THE MODERATING EFFECT OF ORGANIZATIONAL SIZE ON THE RELATIONSHIP BETWEEN INTERNAL & EXTERNAL FACTORS OF ORGANIZATIONS AND MEDICAL WASTE MANAGEMENT PRACTICES IN SOUTHERN LIBYAN HOSPITALS

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DOCTOR OF PHILOSOPHY

UNIVERSITI UTARA MALAYSIA

October 2017

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Thesis Submitted to

School of Technology Management and Logistics,

University Utara Malaysia,

In Fulfillment of the Requirements for the Degree of Doctor of Philosophy

Kolej Perniagaan
(College of Business)
Universiti Utara Malaysia

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(Title of the Thesis / Dissertation) : **The Moderating Effect of Organizational Size on The Relationship Between Internal & External Factors of Organizations and Medical Waste Management Practices in Southern Libyan Hospitals.**

Program Pengajian
(Programme of Study) : **Doctor of Philosophy**

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ABSTRACT

The global debate on medical waste management practices is ongoing and well documented in the literature. While some scholars opine that medical waste management is generally lagging behind other industries in terms of practices, others contend that this claim does not reflect the actual condition of the industry which is reasonably done to a certain extent. With respect to identifying the current medical waste management practices in Libya which is experiencing similar problems, this research aims at examining the internal and external factors that have been found to significantly influence medical waste management practices. The objective of this research is to identify the organizational internal and external factors that influence their waste management practices. A proportionate stratified simple random sampling was used to select two hundred and ten respondents from the targeted hospitals in five states in Libya. A total of one-hundred and seventy-one duly completed and valid questionnaires were returned, yielding approximately eighty-one percent response rate. Statistical Package for the Social Sciences (SPSS) analysis were utilised to achieve the research objectives. This research has found that organizational structure, culture, external factors have strong and positive relationships with medical waste management practices. The correlation analysis carried out between the medical waste management practices and, centralization, formalization, individualism vs collectivism and power distance do not establish any significant relationships with segregation respectively. The findings of this research indicate that the moderating effect of organizational size only establishes the relationship between government policy and medical waste management practices. This research therefore, recommends for future studies to look for additional independent variables so that the moderating effects appears to be more significant.

Keywords: Organizational structure, Organizational culture, External factors and Medical waste management practices

ABSTRAK

Amalan pengurusan sisa perubatan sedang diperdebatkan secara global dan didokumentasikan dengan baik dalam literatur. Walaupun para cendiakawan berpendapat bahawa pengurusan sisa perubatan biasanya agak ketinggalan berbanding industri lain dari segi amalan, cendiakawan lain berpendapat bahawa hal ini tidak mencerminkan keadaan sebenar industri yang wajar berlaku pada tahap tertentu. Berhubung dengan pengenalpastian amalan pengurusan sisa perubatan semasa di Libya yang mengalami masalah yang sama, kajian ini bertujuan untuk menyelidik faktor dalaman dan luaran yang mempengaruhi amalan pengurusan sisa perubatan secara signifikan. Objektif penyelidikan ini adalah untuk mengenalpasti faktor dalaman dan luaran organisasi yang mempengaruhi amalan pengurusan sisa perubatan. Pensampelan mudah rawak berstrata yang sesuai digunakan untuk memilih dua ratus sepuluh responden dari hospital yang disasarkan di lima buah negeri di Libya. Seramai seratus tujuh puluh satu borang soal selidik yang lengkap dan sah telah dikembalikan, menghasilkan kira-kira lapan puluh satu peratus. Analisis Pakej Statistik untuk Sains Sosial (SPSS) digunakan untuk mencapai matlamat penyelidikan. Kajian ini mendapati bahawa struktur organisasi, budaya, dan faktor luaran mempunyai hubungan yang kuat dan positif dengan amalan pengurusan sisa perubatan. Analisis korelasi yang dijalankan antara amalan pengurusan sisa perubatan dan, pemusatan, pemformalan, individualisme lawan kolektivisme dan jarak kuasa tidak menetapkan sebarang perhubungan yang signifikan dengan pemisahan masing-masing. Penemuan kajian ini menunjukkan bahawa kesan pengantaraan saiz organisasi hanya mewujudkan hubungan antara dasar kerajaan dengan amalan pengurusan sisa perubatan. Oleh itu, penyelidikan ini mencadangkan agar kajian pada masa hadapan mencari pemboleh ubah bebas tambahan supaya kesan pengantaraan kelihatan lebih signifikan.

