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Evaluation of medical waste management in Ekurhuleni metropolitan municipality clinics

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CHAPTER 1

1 INTRODUCTION

This chapter covers an introduction and literature review, setting the scene for the research. Background information for the research is presented, as well as the aims and objectives. Literature relevant to the study problem is reviewed and the methodologies used in the research are described. The objective of the study is also presented. The main objective was to determine whether medical waste management practices complied with the Gauteng Health Care Waste Management Regulations (3003 of 2003) in 30 Ekurhuleni Metropolitan municipal (EMM) clinics during 2007.

Section 1.1 presents the background information on the research, while section 1.2 presents views and general principles derived from similar studies by other authors in the literature reviewed. Section 1.3 states the research problem, while section 1.4 outlines the aims and objectives of the research.

1.1 Background information

This study of waste management practices within the EMM, Gauteng Province, is regulated by the Gauteng Health Care Waste Management Regulations (3003 of 2003). No relevant national legislation on the subject exists currently. Furthermore, the study took note of the definitions as contained on page ix following the abstract.

1.1.1 Ekurhuleni Metropolitan Municipality Clinics

The study targets the work environment of EMM clinics, established after the local government elections in 2000. Eleven previously separate municipalities were amalgamated to form the EMM.

The 112 Ekurhuleni clinics are managed by the Health Department under the Executive Director: Health. The organisational structure includes clinic managers, clinic nurses and cleaners. The clinics are spread across municipal spatial boundaries and render the following services to the Ekurhuleni population of 2.5 million people: mental health; primary health care; HIV/AIDS; family planning; ante-natal clinic; communicable diseases [TB]; sexually transmitted diseases, other infectious diseases. Maternity services are provided by seven maternity clinics which operate on a 24 hour basis as opposed to the day clinics. All these services generate medical waste in one way or another. The EMM is thus a generator of medical waste in terms of the Gauteng Health Waste Management Regulations (3003 of 2003).

Before amalgamation, each municipality had its own operating procedures and resources, resulting in non-uniform medical waste management practices. Once unified, rationalization was essential to guarantee the health and safety of both patients and staff at the 112 clinics. This included the need for a study to evaluate the medical waste management practices requirements.

1.1.2 Medical Waste Management Practices

In accordance with the Gauteng Health Care Waste Management Regulations (3003 of 2003), Medical Waste Management Practices are required wherever medical waste is generated. Waste should be segregated at the point of generation, be properly containerised, labelled, stored, treated and finally disposed of.

Clinical and administrative issues influence the production and disposal of medical waste, which is both a labour intensive and costly process. Clinic nurses generate the waste and should be active participants in disposal procedures. Health practitioners must comply with policies and strict regulations governing the disposal of potentially infectious medical waste such as hypodermic needles, syringes, bandages and dressings. This waste must be collected and sterilized by accredited medical waste service contractors.

Medical waste is heterogeneous in nature contain a range of materials, such as paper, plastics, pathological specimens, animal carcasses, blood soaked bandages, syringes, scalpels, and many other materials. The major items of concern are pathogens, cytotoxic chemicals, hazardous chemicals, and radioactive materials. Because of this heterogeneous composition, not all treatment and disposal techniques are effective in the destruction process.

Furthermore, there is a clear distinction between waste treatment and waste disposal. In the treatment process, the major objectives are to reduce the hazardous nature of the waste, to change the waste into a physical form that is easier to manage, and to reduce the volume of the waste. Waste disposal refers to the final step where the waste is finally destroyed.

Medical waste management poses both health and ergonomic risks to health care workers at the Ekurhuleni clinics. This requires that policies and operating procedures for management of workers' safety and disposal of medical waste be assessed and evaluated. There is also need for clarity as to the type and quantity of waste generated and the disposal process.

This study deals with the unresolved issues related to the generation, handling, treatment and disposal of medical waste. The study also intends to help clinic managers and practising nurses to function better, with reduced occupational health risks. It also aims to reduce the health risks faced by patients using the clinics.

1.2 Literature review

Akter (2000:2) reviewed available medical waste management practices relating to their nature, impact and management techniques as either practiced or recommended by various countries including developing countries, where information was obtained through a literature review, online search and personal communications. The review found that waste disposal was quite unsafe in that both clinical and non-clinical waste were thrown together. There was also an insufficient awareness of the medical waste by individuals as well as no safety measure in dealing with waste disposal.

Namogang (2007:v) from Gaborone Botswana audited clinical waste management through interviews with 119 people, a review of documents including national legislation, policy documents and regulations, and by observing clinical waste management processes from generation to disposal. The audit observed that clinical waste was not appropriately managed in that it was not wholly segregated from household waste; inadequate supply of receptacles was found; and that bags containing waste were not securely fastened to avoid spillage.

Hodson & Uhorchak, (2000) studied emerging technologies in the assessment of hazards due to medical waste management practices in the USA by focusing on the chemical, physical and safety hazards using unique methods. They encountered the expected issues, but nothing new. The enforcement of the use of Personal Protective Equipment (PPE) was found to be fair to poor, changes made to facilities overtime created safety problems due to employees' unfamiliarity with relevant codes, directional signage not in place, and tools for detection and monitoring of leaks were not calibrated. They further reported Hodson & Uhorchak, (2000: 4) that "slip and fall hazards that included wet floors, loose planks, hoses and electrical wiring strewn across walkways" were present at all facilities and at all times.

Msimang (2003) identified public health care facilities to be the biggest generators of health care risk waste in KwaZulu Natal, and that these facilities lack knowledge of the appropriate technologies and practices for proper management of health care risk waste. Also, a lack of training on health care facility hygiene for non- professional staff, lack of resources for management, lack of a waste information system, lack of institutional waste management plans, and lack of a dedicated budget for the management of health care risk waste at public health care facilities remain a challenge.

Leonard (2003) contended that health care waste problems in South Africa have reached uncontrollable proportions, where desktop studies showed that 45% of health care waste (HCW) generated in Kwazulu-Natal province cannot be accounted for, suggesting that it is illegally dumped, buried or burnt, .

Fischer, Kristiannsen & Nkosi (2003) concluded that there is a serious backlog in terms of health care waste management (HCWM) in Gauteng, and that the capacity to manage health

care waste in an environmentally sound, occupationally healthy and safe manner is lacking when compared to the current practices in the developed world. This lack of HCWM results in a risk of exposure to blood-borne pathogens by needle- stick injuries and spills during collection and disposal of health care risk waste (Magner, 2003). However, Mintchel (2000) states that hospital employees prevent blood–borne infections by disposing of bio-hazardous waste separately as studied in different cities in America. He further indicates that this process is increasingly expensive because the waste must be sent to EPA-approved disposal facilities.

The Nightingale Institute for Health & Environment states that proper sharps management in health care facilities helps solve risks of disease transmission from medical waste. Proper sharps management includes "proper equipment and containers distributed every where that sharps are generated, a secure accounting and collection system for transporting the contaminated sharps for treatment and final disposal, and training of all hospital personnel on handling and management of sharps and personal protection" (http://www.nihe.org/elevreng.html, accessed 17/05/2006).

An article in *Automatic I.D. News* (1995) defines collection of biomedical waste as a normal housekeeping function in the healthcare industry. This article further states that recent waste management studies show that about 40 percent of waste stream is neither just nor real trash. "Every time a Coke can or glove box ends up in the biomedical waste stream, hospitals are paying 20 times what they should to dispose of it" (Automatic I.D. News, 1995:2). This article quotes Duhamel [n.d.:2] who says "In the healthcare industry, cutting operating costs such as waste disposal is more attractive than cutting patient services." The

article further quotes Walsh [n.d.:2] explaining that "disposal systems are only effective if they are implemented properly and followed up on a regular basis".

Schierhorn (2002:1) contends that "Whether due to caution, convenience or carelessness, non-infectious solid waste often gets tossed into red-lined containers intended for regulated medical waste. While not dangerous and illegal like dumping infectious waste into the solid waste stream, red-bagging solid waste can add many thousands of dollars to a health facility's disposal costs." To reduce costs, healthcare facilities can switch to re-usable products. The article by Schierhorn (2002:2) further states that "…waste segregation training should take place during new employee orientations, in-service sessions and annual training fairs".

Gauteng Provincial Government (2003a) document, which describes the Gauteng HCWM Regulations, states that "…all health care risk waste generators must, at the point of generation and at all times thereafter, segregate health care risk waste from health care general waste. No person shall dispose of health care risk waste together with health care general waste or in any manner other than in the manner prescribed under these Regulations."

Gauteng Provincial Government (2003b), which sets out the Guidelines on Sustainable HCWM in Gauteng gives the flow path for HCW as follows:

Step 1 HCW generation

Step 2 HCW segregation

Step 3 HCW containerisation

Step 4 HCW intermediate storage

Step 5 HCW internal collection and transport

Step 6 HCW central storage

Step 7 HCW external transport

Step 8 HCW treatment

Step 9 HCW residue collection and transport

Step 10 HCW disposal

Jensen (2003) states eight principles of actual Health Care Risk Waste Management to be; separation at the source, minimum contact with waste, packaging at the source, minimum repacking of packaged waste, sound sanitary storage, transportation in approved packaging, automatic handling during feeding at treatment facilities, and treatment by incineration. Adherence to these principles will lessen the risks due to medical waste management practices as the process of anticipation, recognition, evaluation, and control according to Dinardi (1997). This would also minimise health risks in the workplace and lead to lesser problems in communities as medical waste would not be dumped or buried in open fields (Leonard, 2003). Organizational processes would always be associated with hazards and risks at different levels and that these processes may invoke studies to determine the prevalence of exposure to risks that is driven by the need to determine statutory or regulatory compliance.

