

Health Care Waste Management in Public Clinics in the Ilembe District: A Situational Analysis and Intervention Strategy



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November, 2007



**Health Systems Trust
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Health Waste Management in Public Clinics

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ACRONYMS

HCW	health care waste
HCGW	health care general waste
HCRW	health care risk waste



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EXECUTIVE SUMMARY

INTRODUCTION

All waste generated at health care facilities in the past was regarded as hazardous and was incinerated before disposal. Today however, waste generated at health facilities is separated out and disposed of according to the risks it poses.

The purpose of this study was to investigate health care waste (HCW) management practices used in public health clinics in the iLembe Health District, with a view to developing a HCW management intervention strategy.

METHODOLOGY

The study design was observational, descriptive and cross-sectional.

Data was collected using a structured questionnaire, which was administered to key informants from 31 rural and urban public sector fixed clinics in the iLembe District Municipality.

RESULTS

Thirty public clinics in iLembe district participated in the study. A total of 210 kg/day (0.06 kg/patient/day) of HCW was estimated to be generated in public clinics, 69% was health care general waste (HCGW) and 31% was health care risk waste (HCRW). The district's waste generation rate was 0.04 kg/patient/day and 0.018 kg/patient/day, for HCGW and HCRW, respectively.



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DISCUSSION

The study showed that HCW was not adequately managed in the district.

The amount of HCW generated in iLembe differs from World Health Organisation norms and this is attributed to improper segregation of waste categories. Sharp waste, however, is given special treatment and properly segregated and managed.

It is evident that public health sector clinics have not implemented a proper HCW management plan.

CONCLUSION

The management of health care waste is of great concern. There is need to develop a health care waste management intervention strategy to be implemented consistently and universally in the district.

RECOMMENDATIONS

It is recommended that an effective health care waste management intervention strategy be developed and implemented in the whole district. This strategy must incorporate training programmes and a waste management plan.



1 INTRODUCTION

Waste generated at health care facilities was in the past regarded as hazardous and as such needed to be incinerated before disposal. The incineration of health care waste (HCW) results in the emission of dangerous chemicals that threaten public health and the environment. The Environment Protection Agency of the United States of America in 1994 found that emissions from incinerators in health care facilities were responsible for high levels of chemicals such as dioxin and furan in the atmosphere (Malkan 2005).

Dioxin is a known human carcinogen and is also implicated in some endocrine and immune disorders. Dioxin is a lipophilic and bio-accumulative toxin, which moves up the food chain from plants to animals, and then to human beings. Health facility waste contains a large proportion of polyvinyl chloride (PVC) plastics. Dioxin is emitted into the atmosphere when PVC plastics are incinerated.

Muswema (2003) refers to data published by Hall (2000), which states that in South Africa there are approximately 27 000 sources of HCW. These sources include all facilities providing different levels of health care service in public and private institutions.

According to Leonard's (unpublished) desktop study, approximately 45% of health care waste generated in the province of KwaZulu-Natal is not accounted for. HCW volumes and composition in the iLembe health district are not known. This makes it difficult to plan and develop an appropriate intervention strategy in order to provide better HCW management.



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The purpose of this study was to conduct a HCW audit and to investigate health care waste management practices in public health clinics in the iLembe District, with a view to develop an integrated and sustainable HCW management system.

2 LITERATURE REVIEW

HCW is defined as the total waste generated in health care facilities and in addition to hospitals and clinics includes waste generated by blood banks, research facilities and laboratories irrespective of the volumes, characteristics and composition (Pruss, Giroult, Rushbrook, 1999). HCW is sub-divided into health care general waste (HCGW) and health care risk waste (HCRW).

The health system is under pressure to dispose of HCW in such a way as to avoid unnecessarily high levels of environmental damage. Health care facilities worldwide are beginning to subscribe to the social goals of a cleaner and safer environment.

To manage health care waste optimally, health care providers should consider all stages of the medical product's life cycle, by looking at the medical product's up-stream² and down-stream activities (Kaiser, Eagan, Shaner, 2001).

