary	147	91
	Others	1	1
	<= 10years	134	83
	10-20 years	14	9
	21- 30 years	10	6
	> 30 years	4	2

Source: Authors' field work (2016)

## Knowledge of Healthcare Waste

**Table 2** Knowledge of healthcare waste

VARIABLE	CLASS	FREQ	(%)
What is clinical waste?	Waste materials from the hospital.	28	17
	Useless materials from the hospital	38	24
	Used materials from the hospital	26	16
	Unwanted materials from the hospital	29	18
	Anything put inside dustbin as waste	8	5
	Unwanted chemicals	6	4
	Unwanted papers	4	2
	No idea	15	9
Types of clinical waste your departments generate	Human/animal tissue and bodily fluids	21	13
	Excretions	24	15
	Pharmaceutical products	12	8
	Swabs or dressing	21	13
	Syringes, needles, sharp instrument or others		
	Cannot identify various types of waste	68	41
		16	10

Source: Authors' field work (2016)

Most respondents (91%) are aware of what clinical wastes are. The most common conception of types of wastes is syringes, needles and other sharp objects (41%).

Expectedly, 10% of respondents were unaware of what clinical wastes are or constitutes clinical wastes. This group may probably belong to the non-medical personnel in the sector.

## Quantity of Healthcare Waste Generation

**Table 3** Estimated quantity of healthcare waste generated

VARIABLE	QUANTITY	FREQ	(%)
What is the estimated quantity of health care wastes generated per day in your health care facility	<= 12kg/day	33	20
	12kg/day	21	13
	24kg/day	45	28
	36kg/day	20	12
	> 48kg/day	29	18
	Not Applicable	14	9

Source: Authors' field work (2016)

About 91% of respondents indicated they had a good estimation of the quantity of clinical wastes that is generated in the hospitals they work at. About 61% of respondents claimed that less than 25kg of clinical wastes are generated daily, while 39% indicated that upward of 35 kg are generated. A closer scrutiny of the data revealed that the workers at the tertiary health care facilities had actually indicated larger volumes of clinical wastes being generated daily. This is not associated with the level of service being provided by these institutions that attract a large number of patrons. Dana (1999) observed that the volume of waste generated

is not the only factor affecting efficient management of healthcare waste. Rather the volume of waste that is generated and left accumulated within the healthcare facility awaiting final disposal.

Another finding from the research is that, a greater percentage of the healthcare establishments, allow their healthcare waste to accumulate within their premises for over 48hours before evacuation. Pruss *et al.* (1999) also observed that healthcare waste should not be left to accumulate within hospital premises for more than 48 hours because they contain potentially harmful microorganisms, which can infect hospital patients, healthcare

workers, and the general public. Such potential risks may include the spread of drug resistant microorganisms, radiation burns, poisoning and pollution. So, the frequency of the waste evacuation is the most important factor to be considered, i.e., the more frequent the healthcare waste is evacuated from the healthcare facility, the less environmental and public health problem it poses.

#### Hazards of Clinical Waste

There is a high level of awareness among health care workers of the dangers posed by health care wastes, which was attested to by 96% of respondents. The most common danger associated with clinical wastes is health hazards (62%). Pollution of water

resources and air by clinical wastes was recognized by 32% of respondents as important dangers. Importantly, 67% of respondents claimed to have been involved in a clinical waste accident. This shows a high level of exposure and risk. For 39% of respondents the accident involved sharp objects, while 18% reported inhalation of toxic substances. These may explain the relatively high level of awareness of sharp objects as clinical wastes and pollution as dangers of clinical wastes as well. Most respondents indicated health risks as the most common fallout of such clinical waste accidents, including the high risks of contracting HIV/AIDS (32%), Cholera (30%) and respiratory tract infections (24%).