In a procedural outline, Katzenellenbogen, Joubert & Karim (1997) define the collection of information for a study as *measurement* and measurement tools or instruments ranging from a thermometer, a structured interview questionnaire, clinic reports to an observation checklist. In the present study a structured interview questionnaire and an observation checklist are used.

1.3 Problem statement

Medical waste management poses both health and ergonomic risks to health care workers at EMM clinics. This requires that plans, policies and operating procedures for the management of workers' safety and the disposal of medical waste be assessed and evaluated. There is currently uncertainty regarding the type and quantity of medical waste generated, and the disposal mechanism.

1.4 Aim of the study

The aim of the study is to assist EMM clinic managers to determine the state of their medical waste management practices and to take the necessary corrective action where possible.

1.5 Objective of the study

The objective of the study is to determine whether medical waste management practises comply with the Gauteng Health Care Waste Management Regulations (3003 of 2003) in EMM clinics in 2007.

CHAPTER 2

2 MATERIALS AND METHODS

2.1 Introduction

This chapter describes the measuring tools used to measure compliance in terms of the study objective. It discusses in detail the overall research approach or strategy adopted. It also describes the study design, study sites investigated, who the study involved and the sampling strategy and techniques used.

2.2 Study design

The study is a cross-sectional descriptive survey.

Data was acquired by means of interviews with clinic managers regarding medical waste management practices in their clinics. A structured questionnaire was used in conjunction with observations recorded on a walkthrough survey checklist**.**

These research tools included questions on the generation, handling, storage, transportation, and disposal of medical waste.

2.3 Overview

The two measuring tools were selected in order to capture as much relevant data as possible so that results from the interpreted data would be applicable to the organisational settings within the EMM.

2.4 Selection of study sites (sampling)

At the time of the study the EMM managed 112 clinics (7 maternity, 16 satellite, 11 mobile, 78 fixed). Although the EMM had its own nurses working in the clinics, many of the clinic staff were employed by Gauteng Province and were seconded to the EMM clinics to enhance capacity.

Thirty facilities, including the seven maternity clinics, were selected for the study. It was found that, of the seven maternity clinics, three belonged to the EMM and four clinics to the Gauteng Provincial Health department. The latter are managed by the EMM. It was for this reason that a letter of permission had to be obtained from the Gauteng Health Research Committee before any of their clinics could be included in this study. The seven maternity clinics were all included in the study because they fall under different authorities and have unique operations and practices compared to the day clinics.

The remaining 23 participating facilities were selected randomly. Each non-maternity clinic was allocated a number (#001 to #105). A coin was thrown to determine the horizontal and the vertical digits in the table for the selection of the clinics.

2.5 Development of measurement tools

2.5.1 Description of measurement tools

Articles in scientific journals, other researchers' reports, research text books and the Gauteng Health Care Waste Managemen Regulations & Guidelines, were used as sources of information to design the measurement tools used in the study.

2.5.2 Contents of measuring tools

2.5.2.1 Interview questionnaire for clinic managers

The interview questionnaire consisted of six dimensions of measurement of medical waste management practices as stipulated by the Gauteng Health Care Waste Management Regulations (3003 of 2003). These dimensions include:

- the development and implementation of policies on medical waste management and needle stick,
- the existence and implementation of a waste management contract,
- the availability and implementation of safe work procedures,
- development and implementation of a training programme on medical waste
- and the conduct of risk assessment for hazards identification.

2.5.2.2 Walkthrough survey checklist

The walkthrough survey checklist consisted of twenty six items measuring medical waste management practices, which were developed in line with the stipulations of the Gauteng Health Care Waste Management Regulations (3003 of 2003).

2.5.2.3 Pilot Study

Both the walkthrough survey and the interview questionnaire were used in a pilot study.

One EMM clinic (not selected for the study) was used for the pilot study, where the manager was interviewed and a walk through survey was conducted. The results of the pilot study were used to refine the contents and constructs of the research measurement tools and to improve the measurement tools' reliability to obtain valid data.

2.6 Selection of clinic managers for interview

The study sample subjects consisted of clinic managers in EMM. Each clinic in EMM is headed by one clinic manager who is responsible for the overall management, development of policies, procedures and implementation plans. Thirty clinic managers were selected as sample subjects during a random sampling of 112 clinics .

2.7 Data collection

A Letter of Permission obtained from Ekurhuleni Health District Ethics Panel (EHDEP) to visit the study sites, was used as a facilitating tool to enter selected sites to collect data required.

2.7.1 Interviews

Interviews of clinic managers using a structured questionnaire based on the requirements of the Gauteng Health Care Waste Management Regulations related to medical waste management practices were conducted. Supporting evidence for some answers given was obtained in the form of copies of existing documents. An example of the interview

questionnaire is presented in Annexure 1. Appointments for interviews were made with the respective clinic managers by the researcher and members of the research team, who were all employees of the Occupational Health & Safety Section in the Employee Wellbeing Division of the Human Resources Management and Development Department of EMM.

2.7.2 Walkthrough survey checklist

Data was collected by a walkthrough survey coupled with observations and careful recording of the observations using a checklist on medical waste management practices. This checklist is shown in Annexure 2. Both the walkthrough survey and interview questionnaires were administered in combination for four weeks during July 2007.

Observations were made in line with the checklist items while at the same time questions were raised on issues that needed further clarification or confirmation. Upon confirmation of the needed information, factors relevant to making decisions were determined.

The research team consisted of five members who had prior discussions on the approach to the research field work. All had experience in the procedures of interviews and walkthrough survey observations from their professional work activities and from having undertaken similar studies which included the use of this method of data collection.

2.8 Data quality control

The quality of data was ensured by the design of the questionnaire and the walkthrough survey, the selection of experienced research team members who were further trained to do field work and to obtain reliable data, and the pilot study that facilitated the refinement of

the measuring tools. The confidentiality of the data obtained was ensured by keeping documents under lock and key.

The researcher phoned clinic managers randomly selected to confirm whether the research team members actually visited such clinics to obtain data. Further, the research team members were allocated to collect data in areas in which they usually and ordinarily did not operate in to avoid biasness.

2.9 Data analysis and management

Data obtained was analysed in relation to the study objective and the problem statement. Positive responses were identified with positive practices that reduce the risks or hazards, while negative responses were identified with negative practices that increase the risks and hazards. All these were captured and presented in the form of percentages. Responses that were at 50 percent and below were taken as high risk situations for the purposes of this study. The existence of positive responses and observations imply compliance with the regulations, while negative responses and observations imply non-compliance.

Data obtained was presented in tables to determine frequencies of occurrence of positive or negative practices. From these tabulations and frequencies, percentages were used to determine compliance or non-compliance. Compliance or non-compliance were determined in terms of general requirements applicable to health care risk waste; requirements applicable to generators; schedules 1, 2, 6, and 9 of the Gauteng Health Care Risk Waste Management Regulations (3003 of 2003).

2.10 Ethics

The relevant clinic managers were fully consulted and involved in the study to understand the objectives as well as the procedures followed in collecting data and its subsequent analysis and reporting. Only then was information gathered and analysed. Where mismanagement of medical waste was observed, the necessary control measures were recommended without prejudicing the personnel and the clinic concerned. The language used was English, as the targeted population understood it. Furthermore, the University of the Witwatersrand Human Research Ethics Committee's approval of ethical considerations was obtained, which is reflected in Annexure 3.

Strict confidentiality was maintained by eliminating all information leading to the possible identification of the subjects involved in the walkthrough surveys and interview forms. Informed consent was obtained and participation was voluntary, such that those who declined participation were not adversely affected in any way.

CHAPTER 3

3 RESULTS

3.1 Introduction

This chapter presents the results of both the interview questionnaire administered to clinic managers and a walkthrough survey observation checklist done by the researcher and members of the research team. The results are analysed in relation to the study objective, viz: to determine whether medical waste management practices comply with the Gauteng Health Care Waste Management Regulations (3003 of 2003) in 30 EMM clinics in 2007.

Section 3.1 presents the results of the interview questionnaire for clinic managers, while section 3.2 presents results of a walkthrough survey observation checklist. Section 3.3 of this chapter is a concluding section that summarises the main results.

3.2 Interview questionnaire for clinic managers

From an intended study of 30 Ekurhuleni Metropolitan Municipality clinics, 29 were finally studied in 2007, giving a response rate of 29 clinics out of 30 clinics (96.7%). The one clinic was not included due to logistical difficulties.

As it can be seen in Table 3.1, the operations of Ekurhuleni municipal clinics show that the required documents do not exist at 66.7% of the clinics. This predominantly happens to be in the areas of medical waste policy; written safe work procedures; training programme; and conducting of risk assessment.