A number of factors contribute to the volume of HCW generated by health care facilities. These factors include waste management policy, the level of economic development of a country, the size of the health care facility and the type of medical specialities practising in a particular country (Yimer 2005). The volume of HCW generated in a health care facility depends on numerous factors, such as

² This concerns the product development stage, where issues such as raw materials and processes used in the production of a particular product are involved. Down-stream refers to the product life after use in terms of its effects on the environment when disposed of.



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the number of beds (or patients), types of health care services or medical activities provided, the economic, social and cultural status of patients and the general conditions of the area in which the health care facility is situated (Jang *et al* 2006; Askarian *et al* 2004a)

An audit of HCW is necessary to understand the types and volumes of HCW generated so that an appropriate HCW management policy can be formulated (Chitnis *et al* 2005, Almuneef & Memish 2003).

An audit of HCW conducted in Gauteng province in South Africa identified three critical problems in the HCW management system, namely: environmental damage, occupational health, and public health. These critical problems arose as a result of excessive and incorrect manual handling of HCRW, the unsafe utilization of equipment, and the excessive emission of pollutants from HCRW treatment plants (Fischer *et al* 2003).

Public sector clinics in Gauteng produced HCRW at a rate of 0.002kg/patient/day to 0.5 kg/patient/day, while private sector clinics produced 0.06kg/patient/day to 0.48 kg/patient/day (DACEL 2000).

The South African Bureau of Standards (SABS 2004) developed a new SABS Code 10248:2004, entitled “Handling and disposal of waste material within health care facilities”. This provides guidelines for the management of health care waste from its generation to disposal.

The SABS code 10248 of 2004 includes the following:

- ❖ Types of HCW (infectious, pharmaceutical and radioactive) and determines the classes of disposal sites for these classes of waste.
- ❖ Marking and labelling of HCW for transportation purposes.



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- ❖ Management's responsibilities (formulation of HCW management policy, waste management plan, assigning responsibilities, training, supervision, and workplace hygiene).
- ❖ Storage of hazardous health care waste.
- ❖ Segregation and packaging of waste prior to removal.
- ❖ Guidelines in the case of spillages of hazardous HCW.
- ❖ Treatment and disposal methods.
- ❖ Disposal by small scale generators.
- ❖ Minimum guidelines for remote rural health care facilities where legal requirements cannot be met.

3 RESEARCH METHODOLOGY

The study design was observational, descriptive, and cross-sectional.

A structured interview based on a questionnaire was conducted by trained research assistants with key informants from all 31 public sector fixed clinics in the iLembe District Municipality.

The questionnaire used was adapted from one developed for a study conducted on behalf of the Gauteng Department of Agriculture, Conservation, Environment and Land Affairs in 2001 to assess the HCW management practices in Gauteng health care facilities.

A pilot study was conducted at six public health clinics outside the iLembe District which were easily accessible to the Research Assistants.

Data collection for the study was done between 26 June 2006 and 10 July 2006.



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Ethical clearance for this study was obtained from the Biomedical Ethics Committee of the Nelson R Mandela School of Medicine, University of KwaZulu-Natal. The participants were informed about the research, its purpose, confidentiality, and the client's rights to refuse participation if they so desired. Participants were asked to voluntarily sign the consent form prior to participation in the study. Confidentiality was maintained at all times.

Quality control was done on daily basis by the Senior Research Assistant. On completion of data collection, all checked questionnaires were sent to the researcher for data cleaning and capturing on to a spreadsheet. The spreadsheet was referred to a statistician for processing. SPSS software was used for data analysis.

4 RESULTS

The following results were obtained from these structured interviews.

4.1 Types of clinics

Observations were made in 30 of the 31 public sector clinics in the ILembe Health District. The other clinic was under renovation at the time of data collection and therefore was not functioning normally. Of the 30 public clinics observed, two (7%) provide a 24-hour clinic service. The remaining 28 (93%) are day clinics, 10 (36%) of which provide a 24-hour emergency on call clinic service.