**Table 4** Hazards of clinical waste/healthcare waste

VARIABLE	CLASS	SCORE	(%)
Are you aware of the dangers exposed by clinical waste	Yes	156	96
	No	6	4
If yes, what are the dangers	Health hazards	100	62
	Water pollution	34	21
	Air pollution	18	11
	Others	4	2
	Not aware of the dangers	6	4
Have you ever been involved in any clinical waste accident	Yes	109	67
	No	53	33
If yes, what was the nature of the accident	Glass cut	33	20
	Piercing by sharp object	31	19
	Inhalation of toxic substances	30	18
	Ingestion of toxic substances	14	9
	Others	1	1
	Never been involved in clinical waste accident	53	33
	What are the common infectious diseases associated with exposure to clinical waste	Cholera	48
	HIV/AIDS infections	51	32
	Hepatitis infections	20	12
	Dysentery	4	2
	Respiratory tract infections	39	24
	I don't know	19	12
How often do you have cases of accident involving clinical waste	Daily	44	27
	Weekly	57	35
	Bi-weekly	38	24
	Others	4	2
Do you have an idea of the number of people that report on daily basis with the cases of injury/infection from contact with clinical waste	No idea	21	13
	<=5 people	101	62
	6-10 people	31	19
	11-15 people	6	4
	>15 people	3	2

Several studies (Johannessen et al., 2000, Smith, 2002, NIOSH, 2004, Askarian et al., 2004, Blenkarn, 2006a) have pointed out that infectious diseases such as cholera, typhoid, asthma, neurological disorders mutagenicity, and cancer as well as other viral infections including hepatitis and AIDS may be contracted through glass cut and sharp clinical objects contaminated with infected blood. Interestingly, some of the effects of the exposure to clinical waste may not be felt immediately, until years after the accident. It is therefore of utmost importance that hazardous waste be effectively managed to protect lives.

The study further revealed that, on a common basis, upward of five (5) persons report clinical wastes accidents on weekly basis at the health care facilities. Unfortunately, this indicates that clinical waste accidents are more common than they should be. The implication is that clinical wastes are an important source of danger to health care workers in Jos. This may be an indictment of the clinical waste management strategies employed by health care facilities in the metropolis.

### **Healthcare Waste Management**

Most respondents (86%) are not aware of or familiar with the clinical waste management plan of the hospitals where they work. This is unacceptable in view of the enormity of the risks they pose to human health and environmental safety. It is expected that every medical facility should have a health care waste management plan and every health care worker should be made aware of and become familiar with the clinical wastes management plan of the hospital. This would not only generate confidence in health workers but arm them with information on steps to take to avoid or report clinical wastes accidents to mitigate disastrous outcomes.

In spite of this apparent shortcoming, most respondents (87%) reported that clinical wastes are usually segregated based on types, contained and labelled as recommended by health agencies such as the Ministry of Health and World Health Organization (WHO). Also 81% of respondents stated that clinical wastes are segregated either at the points of generation or in a specified/designated place

within the facility, which is in accordance with recommended procedures and practices.

A majority of the participants (83%) also stated that that clinical waste are disposed of on daily basis. This is also the acceptable and recommended practice. However, 17% of respondents said that clinical wastes at hospitals they work in take more than a day to dispose of, which is in contradiction of best practices. The longer the clinical wastes are left undisposed, the greater the exposure and risk they pose to workers. This is especially crucial that 99% of the participants claimed that the wastes are usually disposed of by non-medical workers especially the ward attendants, cleaners and incinerator workers. As earlier pointed out these are the group of workers with the least education and awareness about the nature and enormity of the risks posed by clinical wastes. It may not be far from the truth to state that they probably belong to the 10% of respondents who indicated little awareness and knowledge of clinical wastes and its compositions. By nature of their education, they are also the least trained in handling clinical wastes among the health care workers in hospitals. However, by nature of their employment and status, they are often the group saddled with the responsibility to undertake jobs considered menial even when they are least qualified or trained for some of them. This appears to be more of a cultural issue rather than a professional one. There is a culture, in most Nigerian institutions, where the least educated are perceived as responsible for doing jobs not wanted by the more educated, irrespective of the amount of risk posed and the hazards involved. It may be true that the waste handlers wear protective devices and clothing as indicated by 85% of respondents. It should be pointed out though that no protective device or clothing provides the level of protection that education and training offer.

