

**FACTORS INFLUENCING WASTE MANAGEMENT IN PUBLIC
HOSPITALS IN NAKURU COUNTY, KENYA**

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DECLARATION

This research project report is my original work and has not been presented for a degree in any other University or any other award.

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Date 29/07/2017

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This research project report has been submitted for examination with my approval as the University Supervisor.

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DEDICATION

This work is dedicated to my parents Mr. & Mrs. Mugo who shaped my life, and to my family who have given me a reason to always work hard and be strong in life.

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ACRONYMS & ABBREVIATIONS

EMCA	: Environmental Management and Coordination Act
EPA	: Environmental Protection Agency
EPA	: Environmental Protection Agency
GOK	: Government of Kenya
HCWM	: Health Care Waste Management
HIV	: Human Immunodeficiency Virus
IPFA	: International Project Finance Association
MCH/FP	: Maternal Child Health/Family Planning
MS Excel	: Microsoft Excel
MWM	: Medical waste management
NASCOP	: National AIDS & STI Control Programme
NEMA	: National Environment Management Authority
NGOs	: Non-Governmental Organizations
PATH	: Professional Association of Therapeutic Horsemanship International
PMBOK	: Project Management Body of Knowledge
POPs	: Persistent Organic Pollutants
PPE	: Personal Protective Equipment
PPP	: Public Private Partnership
SPSS	: Statistical Package for the Social Sciences
TQM	: Total Quality Management
UN	: United Nations
USAID	: United States Agency for International Development
WHO	: World Health Organization

ABSTRACT

The study is designed to analyse the factors influencing waste management in public hospitals in Nakuru County in Kenya. Despite much effort by the government and some NGOs on health care waste management, public hospitals in Nakuru County seem to be lagging behind. The research findings and its recommendations are likely to help the policy makers, the environmental watchdog, the hospitals and more so Nakuru County hospitals which are the primary beneficiaries. This study looked into various factors which could be influencing the health care waste management in Public hospitals in Nakuru county which are; Existing systems, Legal framework, Technology and Training and Public awareness. Going deeper into the literature review, the researcher looked into similar cases and how they have been handled. One was in Karachi, Pakistan and the other was in the neighbouring country, Tanzania. Studies have shown that there exists a knowledge gap in understanding the factors that influence the waste management in public hospitals. Some hospitals as per previous studies have poor segregation; others don't have the needed facilities while others have poorly maintained facilities. The Systems Management Theory was adopted to try and understand the operations HCWM. The descriptive survey method was used by the researcher as the appropriate method for the research at hand because it is the most appropriate in collecting data in terms of being cost effective and within the constraints of time available. The research used questionnaires and interviews to collect data. The study made use of both secondary and primary data. The data collected was qualitatively analysed. The analysis of data was presented using tables accompanied by appropriate descriptions or explanations. The study concluded that legal framework and technology on healthcare management in the hospitals has a positive influence on performance of health care waste management. However, the study concluded that existing system, training and public awareness on waste management has a negative influence on performance of health care waste management. The study recommends that the legal framework on health care waste management should be emphasized in order to improve on performance of health care waste management in hospitals. The study further recommended that the rules and regulations pertaining to health care management in the hospitals be adhered to so as to improve performance of health care waste management in hospitals. Additionally, the study recommends that waste segregation be done according to the set standards of operation so as to improve on performance of health care waste management in the hospitals. In the context of training, the study recommends that health workers be updated on how to handle hospital waste. Regular workshops should also be held in order to educate the health workers on hospital waste and its management.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Health care waste is defined as the entire waste stream from health care set ups. This waste is categorised into two groups one being health care general waste and health care risk waste. Health care general waste is that waste which does not contain harmful effects to human and environment. This waste is generated from damaged containers, food preparations, during housekeeping functions, repairs and replacement, packaging, clerical and office services, flowers, tins and plastics (Coulson and Magner, 2004).

The health care risk waste is the waste which is hazardous to either human health or environment and it's estimated by WHO as 10-25% (WHO, 2004). These include; sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials. This waste is generated during investigations, in laboratories, treatment, drug dispensation, in pharmacies, and during research in research facilities not forgetting at homes while administering home-based care to the sick at homes. With poor management of these wastes, the quality of patient's care is compromised (Pruss et al. 1999). Poor handling during generation, packaging, storage, treatment, transport and disposal can bring about environmental pollution and spread of infectious diseases such as AIDS, hepatitis, cholera and tuberculosis among others. Many individuals in the management level in health care facilities leave the management of the health care waste to the poorly educated and lowest category of workers who are either not trained or have very little training if any (WHO, 2004).

A study done in Karachi Pakistan proved that, as the rest of the world, Pakistan faces the problem of mismanagement of hospital waste management. Recently, hospital waste management has been posing more difficulties with the introduction of disposables like needles, syringes and other similar items (Habibullah and Asfar, 2007). Studies have shown that larger hospitals generate about 2kgs of waste per bed where 0.5kgs is considered risky. This makes around 250,000 tonnes of hospital waste annually produced from all sorts of health care facilities of Pakistan which has a bad effect on environment, contaminating land, air and water resources(Hospital Waste management Issues and Steps taken by the Government of Pakistan: Oct 2006). To counter this, the Government of Pakistan developed Hospital Waste Management Rules 2005, Guidelines on Hospital Waste Management, Specifications on Incinerators and Training Manuals for Paramedics.

From 2003-2005, a survey was carried out in Tanzania to study the existing medical waste management (MWM) systems in hospitals during a nationwide health-care waste management-training programme. This was done to enable health workers establish MWM systems in their health facilities aimed at improving infection prevention and control as well as occupational health aspects. The study was done on in existing hospitals in eight regions which revealed that increased population and poor MWM systems as well as expanded use of disposables were the main reasons for increased medical wastes in hospitals. The main waste management methods were open pit burning (50%) and burying (30%) of the waste. A large proportion (71%) of the hospitals used dust bins for transporting waste from generation points to incinerator without plastic bags yet most hospitals had low incineration capacity, with few of them having fire brick incinerators being done by untrained casual labourers. The study recommended proper training and management regarding awareness and

practices of medical waste management to cover all cadres of health workers in the country (Manyele et al, 2003).

Most towns and cities have inefficient waste collection and disposal systems. For instance, a study done in Nairobi indicates that about 30-40% of the waste generated is not collected and less than 50% of the population is served (UN Habitat, 2007). In Nakuru, 45% of the waste generated is estimated to be collected and disposed at Giotto Dumpsite where 18% is recovered and the rest accumulate in the environment. Waste transportation is largely rudimentary using open trucks, hand carts, donkey carts among others which lead to littering. The waste management in the country remains a major challenge since there are no proper and adequate disposal sites. Due to lack of proper technologies and disposal facilities, most of the waste is mixed. To curb this, NEMA directs county governments to properly manage the disposal sites through the waste disposal projects (Department of Environmental Affairs, 2010).

Statistics indicate that the business of a hospital generates large amounts of waste products that need proper and specialized disposable care. Although treatment and disposal of healthcare waste reduces risks, indirect health risks may occur through the release of toxic pollutants into the environment through treatment or disposal. If not properly constructed, landfills such as an ash pit can contaminate drinking water (Hyland, 1993).

Most health facilities incinerate on site since it has many advantages as sterilization of pathological or anatomical waste, volume reduction and waste heat recovery (Hyland, 1993). However, incinerators have been found to release considerable amount of heavy metals that can be emitted as fumes, particles and ash (Fritsky et al. 2001; Yuhua et al. 1994).

1.2 Statement of the Problem

Basel convention to which Kenya is a member, classifies health care waste as the second most hazardous waste after radioactive waste in United Nations. Inappropriate and inadequate handling of health care waste may have serious public Health consequences and a remarkable impact on the environment, thus sound management of the same cannot be overemphasized. There should be sound policies which are well coordinated at all levels, proper training of personnel and raising public awareness.

According to 2009 census, Nakuru County have a population of 1,603,325, has 11 constituencies and it's the fourth largest county in Kenya after Nairobi, Kakamega and Kiambu. This County is served by 109 dispensaries (Tier 2), 29 Health Centres (Tier 3) and 8 hospitals (Tier 4), (Rift valley health website). The waste management is the legal mandate of the county governments. In Nakuru County, the management of solid waste falls under the environmental planning and management section in the department of environment, Natural resources and Energy. Nakuru was once considered the cleanest town in East Africa but currently its performance is below average. Last year, hazardous hospital waste was found to have been dumped at an open dumpsite, Gioto, in Nakuru town (Standard newspaper 26th April, 2016). The mess was blamed on the private hospitals in town since they are known not to be having incinerators and are therefore supposed to be using Rift Valley Provincial Hospital for the service. This study seeks to analyse the factors influencing waste management in public hospitals in Nakuru County, Kenya.

1.3 Purpose of the study

The purpose of this study is to establish the factors influencing waste management in public hospitals in Nakuru County, in Kenya.

1.4 Objectives of the study

This study was based on the following objectives.

1. To assess how the existing system influences health care waste management in Nakuru County hospitals.
2. To assess how the Legal Framework in place influences the waste management in Nakuru County hospitals.
3. To determine how the technology used influences management of the health care waste in Nakuru County hospitals.
4. To review existing training and public awareness programmes on health care waste management in Nakuru County hospitals and establish it's influence.

1.5 Research questions

The study was guided by the following research questions:

1. How does the existing system influence the waste management in Nakuru County hospitals?
2. How does the Legal Framework in place influence the management of waste in Nakuru County hospitals?
3. To what extent does the technology used influence the management of waste management in Nakuru County hospitals?
4. To what extent does the training and public awareness influences the management of waste in Nakuru County hospitals?

1.6 Significance of the study

The research findings and its recommendations are likely to help the hospitals in better performance on waste management. The management of waste is not the responsibility of the hospital administration but also of every department and every healthcare providing personnel in the hospital and the community at large. The

environmental watch dog, NEMA, also benefited from this study. This is the group charged with the implementation of all policies regarding environment. They also supervise and coordinate matters relating to environment.

The country's policy makers are likely to benefit from this study. This will ensure informed decisions are reached at pertaining to hospital waste management in Nakuru County hospitals. This includes a framework of engagement to ensure proper interventions and proper waste management in Kenyan hospitals, quality and timely service delivery impacting positively on good human and environmental health.

1.7 Delimitation of the study

Nakuru was once considered the cleanest town in East Africa but currently its performance is below average. Last year, hazardous hospital waste was found to have been dumped at an open dumpsite, Gioto, in Nakuru town (Standard newspaper 26th April, 2016). The mess was blamed on the private hospitals in town since they are known not be having incinerators and are therefore supposed to be using Rift Valley Provincial Hospital for the service. The study focused on the waste management in the Nakuru County hospitals in Nakuru County. This County is served by 109 dispensaries (Tier 2), 29 Health Centres (Tier 3) and 8 hospitals (Tier 4), (Rift valley health website). The study also sought to interview the most instrumental staff member in HCWM from each of the sampled health facility. The study concentrated on the public health institutions which were picked through cluster sampling which considered the geographical location. The study was carried out over a period of two months.

1.8 Limitation of the study

The study population especially the health workers who are always very busy and may have little time for interviews and filling in the questionnaires. This was overcome by the researcher allocating extra time to gather data from the health workers.

Another limitation the response rate could be lower than 100% since the hospital workers work in shifts. This was overcome by being persistent on the part of the researcher which gave an optimal response rate of 82.1%.

1.9 Basic assumption of the study

The study assumed that the respondents would be cooperative, and answer questions correctly and objectively. The study also assumed that the sample size selected would represent the target population.

1.10 Definition of significant Terms

Factors influencing	Are the factors that have power/capacity to effect on waste management.
Healthcare Waste Management	This is collectively to all administrative and operational activities aimed at ensuring safe disposal of HCW.
Health Care Waste	Healthcare waste is defined as the total waste stream from a healthcare facility, generated during diagnosis, treatment or immunization of human beings or animals or in research in a hospital.
Legal Framework	This is a broad system of rules that governs and regulates decision making, agreements and laws in waste management.
Management Policies	Enforcing the policy (rules and regulations) of the organization that pertains to information and computing.
Medical Personnel	An individual or individuals who provides preventive, curative, promotional or rehabilitative health care services in a systematic way to people, families or communities
Public Awareness	Public awareness is the public's level of understanding about the importance and implications of the dangers of being exposed to

something, they understand and are able to make informed decisions.

Sanitary Staff: Sanitary staffs are people who make sure neighbourhoods, streets, and public areas stay clean, and they dispose of trash in safe, effective, and environmentally friendly ways.

Technology In Place This is the knowledge of techniques and processes which are being used in waste management.

Waste Disposal Removing and destroying or storing damaged, used or other unwanted products and substances.

1.11 Organization of the study

Chapter one covers background of the study, statement of the problem, purpose of the study, research objectives, research questions, significance of the study, delimitation and limitation of the study, basic assumptions of the study, definition of significant terms used in hospital waste disposal projects and organization of the study.

Chapter two covers literature review, theory of hospital waste disposal projects, empirical review, conceptual framework, nature of waste disposal projects, benefits of effective management of waste disposal projects and challenges, knowledge gap and summary of the literature review.

Chapter three covers research methodology with the following subtopics; introduction, research design, target population, sample procedure, data collection methods, validity and reliability of data collection instruments, ethical issues in research, operational definition of variables and methods of data analysis.

Chapter four contains an analysis of the data and presentation, interpretation and discussion of the results.

Chapter five offers a summary, conclusions, recommendations and suggestions from the researcher's findings, implications for the practice and recommendations for the future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents empirical and theoretical reviews, conceptual framework on factors that influence waste management in hospitals. The chapter assisted the researcher to explore on the research study that needs urgent attention by use of unique approaches. The researcher was able to assess the present situation, previous and the expectations to come from literature sources such as publications, reports, books, journals and the internet. It helped obtain suggestions and recommendations by other researchers for planning further research. This facilitated the provision of intensive information which made the study reach a successful end.