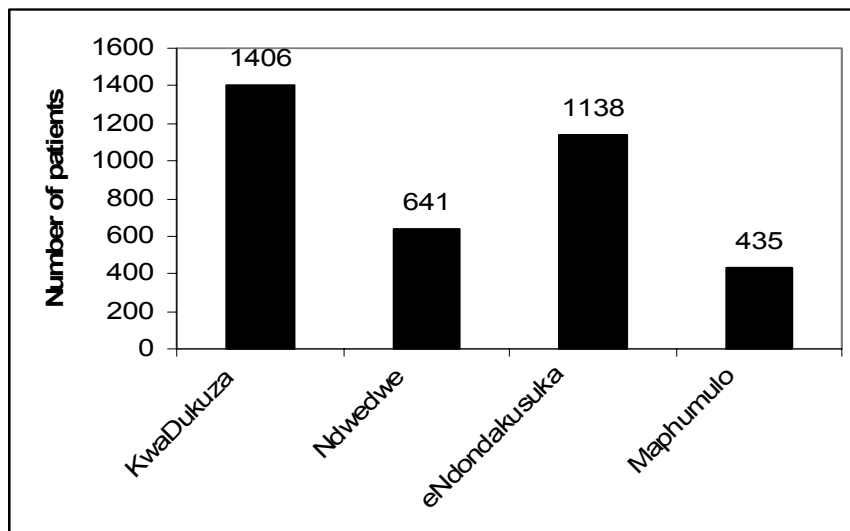
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Table 1: Type of clinic in each local municipality³ (number) in the iLembe Health District, 2006.

Municipality	Type of Clinic		Total
	24 hours	Day	
KwaDukuza	0	8	8(27%)
Ndwedwe	1	6	7(23%)
eNdondakusuka	1	6	7(23%)
Maphumulo	0	8	8(27%)
Total	2	28	30(100%)

4.2 Number of patients per day

Figure 1: Average number of patients/day in each local municipality in iLembe, 2006 (N = 3620)



³ Data on municipality is presented in the same order throughout this report. The order is based on the size of the population living in each municipality, from the highest to the lowest (KwaDukuza: 158 586, Ndwedwe 152 482, eNdondakusuka 128 672 and Maphumulo 120 637), based on information from Statistics South Africa census 2001.



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The total number of patients seen at all the public sector clinics in the district on the day data was collected was 3620 patients. KwaDukuza municipality had the highest patient count at 1406 per day, which was 39% of the total. This was followed by eNdongakusuka with 31% (1138), Ndwedwe with 18% (641) and Maphumulo with 12% (435).

4.3 HCW generated in the district

The HCW generated in the district varies in different municipalities. eNdongakusuka produced the most (45%), KwaDukuza produces 25%, with Ndwedwe and Maphumulo producing 18% and 12% respectively.

Table 2: HCW generated (kg & percent) in the iLembe district, 2006

	Gene- ral (kg)	Infec- tious (kg)	Sharps (kg)	Patho- logicals (kg)	Pharma- ceuti- cals (kg)	Total (kg)	Per- cent %
KwaDukuza	41.8	5.9	1.9	0.0	2.5	52.0	24.8
Ndwedwe	21.9	12.4	2.5	2.0	0.0	38.7	18.4
eNdongakusuka	67.0	13.0	5.8	1.8	7.1	94.7	45.2
Maphumulo	14.0	3.7	1.4	0.0	5.2	24.3	11.6
Total	144.6	35.0	11.5	3.8	14.8	209.7	100.00
Percent %	69.0	16.7	5.5	1.8	7.04	100.0	

Over two-thirds (69%) of the total HCW produced in the district is general or non-risk HCW, and the remaining 31% is HCRW which requires special treatment and proper disposal measures.