The final waste disposal practices also leave much to be desired. According to the 36% of respondents, clinical wastes are disposed of finally at the municipal land fill. This is another layer of exposure especially as waste scavengers roam landfills to retrieve any discarded wastes materials they consider of some economic importance for reuse and recycling. Another 15% stated that wastes are finally disposed of by burying them on

hospital ground. Unless this is done in a completely isolated and protected part of the hospital, there are possible dangers from radioactive materials, erosion and exposure of buried materials and digging up of materials during future expansion of facilities.

Fortunately, most of the participants (44%) claimed that that wastes are disposed using incineration and the ashes are buried. This has the major advantage of ensuring that clinical wastes are obliterated and rendered impotent for possible infections. Anecdotal evidence however shows that there is no provision of air pollution control devices like filters and emission absorbers attached to the incinerators in any of the hospitals that are fitted with one. There is therefore the problem of air pollution associated with incineration as a clinical waste disposal strategy. According

to the research conducted by the Healthcare Without Harm, medical waste incineration was identified to be the simple largest source of dioxin air pollution in the United States of America in 1997 (Jorge et al., 2007). There are some new methods for the treatment of medical healthcare waste before final disposal. And these are believed to be safer and more public health and environment friendly than incineration. These include low heat thermal processes, chemical process, irradiative processes, biological processes and mechanical processes (Jorge et al., 2007, Olaniyi et al., 2018). Unfortunately none of these non-incinerated medical waste treatment technologies is being practiced in any of the healthcare facilities in the study area.

**Table 5** Healthcare waste management

VARIABLE	CLASS	FREQ	(%)
Are you familiar with clinical waste management plan of the hospital	Yes	139	86
	No	23	14
Do you segregate, contain, and label the clinical waste	Yes	141	87
	No	21	13
Where does the segregation take place	I don't know	21	13
	At the point of waste generation	66	41
	In a specified place within the facility	64	40
	Outside the hospital premises	11	6
How often do you dispose of the waste	Daily	135	83
	Weekly	20	12
	Bi-weekly	6	4
	Others	1	1
Who handles (removes) the waste	Ward attendant	67	42
	Cleaner	72	44
	Incinerator worker	21	13
	Others	2	1
Are the waste handlers using any protective devices/clothing during waste handling	Yes	138	85
	No	22	14
	I don't know	2	1
What types of containers are used for collection and transportation of the waste	Waste basket	48	30
	Waste bin	95	59
	Door mounted bin	15	9
	Pedal bin	4	2
Where do you finally dispose waste	Municipal landfill	58	36
	Buried on hospital ground	25	15
	Incinerated and buried	71	44
	Others	8	5

Source: Authors' field work (2016)

A majority of the respondents (87%) contended that new staff are trained, which is

encouraging. Another majority (77%) believed that the hospital they worked in is in

compliance with the World Health Organization (WHO) standards on management of health care wastes. According to (Uwa 2008., Stuart *et al.*, 2019) compliance with WHO formal Policy on clinical waste management will balance the difference between efficient healthcare waste management and sustainability. However, the assessment of compliance with WHO standards by the respondents seems to be undermined by their submissions that there were many problems being encountered with clinical wastes management.

A total of 73% observed that containers for clinical wastes storage or disposal are either damaged or inadequate. Both would constitute serious infringements

on wastes management standards. The implication is that the containers are compromised either by the damage or by overflowing wastes in inadequate containers. The exposure and risks of contamination in both cases would be high. A further 27% of respondents feel that there is problem with the staffing either in their inadequacy or attitudes towards handling clinical wastes. In the former case, the issue may be possible overburden of work and responsibility, which increases the risk of contamination from wastes. The latter situation speaks to issues of education, awareness of risks and training to properly handle clinical wastes, which are generally hazardous materials.