Table 3.1 Existence of Required Documentation on Medical Waste Management in 29 EMM clinics in 2007				
	Yes		**No**	
	No.	(%)	No.	(%)
Operating medical waste policy	10	34.5	19	65.5
Medical waste disposal contract	28	96.6	1	3.4
Written safe work procedures	9	31.0	20	69
Needle stick policy	28	96.6	1	3.4
Training programme	2	6.8	27	93.1
Conducting of risk assessment	9	31.0	20	69

Table 3.1 also shows that 65.5% (19/29) of the clinics had no policy on medical waste while Table 3.2 reveals that 79.3% (23/29) of the clinics did not report any problems with any aspects of the implementation of their medical waste policy.

From data collected from clinics 20.7%, said that the implementation of a medical waste policy is not problematic. This may have the net effect of reducing the number of clinics that have an operating medical waste policy from 34.5% in Table 3.1 to 20.7% in Table 3.2.

Table 3.2 Aspects of implementing clinics operating medical waste management policy that were problematic				
	Problematic		Not problematic	
	No.	(%)	No.	(%)
No mention of problematic policy aspects	23	79.3	6	20.7
Budget problems concern	1	3.4	28	96.6
The placement of sharps container	1	3.4	28	96.6
No modernisation of equipment	1	3.4	28	96.6
Outsource and collection of waste	1	3.4	28	96.6
Wearing of PPE	1	3.4	28	96.6
Transportation	1	3.4	28	96.6

Of the 20.7% of clinics that have an implemented medical waste policy, 16.7% each experienced policy operational problems of equal strength at 16.7%, in particular budgetary problems, placement of sharps container, modernisation of equipment, outsource and collection of waste, wearing of PPE, and transportation.

Of 29 clinic managers who answered the question about feedback by the contractor on waste disposal (see Question 2.1 of the Interview Questionnaire, Annexure 1), 28 said they did not get feedback while one did not know.

Table 3.3 Feedback on medical waste disposal by the contractor to the 29 EMM clinic managers		
	Response	
	No.	(%)
No feedback	28	96.6
Do not know	1	3.4

With respect to 28 (96.6%) clinics that have a medical waste disposal contract, 28 (96.6%) clinics have no feedback on their medical waste disposal activities and contract (see Table 3.3). This lack of feedback indicates that almost all clinics in Ekurhuleni Municipality, as generators of medical waste, are not fully responsible for their medical waste management from cradle to grave.

The nine clinics which have safe work procedures (Table 3.1), i.e. 31% are contrasted by 13 clinics in Table 3.4 that indicated that their safe work procedures communication methods are in the form of meetings (6), verbally (1), informally (1), and through lectures (5). This contradiction created a difference of 4 clinics which communicate safe work procedures they do not have. In comparing reported communication methods that are verbal, informal, in the form of lectures and meetings, it is highly likely that the responses relating to meetings belong to the category that does not have safe work procedures. In the interpretation of these results, meetings as a method of communication have been classified in the category of *not safe work procedures*.

Table 3.4 Methods of communicating safe work procedures used by EMM clinic managers who answered *YES* to written safe work procedures		
	Method	
	No.	(%)
Questions not answered	7	24.1
No method	9	31.0
Meetings	6	20.7
Verbally	1	3.4
Informal	1	3.4
Lectures	5	17.2

Thus effectively, there are only seven clinics that have safe work procedures and communicate such procedures predominantly through lectures (5/7) or 71.4 percent, verbally (1/7), and informally (1/7), according to responses shown in Table 3.4.

Only 1/29 of the clinics in Table 3.1 indicated that they have no needle stick policy, but the number of clinics that have not responded to the aspect of safe work procedures that are followed during needle stick injuries from Table 3.5 is reflected as 7/29. This signifies that the actual number of clinics that have a needle stick policy is not 96.6% as in Table 3.1 but only 75.9%.

Table 3.5 Safe work procedures followed during needle stick injury in 29 EMM clinics		
	Method	
	No.	(%)
Do a baseline test and report	1	3.4
Use running water and soap	2	6.8
No response	7	24.1
As per policy	19	65.5

As shown in Table 3.1, 6.8% indicated that they have a training programme. This includes mainly in-service training lectures (6.9%). This is shown in their training skills audit plan in terms of responses and indications in Table 3.6. The 31% of clinics that did not respond to the training skills audit plan question and the 62.1% that indicated no specific training skills audit plan in Table 3.6 confirm that there is no medical waste management training programme.

From Table 3.7 it can be observed that risks due to needle stick pricks (13.8%) are four times as high as those posed by the placement of sharp containers (3.4%). Those due to TB infections are three times as high (10.3%) as those posed by placement of sharp containers (3.4%). Those posed by steep and slippery ramps (6.9%) are twice as high as those posed by placement of sharp containers (3.4%). Furthermore, the risks of placement of sharp containers (3.4%) have the same rating strength as those posed by delayed equipment plan risks (3.4%).

Table 3.6 Training and method included in skills audit plan in 29 EMM clinics						
	Method		**No method**		**Total**	
	No.	(%)	No.	(%)	No.	(%)
No response to the type of training in audit plan	9	31.0		0.0	9	31.0
No method or training programme	0	0.0	18	62.1	18	62.1
In-service training lectures	2	6.9		0.0	2	6.9

The 62.1% of the clinics that did not rate any risks in (Table 3.7), confirm that risk assessments are not conducted in most clinics.

Table 3.7 Recent highest rated risks identified by clinic managers in 29 EMM clinics		
	Rating	
	No.	(%)
No rating	18	62.1
Steep and slippery ramps	2	6.9
Placement of sharp containers	1	3.4
Delayed equipment plan	1	3.4
Needle prick	4	13.8
TB infection	3	10.3

3.3 Presentation of results of a walkthrough survey observation checklist

3.3.1 Results of walkthrough survey observation checklist

The results of a walkthrough survey are presented in Table 3.8 and are reported in terms of the medical waste management practice numbers, where this number is the same on the statement in the walkthrough survey observation checklist for purposes of brevity. These medical waste practice numbers are retained in the analysis of comments made on each medical waste practice in Table 3.9.

Out of a total of 26 medical waste management practices studied (see Table 3.8a), 46% of the observations showed that practices were clearly occurring; while in 50% of observations practices were clearly not occurring. Only in 4 percent of the practices, particularly in the case of medical waste management practice (Item #24: *the use of airtight seal lid for pathological or anatomical waste containers)* were the occurring and non-occurring practices at 50% for both. Item #24 was thus eliminated, leaving 25 items in the study.

Of these 25 practices, which are reflected in Table 3.8b, 48% were observed to occur while 52% were observed not to occur. Both occurring and non-occurring practices were further analysed for compliance or non-compliance. From observations, 14 practices are compliant and 11 practices are non-compliant as can be seen from Table 3.8b.

In the 48% of medical waste management practices which were observed to occur, there were both compliant and non-compliant practices: eg: #17 was observed to occur, but was non-compliant. Also, in the 52% where practices did not occur, there were both compliant and non-compliant practices. Examples of this were #20, #22 and #25, which were observed

as compliant. Therefore, overall non-compliant practices were observed in 44% of the observations while compliant practices were observed in 56%..

However, the negative medical waste practices that needed attention include among others, the lack of the use of wheeled push trolleys; pathological waste not treated within 24 hours and not stored at -2^{o}C; HCRW not collected within 72 hours for treatment as observed from log sheets; re-usable containers not disinfected before re-use; Health Care facility not in possession of Health Care Waste Management Plan; Health Care facility not in possession of Health Care Waste Audit Report; Health Care Storage facility has insufficient capacity to store up to 8 days of HCRW generated at the facility; Health Care facility is not registered as a generator of HCRW and has no certificate of registration; Central Health Care Waste storage is not clearly demarcated; and Central Health Care Storage does not have impermeable slip resistant, hard-standing floor.

A negative response to practice #22, (*HCRW gets disposed of together with health care general waste)*, translates into positive medical waste practice since it implies that medical waste was segregated before disposal. A positive response to #17 (*Health care workers eat elsewhere in the facility)* translates into a negative medical waste management practice since it implied that health care workers ate not only in the designated area. With regard to HCW containers weighing more than 15kg, and which are manually lifted (#20), 19 clinics did not lift containers manually while practice #6 only seven clinics indicated that they had push trolleys. This contradiction implied that clinic staff did not wait for containers to be filled above 15kg before dispatching to a central storage. With regard to HCRW not loaded on to transportation trolleys higher than the design level (#25), comments obtained in Table 3.9a-m indicate existence of negative medical waste management practices in clinics.