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Table 3: Present HCW generation rates in the iLembe District, 2006

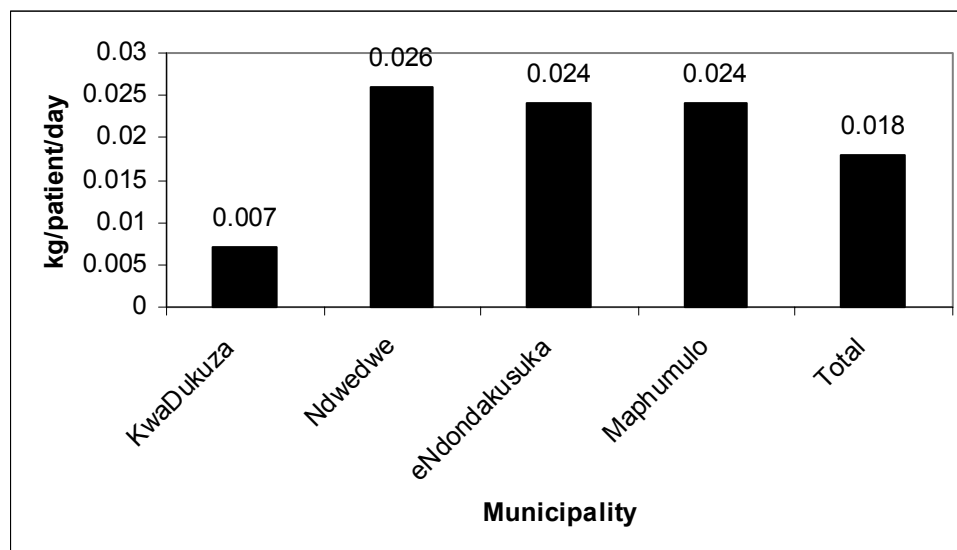
Local Municipality	HCW (kg/day)	Number of patients	Generation rate (kg/patient/day)
KwaDukuza	52	1406	0.04
Ndwedwe	39	641	0.06
eNdongakusuka	95	1138	0.08
Maphumulo	24	435	0.06
Total for district	210	3620	0.06

KwaDukuza had the highest population in the district, but had the lowest generation rate (0.04 kg/day). On the other hand, eNdongakusuka had a lower number of patients per day, but has the highest mass and rate of generating HCW (0.08 kg/day).

4.3.1 Health care risk waste

KwaDukuza produced the lowest ratio of HCRW at 0.007 kg/patient per day. The range generated by the other three municipalities was from 0.024 kg/patient/day to 0.026kg/patient/day.

Figure 2: Amount of HCRW kg/patient/day generated per municipality in the iLembe District, 2006.





4.4 Waste disposal

4.4.1 HCGW disposal

At 6 (20%) of the clinics HCGW is burnt and then buried; at 5 (17%) of the clinics HCGW is collected by a municipality contracted company; at 4 (13%) it is collected by municipal waste collectors; 10 (37%) clinics send their HCGW to the mother hospital, and the remaining 4 (13%) of clinics send their HCGW to a Community Health Centre (CHC) for disposal.

4.4.2 Sharps disposal

Three of the clinics (7%) reported that sharps are collected by a HCW waste management company, 17% send sharps to a Community Health Centre, and the balance (77%) send sharps to their mother hospitals.

4.4.3 Pathological waste disposal

Three of the respondents reported that placentas are given to the patients for their own disposal, and one stated that placentas are disposed in to the clinic's pit latrine.

4.4.4 Pharmaceutical waste disposal

About 7% (N=30) of the respondents stated that expired drugs are dissolved in water and flushed down a drain.

4.4.5 Transportation of HCW to central storage point

Waste is physically carried by general workers and nurses to the central waste storage point at all clinics.



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4.4.6 Conditions of central HCW storage points at the clinics

Only one of the clinics in the iLembe district had a purpose-built central HCGW storage area. A range of other measures are used in the other clinics. These included storing the waste in an unused but lockable toilet (5), a lockable storeroom (4), sluice room (1), consulting room (1), patient toilet (2), purpose-built refuse area, shallow pit (2), strewn at the gate (1) or pit (1), unused locked up toilet (5), or in the clinic boardroom (1).