Kata kunci: Struktur organisasi, budaya organisasi, faktor luaran, amalan pengurusan sisa perubatan

ACKNOWLEDGEMENT

First and foremost, I am grateful to the Almighty Allah for giving me the opportunity to complete my PhD thesis. In completing this thesis, I owe a debt of gratitude and thanks to many persons that have supported me throughout this difficult yet challenging journey. While being thankful to all of them, I must register my gratitude to some in particular. First and foremost, I would like to express my deepest and special appreciation to my supervisors, Dr. Ahmad Yusni Bahaudin, and Dr. Ahmed Mohammed Kamaruddeen. They have been very patient in guiding and supporting me from the very beginning of my first arrival here in Malaysia and throughout the production of this thesis. Also, they have helped me immensely focus my thought and ideas towards the completion of my study. Honestly, I consider them my supervisors, friends and family in Malaysia.

I would like to thank my family members. My gratitude goes to the soul of my father, Khalifa Abdelsalam, my wise teacher in this life, and soul of my mother, Fatima Abosalah for her soft heart and genuine love.

Finally, I would like also to extend my thanks and appreciation to all of my teachers, friends and colleagues who have contributed in one way or another to help me complete this thesis successfully.

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CHAPTER ONE

1.1 Research Background

The Regional office of World Health Organisation (WHO) in Europe organized a meeting of concerned individuals in 1983, at Bergen, Norway and that was the first time medical waste issue was discussed. The danger of improper management of medical waste was brought to spotlight. The investigation made at that time by the Environment Protection Agency (EPA) USA culminated in the passing of the Medical Waste Tracking Act (MWTA) Nov. 1988. This makes USA a pioneer regarding the issue of waste management (Practitioner, 2001).

In recent time, there has been an increase of attention on the issue of medical waste from medical care facilities (i.e. pharmacies, pathology laboratories, clinics, hospitals, and other healthcare services) the world over (Van, Den, Bos & Izadpanah, 2002).

This is due to the fact that waste from Medical Care Facilities (MCFs), emanating mostly from hospitals and medical centres, is potentially hazardous, since it could spread virus because of its infectious nature, and/or due to the misappropriate management of medical solid waste, it may lead to damage of health (El-Salam, 2010; Al-Khatib & Sato, 2009). In recent years, there has been an increase in the concern cross the glob world on the need for proper management of medical care waste (Shinee et al., 2008). Medical care waste is a serious issue because it is detrimental to the wellbeing of people and the environment. The risks are arising from human excremental and excretion, sharps, body parts and other relevant infectious materials (Bavja et al., 2000).

In the same vein, approximately 15%-25% (weight) of healthcare wastes are believed to be infectious (Shinee et al., 2008).

In the year 2002, WHO made a survey on the issue of the management of medical care waste in 22 developed countries. The results of the survey indicate that the percentage of healthcare institutions that do not use appropriate means of waste removal ranges from 18% to 64% (WHO, 2005). That is why most of the previous studies suggest that healthcare workers should increase their vigilance in the field since most of them are not experts in healthcare waste management (Coker et al., 2009; Diaz et al., 2008; Shinee et al., 2008). Shinee et al (2008) argued that such workers employ misappropriate methods when collecting and sorting waste.

It is obvious that improper management of medical waste is a great dilemma for several medical institutions in developing countries, this appears in the form of health hazards and environmental pollution and contamination (Bdour et al., 2007; Coker et al., 2009). Rushbrook et al (2000) argued that the World Health Organisation (WHO) advocated that waste from medical care facilities should be treated carefully and with speciality in specialized way. Undoubtedly, to protect our ecological environment, the first step is to regulate such hazardous waste in environmentally reasonable and sound manner (Misra, 2005). Also, the Environmental Protection Agency of the United States of America (USA) categorised such waste as dangerous and hazardous (Agency, 1991). Moreover, the USA, Britain Canada and other countries of the developed world have devised codes, and legislations that serve as guidelines for the good practice of healthcare waste. They have also explained the range of possible and appropriate methods of transporting, collecting, storing and disposing of such waste. The best accessible equipment and technologies are utilised for the upgrading of methods for the correct disposal of medical care waste with the smallest amount of risk to human health and the environment (Tudor et al., 2005).

While most developing countries are faced with the challenges of managing healthcare waste, this research focuses on influence of organizational internal and external factors that may positively or negatively affect the management of medical waste management in Libya.