Table 3.8a Results of clinics walkthrough survey observation checklist					
Medical Waste Management Practice		Observation			
No	Description	Positive	Negative	Total	% Positive
1	Health Care Risk Waste segregation at point of generation	26	3	29	89.7
2	Solid and Semi Solid HCRW placed in leak proof coded container	27	2	29	93.1
3	HCRW placed in leak proof puncture resistant containers	26	3	28	89.3
4	Sharps placed in sharps containers at point of generation	28	0	28	100.0
5	Sharps containers tightly sealed when full	28	1	29	96.6
6	Wheeled push trolleys used for internal transportation	7	22	29	24.1
7	Pathological waste not treated within 24hours of generation stored at -2°c	6	23	29	20.7
8	HCRW stored at -2°c take not more than 72hours before collected for Treatment	4	25	29	13.8
9	Required Personal Protective Equipment used when handling HCRW	26	2	28	92.9
10	Decanting of HCRW from one container into another not done	15	13	28	53.6
11	Re-usable containers disinfected before re-use	5	23	28	17.9
12	Health Care facility in possession of Health Care Waste Management Plan	5	24	29	17.2
13	Health Care facility in possession of Health Care Waste Audit Report Signed by CEO	1	27	28	3.6
14	Storage facility has sufficient capacity to store up to 8 days HCRW Waste generated at the facility	12	15	27	44.4
15	Health Care facility registered as generator of HCRW has certificate Of Registration	6	22	28	21.4
16	Rigid Puncture resistant containers containing HCRW kept clean and In good repair	20	8	28	71.4
17	Health care workers eat elsewhere in the facility	21	6	27	77.8
18	Central Health Care Waste storage clearly demarcated	5	24	29	17.2
19	Central Health Care Storage has impermeable sleep resistant, Hard –standing floor	9	20	29	31.0
20	HCW containers weighing more than 15kg manually lifted?	9	19	28	32.1
21	Health Care Workers make use of moveable chairs	16	13	29	55.2
22	HCRW gets disposed of together with health care general waste	7	21	28	25.0
23	Lid used for disposable containers secured in a way as not to be reopened once closed	26	2	28	92.9
25	HCRW loaded on to transportation trolleys higher than the design level	13	13	26	50.0
26	HCRW containers not left unattended	4	24	28	14.3

Table 3.8b Occurrence or non-occurrence of medical waste management practices and their compliance or non-compliance status					
Medical Waste Management Practice		Occurring		Compliant	
No	Description	Yes	No	Yes	No
1	Health Care Risk Waste segregation at point of generation	X		X	
2	Solid and Semi Solid HCRW placed in leak proof coded container	X		X	
3	HCRW placed in leak proof puncture resistant containers	X		X	
4	Sharps placed in sharps containers at point of generation	X		X	
5	Sharps containers tightly sealed when full	X		X	
6	Wheeled push trolleys used for internal transportation		X		X
7	Pathological waste not treated within 24hours of generation stored at -2°c		X		X
8	HCRW stored at -2°c take not more than 72hours before collected for Treatment		X		X
9	Required Personal Protective Equipment used when handling HCRW	X		X	
10	Decanting of HCRW from one container into another not done	X		X	
11	Re-usable containers disinfected before re-use		X		X
12	Health Care facility in possession of Health Care Waste Management Plan		X		X
13	Health Care facility in possession of Health Care Waste Audit Report Signed by CEO		X		X
14	Storage facility has sufficient capacity to store up to 8 days HCRW Waste generated at the facility		X		X
15	Health Care facility registered as generator of HCRW has certificate Of Registration		X		X
16	Rigid Puncture resistant containers containing HCRW kept clean and In good repair	X		X	
17	Health care workers eat elsewhere in the facility	X			X
18	Central Health Care Waste storage clearly demarcated		X		X
19	Central Health Care Storage has impermeable sleep resistant, Hard –standing floor		X		X
20	HCW containers weighing more than 15kg manually lifted?		X	X	
21	Health Care Workers make use of moveable chairs	X		X	
22	HCRW gets disposed of together with health care general waste		X	X	
23	Lid used for disposable containers secured in a way as not to be reopened once closed	X		X	
25	HCRW loaded on to transportation trolleys higher than the design level		X	X	
26	HCRW containers not left unattended	X		X	

3.3.2 Results of a walkthrough survey observation checklist comments

A summary of comments made by survey team members during the walkthrough survey was done for each waste management practice and these are presented in Tables 3.9a-m. The complete set of comments is shown in Annexure 4.

Table 3.9a Summary of comments made by researchers during a walkthrough survey: Wheeled push trolleys used for internal transport (practice # 6)

Comments	**Number**	**(%)**
No comment on this practice	5	17.2
No provision of platform or wheeled trolleys, thus internal transportation is by hand	20	69
One trolley was available but waste weight was small enough to carry by hand or manually instead of using a trolley	1	3.4
Platform trolleys are provided and used	3	10.3
Total	**29**	**99.9**

Since the goal of the study is to assist clinic managers to take the necessary corrective actions on their medical waste management practices where possible, the analysis of comments is focused on the negative medical waste management practices observed. This focus is therefore on medical waste management practice numbers 6, 7, 8, 11, 12, 13, 14, 15, 17, 18, 19, 22, and 25 as recorded in Table 3.8. Complete and raw comments are attached in Annexure 4.

Comments on medical waste management practice #6 indicate that 82.8% (24/ 29) of the clinics confirmed the non-existence of push trolleys for purposes of internal transportation. Of comments obtained 88% (21/24) indicated that waste containers are transported manually

as no push trolleys or wheeled trolleys are provided for internal transportation purposes. However, 4.2% (1/24) indicated that their existing trolley is unnecessary and under utilised as the waste generated is small and able to be transported manually. On the other hand, 12.5% (3/24) indicated that platform trolleys are provided and utilised.

Comments on practice #7 indicate that pathological waste which is not treated within 24 hours of generation is not stored at -2^{o}C. However, the majority of comments indicate that no pathological waste is generated at the clinics, while clinics that produce pathological waste indicate that they have no facility for storing pathological waste at minus 2^{o}C. Also, waste generated can be stored for more than a week or indefinitely even in the absence of a freezing facility, as evidenced by comments in medical waste management practice #8.

Table 3.9b Summary of comments made by researchers during a walkthrough survey: Pathological waste not treated within 24 hours of generation stored at -2^{o}C (practice #7)

Comments	**Number**	**(%)**
No comment to this practice	8	27.6
No -2^{o}C freezer facility or special designated place for pathological waste or freezing waste	11	37.9
Waste kept in garage and outside	2	6.9
The room is cool and dark but no thermometer to measure temperature	1	3.4
Human tissue kept in freezer but small amounts	2	6.9
No pathological waste and no storage	5	17.2
Total	**29**	**100**

Responses to medical waste management practice #8 - 58.6% (17/29) provided useful comments, which indicate that HCRW takes more than three days (20.7%) to be collected, partly due to collectors not adhering to removal agreements (3.4%). This non-adherence to

removal agreements for such long periods nullifies the effect or impact of existing contracts, and further challenges the legitimacy or validity of statements that transportation contracts are in place. Furthermore, this non-adherence to removal agreements for such long periods reveals an area of weakness in monitoring and evaluating policies and safe work procedures. Some waste containers are stacked on top of each other as shown earlier in poorly-designed and non-designated storage facilities.

Table 3.9c Summary of comments made by researchers during a walkthrough survey: HCRW stored at -2^{o}C take not more than 72 h to be collected for treatment (practice #8)

Comments	**Number**	**(%)**
No comment on this practice	12	41.4
No -2^{o}C freezer facility	3	10.3
Some times the collectors do not adhere to removal agreements	1	3.4
Ordinary store room at ordinary temperature	5	17.2
No special designated place for freezing waste, waste collected after 3 days or an indefinite period	6	20.7
Not big volumes	1	3.4
Total	**29**	**96.4**

Table 3.9d which shows the results dealing with waste management practice #11. Four out of 23 , (17.4%) of comments indicate that containers used for HCRW are used without being disinfected. However, the heavy reliance on disposable containers by the majority (62.1%) of the clinics amplifies the inconsistencies in operating procedures and policy application or implementation in a number of clinics. This also highlights a possible lack of cost benefit

analysis of the process of containerisation of HCRW, as containerisation differ from clinic to clinic within the same administration.

Table 3.9d Summary of comments made by researchers during a walkthrough survey: Re-usable containers disinfected before re-use (practice #11)

Comments	**Number**	**(%)**
No comment on this practice	6	20.7
Re-usable containers not used, while disposable only containers are used	18	62.1
Re-usable containers used	1	3.4
Ordinary buckets and or containers used and only cleaned without disinfecting	3	10.3
Do not know whether should be disinfected and used	1	3.4
Total	**29**	**99.9**

Analysis of the existence of HCRW management plan in Table 3.9e dealing with medical waste management practice #12 reveals the inconsistency in the approach to managing medical waste in the municipal clinics. Many clinic managers manage their clinics and their subsequently produced HCRW without a plan (44.8%) and with plans that are still in development (17.2%). This means that a total of 62% of the clinics operate without plans on medical waste management. Since plans are developed from policies, this situation confirms the absence of policy documents, as revealed earlier in the questionnaire analysis. It also reveals a shortcoming by clinic management to develop policy and implement it. Furthermore, many clinic managers appear to lack insight into national standards and regulations on HCRW management.

The fact that 34.5% of the clinics (see Table 3.9f) do not know that a HCRW Audit Report is required; and that it should be signed by the CEO or the Municipal Manager, casts doubt

on the ability of the clinic managers to improve HCRW practices, as no scientific basis is developed for such improvement.