2.2 Existing system of management of health care waste

In Kenya, the health care facilities range from National referral hospitals, provincial hospitals, county hospitals, sub-county hospitals, health centres and dispensaries which provide integrated care, rehabilitative care and supportive activities.

Table 2.1; Organization of Health System in Kenya

Population	43.18 million
Number of counties	47
Total number of health facilities	306 hospitals 191 nursing homes 158 public hospitals and sub-district hospital 74 FBO/ NGO 74 private (MOH, 2006)
Number of national referral hospitals	16
Number of provincial hospitals	9
Number of county hospitals	138
Number sub-county hospitals	136
Other hospitals	242

Source; Ministry of Health Data (2016)

Health care facilities are inclusive of government-managed facilities through the ministry of Medical services and the Ministry of Local Government, mission or Faith-

based organizations (FBOs) and privately managed organizations (MOH, 2006). The waste generated from hospitals is considered a serious issue since it may have harmful effects either on human beings or to the environment (environment support human beings, this means that the human beings would suffer more either way). This can happen through direct or indirect contact (El-Salam, 2010). In developed countries, there seems to be safer ways and technology in place to deal with the hospital waste while it's different in developing countries like Kenya (Tudor et al., 2005). There is still a lot which needs to be done to ensure this waste is well handled from generation to disposal to eliminate its dangers.

In some cases, this waste from hospitals finds its way to disposal sites meant for the municipal waste which is considered less harmful. The amount of hospital waste and its risk to the handlers can be considerably reduced if proper systems of handling waste could be put in place. This means there are proper systems of segregation, transportation, treatment and disposal which is strictly adhered to. There are several factors which influence the waste management system in hospitals which requires understanding on how each factor influences the other. An in-depth understanding of the hospital waste generation methods can be informative and beneficial since it would aid in planning and enhancement of waste management system (Sabour et al., 2007).

Due to the complexity and risks associated with health care waste, the World Health Organization (WHO) has put in place four internationally accepted principles which are precautionary, duty of care, proximity and polluter pay which guides the system development and maintenance (WHO, 2014). The government of Kenya recognizes

the mishandling of the hospital waste and is continually working on a system that would be used to reduce the risks associated with the same. However, there is no sustainable system put in place to be used by the public and the private sector on hospital waste management (EMC, 2006). As a result of poor segregation practices, about 50% of waste could be infectious, which includes non-sharps i.e. blood, its derivatives, or other body fluids including bandages, swabs or items soaked with blood. Toxic chemicals like mercury and formalin can contaminate the soil, air and ground water bringing about health problems.

The higher the level of the health institution, the higher the level of the infectious waste generated. This is due to the services offered by those institutions. This means that the systems to be used needs to be tailor made for the particular institutions (MOH, 2007). These infectious wastes could lead to Hospital Acquires Infections (HAIs) and HIV/AIDS among healthcare workers, waste handlers and patients which have been a major contributor to morbidity and mortality burden in developing world. In Kenya, though not quantified, it's believed to account for about 10% to 25% of hospital admissions in government facilities, 2.5% of HIV infections in Health workers, 32% of hepatitis B cases and 40% of hepatitis cases (WHO, 2010).

The Basel convention 1992, ratified in 2002, where Kenya is a member, puts the responsibility of waste management to the polluter that is the health facility. These obligations are; minimize generation of hazardous waste, ensure adequate disposal facilities are available, control and reduce international movements of hazardous waste, ensure environmentally sound management of wastes and prevent and punish illegal traffic. This is also in line with Public health Act Cap 242 laws of Kenya. In a

bid to implement and strengthen proper management of health care waste, the government of Kenya has come up with the following documents; The National Health Care Waste Management Strategic Plan 2015 – 2020, National guidelines for Safe Management of Health Care Waste 2011 and Implementation of Programmes for injection safety and HCWM.

Most counties have inefficient waste collection and disposal systems. A study done for Nairobi indicates that about 30-40% of the waste generated remains uncollected and less than 50% of the population is served. In Nakuru County, it's estimated that 45% of the waste generated is collected and disposed at Giotto Dumpsite, 18% is recovered and the rest accumulate in the environment (UNEP & UN Habitat – Kenya, 2007). NEMA has so far licenced 15 incinerators countrywide both in public and private institutions which are not enough and so health institutions have to share. Most of the private health setups in Nakuru county e.g. Private laboratories, some private hospitals and clinics take their waste for incineration to the Rift Valley Provincial General Hospital which is usually done at a fee.

Hospital Waste Management Structure



Figure 1; Hospital Waste Management

Source; Ndegwa (2011)

A research done at Pakistan by the USAID in 2006 showed that in hospital waste management, institutional strengthening to develop, implement and enforce regulations on Health care waste management is needed.

A properly laid down system would greatly influence positively the management of the hospital waste. In Kenya, health care waste management systems are still being formulated and marketed which can effectively in management of waste from cradle to grave. This means that the health waste still poses great danger to all who come into contact with it thus the health workers, waste handlers, patients and to the environment. The National and the County governments are being guided by the national IPC (Infection Prevention Control) policy and the national IPC guidelines. A

study carried out in Kenya in 2011 revealed that there have been drawbacks in this in that the health facilities are ill-equipped, there's mostly shortage of health care workers and their attitude towards the system. There is also inadequate leadership on these systems and inadequate funding as well as little training being offered to the success of the system (Ndegwa, 2011).

2.3 Legal Framework on health care waste management

In Kenya, the policy and legal framework on health care waste management is found mainly in; the Public Health Act, Chapter 242; the Environmental Management and Coordination Act, 1999; and the Medical Practitioners and Dentists Act, Chapter 253, The Occupational Safety and Health Act 2007, The Food, Drugs and Chemicals Act, Cap 254, and other relevant Acts governing the community, patients and health care workers.

The Public Health Act Cap 242 aims to protect human health, prevent and guard against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, it also aims to limit or suppress infectious, communicable or preventable diseases within Kenya, it also advises and directs local authorities in regard to matters affecting the public health to promote or carry out researches and investigations in connection with the prevention or treatment of human diseases. It aims at a healthy environment and regulates waste management, pollution and human health.

The local authorities in the Local Government Act (Cap 265) provide the Environmental health requirements. This Act states that Municipal Councils are required to provide and maintain sanitary services, sewage and drainage facilities,

take measures for the control, destruction of rats, vermin, insects and pests, control or prohibit industries, factories and businesses which emit smoke, fumes, chemicals, gases, dust, smell, noise vibrations, discomfort or annoyance to the neighbourhood, and to prohibit or control work or trade of disinfection or fumigation by cyanide or other means. Kenya does not have a statute that deals with the management of hazardous waste which includes disposal. There have been several international conventions such as Basel, London and Bamako conventions but Kenya needs to develop its own legislation on hazardous waste management. NEMA is expected to develop regulations that will give guidance on management of waste.

The Medical Practitioners and Dentists Act, Chapter 253 provides for registration of medical practitioners. The Medical Practitioners' and Dentists' Board Rules that no private practitioner can practice without this boards' licence. During licencing, the board considers the management of medical waste and any clinic, nursing home or hospital should meet the board's requirements of healthcare waste management failure to which it risks to be deregistered. To deal with health care waste in any county, this Act comes in handy.

As far as Transboundary Hazardous Wastes are concerned, The Basel Convention provides for the control of special HCW which includes sharps, pathological infectious waste, hazardous chemical waste, and pharmaceutical waste.

The Constitution of Kenya, Article 42 on the Environment provides that every person has the right to a clean and healthy environment. This includes the right to have environment protected for the sake of present and future generations Article 69, to encourage public participation in management, protection and conservation of

environment, Article 70, put in place systems of environmental assessment, audit and monitoring, avoid activities and processes likely to endanger environment and utilize natural resources and environment to the benefit of all.

The Kenya Health Sector Strategic Plan III (KHSSP III) 2012-2018 seeks to minimize exposure to health risk factors which relates to HCWM. Poor HCWM encourages the spread of communicable diseases thus proper management of the same will eliminate the spread of diseases. KHSSP III encourages the health sector to collaborate with other health-related sectors, this is vital when it comes to waste management. The health sector is encouraged to influence design implementation and monitoring processes health-related sector actions. These other sectors could be urbanization and population, land and housing, environment, which affect methods of treatment and disposal of waste.

Every health setup, be it private or public should adhere to the set laws and regulations of waste management failure to which can be deregistered. This means that the practices and processes of waste management in those setups are controlled by the legal framework in place. In these setups, there are interventions put in place aimed at protecting human health as well job and wealth creation. The current waste regulations can be amended or the health setup can develop a comprehensive waste management strategy.

2.4 Technology used in HCWM

Kenya is faced by limited technical competencies in waste management leading to poor management of equipments and facilities. Relevant practitioners are reluctant to uptake the available waste management technologies. This has been as a result of

inadequate funding to purchase the needed equipments, resistant to change, lack of awareness, poor incentives, inadequate space and lack or weak enforcement. Incineration is largely used in hospitals and should be undertaken by facilities which meet the requirements in Third schedule of the Environment Management and Coordination (Waste management) regulations of 2006.

In HCWM the health workers are encouraged to minimize generation of hazardous waste; one way could be by reducing unnecessary injections, reusing and recycling. The waste should also be well segregated into properly colour-coded bins as per the type i.e. non-infectious, infectious, highly infectious and sharps as this is key to proper HCWM. It should be well stored before transportation or treatment (Fiedler, 1998).

Some of the methods used to render HCW harmless are;

Incineration: burning at high temperatures,




Sterilization: This is the use of microwave or autoclave technology. This is use of steam under pressure to decontaminate waste or sterilize it usually at a temperature of 121-134°C for about 15-20 minutes. Thus sterilization occurs through temperature, pressure and thermal oxidation.

Chemical disinfection: This is the use of chemicals such as JIK to render the waste safe.

Shredding: This involves grinding the waste into unrecognizable pieces, it should however be used together with sterilization or disinfection. It's usually cheaper and no pollution results.

For the final disposal, municipal landfills for municipal waste and burial in pits for infectious waste e.g. placenta is used.

Table 2.2; Health Care Waste Categories, Colour-coding, and Marking

Category	Examples	Colour of bin & liner	Marking
General/non-infectious	Paper, packaging materials, Plastic bottles, food, cartons	Black	No recommended marking
Infectious	Gloves, dressings, blood, body fluids, used specimen containers	Yellow	 BIOHAZARD
Highly infectious or anatomical/pathological	Laboratory specimens and containers with biological agents, anatomical waste, pathological waste	Red	 BIOHAZARD
Chemical	Formaldehyde, batteries, photographic chemicals, solvents, organic chemicals, inorganic chemicals	Brown	Marking will vary with classification of the chemical
Radioactive	Any solid, liquid, or pathological waste contaminated with radioactive isotopes of any kind	Yellow	 Radioactive symbol

Source; Environmental Protection Agency (EPA), (1997)

Controlled air incinerators are the ones largely used since they are easily affordable in terms of capital, operation and maintenance as well as meeting existing air standards with or without air pollution controls (Colin, 1998). This should be located at a place where it won't easily affect human and environment (Environmental Protection Agency (EPA), 1997). Even though the incinerators are widely used and considered as good methods of hazardous waste management, there is the risk of possible health effects due to emission of Dioxins and Furans which are environmental pollutants. These pollutants are believed to bring about several types of cancers, impairment of nervous system, affect endocrine system and reproductive functions, skin lesions and

altered liver function. There are also some metallic and organic pollutants (POPs) which are emitted to the environment (Francini et al, 2004).

From the generation of the HCW to its final disposal, all involved are advised to use Personal Protective Equipment to protect them from the risks that can occur as a result of handling the HCW. The PPE are used as illustrated in Table 2.3;

The technology in use influences greatly the way HCW is managed. When the technology is well understood and all the equipment needed available, the waste management will be swift. Studies have shown that some HCFs do not have the needed facilities especially incinerators and this means that they have to share with the facilities that have them. This means that they will be taking longer than usual to get rid of the HCW and they will need to transport it far posing dangers to the human and environment. HCW should be collected frequently and be destroyed nearest possible from the point of collection/generation. This study sought to establish the influence technology being used on HCWM have on the practice in public hospitals in Nakuru county.

Table 2.3; Types of PPE and their Recommended Uses

Type of PPE	Recommended use	Person protected
Gloves	When there is a reasonable chance of hands coming in contact with blood or other body fluids, mucous membranes, or skin that is not intact. Before performing invasive medical procedures (e.g., when inserting vascular devices such as peripheral venous lines). Before handling contaminated waste items or touching contaminated surfaces.	Service providers
Caps, gowns, scrub suits, or aprons	When performing invasive procedures during which tissue beneath the skin is exposed. When handling immunocompromised patients or clients. When handling patients with infectious disease. When handling contaminated waste.	Service providers and patients
Masks	When performing invasive procedures. When handling patients with airborne or droplet infections. When handling medical waste.	Service providers, patients, incinerator operators, and visitors
Goggles or glasses	Situations in which splashing of blood, body fluids, secretions, or excretions is likely.	Service providers
Mackintoshes, plastic or rubber aprons	Situations in which splashing or spillage of blood, body fluids, secretions, or excretions is likely. When handling infectious waste.	Service providers
Closed boots or shoes	Situations in which sharp instruments or in which spillage of infectious agents is likely. When handling immunocompromised patients.	Service providers and patients
Sterile drapes	When performing major or minor surgical procedures.	Patients

Source;Francini et al, 2004

2.5 Training and public awareness in HCWM

Proper management of HCW is of great importance due to its potential environmental hazards and health problems if ill managed. The hospital waste managers should bear in mind that this does not affect just the hospital staff and the waste handlers but it can be a health hazard to the entire community. This can happen in hospital and outside when the environment is affected negatively. This calls for the public awareness on the HCWM. The public is also great in monitoring the activities and will be the first to raise a red flag when something goes wrong and when their health is at risk.