Libya has been evolving in environmental development and also faces waste problems. Therefore, some effort needs to be made in order to successful control, by mean of education and enlightening programs and events for the workers and staff that involved in handling medical waste. However, in Libya, as is the case in other countries of the developing world, healthcare waste has not been receiving sufficient attention, meaning that waste is still dangerous and is treated together with domestic waste. Consequently this leads to a greater health risk to the general public, and the environment as a whole (Silva et al., 2005). Such an approach (disposing of medical and domestic waste together) may unite diverse technologies which are considered to be a unique process part of the stream of the waste. This integration of several techniques to combat the Medical Waste Management (MWM) problem, called combined medical waste management (CMWM), needs consideration of the managerial, technical, environmental, legal, financial and economic aspects. Technologies are in existence to deal with the large amount of the environmental problems of big and small cities. All of the parties interested in dealing with medical waste such as managers of healthcare facilities, civil engineers and environmental protection agencies in the local government are entrusted with the undertaking of waste services. This kind of low priority in the developing African countries resulted in inefficiency and obsolescence. Rising costs, inadequate funds, institutional inefficiencies, lack of job ethnics among the work force, inadequate number of trained personnel make the situation worse over time (Asnani, 1996). The major medical wastes disposal method in African countries such as Libya, has been unhygienic landfill or open disposal, mostly because of its simplicity and cheapness (Sati, 2004). Recently, it has been noticed that the rising amount of healthcare waste from hospitals, clinics and other sources has been one of the main environmental issues in Libya (Sawalem et al., 2009). For example, the separation and transportation stages of healthcare waste handling are not in general well structured and managed in the whole country. In the similar case, disposal of collected waste from hospitals and other healthcare facilities requires an adequate attention. All of these barriers and issues resulted in that Libya has not been listed among the top developing countries in terms of environmental-pollution control and safe management of medical waste.

In summary, clinical or hospital waste handling requires a number of activities that are fundamentally engineering related operation, like collecting, transporting, operation as well as treatment of progressing systems, and dumping of waste. However in many instances, segregation at the point of waste generated and storage activities are the main responsibility of nursing personnel. It should be noticed that where contagious component is mixed with noncontiguous waste, then the whole mass becomes potentially infectious (Abor, 2007). There should be no doubt that it is the liability of hospitals and other medical care facilities to make sure that there is absence of unwanted environment and health consequences arising from their waste activities in the process of management and disposal of this waste (Patil and Pokhel, 2005).

In many countries such as Croatia, Iran and Karachi there is lack of proper separation of harmful and non-harmful biomedical waste. There is an absence of appropriate waste treatment facilities and methods. Also, they have not regulated legislation, concerning waste processing and treatment. In addition to that, there is ineffective training of workers as well as poor personal protective gears (Askarian et al., 2004; Marinkovic et al., 2005; Rasheed et al., 2005). With regard to developing African countries such as Egypt and Libya, the situation is not much different where, for example, medical waste is inefficiently segregated, collected as well as transported. In addition, there is poor implementation of protective measurement, absence of written clear policies and guidelines, as well as inefficient training programs (Soliman and Ahmed, 2007; Sawalem et al. 2009). All of these factors contribute to increased risk of exposure of staff, patients and the community to biomedical hazards.

1.2 Problem Statement

In the recent past, there have been several researches that focused on Medical Waste Management (MWM) cross countries such as The United Kingdom (UK) (Tudor et al., 2005), the USA (Lee et al., 2004), Greece (Tsakona et al., 2007), Turkey (Birpinar at al., 2008), Korea (Jang et al., 2006), Mongolia (Shinee et al., 2008), Iran (Askarian et al., 2004), Brazil (Da Silva et al., 2005), Egypt (Soliman and Ahmed, 2007), Mauritius (Mohee, 2005) and Jordan (Abdulla et al., 2008), all these research is a reflection of the importance of proper management of healthcare waste. In several advanced nations, policies are clear and implemented in the management of hospital waste and, consequently, more effectiveness than those in many less developed nations. Pruess et al. (1999) indicated that medical waste management in less advanced countries of world is often poor and fraught with difficulty. This was further supported by Jones, (2007) where research on environmental health in China showed that there is significant health risk associated with hospital waste and many challenges must be addressed to avoid the spreading of infectious disease. However, developing countries such as India and Iran are facing difficulties with regard to lack of suitable waste management facilities, protective measures and sufficient training (Patil and Shekdar, 2001: Askarian et al., 2004). Similarity, Manyele and Anicetus,2006; Manyele et al (2003) revealed that poor management of hazardous waste is a problem, not only in Tanzania, but it is also the same matter in all developing country around the world.