Table 3.9e Summary of comments made by researchers during a walkthrough survey: Health Care Facility in possession of Health Care Waste Management Plan (practice #12)

Comments	**Number**	**(%)**
No comment on this practice	9	31
The plan is in the form of a checklist system	1	3.4
Not aware of any plan	13	44.8
No entry at District office	1	3.4
Busy working on it, not yet in place	5	17.2
Total	**29**	**99.8**

From Table 3.9f, the absence of the audit report (10.3%) and the audit report that is not yet in place (13.8%) further demonstrate a possible lack of accountability on generated HCRW by the municipal clinics and their management. The existence of audit reports kept at district offices (6.9%) and not at the facilities creates an disempowering environment for both clinic managers and their staff as they lack a handy reference, a reminder, and advice on the necessary practices to implement at the required time.

Considering the capacity of the available storage facility for HCRW captured in Table 3.9g which deals with medical waste management practice #14, the lack of sufficient space evidenced by the lack of a proper and specific facility (31%), placing of containers on top

of cupboards (10.3%), and the use of consulting rooms (3.4%), reveal a weakness in the design of the operations relating to management of HCRW from generation to disposal.

Table 3.9f Summary of comments made by researchers during a walkthrough survey: Health Care facility in possession of Health Care Waste Audit Report Signed by CEO (practice #13)

Comments	**Number**	**(%)**
No comment on this practice	10	34.5
Do not know of this kind of report	10	34.5
Certificate kept at District Office and not on site	2	6.9
No audit report in place and no CEO	3	10.3
Not yet in place	4	13.8
Total	**29**	**100**

This weakness poses a challenge relating to possible short cuts and unavoidable misplacement of HCRW, thus leading to unwanted outcomes. It further challenges the ability of clinics and their managers to quantify the amount of HCRW they generate over a given time period. Thus individual clinics and the whole municipality may not accurately size its HCRW operations.

Clinic managers and their staff (27.6% from responding clinics) as seen on Table 3.9h dealing with waste management practice #15, do not know if their clinics are registered as HCRW generators, while the same number did not display such certificates during the survey. This further confirms their inability to manage HCRW in accordance with plans. This also signals the state of unfamiliarity with the necessary policies and regulations on the part of both clinic managers and their staff. No benefit accrues if registration certificates

exist but are kept centrally and not at the registered facility. They should be displayed prominently to reinforce confidence in the clinic.

Table 3.9g Summary of comments made by researchers during a walkthrough survey: Storage facility has sufficient capacity to store up to 8 days HCRW Waste generated at the facility (practice #14)

Comments	**Number**	**(%)**
No comment on this practice	5	17
No storage or specific facility exists	9	31.0
Placed on top of cupboards whilst awaiting service provider and use chairs to reach higher levels	3	10.3
Waste stored in one of the unused consulting rooms	1	3.4
Not able to view the size of the garage and room as keys were missing	2	6.9
Sufficient space	7	24.1
Sluice room and outside storage used for this purpose	2	6.9
Total	**29**	**99.6**

Table 3.9i deals with the eating facilities in relation to medical waste management practice #17. The use of consulting rooms (in 17% of the clinics) for eating purposes, poses a health hazard. Over and above that, it creates a environment for mixing of HCRW with general waste, thus defeating the purpose of a proper and planned HCRW management effort. Since mixing HCRW and general waste converts it all to HCRW, this inflates the costs to the municipality of handling medical waste. Also, more storage space is required.

The lack of signage and demarcation for clearly visible HCRW storage facilities within clinics (34.5%) is shown in Table 3.9j. This deals with medical waste management practice

#18 and illustrates a situation where HCRW is stored haphazardly within clinics at various points such as in toilets and garages (6.9%).

Table 3.9h Summary of comments made by researchers during a walkthrough survey: Health Care facility registered as generator of HCRW has certificate of Registration (practice #15)

Comments	**Number**	**(%)**
No comment on this practice	7	21.1
Certificates not displayed but kept by Head Office or regional office	3	10.3
Certificate not displayed, provided or in place	8	27.6
Available and seen	2	6.9
They do not know or are not sure or certificates may be with chiefs	8	27.6
Only if 150kg are generated	1	3.4
Total	**29**	**96.9**

This haphazard storage of HCRW creates a ripe environment for both biological and ergonomic hazards. This also reveals a weakness in the design stage of the HCRW handling and managing process.

Table 3.9i Summary of comments made by researchers during a walkthrough survey: Health care workers eat elsewhere in the facility (practice #17)

Comments	**Number**	**(%)**
No comment on this practice	11	37.9
Kitchen used by the staff	12	41.4
Use one of the nurses' rest room and consulting rooms as a kitchen	5	17.2
Tea room	1	3.4
Total	**29**	**99.9**

Table 3.9j Summary of comments made by researchers during a walkthrough survey: Central Health Care Waste storage clearly demarcated (practice #18)

Comments	**Number**	**(%)**
No comment on this practice	3	10.3
HCRW mixed with normal waste, storage not suitable in rainy weather kept in marquee	2	6.9
Placed on top of cupboards and use clinic store room whilst awaiting service provider	3	10.3
Using garage and toilet	2	6.9
Storage room is not labeled or demarcated	10	34.5
No special storage space or rooms and waste kept in untidy room	7	24.1
Sluice room used	1	3.4
Signage provided	1	3.4
Total	**29**	**99.8**

Table 3.9k deals with medical waste management practice #19, where normal and tiled floors are used as opposed to non-slip resistant floors (3.4%), thus revealing inadequacies in the knowledge management systems relating to the requirements of storage facilities for HCRW. Since these floors are slippery in wet weather (6.9%), more hazardous environments are added or introduced in the way of HCRW management in municipal clinics.

Table 3.9k Summary of comments made by researchers during a walkthrough survey: Central Health Care Storage has impermeable sleep resistant, Hard –standing floor (practice #19)

Comments	**Number**	**(%)**
No comment on this practice	8	25.6
Slippery floors during wet weather	2	6.9
Normal and ordinary tiled floor	12	41.4
Did not view	1	3.4
Open on site and not originally meant for waste storage	1	3.4
No storage rooms	3	10.3
Sluice room used	1	3.4
Non-slippery floor provided	1	3.4
Total	**29**	**97.8**

Clinic managers and their staff mix HCRW and general waste during their operations (10.3%) as seen from Table 3.9l dealing with waste management practice #22. Although they apportion the responsibility for such mixing to the contractors (13.8%) such a high percentage of shifting the responsibility of mixing waste, can only reveal the lack of knowledge of management and their staff on taking responsibility for HCRW from cradle to grave.

Considering transportation of HCRW management (Table 3.9m) which deals with medical waste management practice #25, it is clear that HCRW carried manually (13.8%) and that carried not using trolleys (13.8%) together much outweigh the use of trolleys (10.3%).

Table 3.9l Summary of comments made by researchers during a walkthrough survey: HCRW gets disposed of together with health care general waste (practice #22)

Comments	Number	(%)
No comment on this practice	11	37.9
Facilities not fully catered for yet	1	3.4
Although stored separately	1	3.4
HCRW mixed with general waste and disposed of in common containers	3	10.3
The contractor is responsible	4	13.8
They are segregated and disposed separately	9	31.0
Total	**29**	**99.8**

Since these containers are carried to loading transportation, there is a likelihood that ergonomic hazards are increased.

Table 3.9m Summary of comments made by researchers during a walkthrough survey: HCRW loaded on to transportation trolleys higher than the design level (practice #25)

Comments	Number	(%)
No comment on this practice	12	41.4
Waste carried manually to the waste van	4	13.8
Waste loaded by removal company	5	17.2
Mixed domestic waste and medical waste	1	3.4
No trolleys used and not loading containers	4	13.8
Platform and push trolleys provided	3	10.3
Total	**29**	**99.9**

3.4 SUMMARY OF RESULTS

The results which were analysed and presented in Section 3.3 can be summarized in the following findings:

3.4.1 Findings on required documentation

The operations of Ekurhuleni municipal clinics revealed a 67% absence of the required documents, predominantly in the areas of medical waste policy; written safe work procedures; training programme; and conducting of risk assessment. Specifically:

- The majority (65.5%) of clinics in the EMM have no medical waste management policy.
- The majority (69%) of clinics in EMM have no safe work procedures
- The majority (93.1%) of clinics in the EMM have no waste management training programme
- The majority (69%) of clinics in the EMM do not conduct risk assessments for their operations

3.4.2 Findings on aspects of medical waste policy

Of the respondents, 16.7% of the clinics that have implemented a medical waste policy Each has experienced budgetary problems, problems of placement of sharps container, problems of modernisation of equipment, problems with the outsourcing and collection of HCW waste, problems with wearing of PPE, and transportation problems.

3.4.3 Findings on feedback on the medical waste disposal contract

Of the 29 respondents, 96.6% of clinics have no feedback on their medical waste disposal activities and contract.

3.4.4 Findings on communication methods of safe work procedures

Clinics communicate procedures predominantly through lectures (71.4%), verbally (14.3%), and informally (14.3%).

3.4.5 Findings on safe work procedures followed during a needle stick injury

Of the responding clinics, 65.5% follow safe work procedures as per policy with respect to a needle stick injury, contradicting the number of clinics which indicated that they have safe work procedures (31%).