Public concern about the medical wastes management has increased largely in the past few years on a global basis and a significant effort has been directed toward proper and safe management of hospital waste (Shinee E, et al, 2008). Due to lack of awareness of the risks, and as consequence, inadequate management of HCW practices are often implemented. Some studies conducted around the world to assess the hospital wastes management practices and all of them concurred that planning and implementation of waste management reduce health and environmental risks (Silva CE et al, 2004). Proper health care waste management depends on a dedicated waste management team, good administration, careful planning, sound organization, underpinning legislation, adequate financing, and full participation by trained staff (WHO, 2005a).

Sharing best practices also enhances the public private dialogue. Information and awareness rising on risks, waste segregation and disposal practices is undertaken in both, the public and private sector. At the highly frequented points, posters are displayed in health care facilities, which address literate and illiterate people. Public

education activities are carried out by target group with specific radio and television advertising as well as advertisements in newspaper.

A lack of training and awareness by waste disposal site supervisors / operators prevent them from realising the risks associated with illegal disposal of untreated or poorly treated hospital waste on general waste disposal sites. Proper waste handling should start from generation, segregation, storing, treating, transporting and disposal. Lack of training and awareness can bring about negative attitude towards HCWM. Individual responsibility on HCWM cannot be overemphasized.

A 2014 WHO study says that in 2010, some 1.7 million people were infected with the hepatitis B virus, another 315,000 with the hepatitis C virus and as many as 33,800 with HIV through needle pricks. The Ministry of Health, in collaboration with some organisations, set out to protect human resources in the sector. Through the National Guidelines for Safe Management of hospital waste, it laid down the procedures for handling the entire cycle, including waste collection, storage, transportation and disposal. PATH, a non-governmental organisation that deals in health technologies has facilitated this by providing bins and trolleys in several hospitals that makes handling of hospital waste easier. The director of PATH's Health Care Waste Management (HCWM) Project, Mr Fred Okuku, once said: "We are aware of the cost of medical waste. We train health workers across the country on how to handle it to minimise infections and provide protective equipment for their work. We are involved in the whole waste cycle to ensure safety." Through this PATH project, more than 6,000 health workers from the hospitals around the country have so far been trained on hospital waste management (Daily Nation, April 7 2015).

To achieve successful HCWM, all the stakeholders have to be incorporated. These are the all Health workers, administrators, support staff and patients. This means that knowledge in handling healthcare waste should be disseminated to all and each should be well conversant with their roles. That is; Information and awareness rising on risks, waste management practices is undertaken (Madhukumar& Ramesh, 2012). At highly frequented points, posters are displayed in health care facilities, addressing literate and illiterate people. Public education activities should be completed by target group specific radio and television advertising as well as advertisements in newspaper where possible. An information management system should monitor and evaluate waste management.

2.6 Theoretical framework

Management theories are implemented to help increase organizational productivity and service quality. This study was based on the systems theory as a strategy in management. Systems theory treats an organization as a system which can either be closed or open. Managers who understand systems theory recognize how different systems affect a worker and how a worker affects the systems around them (Midgley, 2003). A system is made up of a various parts with the aim of achieving a certain goal(Bertalanffy, 1968).

Aristotle claimed that knowledge is derived from the understanding of the whole and not that of the single parts (Aristotle's Holism). This historic effort evolved during the last century into so-called "systems theory" (Bogdanov, 1922, 1980; von Bertalanffy, 1968, Lazlo, 1996; Meadows, 2008). The relationships between the parts and the events they produce through their interaction is more important, with the result that

“system elements are rationally connected” (Luhmann, 1990) towards a shared purpose (Golinelli, 2009). In management a number of authors and scholars have adopted implicitly or explicitly, a vision of organizations as systems with the aim of analysing the relationship between organizations and their environment (e.g. Burns and Stalker, 1961; Lawrence and Lorsch, 1967; Aldrich, 1979).

2.6.1 Systems Theory Applications in Management

Systems theory and systems thinking can be applied in management and marketing as well as to the concept of service systems engineering. The main focus here was on knowledge, value, quality, environment, relationships, adaptation, and complexity.

2.6.2 Knowledge in management

The firm is seen as a learning system and as having a set of skills and competences that enables it to produce its own knowledge. (Nonaka and Takeuchi, 1995). There is a lot of learning in waste HCWM. New knowledge is coming up every day which is vital for the right job to be done. One may apply the knowledge they already have but the best comes from doing (Vicari, 1992).

2.6.3 Value of management

HCWM was looked at as a holistic with a high degree of integration (Grant, Shani and Krishnan, 1994). Its value can be expressed as the “potentiality of existence, development, evolution” (Vicari, 1992). The systemic perspective allows one to move from the single firm to the entire supply chain (Mele, 2003) or network (Polese, 2004), involving many system actors (firms, individuals, districts, nations, customers, markets; Alter, 2008). The waste management’s value will be felt if all the actors are actively incorporated and at all levels.

2.6.4 Quality of service in waste management

When discussing quality issues, it is necessary to focus on the link between TQM and systems thinking (Kim, 1990; Senge and Sterman, 1990; Kim and Burchill, 1992). In TQM, the systemic conception of the organization is strengthened by its emphasis on the importance of the relationships of the parts to the goal to be reached (Mele and Colurcio, 2006. TQM is a system for developing an individual, team, company and National skill” (Shiba, Graham and Walden, 1993, p. 534). Application of TQM will enable the hospital to provide the best service to the community.

2.6.5 Environment of health care waste management

The organization (hospital) is the system at the micro level, while the environment is the system at the macro level. Brownlie (1994) highlights two conceptualizations of the environment which are the objective environment and the enacted environment. The organizations and environment are seen as labels for patterns of activities that are generated by human actions and their accompanying efforts to make sense out of these actions (Smircich and Stubbart, 1985).

2.6.6 Relationships of stakeholders in health care waste management

Competitive organization behaviour is linked to the ability to identify and manage functions and relationships, thereby establishing communication channels, organizing information flow, and rationalizing and harmonizing a firm’s development aligned with all external relationships (Christopher, 2007). The waste management team have to actively interact within itself, its environment and the community it’s servicing. In this case, open systems are the best since they are able to grow and improve on their services.

2.6.7 Adaptation to new methods of health care waste management

According to the viable systems approach (Barile and Polese, 2010a), any organization has to be able to preserve its viability and stability, creating its own internal environment that is able to respond effectively to external stimuli at all levels (viability). There is so much waste being generated each day which increases with the population and so change is inevitable. Changes can occur in the quantity of waste, in management as well in policies and principles of the waste management.

2.6.8 Complexity of health care waste management

Networked systems are based on three parameters: variety (possible variance that a phenomenon may present to the observer), variability (variety observed over time) and indeterminacy (the ability to fully understand a phenomenon) (Barile, 2009; Golinelli, 2010). With this in mind, it's possible to address the relative concept of complexity, which can be very useful in interpreting Service systems, since these are complex adaptive systems (Gell-Mann, 1994; Holland, 1999) since they are made up of multiple interconnected network elements and adaptive in that they change and learn from experience. The management of the waste is somehow controlled by the environmental body from the county to the national level. With the ever-increasing research on waste management, there are many changes that are taking place every day at the National as well as the County levels.

2.7 Conceptual framework

The conceptual framework gives a depiction on how the variables are related to one another. The conceptual framework of the study is depicted in the figure as;

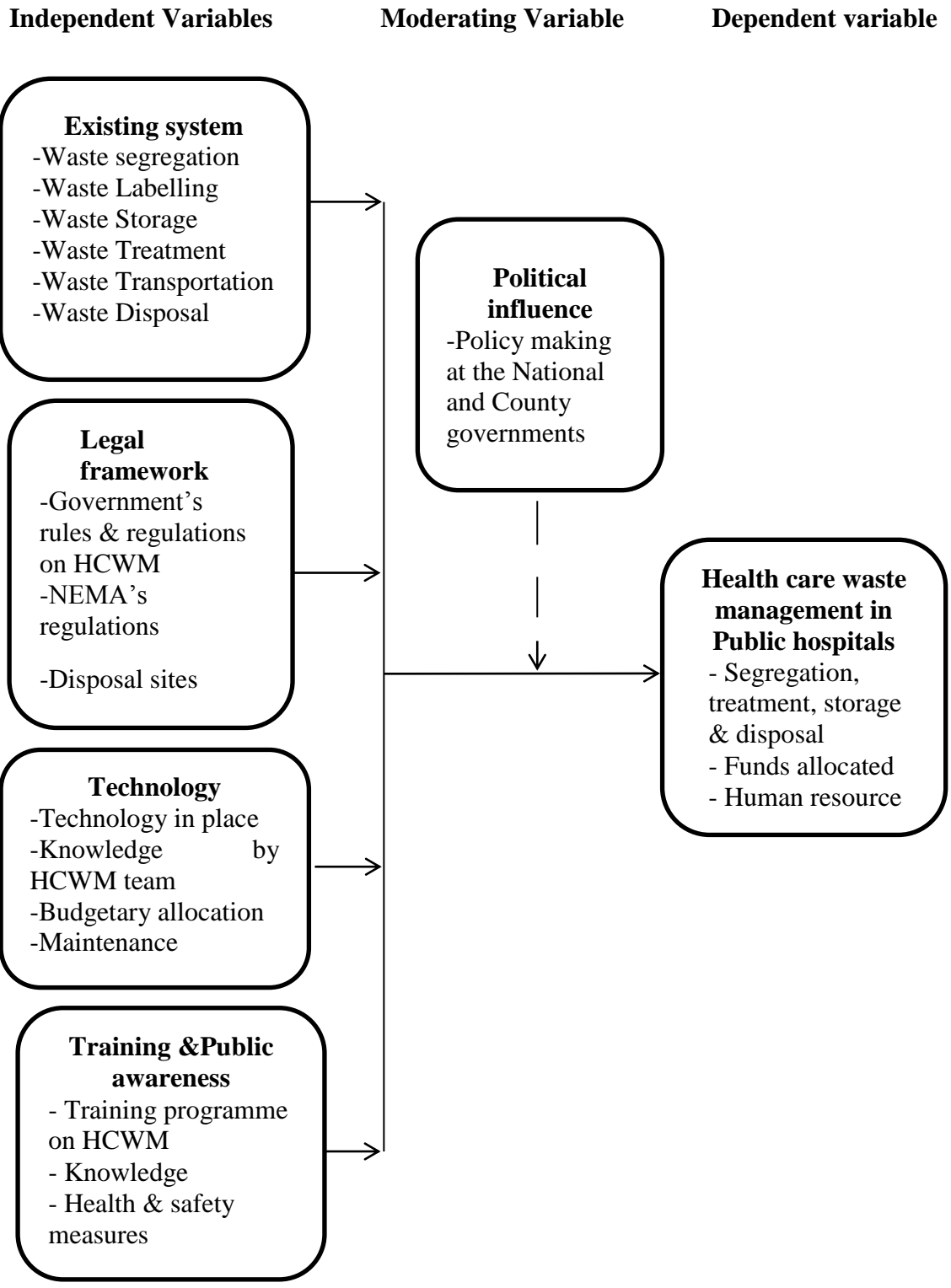


Figure 2;The Conceptual Framework

The variables defined here are the independent and dependent variable. An independent variable influences and determines the effect of another variable. These include the existing system, legal framework, technology and training and level of public awareness. A moderating variable is a variable that may influence the

dependent variable but is not a point of interest. In this case, the moderating variable is political influence. Dependent variable is the factor which is observed and measured to determine the effect of the independent variable, in the case, the status of waste management in public hospitals.

2.8 Knowledge gap

Related studies in Kenya and other countries have been analysed and reveal that there exists a knowledge gap in understanding the factors that influence waste management of hospital in our Kenyan hospitals. A study was done in Nyanza in 2008 (Kochaga, 2008) which showed inadequate segregation of HCW, in 2009, a study was done in Nairobi which showed that the hospitals in the county did not HCWM plan or team in place. A Kenyan government's report in 2012 revealed that good HCW segregation existed only in 27% of all the hospitals (GOK, 2008-2012). This calls for the desire to study the factors that influence waste management in hospitals.

2.9 Summary Of Literature Review

This chapter has provided an in-depth literature review. As per the conceptual framework, the study investigated factors influencing waste management in public hospitals in Nakuru County as a dependent variable while the independent variables were the existing system, legal framework, technology and training and public awareness. The moderating variable in this study was political influence. The researcher looked into practices of HCWM in Karachi, Pakistan and in neighbouring Tanzania. Its evident this study's recommendations were helpful to the hospitals in Kenya, to the policy makers, to the Environmental body and to the entire population. The chapter finalized by explaining the knowledge gap that the study sought to fill.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter contained a discussion of various components of the research methodology that was applied in the study. These include research design, target population, sample procedures and methods of data collection.

3.2 Research design

The study adopted a descriptive survey research design to ascertain and make assertions on how existing system, legal framework, technology and training and public awareness influence the waste management in Nakuru County hospitals. Descriptive research studies are those studies which are concerned with describing the characteristics of a particular individual or of a group and ascertain whether variables are associated (Kothari, 2004).

Survey research seeks to obtain information that describes existing phenomena by asking individuals about their perceptions, attitude, behaviour or values (Mugenda&Mugenda, 1999). The descriptive survey method was used by the researcher as the appropriate method for the research at hand because it is the most appropriate in collecting data about the characteristics of a large population in terms of being cost effective and within the constraints of time available. The questionnaire was used as the main tool for data collection. Descriptive data are typically collected through a questionnaire survey, interview or by observation (Mugenda&Mugenda, 1999).