4.4.7 Storage and collection of sharps

All clinics reported that sharps are stored in puncture proof containers. Different types of non purpose-built vehicles are utilised to collect sharps from the different clinics and transported to either the hospital or a CHC.

5 DISCUSSION

Health care waste is produced from a number of activities performed in different areas of health care facilities. This includes, but is not limited to, consulting rooms, waiting areas, reception and the staff canteen. Different categories of health care waste are generated from different health care activities. HCRW, if not treated and disposed of properly, poses a serious threat to public health and to the environment.

5.1 Health Care Waste Generation

This study found that about 69% of the total HCW generated in the district was HCGW; the remaining 31% was made up of HCRW. The 31% HCRW was made up of 19 % infectious and pathological waste; 7% pharmaceutical waste and 5% sharp waste. The norm, according to the World Health Organization's (WHO) guidelines, is that clinics produce 75% to 90% HCGW, and 10% to 25% HCRW.



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The results from this study do not comply with the norm according to the WHO guidelines.

Comparable clinics in India generated 71% HCGW, 19% infectious waste, 8% pathological, 1% pharmaceutical and 1% sharps (Patil & Shekdar, 2001). HCRW was about 10% of the total HCW generated in Mauritius (Mohee 2004), while it was 26.5% in Nigeria (Bassey *et al* 2006). At Leratong Hospital (South Africa) HCGW was 84% and HCRW was 16%. These two figures correspond with the WHO's norms (Kristiansen, Senoana, unpublished).

The difference found between iLembe's figures and the WHO norms can be attributed to a lack of proper segregation of HCW into the five defined categories. In some instances syringes and surgical gloves were disposed of in HCGW containers. There is a tendency to over-dispose HCRW because of fear of transmitting pathogens from waste suspected to be contaminated. The proper implementation of a HCW management plan will change the proportions of volumes. With proper segregation of HCW, less than 10% of the total HCW should be HCRW (Leonard, Unpublished).

5.2 Generation Rate

Maphumulo and Ndwedwe (regarded as rural municipalities) had a similar HCW generation rate of 0.06kg/patient/day, while KwaDukuza and eNdongakusuka (regarded as urban municipalities) were at the opposite ends of the spectrum at 0.04kg/patient/day and 0.08kg/patient/day respectively. This is contrary to the belief that urban health facilities tend to have a higher HCW generation rate (Patil & Shekdar 2001).

KwaDukuza had the lowest HCRW generation rate at 0.007kg/patient/day. The highest was Ndwedwe, with 0.026kg/patient/day. This is very low in comparison



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to studies in Mauritius where 0.179kg/patient/day of HCRW was generated (Mohee 2004).

5.3 Segregation of health care waste

All the clinics in the district indicated that they are separating waste into five categories, but of concern was that in some of the clinics, HCGW contained elements of HCRW such as syringes, surgical gloves, and other infectious waste. The iLembe Health District results were similar to those in Brazil in the study conducted by Da Silva *et al* (2004) where all public clinics demonstrated strict adherence to segregating sharps waste. Public clinics were using rigid, puncture-proof, yellow containers with the international hazardous waste logo.

The presence of HCRW in HCGW indicates poor HCW segregation. It exposes those who come into direct contact with the HCGW to the risk of infection with pathogens and renders the environment unsafe. HCRW must be appropriately labelled and segregated from HCGW, from the facility where it is generated to the point of treatment and disposal (McLean *et al* 2006).

When significant amounts of poorly segregated HCGW are placed in HCRW containers, HCGW is treated at a higher cost. Significant savings can be achieved by appropriately segregating HCW (Kristiansen & Senaoana, unpublished).