3.4.6 Findings on training and methods included in the skills audit plan

Of the responding clinics, 62.1% have no specific training method implemented.

3.4.7 Findings on highest recently rated risks

Of the responding clinics, 62.1% could not rate any risks, confirming that they did not conduct any risk assessments; while 37.9% rated needle stick prick risks to be 4 x as high as those posed by placement of sharp containers. Risks due to TB infection were perceived to be 3 x higher than those posed by placement of sharp containers; and those posed by steep and slippery ramps to be 2 x as high as those posed by placement of sharp containers. Needle stick pricks are more closely related to a lack of safe work procedure or safe work

procedures not properly followed; while TB infection is more related to the non-use of PPE. In the same argument, steep and slippery floors are related to both the non-use of PPE and lack of a Waste Management Plan.

3.4.8 Findings on clinics walkthrough survey checklist observations

Positive observations were made in 46% of cases compared to 50% of negative observations made on the operating conditions of clinics.

3.4.9 Findings on comments from walkthrough survey checklist

- The lack of push trolleys raises a challenge of exposure to ergonomic hazards that put health care workers at risk of contracting muskulosketal disorders.
- The storage of pathological waste is a challenge that exposes health care workers to the risk of inhalation of bad odours and exposure to biological hazards.
- The storage of healthcare risk waste for more than three days is a challenge that prompts illegal dumping of medical waste. The non-existence of a medical waste management plan is a challenge of incapacity within clinic management to develop work plans.
- Lack of audit reports indicates high levels of repetitive non-compliant behaviours.
- Most clinics and the municipality as an entity are not registered as medical waste generators, which raises a challenge of non-traceability of their health care risk waste.

- Lack of signage encourages haphazard storage of health care risk waste which, in turn, creates conditions favouring exposure to both biological and ergonomic hazards. Tiled, central storage floors promote slippery conditions and high levels of trip and falls, which leads to ergonomic hazards and spillages that put health care workers at the risk of exposure to biological hazards.

- Mixing of general waste with health care risk waste creates an environment for high costs of managing medical injuries due to needle pricks.

- Overloading of trolleys to a level higher than the design level, leads to possible falls, spillages and the risks of contracting muskulosketal disorders.

CHAPTER 4

4 DISCUSSION

4.1 Introduction

The aim of the study was to assist Ekurhuleni Metropolitan Municipality clinic managers to take the necessary corrective action after determining whether the medical waste management practises in their clinics comply or do not comply with the Gauteng Health Care Waste Management Regulations (3003 of 2003).

4.2 Limitations

The focus of this study was in the Ekurhuleni Metropolitan Municipality clinics. Therefore, the results obtained may not represent the status quo in all clinics in Gauteng Province nor elsewhere in South Africa. Thus the results of this study should not be applied to clinics outside Ekurhuleni without first determining local conditions.

It was not possible to validate the responses obtained from clinic managers during the administration of the questionnaire. Some aspects of medical waste management may be worse than was reported by the clinic managers.

Using walkthrough survey observations as the second instrument in the study has its own limitations. The procedure does not require that prior notice be given to those in the clinic being studied. As a result the outcomes obtained could be negatively impacted upon by the chance that the study was conducted on a day not representative of actual practice or

activities. The study would have been stronger if data were collected on more than one occasion for each site.

The interviews and the walkthrough survey were not done on the same day for each clinic, where the administration of the interview questionnaire was done days before the walkthrough survey. As a result, the walkthrough survey showed an improvement on the state of compliance as opposed to that of the questionnaire. These improvements may reflect positive interventions introduced after the application of the questionnaire.

4.3 Findings in the context of literature

Non-existence of a medical waste management plan indicates the failure of clinic management to develop work plans. A lack of required documentation such as a medical waste management policy, safe work procedures, training programme, waste management and audit plans in Ekurhuleni, was not only a phenomena of Ekurhuleni, but was found in health facilities in KZN as reported by Msimang (2003) and Leonard (2003), which signal non-compliance of clinic waste management practices with regulations in municipal clinics. Akter (2000) also found that in Bangladesh, inadequate and ineffective government policy did not guide health providers and did not punish offenders regarding practices of waste management. Again, Bangladesh was found to severely lack well conceived waste disposal systems in government hospitals and private clinics.

Deviations or non-compliant behaviours are intensified by problems of modernisation of equipment, lack of training and under resourcing as a result of an inadequate budget. This is in agreement with what Msimang (2003) found. Hodson & Uhorchak, (2000) also found that a lack of training on medical waste management in USA contributed to non-compliant

practices such as storage of equipments and PPE without cleaning it after use and storing itI incorrectly.

A lack of written safe work procedures in EEM clinics confirms the municipality's lack of capacity to manage medical waste and thus increases the risk of exposure to blood borne pathogens. This is in agreement with the observations in KZN by Fischer, Kristiannsen & Nkosi (2003). Furthermore, this lack of safe work procedures increases the potential risk of infections such as TB as observed in Bangladesh by Akter (2000).

The storage of pathological waste is a challenge that exposes health care workers to the risk of inhalation of bad odours and exposure to biological hazards, while mixing of general waste with health care risk waste creates an environment for high costs of managing medical and injuries due to needle pricks. This confirms findings by Fischer, Kristiannsen & Nkosi (2003) and Mintchel (2000). Non-compliance with written medical waste management plans, such as respiratory protection programmes, was found to be prevalent due to programme violations by employees of health care facilities in the USA (Hodson & Uhorchak, 2000).

Of the responding clinics, 62.1% could not rate any risks, confirming that they were not conducting any risk assessments as asserted by Dinardi (1997), that risk assessment is the process that includes evaluation, judgement or rating of risks. However, 37.9% of those clinics that conducted risk assessments, rated needle stick injuries to be the highest risk, confirming the study conducted in Bangladesh government hospitals and clinics as reported by Akter (2000). These risks are followed by TB and then by steep and slippery floors.

Overloading of trolleys to levels higher than the design level leads to possible falls, spillages and the risks of developing muskulosketal disorders. Furthermore, the lack of push trolleys raises the chance of exposure to ergonomic hazards that put health care workers at the risk of developing muskulosketal disorders as asserted by Dinardi (1997).

The lack of audit reports and non-registration of clinics as medical waste generators accounts for the non-quantification of generated medical waste, revealing that most of the generated medical waste cannot be accounted for, situation similar to that found by Leonard (2003). Also, a lack of feedback on medical waste disposal activities and disposal contracts concurs with high levels of repetitive non-compliant behaviours and problems of placement of sharp containers. This is a failing that prompts illegal dumping of medical waste as found by Leonard (2003) and Msimang (2003).

A lack of clearly marked storage area with warning signs as stipulated by Gauteng Health Care Waste Management Regulations (3003 of 2003), encourages haphazard storage of health care risk waste. This in turn leads to conditions favourable for the exposure to both biological and ergonomic hazards.

Tiled central storage floors in EEM clinics are likely to promote slippery conditions and high risk of trips and falls as asserted by Hodson & Uhorchak, (2000), that “slip and fall hazards that included wet floors, loose planks, hoses and electrical wiring strewn across walkways”.

4.4 Overall conclusions relating to the findings

The findings of the study revealed a high degree of non-compliance of EMM clinics with the Gauteng Health Care Waste Management Regulations (3003 of 2003). This can be assumed from the fact that the substantial majority do not have policy documents required for management of medical waste.

Adequate medical waste management training in the EMM clinics is not taking place due to both the lack of policy documents and budgetary constraints. Furthermore, there are inadequate written safe work procedures in place for critical tasks in these clinics.

Health care workers are exposed to both ergonomic and biological hazards due to a lack of proper medical waste storage, storage signage and the incorrect handling of medical waste. Non-accountability regarding the disposal of medical waste may lead to the illegal dumping of medical waste generated by the EMM facilities.

No medical waste management audits and risk assessments are conducted in EMM clinics.

4.5 Recommendations based on the findings

Since the findings of the study revealed a high degree of non-compliance by EMM clinics with the Gauteng Health Care Waste Management Regulations (3003 of 2003), the following recommendations are made:

- Managers of clinics in the EMM should be made fully cognizant with the stipulations of Gauteng Health Care Waste Management Regulations (3003 of 2003). This could be achieved at a workshop.

- Clinic managers should develop appropriate policy documents based on the Regulations after attending the workshop.

- Based on the policy documents, clinic managers should develop medical waste management training programmes incorporating the stipulations of the Regulations.

- Clinic staff and all other EMM health care workers should be trained on all aspects of the medical waste management process.

- Medical Waste Management Officers to be appointed for EMM clinics for infection control and to ensure that written safe work procedures for critical tasks are developed and adhered to.

- Designated medical waste management storage facilities must be provided for all EMM clinics.

- Clinic management and appointed Medical Waste Management Officers must ensure that medical waste management audits and risk assessments are conducted and that corrective measures are implemented in EMM clinics.

- The EMM should register as a *Major Generator of Medical Waste* in terms of the Regulations. The office of the EMM Municipal Accounting Officer should assume responsibility for the generation and signing of medical waste audit reports.