3.3 Target population

The target population is the entire aggregation of respondents that meet the designated set of criteria (Burns & Grove, 1997). The study targeted 145 public health institutions in Nakuru County. A respondent was an instrumental person in each of these hospitals that were versed in the area of HCWM. The inclusion criteria was that the participants must have worked in the hospital for at least six months and in any of the following divisions of the hospital: Administration, Infection control unit, waste management unit, Housekeeping, Attendants and ancillary, Departmental heads, Matron or Health workers who are actively involved in HCWM. There were 145 persons who had met this criteria and therefore the population size of this study was 145. This implied that a single individual was picked per hospital.

3.4 Sample Size And Sampling Procedure

Sampling is a process or technique of choosing a sub-group from a population to participate in the study. A sample population is assumed to represent a target population (Ogula, 2005) where individuals possess some common observable characteristics. The sampling plan describes the sampling unit, sampling frame, sampling procedures and the sample size for the study. The sample size of this study was calculated through the Yaro Yamane Formula as shown below;

$$n = \frac{N}{1 + N(e^2)}$$

Where

n = sample size

N = size of target population

e = error margin (0.05)

Substituting these values in the equation, estimated sample size (n) will be:

$$n = 145 / (1 + 145 (0.05^2))$$

n = 106 respondents

This means a total of 106 respondents were purposively picked for the purpose of this study. There are two major sampling procedures in research which are probability and non-probability sampling. Cluster sampling was employed in this study. The sampling frame is readily available and it's cost effective. It is suitable for survey of institutions (Ahmed, 2009) or households within a geographical area. The target population was 145 public health institutions where they were sampled systematically according to their geographical location. Homogenous sampling which is a type of purposive sampling was also considered while picking the respondents from each since the study considered the respondents who were most useful, the ones who were directly involved in the management of HCW. Purposive sampling is where respondents are picked based on the characteristics of population and study's objective (Black, 2010). The study sought a respondent who was quite instrumental in the HCWM.

3.5 Methods Of Data Collection

A combination of methods which included questionnaires and document analysis was used. The questionnaires are easy to administer and at the same time they could generate a large array of needed data. Questionnaires are also known to save time especially the self-administered as the respondents have ample time to think and fill the questionnaires at their free time minimizing errors.

Document analysis is a method of data collection from documented sources. The method was used to gather information that was not captured in the responses in the questionnaires. This came from paper documents as well as computer databases and policy documents of the sampled Nakuru County public hospitals. Mostly, document analysis provides complete, detailed, consistent and well-structured information.

3.5.1 Validity Of Instruments

Validity refers to how well a test measures what it is purported to measure. Validity is the accuracy and meaningfulness of inferences based on the research results. It is the correctness and reasonability of the data. It refers to getting result that accurately reflects the concept being measured. Expert opinion from supervisors was sought to assess the validity of the data collection instruments. The researcher improved validity by matching assessment measure to the goals and objectives and by making useful adjustments to the research instruments after the pilot study.

3.5.2 Reliability Of Instruments

Reliability is the degree to which an assessment tool produces stable and consistent results. Test-retest reliability is a measure of reliability obtained by administering the same test twice over a period of time to a group of individuals. Reliability as the extent to which a questionnaire, test, observation or any measurement procedure produces the same results on repeated trials. The pre-testing assisted in enhancing the clarity of the questionnaire. A pilot study was conducted to find the instruments reliability and the procedures of administration. Reliability co-efficient was obtained by correlating the scores of odd numbered statement with the score of even numbered statement in the questionnaire. To test the reliability of instruments, the following formula was employed. The formula for KR-20 (Kuder–Richardson Formula, 1937) for a test with K test items numbered $i=1$ to K is;

$$r = \frac{K}{K-1} \left[1 - \frac{\sum_{i=1}^K p_i q_i}{\sigma_X^2} \right]$$

Where p_i is the proportion of correct responses to test item i ,

q_i is the proportion of incorrect responses to test item i (so that $p_i + q_i = 1$),

The variance for the denominator is;

$$\sigma_X^2 = \frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n}$$

Where n is the total sample size. The sum of squares should be divided by degrees of freedom ($n - 1$) and the probabilities are multiplied by;

$$\frac{n}{n - 1}$$

The cronbach alpha coefficient correlations for existing system of health care waste management, Legal Framework, technology used in management of the health care waste and training and public awareness programmes on health care waste management in Nakuru County hospital were 0.765, 0.794, 0.876, and 0.725 respectively indicating the cronbach alpha coefficients were above 0.7 hence were deemed reliable.

3.6 Methods Of Data Analysis

The gathered data from the questionnaires was validated, edited and then coded. The validation process enabled the researcher to determine the rate of questionnaires. In editing, the questionnaires were scrutinized to determine the response rates, data from interviews and open ended items in the questionnaires constituting the qualitative data in form of words and phrases. This data was transcribed and then arranged as per emerging themes. Some data however was quantified where possible along with quantitative data from the structured questionnaire items. Finally, all qualitative data was coded whereby categories of responses were identified, classified and then recorded or tabulated on a prepared sheet as per the objectives of the study. They were subjected to descriptive statistics so as to produce frequencies and percentages which were used as tools of analysis. The analysis of data was presented using tables accompanied by appropriate descriptions or explanations.

Regression is a statistical measure that attempts to determine the strength of the relationship between one dependent variable (usually denoted by Y) and a series of other changing variables (known as independent variables). The following multiple regression was used to determine the extent to which two or more independent variables affects the dependent variable. The general form of each the regression was:

$$\text{Multiple Regression: } Y = a + b_1X_1 + b_2X_2 + b_3X_3 + B_4X_4 + u$$

Where:

Y= is the dependent variable (Effective management of waste disposal projects) i.e. the variable that the research seeks to predict

A= is the Y intercept, occurring when $X_1 = X_2 X_3 X_4 = 0$

X= is the variable that we are using to predict Y

X_1 = Existing system

X_2 = Legal framework

X_3 = Technology

X_4 = Training and Public awareness

b= the slope

u= the regression residue

3.7 Ethical Issues In Research

Some of the most important ethical principles in educational research are; minimizing harm, harm include among others financial and reputational consequences for the people being studied; protecting privacy; this means to keep data confidential; and respecting autonomy; that is showing respect for people in the sense of allowing them to make decisions for themselves, notably about whether or not to participate. In this study the researcher treated all the gathered information with utmost confidentiality to safeguard the public reputation of organizations and people concerned. Informed

consent was obtained by informing the respondents the purpose of the study and benefits of participation, so as to provide sufficient information so that a participant could make an informed decision about whether or not to continue participation. Nakuru County Medical Officer and the ethics committee approved the study protocols and permission to carry out the study was obtained.

3.8 Operationalization Of Variables

The operational definition of a variable is the specific way in which it is measured in that study. Effective policy management requires that organizations periodically (minimum annually) review policies to ensure they remain relevant and aligned with corporate objectives. A complete history of revisions, collaborations, communications, training and acceptance, exceptions, and enforcement actions should be carefully preserved. This, along with a program to proactively identify and respond to business changes that impact the policy environment, will ensure an organization can effectively demonstrate and defend a strong policy governance program. This was demonstrated in table 3.1.

Table 3.1; Operationalization of Variables

Variable	Type of variable	Indicators	Measures	Scale of measure	Tools for data collection	Types of analysis
Existing system	Independent	Waste segregation, Labelling, Storage, Treatment, Transportation & its Disposal.	HCWM system in place in the hospital	Interval & Nominal	Questionnaire Interview Observation	Percentages Frequencies
Legal framework	Independent	Government's rules & regulations on HCWM NEMA's regulations	Understanding of the rules & regulations	Interval & Nominal	Questionnaire Interview Data analysis	Percentages
Technology	Independent	Technology in place Knowledge by HCWM team Budgetary allocation Maintenance	How technology in place works	Interval & Nominal	Questionnaire Interview	Percentages
Training & Public awareness	Independent	Training programme on HCWM, knowledge, health & safety measures in place	Frequency of updates and knowledge assessment	Interval & Nominal	Questionnaire Interview	Percentages
Waste management in Public hospitals	Dependent	Hospital goals, commitment by management on HCWM, resource allocation and coordination	Goals, commitment & coordination	Interval & Nominal	Questionnaire Document analysis	Percentages Frequencies

Source; Researcher (2017)

CHAPTER FOUR
DATA ANALYSIS DISCUSSION, PRESENTATION AND
INTERPRETATION

4.1 Introduction

This chapter examined the results of the data that was analyzed and the findings thereof. The background characteristics, response rate and the relationship between the independent variables and the dependent variable was examined. Data was presented in tables and interpreted.

4.2 Response Rate of Respondents

This study utilized a sample of 106 respondents. Therefore, 106 questionnaires were distributed to the various hospitals under study. All the questionnaires that were distributed were returned. However, 19 questionnaires were rejected as they were incomplete. This meant that 87 questionnaires were the ones which were completely filled. This meant that the response rate was 82.1% which met the 80.0% threshold recommended by Mugenda&Mugenda, (1999). The data from the 87 complete questionnaires was analyzed using SPSS which formed the basis of the results.

4.3 Background Information of the Respondents

The background information of this study was examined by the hospital level or tier, job role of the respondents, and number of patients/clients that are attended to in the respondents' hospital per day. The length of time that the respondent had been at the hospital, the length of time the respondents had worked in the capacity of waste management, and whether the respondent has always been involved in the waste management in the hospital was also examined.

4.3.1 Hospital Level (Tier) of the Respondents

In Kenya, the health care facilities range from National referral hospitals, provincial hospitals, county hospitals, sub-county hospitals, health centres and dispensaries which provide integrated care, rehabilitative care and supportive activities. Health care facilities are inclusive of government-managed facilities through the ministry of Medical services and the Ministry of Local Government, mission or Faith-based organizations (FBOs) and privately managed organizations (MOH, 2006). The hospital level was examined by grouping in tiers, that is Tier 2 for a dispensary, Tier 3 for a health Centre and Tier 4 for a major hospital. The results are presented in table 4.1.

Table 4.1; Distribution by Hospital Tier

	Frequency	Percentage
Tier 2 (Dispensary)	53	59.7%
Tier 3 (Health Centre)	26	29.8%
Tier 4 (Major Hospital)	8	10.5%
Total	87	100.0%

Most of the respondents (59.7%) for this study work in Tier 2 hospitals (dispensary), followed by Tier 3 hospitals (health centre) which had 29.8% and Tier 4 hospitals (major hospital) which had 10.5% of the respondents.

4.3.2 Job Role of the Respondents

The job role of the respondents was also examined to get the background characteristics of the respondents. This was done by finding out in which department the respondent worked, that is, among administrator, infection control unit, waste management unit, head of housekeeping, public health officer, and support staff, with results as presented in table 4.2.

Table 4.2; Distribution by Job Role of the Respondents

	Frequency	Percentage
Administrator	47	54.0%
Waste management unit	3	3.4%
Head of Housekeeping	3	3.4%
Public Health Officer	34	39.1%
Total	87	100%

There were no respondents (0.0%) from the infection control unit and support staff who participated in this study in all the hospitals. Most of the respondents (54.0%) were administrators in the hospitals followed by public health officers (39.1%). The heads of housekeeping and respondents from the waste management unit were equal in number (3.4% each).

4.3.3 Number of Patients attended To Per Day

The study sought to know approximately how many patients are attended to per day in the hospital. The number of patients per day was put into categories, that is, 10-20, 21-30, 31-40, 41-50, and over 50 patients. Table 4.3 presents results in each category.

Table 4.3; Distribution by Patients attended to per day

	Frequency	Percentage
10-20	0	0.0%
21-30	5	5.7%
31-40	11	12.6%
41-50	20	23.0%
Over 50	51	58.6%
Total	87	100.0%

None of the hospitals had less than 20 patients per day (10-20 patients=0.0%). More than half of the hospitals attended to over 50 patients per day, while 23.0% of the hospitals attended to 41 to 50 patients per day. The hospitals that attended to 31-40 patients per day were 12.6% and 21-30 patients were 5.7%.

4.3.4 Length Of Service of the Respondents at The Hospital

The study examined how long the respondents had worked in the hospitals under study. A huge percentage of the respondents (70.1%) had worked in their current hospitals for 1-5 years. as shown in table 4.4.

Table 4.4; Distribution by Length of Service at Hospital

	Frequency	Percentage
6 Months-1 Year	3	3.4%
1-5 Years	61	70.1%
6-11 Years	12	13.8%
12-17 Years	8	9.2%
18 years and above	3	3.4%
Total	87	100.0%

The respondents who had worked in their current hospital for 6-11 years were 13.8%, while those who had worked for 12-17 years were 9.2%. The respondents who had worked at their current hospital for half a year to a year, and for 18 years and above were equal, that is, 3.4%.

4.3.5 Respondent's Length Of Service In Waste Management

The length of time the respondents had worked in the waste management capacity was of interest to the study. This was examined by categorising the number of years under 6months to a year, 1-5 Years, 6-11 Years, 12-17 Years, and 18 years and above, and results presented in table 4.5.

Table 4.5; Distribution by Length of Service in Waste Management

	Frequency	Percentage
6 months to 1 year	3	3.4%
1-5 Years	62	71.3%
6-11 Years	7	8.0%
12-17 Years	8	9.2%
18 years and above	7	8.0%
Total	87	100.0%

Most of the respondents (71.3%) had worked in waste management for 1-5 years. Those who had worked in waste management for 6 months to a year were a very negligible number at 3.4%, while those who had worked in waste management for 12-17 years were 9.2%. The respondents who had worked in waste management for 6-11 years and for 18 years and above were equal at 8.0% each.