5.4 Training of staff

In 77% (N=30) of the clinics staff had received training in HCW management compared to 40% reported in the study conducted in Iran (Askarian *et al* 2004b). Training in HCW reduces the negative impact that can be caused by poor HCW management. Lack of training of personnel in HCW poses a serious risk to patients, the public, and the environment (Miyazaki & Une 2005).



5.5 Storage and collection

All clinics stored and collected sharps in colour-coded puncture-proof containers as per the requirements of the provincial protocol. The storage areas, however, were found to be freely accessible to visitors and other unauthorized persons, which is the same as found by Blenkharn (2006). .

5.6 Transportation

Safe transportation of high-risk HCW items such as sharps and infectious wastes is needed to prevent accidental injuries and infection to anyone who comes into contact with it during transit. Dedicated and purpose built vehicles are required. These vehicles must be fully enclosed, seamless and easy to clean. The drivers, according to WHO (undated), who transport HCRW must at all times carry consignment documents detailing the HCRW being transported. According to McLean *et al* there is insufficient training of staff that are handling and transporting HCRW (McLean *et al* 2006).

5.7 HCW disposal

About 10% of the clinics give pathological waste, such as placentas, to patients for disposal at their homes. A similar practice has been reported in Iran where pathological waste (with bones attached) is given to the patient or a relative for burial according to religious rites (Askarian *et al* 2004b).

5.8 Waste Management team

It was noted that the majority of public clinics in the district do not have a structure or system for dealing with HCW. Many clinics do not have health care waste management teams which are central to a proper HCW management plan.



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Oweis *et al* note that the health care waste management team plays a pivotal role in the successful implementation of a HCW management plan (Oweis *et al* 2005).

6 CONCLUSION AND RECOMMENDATIONS

For a long time, health care services have been rendered without taking into consideration the impact that waste can have on the environment and public health. The onus is on health care workers to apply the principle of caring, by ensuring proper disposal of HCW. Worldwide health care facilities are beginning to fulfil societal goals for a cleaner and safer environment.

Research in other parts of the world has demonstrated that improving the standard of health care waste management is practical and economically efficient (Jameton & Pierce 2001).

Recommendations for improvement

6.1 Responsibilities of waste generators

Waste generators are required by law, as stated in section 2 of NEMA, to ensure proper handling, transportation, and disposal of the waste they generate. The White Paper on Integrated Pollution and Waste Management emphasises the duty of care as one of the responsibilities of the health care waste generator.

The employer is entrusted with the responsibility, in terms of the Occupational Health and Safety Act, of providing a safe working environment.

The waste generator is also responsible for record keeping.



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6.2 Waste segregation

Before considering waste segregation, health care institutions must first consider waste minimisation, and must apply the principle of “green purchasing” i.e. environmentally friendly purchasing. When minimisation fails, then proper waste segregation at the source must be implemented, with waste separated into the five relevant categories for disposal. Segregation and colour-coding must work hand-in-hand.

Proper waste segregation offers protection to workers and the environment as well as reduces the cost of disposal.

6.3 Waste storage area

All facilities need to designate an appropriate area for waste storage which meets all the requirements of the WHO’s HCW management guidelines. Provision for a dedicated waste storage area should be included in the plans for all new clinics.

6.4 Transportation

Health districts need to establish a regular health care waste removal transport system, operated by a qualified and adequately trained drivers operating purpose-built vehicles.

6.5 Health care waste management plan

A waste management plan is essential for all health facilities.



6.6 Health care waste management team

A functional and accountable HCW management team that meets on a regular basis is essential in all health facilities.

6.7 Health care waste disposal

HCGW should preferably be disposed of using the municipal waste removal system. Where this is not possible other means of disposing of waste must be explored, without compromising the health of the public and the environment.

All HCRW should be disposed of using HCW Management companies, as they are equipped to treat and dispose of HCRW without causing any environmental degradation.

The practice of dissolving and discharging drugs into the sewer system, which is generally not connected to the municipal sewer system, must be discouraged, as it pollutes ground water, which is in contravention of the NWA.



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