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ANNEXURE 1. INTERVIEW QUESTIONNAIRE FOR CLINIC MANAGERS

1. Do you have an operating policy regarding medical waste?

Response

1.1 If yes, what aspects of the policy are problematic?

Response

2. Do you have medical waste disposal contract with a permitted treatment facility?

Response

2.1. If yes, what treatment feedback have you received recently?

Response

3. Do you have written safe work procedures for your critical tasks?

Response

3.1. If yes, how are they communicated to all health care workers?

Response

4. Do you have a needle stick policy?

Response

4.1 If yes, what safe work procedures do you follow during a needle stick injury?

Response

5. Do you have a training program on medical waste management for new and existing health care workers?

Response

5.1. If yes, what type of training is included in your skills audit plan?

Response

6.0 Do you conduct risk assessment to assess your risks?

Response

6.1. If yes, what were your recent highest rated risks?

Response

ANNEXURE 2: WALK THROUGH SURVEY OBSERVATION CHECKLIST

	Yes	No
1. Health Care Risk Waste (HCRW) segregated at the point of generation?	☐	☐

Comment: ----------

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2. Solid and Semi Solid HCRW placed in leak proof coded container indicating contents therein?	☐	☐

Comment: ----------

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3. HCRW placed in leak proof puncture resistant containers prior to storage or transport from the facility.	☐	☐

Comment: ----------

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4. Sharps at the point of generation placed in sharp containers?	☐	☐

Comment: ----------

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5. Sharps containers tightly sealed when full?	☐	☐

Comment: ----------

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6. Wheeled push trolleys used for internal transportation?	☐	☐

Comment: ----------

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7. Pathological waste not treated within 24hours of generation stored at -2°c? ☐ ☐

Comment: ----------

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8. HCRW stored at -2°c take not more than 72hours before collected for treatment? ☐ ☐

Comment: ----------

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9. Required Personal Protective Equipment used when handling HCRW? ☐ ☐

Comment: ----------

---

10. Decanting of HCRW from one container into another not done? ☐ ☐

Comment: ----------

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11. Re-usable containers disinfected before re-use? ☐ ☐

Comment: ----------

	Yes	No
Health Care facility in possession of Health Care Waste Management Plan?	☐	☐

Comment: ----------

---

13. Health Care facility in possession of Health Care Waste Audit Report signed by CEO?	☐	☐

Comment: ----------

---

14. Storage facility has sufficient capacity to store up to 8 days HCRW waste generated at the facility?	☐	☐

Comment: ----------

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15. Health Care facility registered as generator of HCRW has certificate of Registration?	☐	☐

Comment: ----------

---

16. Rigid Puncture resistant containers containing HCRW kept clean and in good repair?	☐	☐

Comment: ----------

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17. Health care workers eat elsewhere in the facility? ☐ ☐

Comment: ----------

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18. Central Health Care Waste storage clearly demarcated? ☐ ☐

Comment: ----------

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19. Central Health Care Storage has impermeable slip resistant, hard-standing floor? ☐ ☐

Comment: ----------

---

20. HCW containers weighing more than 15kg manually lifted? ☐ ☐

Comment: ----------

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21. Health Care Workers make use of moveable chairs? ☐ ☐

Comment: ---------- ----

--- ----------

Yes No

22. HCRW gets disposed of together with health care general waste? ☐ ☐

Comment: ----------

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23. Lid used for disposable containers secured in a way as not to be reopened once closed? ☐ ☐

Comment: ----------

---

24. Lid used for pathological or anatomical waste containers provided with airtight seal? ☐ ☐

Comment: ----------

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25. HCRW loaded on to transportation trolleys higher than the design level? ☐ ☐

Comment: ----------

---

26. HCRW containers not left unattended? ☐ ☐

Comment: ----------

GENERAL COMMENTS:

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……

ANNEXURE 3. WITS HUMAN RESEARCH ETHICS COMMITTEE APPROVAL

File

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Thopola

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M051106**
PROJECT	Evaluation of Medical Waste Management in Ekurhuleni Metropolitan Municipality
INVESTIGATORS	Ms HT Thopola
DEPARTMENT	School of Public Health
DATE CONSIDERED	05.11.25
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 06.01.18 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Dr H Moomal

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

ANNEXTURE 4. RAW DATA OF COMMENTS ON WALKTHROUGH SURVEY CHECKLIST

Medical waste management practice No	**Comments**	
	Clinic 1	**Clinic 2**
1	none	none
2	**none**	none
3	none	none
4	none	none
5	none	none
6	internal transportation by hand	none
7	none	no freezer facility
8	none	no freezer facility
9	none	none
10	none	none
11	Re-usable containers not used	none
12	none	The plan is in the form of a checklist system
13	none	none
14	none	no freezer facility
15	Certificates not displayed but kept by Head Office	Certificate kept at the regional office
16	none	none
17	none	none
18	Cleaners to be trained	none
19	slippery floors during wet whether	none
20	none	size of containers limits weight to less than 15kg
21	none	none
22	Facilities not fully catered for yet	Although stored separately
23	none	none
24	none	Not in use
25	No trolleys	none
26	Storage doors are kept closed	Placed out of reach of children

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments	
	Clinic 3	**Clinic 4**
1	none	none
2	none	none
3	none	none
4	none	none
5	none	none
6	no trolleys available	one trolley available but waste weight small to carry by hand
7	none	none
8	Some times the collectors do not adhere to removal agreements	none
9	none	none
10	not done	none
11	No re-usable containers on the premises	Re-usable containers not in use
12	none	none
13	none	Not kept on site
14	Ergonomic problems-staff use chairs to reach higher shelves	none
15	Certificate not displayed but kept at regional head office	Certificate not displayed
16	none	none
17	none	none
18	HCRW mixed with normal waste, storage not suitable in rainy weather	Waste room sign available
19	slippery floors in wet weather	none
20	none	none
21	none	none
22	none	none
23	none	none
24	none	none
25	none	only one trolley
26		Sometimes but for a very short time

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments		
	Clinic 5	**Clinic 6**	**Clinic 7**
1	none	Only sharps containers, no boxes	None
2	none	No proper containers used	None
3	none	Bug bins and ordinary bins used	None
4	none	Sharps in sharps container mixed with other things	None
5	none	Closed not tightly	None
6	none	manual waste removal	None
7	none	no special storage area	None
8	none	ordinary store room at ordinary temperature	None
9	none	Only gloves used	only gloves
10	none	Waste taken out of ordinary containers	None
11	none	No re-usable bins	None
12	Plan not displayed	Not aware of any plan	None
13	none	Do not know of this kind of report	None
14	none	No storage facility exist	Placed on top of cupboards whilst awaiting service provider
15	Available and seen	They do not know	None
16	none	Only bug bins for sharps	None
17	none	Kitchen used by the staff	None
18	Kept in marquee	none	Placed on top of cupboards whilst awaiting service provider
19	none	no special storage area	None
20	none	No weighing	use trolleys
21	none	Waste transported manually	None
22	none	Waste not separated but disposed of in common containers	None
23	none	Lids not secured	None
24	none	No proper containers used	None
25	none	Waste carried manually to the waste van	None
26	none	Containers in consulting rooms not guarded all the time	None

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments	
	Clinic 8	**Clinic 9**
1	HCRW is mixed	Boxes for swabs not present
2	Not coded	none
3	none	none
4	Only needles while other sharps are in waste box	no seal
5	none	none
6	Carried manually	none
7	Waste kept in store room	Waste kept at room temperature
8	Waste kept in store room	none
9	Only gloves	Only gloves
10	none	When transferring waste
11	none	none
12	not aware of any plan	none
13	none	none
14	unable to view the room as keys were missing	none
15	Do not know	not sure, maybe from management
16	none	none
17	Kitchen	Kitchen
18	Clinic store room used	none
19	Tiled floor	none
20	Not weighed	Waste not weighed
21	Waste carried manually	none
22	Waste separated	none
23	none	none
24	Not airtight	none
25	Waste carried manually	No trolleys
26	containers remain in consulting room	none

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments	
	Clinic 10	**Clinic 11**
1	none	no bug bin, dressings in a bucket and no closed red bins,
2	none	Use buckets that are not coded
3	none	Plastics used for waste
4	none	none
5	none	none
6	Carried manually	Waste carried manually
7	No special designated place for freezing waste	Waste kept in garage
8	No special designated place for freezing waste, waste collected after 1 month	none
9	only gloves	Gloves used but masks available though not used
10	not done	Emptying plastics into boxes
11	Re-usable containers used	Ordinary buckets
12	none	none
13	none	none
14	Waste stored in one of the unused consulting rooms	Not able to view the size of the garage as keys were missing
15	Not known	Certificates may be with chiefs
16	using boxes	using red plastic bags
17	use one of the consulting rooms as a kitchen	Using nurses' rest room
18	Waste kept in the clinic	using garage
19	Tiled floors	Did not view
20	Waste not weighed	Weighing at the treatment facility
21	Waste carried manually	Waste carried manually
22	separated	Separated
23	none	Sealed
24	none	Seals not airtight
25	Waste carried manually	Waste loaded by removal company
26	none	Waste remain in rooms