4.3.6 Respondent’s Involvement in Waste Management

The study sought to find out whether the respondents have always been involved in waste management, results of which were as shown in table 4.6.

Table 4.6; Involvement in Waste Management

	Frequency	Percentage
Yes	81	93.1%
No	6	6.9%
Total	87	100.0%

Most of the respondents (93.1%) have always been involved in waste management with only a negligible 6.9% who have not always been involved in waste management.

4.4 Existing System of HCWM

The study sought to investigate the existing system of waste management. In this context, the respondents’ understanding of waste management system was examined, who is responsible for segregation as well as labelling of waste, and where labelling of waste is done was also examined. Additionally, the methods used to deal with waste management, who are involved in the actual disposal of hospital waste and how often the waste is collected and disposed of were examined.

4.4.1 Respondent’s Understanding of Waste Management System

The respondents were asked whether they clearly understand the system used by the hospital in waste management, and results presented in table 4.7.

Table 4.7; Table Showing Understanding of Waste Management

	Frequency	Percentage
Yes	81	93.1%
No	0	0.0%
I don't Know	6	6.9%
Total	87	100.0%

Most of the respondents (93.1%) clearly understand the system used by the hospital in waste management while 6.9% are undecided whether they clearly understand the system used by the hospital in waste management. None of the respondents said they did not clearly understand the system used by the hospital in waste management.

4.4.2 Staff Involvement in Waste management

The study sought to know the people aspect of waste management in the hospitals. This was done by examining the people involved in segregation of waste, labelling of waste and actual disposal of waste. The results were presented in table 4.8.

Table 4.8; Table Showing Staff Involvement in Waste Management

	Staff	Frequency	Percentage
Segregation of Waste	Hospital Administrators	0	0.0%
	All the health workers	87	100.0%
	Waste Management Team	0	0.0%
	I don't know	0	0.0%
Total		87	100.0%
Labelling of Waste	Waster Handlers	5	5.7%
	Health workers	79	90.8%
	I don't know	3	3.4%
Total		87	100.0%
Actual Disposal of Waste	Sanitary Staff	0	0.0%
	Casual labourers	85	97.7%
	Trained personnel	2	2.3%
	I don't Know	0	0.0%
Total		87	100.0%

None of the respondents (0.0%) said they do not know who does segregation of waste. Additionally, none of the respondents (0.0%) said the segregation of waste is done by

hospital administrators and the waste management team. All the respondents (100%) said the segregation of waste is done by all health workers. This therefore implies that the responsibility of segregating waste is vested in all the health workers.

In the context of labelling of waste, the respondents were asked who labels the waste. A resounding majority of 90.8% of the respondents said it is the health workers who label waste. 5.7% of the respondents said that labelling of waste is done by waste handlers while 3.4% of the respondents don't know who labels the waste. In the context of actual disposal of hospital waste, the respondents were asked who are involved in the actual disposal of hospital waste among sanitary staff, casual labourers, trained personnel and an option of I don't know was also given. None of the respondents (0.0%) said they do not know who are involved in the actual disposal of hospital waste. Additionally, none of the respondents (0.0%) said that sanitary staff is involved in the actual disposal of hospital waste. The responsibility of the actual disposal of waste is given to casual labourers as was the opinion of most of the respondents (97.7%). A negligible percentage (2.3%) of respondents said trained personnel are involved in the actual disposal of hospital waste.

4.4.3 Waste Disposal in Respondent's hospital

The aspects of where labelling of waste is done and how often waste is collected and disposed of was examined, the results were as shown in table 4.9.

Table 4.9; Table on Waste Disposal

	Staff	Frequency	Percentage
Where labelling of waste is done	At the site of segregation	11	12.6%
	At the Storage place	0	0.0%
	Where generated	76	87.4%
Total		87	100.0%
How often waste is collected and disposed of	Once a Day	6	6.9%
	As Needed	78	89.7%
	I don't Know	3	3.4%
Total		87	100.0%

In the context of where labelling of waste is done, most of the respondents (87.4%) said labelling of waste is done where it is generated. No labelling of waste is done at the storage place as none of the respondents (0.0%) responded with this prompt. 12.6% of the respondents said that labelling of waste is done at the site of segregation. In the context of how often waste is collected and disposed of, 3.4% of the respondents said they do not know how often waste is collected and disposed of while 6.9% said that it is collected and disposed of once a day. Waste in the hospitals is collected and disposed of as needed as supported by most of the respondents (89.7%). HCW should be collected frequently and be destroyed nearest possible from the point of collection/generation.

4.4.4 Methods Used in Dealing with Waste Management

The study sought to determine which methods are used in dealing with waste management in the existing system. The methods under examination were sterilization, use of chemical (JIK), incineration, burying and burning chamber. Table 4.10 presented the results.

Table 4.10; Methods Used in Dealing with Waste Management

	Yes (%)	No (%)	Total (%)
Sterilization	12.6	87.4	100
Use of chemical (JIK)	93.1	6.9	100

Incineration	64.4	35.6	100
Burying	2.3	97.7	100
Burning Chamber	39.1	60.9	100

Most of the respondents said that waste management is done by sterilization (12.6%), use of chemical (JIK) (93.1%), incineration (64.4%) and burning chamber (39.1%). This was consistent with Fiedler (1998), who noted that incineration is largely used in hospitals and should be undertaken by facilities which meet the requirements in Third schedule of the Environment Management and Coordination (Waste management) regulations of 2006.

Use of chemical (JIK) is the most used method of waste management in the existing system among the methods that were under investigation. 39.1% of the respondents (mostly dispensaries) said the burning chamber is used for waste management in the existing system. A study in Tanzania noted that the main waste management methods were open pit burning (50%) and burying (30%) of the waste. A large proportion (71%) of the hospitals used dust bins for transporting waste from generation points to incinerator without plastic bags yet most hospitals had low incineration capacity, with few of them having fire brick incinerators being done by untrained casual labourers.

In order to understand on the levels in which each of the method was used relative to the other methods, the multiple response rate was examined. The multiple response rates examines all the positive responses and cumulates them in order to get an understanding on the popularity of each of the method. In this context, the use of chemical (JIK) was the most popular method of waste management at 44% followed by incineration at 30.4%, as shown in table 4.11.

Table 4.11; Prevalence of Methods Used in Dealing with Waste Management

	Frequency	Percentage
Sterilization	11	5.9%
Use of chemical (JIK)	81	44.0%
Incineration	56	30.4%
Burying	2	1.0%
Burning Chamber	34	18.7%
Total	184	100%

4.4.5 Possession of Incinerators in Respondent's Hospitals

The study sought to determine whether the hospitals have an incinerator in the context of those who chose an incinerator as a method of waste management in the existing system, results were as shown in table 4.12.

Table 4.12; Possession of Incinerators in Hospitals

	Frequency	Percentage
Yes	45	51.7%
No	42	48.3%
Total	87	100.0%

Slightly more than half of the respondents (51.7%) said that the hospital has an incinerator. The respondents who said their hospital uses an incinerator as a waste management method but don't have one in the hospital were 48.3%. Colin (1998), noted that controlled air incinerators are the ones largely used since they are easily affordable in terms of capital, operation and maintenance as well as meeting existing air standards with or without air pollution controls. This was consistent with UNEP & UN Habitat – Kenya (2007), that incinerators are not enough and so health institutions have to share. Most of the private health setups in Nakuru county e.g. Private laboratories, some private hospitals and clinics take their waste for incineration to the Rift Valley Provincial General Hospital which is usually done at a fee.

4.5 Legal Framework Used in Health Care Waste Management

Every health setup, be it private or public should adhere to the set laws and regulations of waste management failure to which can be deregistered. This means that the practices and processes of waste management in those setups are controlled by the legal framework in place.

4.5.1 Frequency Distribution of Responses in Legal Framework

The legal framework was examined by getting responses from a scale of 1 to 5 on various statements related to different aspects of legal framework on healthcare waste management in their hospitals. The frequency distributions, means and standard deviation, minimum and maximum values were used to analyse the descriptive statistics. The responses corresponding to the 5 point Likert scale were Strongly Agree=5, Agree=4, Uncertain=3, Disagree=2, and Strongly Disagree=1. The frequency distributions were represented as percentages and the interpretations given accordingly.

Table 4.13 presents results from this examination. An equal number of respondents (71.3%) of the respondents were inclined to agree that the Government of Kenya laws on Health care waste management are well kept in their hospital, and that the hospital waste disposal sites are safe to the community and environment.

Table 4.13; Frequency Distributions of Legal Framework on HCWM

	SA	A	U	D	SD
	(%)	(%)	(%)	(%)	(%)
I fully understand the rules and regulations pertaining to health care management in this hospital	29.9	60.9	9.2	0.0	0.0
The Government of Kenya laws on Health care waste management are well kept in this hospital	5.7	71.3	20.7	2.3	0.0
The hospital abides with the NEMA regulations fully	2.3	57.5	31.0	9.2	0.0
The hospital waste disposal sites are safe to the community and environment	5.7	71.3	13.8	9.2	0.0
The hospital has acquired the right trucks for the transportation of waste to disposal site	0.0	2.3	5.7	13.8	78.2
The hospital has valid licences of health care waste management at the National and County level.	4.6	72.4	16.1	6.9	0.0

Additionally, 72.4% of the respondents were inclined to agree that the hospital has valid licences of health care waste management at the National and County level. The only metric with strongly disagree responses was the hospital having acquired the right trucks for the transportation of waste to disposal site, which had 78.2% of the respondents with a contrary perception. With the exception of hospital acquiring the right trucks for the transportation of waste to disposal site (Agree=2.3%), most of the respondents were inclined to agree that all other metrics of the legal framework on healthcare waste management in their hospitals were met. This corresponded to 60.9% of the respondents who agreed that they fully understand the rules and regulations pertaining to health care management in their hospital, and 57.5% who agreed that the hospital abides with the NEMA regulations fully.

4.5.2 Means and Standard Deviation of Responses in Legal Framework

The study sought to examine the average perception on legal framework, technology, and training and awareness aspects of healthcare waste management in hospitals. This was done by generating the minimum values, maximum values, means (μ) and

standard deviations (σ_x) of the various metrics of each aspect under study. The means were categorised into five groups and interpreted as an average tendency to either strongly agree, agree, be uncertain, disagree and strongly disagree, that is, strongly agreed ($5 \leq \mu \leq 4.5$), agree ($4.5 \leq \mu < 3.5$), be uncertain ($3.5 \leq \mu < 2.5$), disagree ($2.5 \leq \mu < 1.5$), and strongly disagree ($1.5 \leq \mu < 1$).

The distribution of the responses around the mean was examined by getting the standard deviation of the metrics. The standard deviations were grouped into three intervals, that is, close distribution of responses around the mean for standard deviation of ($\sigma_x < 0.5$) implying high consensus, moderate distribution of responses around the mean for standard deviation of ($0.5 \leq \sigma_x < 1$) implying moderate consensus and wide distribution of responses around the mean for standard deviation ($\sigma_x \geq 1$) implying no consensus on the metric.

The average perception of the respondents on the legal framework of healthcare waste management in their hospitals was of interest in this study. In this context, the average perception of the respondents of the rules and regulations pertaining to health care management in their hospital, observation of Government of Kenya laws on Health care waste management, and whether their hospital abides with the NEMA regulations fully was examined. Additionally, the respondents average perception on whether the hospital waste disposal sites are safe to the community and environment, it has acquired the right trucks for the transportation of waste to disposal site, and it has valid licences of health care waste management at the National and County level was sought. Table 4.14 presents the results for means and standard deviations of legal framework on HCWM.

Table 4.14; Means and Standard Deviations of Legal Framework on HCWM

	Min	Max	Mean	Std. Dev.
I fully understand the rules and regulations pertaining to health care management in this hospital	3	5	4.21	0.59
The Government of Kenya laws on Health care waste management are well kept in this hospital	2	5	3.80	0.57
The hospital abides with the NEMA regulations fully	2	5	3.53	0.70
The hospital waste disposal sites are safe to the community and environment	2	5	3.74	0.71
The hospitals has acquired the right trucks for the transportation of waste to disposal site	1	4	1.32	0.69
The hospital has valid licences of health care waste management at the National and County level.	2	5	3.75	0.65

On average, the respondents tended to agree ($4.5 \leq \mu < 3.5$) that the Government of Kenya laws on Health care waste management are well kept in their hospital (mean score=3.80), the hospital abides with the NEMA regulations fully (mean score=3.53) the hospital waste disposal sites are safe to the community and environment (mean score=3.74), and the hospital has valid licences of health care waste management at the National and County level (mean score=3.75). Additionally, the minimum values for each of these metrics was 2 and the maximum value was 5, implying that there were no strongly disagreed responses on any of the four metrics.

The responses for the four metrics were moderately distributed around the mean which implied that there was moderate consensus that on each of the metrics, that is The Government of Kenya laws on Health care waste management are well kept in this hospital (std. dev.=0.57), the hospital abides with the NEMA regulations fully (std. dev.=0.70), the hospital waste disposal sites are safe to the community and

environment (std. dev.=0.71), and the hospital has valid licences of health care waste management at the National and County level (std. dev.=0.65).

The respondents on average were inclined to agree ($4.5 \leq \mu < 3.5$) that they fully understand the rules and regulations pertaining to health care management in this hospital (Min=3; Mean score=4.21). On average, this metric scored the highest mean among the legal framework metrics and had a minimum score of 3 (no disagree or strongly disagree responses). This implied that among the legal framework metrics, fully understanding the rules and regulations pertaining to health care management is more critical in the hospital than the other metrics.