### Training of Healthcare Workers

**Table 6** Training of healthcare workers

VARIABLE	CLASS	FREQ	(%)
Are training given to newly employed staff	Yes	141	87
	No	21	13
Is your facility working in line with the World Health Organization formal policy on the management of hospital/healthcare waste	Yes	125	77
	No	37	23
What are the problems encountered in disposing your healthcare waste	Damaged waste disposal container	53	33
	insufficient of waste disposal container	64	40
	Inadequate staff to handle waste disposal	31	19
	Nonchalant attitude of the users	14	8
What do you suggest should be done in order to minimize the problem	Sufficient containers should be provided	35	22
	Appropriate containers should be used	60	37
	Sufficient number of staff should be employed		
	Training of workers on waste management	35	22
	Others	19	12
Do you have any relevant information to add on the management of hospital/healthcare waste generally	Ensure adherence to management of clinical waste policies	37	23
	Staff should be properly trained	84	52
	Seminars should be organized periodically on management of clinical wastes for enlightenment	35	22
	Others	5	3

Source: Authors' field work (2016)

It is not enough to train new staff only. In a situation of handling hazardous materials such as clinical wastes, which pose serious health risks to medical workers, hospital patients, the public and have many serious negative implications for

environmental safety, there is the need for regular training and retraining of staff. This seems to have been recognized as a missing gap by at least 74% of respondents who recommend that regular staff training and seminars be organized for staff on clinical

wastes management. Twenty-three (23%) also recommended that strict adherence to clinical waste management should be strictly adhered to and enforced. The Environmental Protection Department's Code of Practice for Management of Clinical Waste in Hong Kong, (2010) insisted that waste producers should ensure that their staff receive adequate training in the safe handling of clinical waste, including cleaning-up of spillage.

## CONCLUSION

Healthcare wastes management services are aimed at preventing potential human health risks and environmental hazards as well as improving wellbeing. Based on the observations made during the study in Jos metropolis the healthcare facilities clinical wastes management system is not very effective and efficient, with a mixture of potential infection and non-infectious waste being commonly sighted in hospital grounds. This waste is either burnt or left unsanitary, which generates the problems of air pollution and underground leakages. The study explored the level of effectiveness of clinical governance efforts in the management of clinical wastes in hospitals in Jos. The result showed that good clinical governance is not significant in the quality of healthcare waste management in healthcare facilities in Jos metropolis. Poor management of these healthcare wastes exposes the health workers, patients, waste handlers and the general public to health risks.

From the findings of this study, it is clear that healthcare waste management in Jos metropolis is unsustainable. This study therefore recommends the need to balance between the level of awareness of healthcare waste management and sustainability as that will help in curtailing the effects of healthcare wastes on health workers, patients, waste handlers and the general public. The study suggests that there should be sufficient supply of equipment for collection, storage and removal of healthcare wastes. There should be provision of special vehicles for the safe transportation of healthcare waste. Infectious waste should be treated before disposal into incinerators. Incinerators should be equipped with smoke and emission control facility as this will prevent the problem of emission of hazardous gases such as furans, dioxins,

sulphur dioxide and others hazardous gases and of course these gases are capable of affecting the general public and the environment.

The study also recommends the need for both the Federal and State Ministries of Environment and Health to put in place a legislation that will regulate medical waste generation and management in Nigeria. This legislation will help enforce standard practices in the handling of medical waste. There is need for public enlightenment campaign through media advocacy such as videos, newspapers, short booklets and leaflets on healthcare waste management and the dangers associated with it. Importantly, there is also the need for capacity building by ensuring continuing education and training of medical personnel, particularly waste handle.

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