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments	
	Clinic 12	**Clinic 13**
1	none	none
2	none	Containers not coded
3	none	none
4	none	none
5	none	none
6	no trolleys used, waste carried manually	no special trolleys
7	The room is cool and dark but no thermometer to measure temperature	Generated waste collected and sent to Paul Nigel clinic
8	store room is cool	Generated waste collected and sent to Paul Nigel clinic
9	only gloves and plastic aprons	Only gloves
10	From boxes into another	Containers are expensive and so they re-use them
11	No re-usable containers	ordinary containers used and only cleaned without disinfecting
12	Not aware of any plan	Not aware of any plan
13	Do not know	Do not know
14	Sufficient space	Waste only sent to Nigel
15	Do not know	Do not know
16	Do not have puncture resistant containers	Do not have rigid puncture resistant containers
17	Eating in one of the rooms	Kitchen for staff
18	Not demarcated	Old storage space
19	none	none
20	Waste carried manually	Containers carried manually
21	Waste carried manually	Containers carried manually
22	Waste separated	HCRW mixed with general waste
23	none	none
24	Smelly	Lids are not airtight
25	Waste carried manually	Waste carried manually
26	Waste locked up in the room	none

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments	
	Clinic 14	**Clinic 15**
1	none	only needles and syringes
2	none	none
3	none	none
4	none	not enough containers
5	none	kept in the room awaiting disposal
6	no trolleys	They do not have push trolleys
7	no special room for pathological waste containers	There is no special room to keep waste
8	Waste can remain for an indefinite period	Waste can remain for an indefinite period
9	Gloves and aprons	only gloves
10	Waste separated	It is done
11	No re-usable containers	Do not know whether should be disinfected and used
12	Not aware of any plan	They do not know
13	Not aware of any	Not aware of the report
14	not adequate	storage not designated
15	They are not sure	Do not know
16	Rigid puncture resistant containers not used	They do not know how to keep it
17	Small kitchen on the premises	Kitchen
18	Use the toilet	Waste kept in an empty untidy room
19	Ordinary tiles	Ordinary tiles
20	Containers not weighed	Waste not measured
21	Chairs used for stacking containers	Waste is manually carried
22	separated	waste separated
23	none	none
24	not airtight	lids are not airtight
25	not loading containers	Waste is manually carried
26	none	They are left unattended during consultation

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments		
	Clinic 16	**Clinic 17**	**Clinic 18**
1	none	Gloves and teeth container	none
2	none	none	none
3	none	none	none
4	none	none	none
5	none	sealed by tape	none
6	Waste containers carried manually	Containers carried manually	not using trolleys
7	Human tissue kept in freezer	no special storage space	no pathological waste and no storage
8	waste kept in special container outside	waste kept in a spare room in the clinic	not big volumes
9	only gloves	Facial mask and gloves	uniforms, masks and rubber gloves
10	separation done	Boxes expensive and thus use plastic	none
11	none	ordinary dust bin and boxes that are not disinfected	use disposables only
12	No entry at District office	Not that they know of	They do not know about it
13	Certificate at District Office	Do not know	not sure
14	outside storage area made of steel	sufficient	no storage rooms
15	one copy of certificate present	Do not know	no certificate produced
16	none	none	none
17	Tea room	kitchen	none
18	none	no special storage space	no storage rooms
19	open on site and not originally meant for waste storage	ordinary floor tiles	no storage rooms
20	none	Waste not measured	less than 15kg
21	none	none	none
22	none	separated	none
23	none	special tape used to seal full containers	sealed
24	only use tape	other waste separated from dental waste	bins provided with airtight seal
25	none	Waste taken out manually	no trolleys used
26	none	Containers left in consulting rooms	patients far away from waste as possible

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments		
	Clinic 19	**Clinic 20**	**Clinic 21**
1	none	none	none
2	none	contains biohazard waste	container labeled bio-hazards
3	none	none	none
4	none	none	none
5	none	none	none
6	no trolleys used	no trolleys are used	n trolleys used
7	not big amounts	stored outside	no pathological waste and waste is collected monthly
8	sometimes removed after a week	stored for more than three days	only tissues or cotton wool with sputum's
9	rubber gloves	masks and gloves	masks and rubber gloves
10	none	not practiced	not done
11	use disposables only	only disposables	disposables used
12	do not know about it	none	none
13	do not know about it	none	no CEO
14	mixed with other waste	no storage room	Sluice room used for this purpose
15	no certificate	no certificate produced	only if 150kg are generated
16	use paper and plastic container	none	none
17	none	none	none
18	no storage room	no storage room	Sluice room used
19	no storage room	no storage room	Sluice room used
20	less than 15kg	none	Bins are less than 15kg
21	none	none	none
22	none	none	none
23	none	none	none
24	use sellotape	none	only sputum's and little body fluids
25	not using trolleys	no trolleys are used	no trolleys used
26	rooms are closed	waste monitored as rooms are locked	rooms locked

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments		
	Clinic 22	**Clinic 23**	**Clinic 24**
1	none	mixed domestic waste and medical waste	Cotton and pads together while needles and syringes are together
2	none	small amount of waste	container indicated sharps waste only
3	paper and plastic containers	none	none
4	none	takes long	none
5	none	none	lid and masking tape used
6	no trolleys are used	no trolleys used	none
7	no -2^{o}C storage	longer than a week	none
8	no waste stored at -2^{o}C	no storage of -2^{o}C	none
9	masks and rubber gloves	rubber gloves and masks	Gloves and masks
10	none	none	no decanting done
11	disposables only	disposable only	Re-usable containers not used
12	Do not know about the plan	not sure	Not yet in place
13	Do no know about it	do not know	Not yet in place
14	enough space	no specific storage facility	none
15	no certificate	no proof was produced	none
16	none	none	none
17	sufficient space and chairs	only three rooms used for health care	kitchen
18	storage room is not labeled	no such storage	staff only signage
19	none	no specific storage facility	normal floor
20	less than 15 kg	not weighing	push trolleys provided
21	none	none	No movable chairs provided
22	none	mixed domestic waste and medical waste	The contractor is responsible
23	none	none	Secured by masking tape
24	none	only tissues and cotton wool	none
25	no trolleys are used	no trolleys used	push trolleys provided
26	strict measures are applied	under monitoring by health workers	Every employee has a code for access into the central storage area

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments		
	Clinic 25	**Clinic 26**	**Clinic 27**
1	Cotton wool and pads are stored in a box while sharp are stored in a 5kg plastic container	Cotton and pads stored in boxes while sharps are stored in buckets	Cotton and pads stored in the box while sharps are stored in 5kg buckets
2	plastic containers are used	Plastic containers provided	none
3	plastic buckets are used	Leak proof buckets	none
4	none	none	special containers provided
5	lid and masking tape are used	lid and tapes used	lid and masking tapes used
6	platform trolleys are used	platform trolleys provided	no provision of platform trolleys
7	no pathological waste is stored in the clinic	no pathological waste stored	none
8	none	none	none
9	Gloves, apron and goggles	Gloves and apron	Gloves and aprons provided
10	no decanting is done	no decanting done	no decanting is done
11	n o re-usable containers are used	Re-usable containers not used	Re-usable containers not used
12	busy working on it	not yet in place	The plan is not yet in place
13	no audit report in place	not yet in place	The plan is not yet in place
14	special room provided	Enough space	Enough space
15	no certificate of registration provided	no certificate in place	no certificate is provided
16	containers used once	containers used once	containers used once
17	kitchen	Eating facilities provided	kitchen
18	signage provided	Not demarcated	no signage
19	normal floor	normal floor	non-slippery floor provided
20	platform trolleys are used	platform trolleys provided	no provision of platform trolleys
21	movable chairs used	movable chairs provided	movable chairs provided
22	the contractor is responsible	The contractor is responsible	Contractor is responsible
23	none	lid and tapes used	none
24	no pathological waste is stored in the clinic	no pathological waste stored	none
25	trolleys provided	platform trolleys provided	none
26	staff provided with access code for entering storage	provision of a key to staff	key provided to employees

Raw data of comments on walkthrough survey checklist (continued)

Medical waste management practice No	Comments	
	Clinic 28	**Clinic 29**
1	Needles stored in 5kg buckets while cotton and pads are stored in bio-hazards boxes	Buckets provided for sharps while boxes are provided for dressings
2	buckets labeled	provision for buckets
3	buckets labeled	Leak proof buckets
4	yellow 5kg buckets provided	provision for buckets
5	lid and masking tape provided	Lid and masking tape used
6	provision of trolleys	no provision for wheeled trolleys
7	none	no pathological waste is stored
8	none	none
9	safety gloves and aprons	no provision of PPE
10	no decanting is done	No decanting is done
11	Re-usable containers not used	Re-usable containers not used
12	not yet in place	No waste management plan
13	not yet in place	No audit report
14	HCRW collected as and when required	Sufficient storage
15	none	No certificate in place
16	containers used once	containers used once
17	kitchen	provision for eating facilities
18	no signage	Storage not demarcated
19	normal floor	normal floor
20	provision of trolleys	containers lifted manually
21	mobile chairs provided	normal chairs used
22	They are segregated	Disposed separately
23	supported by masking tape	Lid and masking tape used
24	none	no pathological waste is stored
25	provision of trolleys	no provision for wheeled trolleys
26	Every employee has a key to storage	Storage of HCRW left unattended