The respondents on average tended to strongly disagree ($1.5 \leq \mu < 1$) that the hospital has acquired the right trucks for the transportation of waste to disposal site (Min=1; Mean score=1.32). This could be as a result of the County Government privatization of waste disposal through Private Public Partnership arrangements and availability of incinerators and burning chambers in most of the hospitals. The responses were moderately distributed from the mean with standard deviation of 0.65 implying moderate consensus ($0.5 \leq \sigma X < 1$) that the hospital has acquired the right trucks for the transportation of waste to disposal site.

4.6 Technology used in HCWM

The aspect of technology used for health care waste management was examined in this study.

4.6.1 Frequency Distribution of Responses in Technology

The results were as shown in table 4.15.

Table 4.15; Frequency Distributions of Technology Used for HCWM

	SA (%)	A (%)	U (%)	D (%)	SD (%)
Waste segregation is carried out according to the set standards of operation in this hospital	24.1	66.7	9.2	0.0	0.0
Labelling of waste is done by trained people and with the right labels which are always available.	8.0	65.5	13.8	5.7	6.9
The hospital has in place all the necessary facilities that are needed to render waste harmless	5.7	71.3	10.3	6.9	5.7
The incinerator in the hospital is sufficient to handle all the hospital waste to be incinerated at any given time	2.3	52.9	41.4	3.4	0.0
The maintenance of the incinerator and or kiln is done appropriately by trained personnel.	2.3	18.4	62.1	17.2	0.0
The waste disposal methods are always healthy and safe to the users, the community and environment	5.7	60.9	29.9	3.4	0.0
The waste disposal personnel puts emphasis on environmental care	22.3	85.1	3.4	9.2	0.0
There is always smooth operation of the waste management from generation to disposal	5.7	67.8	23.0	0.0	3.4

Most of the respondents (66.7%) were inclined to agree that waste segregation is carried out according to the set standards of operation in their hospital which was affirmed by 24.1% of the respondents who were inclined to strongly agree on the same and no disagree (0.0%) and strongly disagree (0.0%) responses. Most of the respondents were inclined to agree that labelling of waste is done by trained people and with the right labels which are always available (65.5%), the hospital has in place all the necessary facilities that are needed to render waste harmless (71.3%), and the incinerator in the hospital is sufficient to handle all the hospital waste (52.9%). This was the same for 60.9% of the respondents who were inclined to agree that the waste disposal methods are always healthy and safe to the users, the community and environment, the waste disposal personnel puts emphasis on environmental care (85.1%), and there is always smooth operation of the waste management from generation to disposal (67.8%).

Most of the respondents were undecided (62.1%) on whether the maintenance of the incinerator and or kiln is done appropriately by trained personnel even though there were 18.4% and 2.3% who were inclined to agree and strongly agree respectively. None of the respondents strongly disagreed that the incinerator in the hospital is sufficient to handle all the hospital waste to be incinerated at any given time and is maintained appropriately by trained personnel. Additionally, none of the respondents were inclined to strongly disagree that waste disposal methods are always healthy and safe to the users, the community and environment, and the waste disposal personnel puts emphasis on environmental care.

4.6.2 Means and Standard Deviation of Technology in HCWM

The average influence of technology used for health care waste management was examined by getting the mean scores of the various metrics of the technology matrix and results presented in table 4.16.

Table 4.16; Means and Standard Deviation of Technology used for HCWM

	Min	Max	Mean	Std. Dev.
Waste segregation is carried out according to the set standards of operation in this hospital	3	5	4.15	0.56
Labelling of waste is done by trained people and with the right labels which are always available.	1.	5	3.62	0.97
The hospitals has in place all the necessary facilities that are needed to render waste harmless	1	5	3.64	0.91
The incinerator in the hospital is sufficient to handle all the hospital waste to be incinerated at any given time	2	5	3.54	0.61
The maintenance of the incinerator and or kiln is done appropriately by trained personnel.	2	5	3.06	0.67
The waste disposal methods are always health and safe to the users, the community and environment	1	5	3.66	0.74
The waste disposal personnel puts emphasis on	2	5	3.80	0.63

environmental care				
There is always smooth operation of the waste management from generation to disposal	1	5	3.72	0.73

On average, the respondents tended to agree ($4.5 \leq \mu < 3.5$) that waste segregation is carried out according to the set standards of operation in the hospital (mean score=4.15). This contradicted a Kenyan government's report in 2012 that revealed that good HCW segregation existed only in 27% of all the hospitals (GOK, 2008-2012). This is due to lack of proper and adequate disposal sites, and lack of proper technologies and disposal facilities, which leaves most of the waste to be mixed. To curb this, NEMA directs county governments to properly manage the disposal sites through the waste disposal projects (Department of Environmental Affairs, 2010). On average, the respondents tended to agree labelling of waste is done by trained people and with the right labels which are always available (mean score=3.62), and the hospital has in place all the necessary facilities that are needed to render waste harmless (mean score=3.64).

Additionally, the respondents on average tended to agree that the incinerator in the hospital is sufficient to handle all the hospital waste to be incinerated at any given time (mean score=3.54), there is always smooth operation of the waste management from generation to disposal (mean score=3.72), and the waste disposal methods are always healthy and safe to the users, the community and environment (mean score=3.66). The respondents on average tended to agree that the waste disposal personnel puts emphasis on environmental care (mean score=3.80).

The respondents tended on average to agree that the management of hospital waste requires its segregation and removal from the health care establishments in such a

way that it will not be a source of health hazards to those who are directly or indirectly related to the hospital environment. The hospital waste managers should bear in mind that this does not affect just the hospital staff and the waste handlers but it can be a health hazard to the entire community. This can happen in hospital and outside when the environment is affected negatively.

On the other hand, respondents were on average undecided ($3.5 \leq \mu < 2.5$), whether the maintenance of the incinerator and or kiln is done appropriately by trained personnel (mean score=3.06). When the mean scores were ranked from the highest scored mean to the lowest to get which metric had greater influence on waste management in the context of technology used for health care waste management, waste segregation according to the set standards of operation in the hospital ranked first. Additionally, the minimum value for this metric was 3 implying none of the respondents opposed this metric. This implied that more emphasis should be put on waste segregation according to the set standards of operation in the hospital than the other metrics of the technology matrix.

The responses for all the metrics on technology used for health care waste management were moderately distributed around the mean which implied that there was moderate consensus ($0.5 \leq \sigma_x < 1$) on all the metrics. This implied that there was moderate consensus that labelling of waste is done by trained people and with the right labels which are always available (std. dev.=0.97), the hospital has in place all the necessary facilities that are needed to render waste harmless (std. dev.=0.91), and waste disposal methods are always healthy and safe to the users, the community and environment (std. dev.=0.97).

Additionally, there was moderate consensus that there is always smooth operation of the waste management from generation to disposal (std. dev.=0.73), the maintenance of the incinerator and or kiln is done appropriately by trained personnel (std. dev.=0.67), the waste disposal personnel puts emphasis on environmental care (std. dev.=0.63), and the incinerator in the hospital is sufficient to handle all the hospital waste to be incinerated at any given time (std. dev.=0.61). There was however greater moderate consensus that waste segregation is carried out according to the set standards of operation in this hospital as its standard deviation was nearer the high consensus ($\sigma_x < 0.5$) threshold than the other metrics.

4.7 Training and Public Awareness

The study examined the training and public awareness on waste management in the hospitals by getting responses on various statements on this aspect.

4.7.1 Frequency Distribution of Training and Public Awareness in HCWM

The study examined the training and public awareness on waste management in the hospitals by getting responses on various statements on this aspect.

The results were presented in table 4.17.

Table 4.17; Frequency distributions of Training and Public Awareness in HCWM

	SA (%)	A (%)	U (%)	D (%)	SD (%)
Everyone handling hospital waste is taken through thorough training	5.7	59.8	27.6	0.0	6.9
The general Public understands well the risks of hospital waste	3.4	20.7	43.7	28.7	3.4
There are regular updates on handling hospital waste	5.7	79.3	9.2	2.3	3.4
The patients and clients visiting the hospital are well updated regularly on handling hospital waste	0.0	19.5	48.3	28.7	3.4
The community knows when to raise their	0.0	12.6	47.1	18.4	21.8

voice in case there's impending danger as a result of hospital waste					
Everyone visiting the hospital is actively involved in maintaining proper waste handling and are aware of where to put what waste	2.3	3.4	46.0	37.9	10.3
There are well labelled bins which everyone understands and uses them correctly	2.3	52.9	31.0	10.3	3.4
The community is well sensitized on the need of proper management of hospital waste	2.3	41.4	26.4	23.0	6.9
There are regular workshops and updates on hospital waste to the health workers	9.2	77.0	6.9	3.4	3.4

More than half of the respondents (59.8%) were inclined to agree that everyone handling hospital waste is taken through thorough training, there are regular updates on handling hospital waste (79.3%), there are well labelled bins which everyone understands and uses them correctly (52.9%), and there are regular workshops and updates on hospital waste to the health workers (77.0%).

Most of the respondents (41.4%) were inclined to agree that the community is well sensitized on the need of proper management of hospital waste, with an almost equal number of respondents undecided (26.4%) and inclined to disagree on the same (23.0%). Most of the respondents were not sure whether the general public understands well the risks of hospital waste, and whether everyone visiting the hospital is actively involved in maintaining proper waste handling and are aware of where to put what waste.

Besides there being no strong affirmation that the patients and clients visiting the hospital are well updated regularly on handling hospital waste and that the community knows when to raise their voice in case there's impending danger as a result of hospital waste, 19.5% and 12.6% of the respondents were inclined to agree with the statements. On the other hand, most of the respondents (48.3%) were not sure whether

the patients and clients visiting the hospital are well updated regularly on handling hospital waste. and whether the community knows when to raise their voice in case there's impending danger as a result of hospital waste (47.1%).

Means and Standard Deviation of Training and Public Awareness in HCWM

The results were presented in table 4.18.

Table 4.18; Means and Standard Deviation of Training and Public Awareness

	Min	Max	Mean	Std. Dev.
Everyone handling hospital waste is taken through thorough training	1	5	3.57	0.88
The general Public understands well the risks of hospital waste	1	5	2.92	0.88
There are regular updates on handling hospital waste	1	5	3.82	0.72
The patients and clients visiting the hospital are well updated regularly on handling hospital waste	1	4	2.84	0.78
The community knows when to raise their voice in case there's impending danger as a result of hospital waste	1	4	2.51	0.97
Everyone visiting the hospital is actively involved in maintaining proper waste handling and are aware of where to put what waste	1	5	2.40	0.82
There are well labelled bins which everyone understands and uses them correctly	1	5	3.40	0.84
The community is well sensitized on the need of proper management of hospital waste	1	5	3.09	1.00
There are regular workshops and updates on hospital waste to the health workers	1	5	3.85	0.77

On average, the respondents were inclined to agree ($4.5 \leq \mu < 3.5$) that everyone handling hospital waste is taken through thorough training (mean score=3.57). This was inconsistent with findings by WHO (2004), that many individuals in the management level in health care facilities leave the management of the health care waste to the poorly educated and lowest category of workers who are either not trained or have very little training if any. On average, the respondents were inclined to

agree that there are regular updates on handling hospital waste (mean score=3.82), and there are regular workshops and updates on hospital waste to the health workers (mean score=3.82).

On the other hand, the respondents were on average not sure whether the general public understands well the risks of hospital waste (mean score=2.92), and whether the patients and clients visiting the hospital are well updated regularly on handling hospital waste (mean score=2.84). Some studies have shown that there is limited awareness and knowledge on the importance of a clean and healthy environment which leads to mishandling of waste hence polluting the environment.

Similarly, the respondents were on average not sure whether the community knows when to raise their voice in case there's impending danger as a result of hospital waste (mean score=2.51). The public is also great in monitoring the activities and will be the first to raise a red flag when something goes wrong and when their health is at risk. Public concern about the medical wastes management has increased largely in the past few years on a global basis and a significant effort has been directed toward proper and safe management of hospital waste (Shineeet al, 2008).

The respondents were on average not sure whether everyone visiting the hospital is actively involved in maintaining proper waste handling and are aware of where to put what waste (mean score=2.40), and whether there are well labelled bins which everyone understands and uses them correctly (mean score=3.40). On average, the respondents were inclined to agree that the community is well sensitized on the need of proper management of hospital waste (mean score=3.09). This was consistent with

a study that noted that public concern about the medical wastes management has increased largely in the past few years on a global basis and a significant effort has been directed toward proper and safe management of hospital waste (Shinee et al, 2008).

The highest mean score when the mean scores were ranked was 3.85 which implied that on average, the respondents perceived regular workshops and updates on hospital waste to the health workers has greater influence on waste management in the hospitals than the other metrics of the training and awareness matrix.

The responses were distributed across all the 5 likert scale scores for all the metrics (Min=1; Max=5) except for two metrics which had no strongly agree responses (Max.=4). One of these metrics was the patients and clients visiting the hospital are well updated regularly on handling hospital waste. The other metric was the community knows when to raise their voice in case there's impending danger as a result of hospital waste.

The responses for the metrics of the training an awareness matrix were moderately distributed except for sensitization of the community on the need of proper management of hospital waste (std. dev.=1.00) which had widely distributed responses implying no consensus($\sigma_x \geq 1$) on the metric. This therefore implied that there was moderate consensus ($0.5 \leq \sigma_x < 1$) on all the other metrics, that is on everyone handling hospital waste is taken through thorough training (std. dev.=0.88), the general public understands well the risks of hospital waste (std. dev.=0.88), and there are regular updates on handling hospital waste (std. dev.=0.72).

Additionally, there was moderate consensus that the patients and clients visiting the hospital are well updated regularly on handling hospital waste (std. dev.=0.78), there are well labelled bins which everyone understands and uses correctly(std. dev.=0.97), and the community knows when to raise their voice in case there's impending danger as a result of hospital waste,(std. dev.=0.82). There was also moderate consensus that the community is well sensitized on the need of proper management of hospital waste (std. dev.=0.84), and there are regular workshops and updates on hospital waste to the health workers (std. dev.=0.77).

4.8 Health Care Waste Management

The Basel convention 1992, ratified in 2002, where Kenya is a member, puts the responsibility of waste management to the polluter that is the health facility.

Performance of Health Care Waste Management

The study sought to examine the status of health care waste management in public hospitals. This was done by rating the performance of the healthcare waste management in public hospitals on a five point Likert scale of 1,2,3,4,5 corresponding to Very Good, Good, Fair, Poor, and Very Poor respectively, and results shown in table 4.19.

Table 4.19; Table Showing Performance of Health Care Waste Management

	Frequency	Percentage
Very Good	0	0.0%
Good	31	35.6%
Fair	56	64.4%
Poor	0	0.0%
Very Poor	0	0.0%
Total	87	100.0%

More than half of the respondents were inclined to give a fair rating (64.4%) of the performance of the healthcare waste management in public hospitals, while 35.6%

gave rated the performance as good. None of the respondents rated the performance of the healthcare waste management in public hospitals as very good, poor, or very poor (0.0% each).

4.8.1 Need for Improvement in Healthcare Waste Management

The study sought to determine whether there is need for improvement on the way healthcare waste is managed in the respondents' hospital. All the respondents (100.0%) affirmed that there is need for improvement on the way healthcare waste is managed in their hospitals, as shown in table 4.20.

Table 4.20; Table Showing Need for Improvement in Healthcare Waste Management

	Frequency	Percentage
Yes	87	100.0%
No	0	0.0%
Total	87	100.0%

4.9 Inferential Statistics

The inferential statistics are used to make judgments of the probability that an observed difference between groups is a dependable one, or it happened by chance (Saunders, Lewis, & Thornhill, 2009). The multiple linear regression was used to get the inferential statistics of this study. In this context, the composite variables of existing system, legal framework, technology, and training and public awareness (independent variables) were regressed against performance of HCWM (dependent variable). The summary results for this model were presented in table 4.21.

Table 4.21; Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.469 ^a	.220	.181	.436

a. Predictors: (Constant), TrainingandAwareness, ExistingSystem, Technology, LegalFramework

The correlation coefficient denoted as R, of 0.469 indicated that the four independent variables (existing system, legal framework, technology, and training and public awareness) were positively correlated with performance of HCWM. The coefficient of determination denoted as R², was used to determine the level of variation in the dependent variable which could be accounted for by the independent variables. The R² for this model was 0.220 (22.0%) which implies that 22.0% variation in the performance of HCWM can be accounted for by the existing system in HCWM, legal framework on HCWM, technology used for HCWM, and training and public awareness on HCWM. Hence 78.0% of the variation in the performance of HCWM is due to other factors not considered in this model.

The viability of the regression model was determined by the ANOVA, with results shown in table 4.22.

Table 4.22; ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	4.380	4	1.095	5.766	.000 ^b
Residual	15.574	82	.190		
Total	19.954	86			

a. Dependent Variable: How can you rate the performance of the health care waste management in this setup?

b. Predictors: (Constant), TrainingandAwareness, ExistingSystem, Technology, LegalFramework

The threshold for viability was a p value of 0.05 which indicated that there was only a 5.0% likelihood or probability of the regression model giving a wrong prediction.

This regression model gave a p value of 0.000 (p<0.05) which was less than 0.05 threshold therefore the model was deemed reliable.

The beta coefficients of the independent variables, that is, existing system, legal framework, technology, and training and public awareness were examined to find out

the effect of each individual independent variable on the dependent variable. These coefficients were as shown in table 4.23.

Table 4.23; Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.415	.400		6.039	.000
ExistingSystem	-1.390	.510	-.310	-2.724	.008
1 LegalFramework	.426	.247	.388	1.722	.089
Technology	.171	.204	.174	.837	.405
TrainingandAwar reness	-.170	.133	-.208	-1.276	.205

Dependent Variable: How can you rate the performance of the health care waste management in this setup?

The resulting regression model was;

$$\text{Performance of HCWM} = 2.415 - 1.390 (\text{Existing System}) + 0.426 (\text{Legal Framework}) + 0.171(\text{Technology}) - 0.170 (\text{Training and Public Awareness})$$

In the context of the legal framework on healthcare waste management, the regression model gave a coefficient of 0.426. This implies that if the legal framework on healthcare waste management is increased by a unit with the other factors held constant, the performance of HCWM will increase by 0.426. In the context of technology used for healthcare waste management, the regression model gave a coefficient of 0.171. This implies that if the technology used in healthcare waste management is increased by a unit with the other factors held constant, the performance of HCWM will increase by 0.171. In the context of training and public awareness on healthcare waste management, the regression model gave a coefficient of -0.170. This implies that if the training and public awareness on healthcare waste management is increased by a unit with the other factors held constant, the performance of HCWM will decrease by 0.170.

In the context of the existing system in healthcare waste management, the regression model gave a coefficient of -1.390. This implies that if the existing system on healthcare waste management is increased by a unit with the other factors held constant, performance of HCWM will decrease by 1.390. This therefore implies that only the legal framework on healthcare waste management and the technology used for healthcare waste management have a positive influence on the performance of healthcare waste management in public hospitals.

4.10 Discussions of Findings

All the respondents (100%) said the segregation of waste is done by all health workers. This therefore implies that the responsibility of segregating waste is vested in all the health workers.

Most of the respondents said that waste management is done by sterilization (12.6%), use of chemical (JIK) (93.1%), incineration (64.4%) and burning chamber (39.1%). This was consistent with Fiedler (1998), who noted that incineration is largely used in hospitals and should be undertaken by facilities which meet the requirements in Third schedule of the Environment Management and Coordination (Waste management) regulations of 2006. Use of chemical (JIK) is the most used method of waste management in the existing system among the methods that were under investigation. 39.1% of the respondents (mostly dispensaries) said the burning chamber is used for waste management in the existing system. A study in Tanzania noted that the main waste management methods were open pit burning (50%) and burying (30%) of the waste. A large proportion (71%) of the hospitals used dust bins for transporting waste from generation points to incinerator without plastic bags yet most hospitals had low

incineration capacity, with few of them having fire brick incinerators being done by untrained casual labourers.

Slightly more than half of the respondents (51.7%) said that the hospital has an incinerator. The respondents who said their hospital uses an incinerator as a waste management method but don't have one in the hospital were 48.3%. Colin (1998), noted that controlled air incinerators are the ones largely used since they are easily affordable in terms of capital, operation and maintenance as well as meeting existing air standards with or without air pollution controls. Most of the private health setups in Nakuru county e.g. Private laboratories, some private hospitals and clinics take their waste for incineration to the Rift Valley Provincial General Hospital which is usually done at a fee.

On average, the respondents tended to agree ($4.5 \leq \mu < 3.5$) that the Government of Kenya laws on Health care waste management are well kept in their hospital (mean score=3.80), the hospital abides with the NEMA regulations fully (mean score=3.53) the hospital waste disposal sites are safe to the community and environment (mean score=3.74), and the hospital has valid licences of health care waste management at the National and County level (mean score=3.75). Additionally, the minimum values for each of these metrics was 2 and the maximum value was 5, implying that there were no strongly disagreed responses on any of the four metrics.

The responses for the four metrics were moderately distributed around the mean which implied that there was moderate consensus that on each of the metrics, that is The Government of Kenya laws on Health care waste management are well kept in

this hospital (std. dev.=0.57), the hospital abides with the NEMA regulations fully (std. dev.=0.70), the hospital waste disposal sites are safe to the community and environment (std. dev.=0.71), and the hospital has valid licences of health care waste management at the National and County level (std. dev.=0.65).

On average, the respondents tended to agree ($4.5 \leq \mu < 3.5$) that waste segregation is carried out according to the set standards of operation in the hospital (mean score=4.15). This contradicted a Kenyan government's report in 2012 that revealed that good HCW segregation existed only in 27% of all the hospitals (GOK, 2008-2012). This is due to lack of proper and adequate disposal sites, and lack of proper technologies and disposal facilities, which leaves most of the waste to be mixed. To curb this, NEMA directs county governments to properly manage the disposal sites through the waste disposal projects (Department of Environmental Affairs, 2010). On average, the respondents tended to agree labelling of waste is done by trained people and with the right labels which are always available (mean score=3.62), and the hospital has in place all the necessary facilities that are needed to render waste harmless (mean score=3.64).

On average, the respondents were inclined to agree ($4.5 \leq \mu < 3.5$) that everyone handling hospital waste is taken through thorough training (mean score=3.57). This was inconsistent with findings by WHO (2004), that many individuals in the management level in health care facilities leave the management of the health care waste to the poorly educated and lowest category of workers who are either not trained or have very little training if any. On average, the respondents were inclined to agree that there are regular updates on handling hospital waste (mean score=3.82),

and there are regular workshops and updates on hospital waste to the health workers (mean score=3.82).

On the other hand, the respondents were on average not sure whether the general public understands well the risks of hospital waste (mean score=2.92), and whether the patients and clients visiting the hospital are well updated regularly on handling hospital waste (mean score=2.84).

Similarly, the respondents were on average not sure whether the community knows when to raise their voice in case there's impending danger as a result of hospital waste (mean score=2.51).

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS, RECOMMENDATIONS
AND SUGGESTIONS

5.1 Introduction

The study sought to find out what factors influence waste management in public hospitals in Nakuru County, Kenya. The objectives that guided this study were to assess the existing system of health care waste management in Nakuru County hospitals and to assess the legal framework in place for the waste management in Nakuru County hospitals. The other objectives guiding the study were to determine the technology used in management of the health care waste in Nakuru County hospitals, as well as to review existing training and public awareness programmes on health care waste management in Nakuru County hospitals.

5.2 Summary of Findings

The objectives of the study were examined to form the basis of the summary. In existing system, all the respondents (100%) concur that the segregation of waste is done by all health workers. In the context of labelling of waste, a resounding majority of 90.8% of the respondents said it is the health workers who label waste. 5.7% of the respondents said that labelling of waste is done by waste handlers while 3.4% of the respondents don't know who labels the waste. The responsibility of the actual disposal of waste is given to casual laborers as was the opinion of most of the respondents (97.7%). A negligible percentage (2.3%) of respondents said trained personnel are involved in the actual disposal of hospital waste. Labelling of waste is done where it is generated as supported by most of the respondents (87.4%). No labelling of waste is done at the storage place (0.0% respondents), and 6% of the respondents said labelling of waste is done at the site of segregation. In the context of

how often waste is collected and disposed of, 3.4% of the respondents said they do not know often waste is collected and disposed of while 6.9% said that it is collected and disposed of once a day. Waste in the hospitals is collected and disposed of as needed as supported by most of the respondents (89.7%).

Most of the respondents said that waste management is done by sterilization (12.6%), use of chemical (JIK) (93.1%), incineration (64.4%) and burning chamber (39.1%). Use of chemical (JIK) is the most used method of waste management in the existing system among the methods that were under investigation. 39.1% of the respondents said the burning chamber is used for waste management in the existing system. Slightly more than half of the respondents (51.7%) said that the hospital has an incinerator. The respondents who said their hospital uses an incinerator as a waste management method but don't have one in the hospital were 48.3%.

The average perception of the respondents on the legal framework of healthcare waste management in their hospitals was of interest in this study. On average, the respondents tended to agree ($4.5 \leq \mu < 3.5$) that the Government of Kenya laws on Health care waste management are well kept in their hospital, the hospital abides with the NEMA regulations fully, the hospital waste disposal sites are safe to the community and environment, and the hospital has valid licences of health care waste management at the National and County level. Additionally, the minimum values for each of these metrics was 2 and the maximum value was 5, implying that there were no strongly disagreed responses on any of the four metrics.

The responses to the four metrics were moderately distributed around the mean which implied that there was moderate consensus ($0.5 \leq \sigma X < 1$) amongst the respondents that the Government of Kenya laws on Health care waste management are well kept in their hospital and the hospital abides with the NEMA regulations fully. Similarly, there was moderate consensus amongst the respondents that the hospital waste disposal sites are safe to the community and environment, and the hospital has valid licences of health care waste management at the National and County level (std. dev.=0.65).

The respondents on average were inclined to agree ($4.5 \leq \mu < 3.5$) that they fully understood the rules and regulations pertaining to health care management in this hospital (Min=3; Mean score=4.21). On average, this metric scored the highest mean among the legal framework metrics and had a minimum score of 3 (no disagree or strongly disagree responses). This implied that among the legal framework metrics, fully understanding the rules and regulations pertaining to health care management is more critical in the hospital than the other metrics. The responses were moderately distributed from the mean implying moderate consensus ($0.5 \leq \sigma X < 1$) that respondents fully understand the rules and regulations pertaining to health care management in their hospital.

The respondents on average tended to strongly disagree ($1.5 \leq \mu < 1$) that the hospital has acquired the right trucks for the transportation of waste to disposal site. The responses were moderately distributed from the mean with standard deviation of 0.65 implying moderate consensus ($0.5 \leq \sigma X < 1$) that the hospital has acquired the right trucks for the transportation of waste to disposal site.

The average influence of technology used for health care waste management was examined by getting the mean scores of the various metrics of the technology matrix. On average, the respondents tended to agree ($4.5 \leq \mu < 3.5$) that waste segregation is carried out according to the set standards of operation in the hospital, labelling of waste is done by trained people and with the right labels which are always available, and the hospital has in place all the necessary facilities that are needed to render waste harmless. Similarly, the respondents on average tended to agree that the incinerator in the hospital is sufficient to handle all the hospital waste to be incinerated at any given time and there is always smooth operation of the waste management from generation to disposal. Additionally, the respondents on average tended to agree that the waste disposal methods are always healthy and safe to the users, the community and environment, and the waste disposal personnel puts emphasis on environmental care.

On the other hand, respondents were on average undecided ($3.5 \leq \mu < 2.5$), whether the maintenance of the incinerator and or kiln is done appropriately by trained personnel (mean score=3.06). When the mean scores were ranked from the highest scored mean to the lowest to get which metric had greater influence on waste management in the context of technology used for health care waste management, waste segregation according to the set standards of operation in the hospital ranked first. Additionally, the minimum value for this metric was 3 implying none of the respondents opposed this metric. This implied that more emphasis should be put on waste segregation according to the set standards of operation in the hospital than the other metrics of the technology matrix.

The responses for all the metrics on technology used for health care waste management were moderately distributed around the mean which implied that there was moderate consensus ($0.5 \leq \sigma_X < 1$) on all the metrics. This implied that there was moderate consensus on each metric. There was however greater moderate consensus that waste segregation is carried out according to the set standards of operation in this hospital as its standard deviation was nearer the high consensus ($\sigma_X < 0.5$) threshold than the other metrics.

The study examined the average influence of training and public awareness on waste management in the hospitals by getting the mean scores of various statements on this aspect. The standard deviations of the various metrics on training and awareness were used to examine the distribution of responses from the mean hence the level of consensus on a given metric. On average, the respondents were inclined to agree ($4.5 \leq \mu < 3.5$) that everyone handling hospital waste is taken through thorough training, there are regular updates on handling hospital waste, the community is well sensitized on the need of proper management of hospital waste, and there are regular workshops and updates on hospital waste to the health workers.

On the other hand, the respondents were on average not sure ($3.5 \leq \mu < 4.5$) whether the general public understands well the risks of hospital waste and whether the patients and clients visiting the hospital are well updated regularly on handling hospital waste. Additionally, the respondents were on average not sure whether the community knows when to raise their voice in case there's impending danger as a result of hospital waste, whether everyone visiting the hospital is actively involved in maintaining proper waste handling and are aware of where to put what waste, and

whether there are well labelled bins which everyone understands and uses them correctly. The highest mean score when the mean scores were ranked was 3.85 which implied that on average, the respondents perceived regular workshops and updates on hospital waste to the health workers has greater influence on waste management in the hospitals than the other metrics of the training and awareness matrix.

The responses were distributed across all the 5 likert scale scores for all the metrics (Min=1; Max=5) except for the patients and clients visiting the hospital are well updated regularly on handling hospital waste, the community knows when to raise their voice in case there's impending danger as a result of hospital waste, which had no strongly agree responses (Max. =4). The responses for the metrics of the training an awareness matrix were moderately distributed except for sensitization of the community on the need of proper management of hospital waste (std. dev.=1.00) which had widely distributed responses implying no consensus($\sigma X \geq 1$) on the metric. This therefore implied that there was moderate consensus ($0.5 \leq \sigma X < 1$) on all the other metrics, that is on everyone handling hospital waste is taken through thorough training, the general public understands well the risks of hospital waste, and there are regular updates on handling hospital waste (std. dev.=0.72).

Additionally, there was moderate consensus that the patients and clients visiting the hospital are well updated regularly on handling hospital waste, there are well labelled bins which everyone understands and uses correctly, and the community knows when to raise their voice in case there's impending danger as a result of hospital waste. There was also moderate consensus that the community is well sensitized on the need

of proper management of hospital waste, and there are regular workshops and updates on hospital waste to the health workers.

The study sought to examine the status of health care waste management in public hospitals. More than half of the respondents were inclined to give a fair rating (64.4%) of the performance of the healthcare waste management in public hospitals, while 35.6% gave rated the performance as good. None of the respondents rated the performance of the healthcare waste management in public hospitals as very good, poor, or very poor (0.0% each).

5.3 Conclusions

The study concluded that legal framework on healthcare management in the hospitals has a positive influence on performance of health care waste management. On average, the respondents tended to agree that the Government of Kenya laws on Health care waste management are well kept in their hospital, the hospital abides with the NEMA regulations fully, the hospital waste disposal sites are safe to the community and environment, and the hospital has valid licences of health care waste management at the National and County level.

The study also concluded that the technology used for health care management in the hospitals has a positive influence on performance of health care waste management. The responses for all the metrics on technology used for health care waste management were moderately distributed around the mean which implied that there was moderate consensus on each metric. There was however greater moderate consensus that waste segregation is carried out according to the set standards of operation meaning greater emphasis should be put on segregation.

However, the study concluded that training and public awareness on waste management has a negative influence on performance of health care waste management. There was moderate consensus that the community is well sensitized on the need of proper management of hospital waste, and there are regular workshops and updates on hospital waste to the health workers.

Additionally, the study concluded that the existing system in health care waste management has a negative influence on health care waste management. However, the study found out that most of the hospitals were using either an incinerator or a burning chamber while using chemical, JIK as the main agent of rendering waste harmless.

Ranking the factors influencing performance of health care management in hospitals on order of influence resulted in the conclusion that the legal framework had greater influence on performance of health care waste management in the hospital.

5.4 Recommendations

The study recommended that the legal framework on health care waste management should be emphasized in order to improve on performance of health care waste management in hospitals. The study further recommended that the rules and regulations pertaining to health care management in the hospitals be adhered to so as to improve performance of health care waste management in hospitals. Additionally, the study recommends that waste segregation be done according to the set standards of operation so as to improve on performance of health care waste management in the hospitals. In the context of training, the study recommends that health workers be updated on how to handle hospital waste. Regular workshops should also be held in order to educate the health workers on hospital waste and its management.

5.5 Suggestions for Further Studies

The study suggests for further studies an examination of the role of training and public awareness on waste management in the performance of health care waste management in hospitals.

The study also suggests further studies on management of expired medicines as part of the HCW.

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APPENDIX 1: LETTER TO RESPONDENTS

Lucy NyamburaMugo,
University of Nairobi,
NakuruExtra-Mural Centre
NAKURU

Dear Respondent,

I am a student at the University of Nairobi pursuing a Master's Degree in Project Planning and management. I am carrying out a research study on the factors influencing waste management in Public Hospitals in Nakuru County. To make this study a success, I kindly request for your participation by answering this questionnaire booklet. Please note that the information obtained from you will be used for the purpose of this research only and will be treated with utmost confidentiality.

Thank you for your cooperation and support.

Yours sincerely,

Lucy N. Mugo

L50/79807/2015

APPENDIX 2: LETTER FROM UNIVERSITY



UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
DEPARTMENT OF EXTRA - MURAL STUDIES

Tel 051 - 2210863

P. O Box 1120, Nakuru
27th April 2017

Our Ref: UoN/CEES/NKUEMC/1/12

To whom it may concern:



RE: LUCY NYAMBURA MUGO– L50/79807/2015

The above named is a student of the University of Nairobi at Nakuru Extra-Mural Centre Pursuing a Masters degree in Project Planning and Management.

Part of the course requirement is that students must undertake a research project during their course of study. She has now been released to undertake the same and has identified your institution for the purpose of data collection on "Factors Influencing Waste Management in Public Hospitals in Nakuru County, Kenya."

The information obtained will strictly be used for the purpose of the study.

I am for that reason writing to request that you please assist her.

Yours faithfully,


RESIDENT LECTURER
Mumo Mwaere
P.O. Box 1120
NAKURU
UNIVERSITY OF NAIROBI
Nakuru Extra-Mural Centre

APPENDIX 3: LETTER FROM NACOSTI



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

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Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/17/87548/17209**

Date: **27th June, 2017**


Lucy Nyambura Waweru
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Factors influencing waste management in public hospitals in Nakuru County,”* I am pleased to inform you that you have been authorized to undertake research in **Nakuru County** for the period ending **22nd June, 2018.**

You are advised to report to **the County Commissioner, the County Director of Education and the County Director of Health Services, Nakuru County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.


GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:


The County Commissioner
Nakuru County.

The County Director of Education
Nakuru County.

The County Director of Health Services
Nakuru County.

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APPENDIX 4: TURNITIN REPORT

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FACTORS INFLUENCING WASTE MANAGEMENT IN PUBLIC HOSPITALS IN NAKURU COUNTY, KENYA by Lucy N. Mugo
From FACTORS INFLUENCING WASTE MANAGEMENT IN PUBLIC HOSPITALS IN NAKURU COUNTY, KENYA (Innovative resources)

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APPENDIX 5: QUESTIONNAIRE

As part of the requirement for my course, I will be conducting a study on the “Factors Influencing Waste Management in Public hospitals in Nakuru County”. You have been chosen to be part of the study. Kindly provide the needed information. This study is for academic purpose hence confidentiality is guaranteed.

Section A: Background information

1. Name of the Hospital:

.....

2. Hospital Level (Tier)

Tier 2 (Dispensary) { }

Tier 3 (Health Centre) { }

Tier 4 (Major Hospital) { }

3. Department;

Administrator { }

Infection control unit { }

Waste management unit { }

Head of Housekeeping { }

Public Health Officer { }

Support staff { }

Other (Please Specify)

4. Approximately how many patients/clients are attended to per day in this hospital?

10-20 { } 21-30 { } 31-40 { } 41-50 { } Over 50 { }

5. How long have you been in this hospital?

6months to year { } 1-5 Years { } 6-11 Years { }

12-17 Years { } 18 years and above { }

6. How long have you worked in this capacity?

6months to year { } 1-5 Years { } 6-11 Years { }

12-17 Years { } 18 years and above { }

7. Have you always been involved in the waste management in the hospital?

Yes { } No { }

8. If yes to No. 7, how have you been involved?

.....

Section B: Existing system

9. Do you understand clearly the system used by the hospital in waste management?

Yes { } No { } I don't know { }

10. Who does the segregation of waste?

Hospital administrators { } All the health workers { }

Waste management team { } I don't know { }

11. Who labels the waste?

Waste handlers { } Health workers { } I don't know { }

12. Where is the labelling of waste done?

At the site of segregation { } At the storage place { } Where generated { }

13. Which methods are used in dealing with waste management in this set up?

(Please tick all that apply)

Sterilization { } Use of chemical (JIK) { } Incineration { } Burying { }

Other

If you have ticked incinerator, does this hospital have one?

Yes { } No { }

Other

14. Who are involved in the actual disposal of the hospital waste?

Sanitary staff { } Casual labourers { } Trained personnel { }

I don't know { }

Others

15. How often is waste collected and disposed of?

Once a day { } As needed { } I don't know { }

Section C: Legal Framework

Kindly indicate the extent to which you agree with the following statements on Legal Framework on HCWM in this hospital.

Key: 5=Strongly Agree (SA), 4=Agree (A), 3=Neutral (N), 2=Disagree (D), 1=Strongly Disagree (SD)

No	Statement	5 SA	4 A	3 N	2 D	1 SD
15.	I fully understand the rules and regulations pertaining to health care management in this hospital					
16.	The Government of Kenya laws on Health care waste management are well kept in this hospital					
17.	The hospital abides with the NEMA regulations fully					
18.	The hospital waste disposal sites are safe to the community and environment					
19.	The hospitals has acquired the right trucks for the transportation of waste to disposal site					
20.	The hospital has valid licences of health care waste management at the National and County level.					

Section D: Technology

Kindly indicate the extent to which you agree with the following statements on the technology used for health care waste management in this hospital

Key: 5=Strongly Agree (SA), 4=Agree (A), 3=Neutral (N), 2=Disagree (D), 1=Strongly Disagree (SD)

No	Statement	5 SA	4 A	3 N	2 D	1 SD
16.	Waste segregation is carried out according to the set standards of operation in this hospital					
17.	Labelling of waste is done by trained people and with the right labels which are always available.					
18.	The hospitals has in place all the necessary facilities that are needed to render waste harmless					
19.	The incinerator in the hospital is sufficient to handle all the hospital waste to be incinerated at any given time					
20.	The maintenance of the incinerator and or kiln is done appropriately by trained personnel.					
21.	The waste disposal methods are always health and safe to the users, the community and environment					
22.	The waste disposal personnel puts emphasis on environmental care					
23.	There is always smooth operation of the waste management from generation to disposal					

In your own opinion, explain briefly what should be done to improve on the technology used.

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.....

Section E: Training and Public awareness

Kindly indicate the extent to which you agree with the following statements on training and public awareness on waste management in this hospital.

Key: 5=Strongly Agree (SA), 4=Agree (A), 3=Neutral (N), 2=Disagree (D),

1=Strongly Disagree (SD)

No	Statement	5	4	3	2	1
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		SA	A	N	D	SD
24.	Everyone handling hospital waste is taken through thorough training					
25.	The general Public understands well the risks of hospital waste					
26.	There are regular updates on handling hospital waste					
27.	The patients and clients visiting the hospital are well updated regularly on handling hospital waste					
28.	The community knows when to raise their voice in case there's impending danger as a result of hospital waste					
29.	Everyone visiting the hospital is actively involved in maintaining proper waste handling and are aware of where to put what waste					
30.	There are well labelled bins which everyone understands and uses them correctly					
31.	The community is well sensitized on the need of proper management of hospital waste					
32.	There are regular workshops and updates on hospital waste to the health workers					

What do you think should be done to improve training and public awareness on hospital waste management?

.....

.....

Section F: HCWM in public hospitals

33. How can you rate the performance of the health care waste management in this setup?

Very Good { }

Good { }

Fair { }

Poor { }

Very Poor { }

34. Do you think there is need for improvement on the way healthcare waste is managed in this hospital?

Yes { }

No { }

Thank you for taking time to fill this questionnaire.