Having good health waste management first depends on a dedicated team, good administration, careful planning, well-established organization, underpinning of legislation, adequate financing and full participation by trained staff (WHO, 2005). WHO (2005) revealed that the preferred management solution is quite simply not to produce the waste, by avoiding wasteful ways of working. To achieve lasting waste reduction or minimizing, the focus should be on working with medical staff to change clinical practices to ones that uses less material. Although waste reduction is most commonly applied at the place where waste is generated, medical-care institution managers can also take measures to minimize the production of waste through adapting their purchasing and stock control strategies. In the same direction, the minimum standard to segregating healthcare waste is the "three-bin system", where separate containers are provided for infectious waste, used sharps and general waste. WHO (2005, 2008) explain the hazards and infection risks they may encounter, and the prevention and control of exposure to them. Healthcare waste management policies or plan should include arrangement for the continuous monitoring of workers' health and safety. This is to ensure that correct handling, treatment, storage and disposal procedures are being followed as a part of their occupational safety.

It is obvious that improper management of medical waste is a great dilemma for several medical institutions in developing countries, this appears in the form of health hazards and environmental pollution and contamination (Bdour et al., 2007; Coker et al., 2009). Rushbrook et al (2000) argued that the World Health Organisation (WHO) advocated that waste from medical care facilities should be treated carefully and with speciality in specialized way. Undoubtedly, to protect our ecological environment, the first step is to regulate such hazardous waste in environmentally reasonable and sound manner (Misra, 2005). Also, the Environmental Protection Agency of the United States of America (USA) categorised such waste as dangerous and hazardous (Agency, 1991). Moreover, the USA, Britain Canada and other countries of the developed world have devised codes, and legislations that serve as guidelines for the good practice of healthcare waste. They have also explained the range of possible and appropriate methods of transporting, collecting, storing and disposing of such waste. The best accessible equipment and technologies are utilised for the upgrading of methods for the correct disposal of medical care waste with the smallest amount of risk to human health and the environment (Tudor et al., 2005).

It is beyond a doubt that having a useful and standard management structure for healthcare waste, isolation should occur in the medical waste chain, such as separation errors, may take place in the form of a threat to further wastes in the disposal chain, which is not a new dilemma (Taylor, 1988). The most important thing for effective clinical waste management is to segregate the waste at the origin of the stream. This can enable hospital employees to utilize safe handling and will help the administrators of the medical care facilities to save the waste disposal costs. On the other hand, most of the medical care facilities in the developing African countries including Libya face monetary problems and for that reason, they are looking for cost effective disposal means of healthcare waste.

Sanitation Connection (2002) stated that medical waste management is a process that helps to ensure proper hygiene in health institutions and the safety of health-care employees and other personnel involved. Johannessen et al. (2000) pointed out that proper management of medical waste can minimize the risks within and outside health-care facilities. The first priority is to segregate wastes, preferably at the point of generation, into reusable and non-reusable, hazardous and non-hazardous components. They identified other important steps, such as the institution of a sharps management system, waste reduction, avoidance of hazardous substances wherever possible, ensuring worker safety, providing secure methods of waste collection and transportation, and installing safe treatment and disposal mechanisms. Acharya and Singh, New Delhi, India (2000) had also identified the medical waste management process to include handling, segregation, mutilation, disinfection, storage, transportation and final disposal. However, they think that there are very important steps for safe and scientific management of medical waste in any establishment.

In recent years, the number of healthcare facilities in Libya has drastically increased to serve their community, especially for large cities such as Tripoli, Sabha and Benghazi. However, most of the cities, if not all, have serious problems with medical waste management and the current exited system needs to be developed and improved. Medical waste management studies in Libya are few. To mention the few, Sati (2004) conducted a study for ten hospitals in the city of Benghazi, Libya, in the period between 2004-2005, and he found the realities of how to deal with hazardous medical waste at all stages and estimated the size of the damage resulted from the residues.

Sawalem et al. (2009) conducted a study on the management of hospital waste in three cities in Libya namely Tripoli, Misurata and Sirt from a one dimensional approach. The authors found that the targeted hospitals were having poor waste management. Regulation with regard to proper to method of waste handling and disposal do not exist. However, they recorded that studies and reports on the management of waste were missed in all the surveyed hospitals. Their study did not consider those factors internally and externally affecting the results of insufficient practice of waste handling at the studied hospitals.

Although there has been tremendous growth of healthcare institution in Libya (Walid at al 2016); and the medical care industry has made an immense contribution to the Libyan economy (WHO,2011), there is however room for improving the reputation of the medical waste industry. Some of the issues that need to be addressed in the medical industry range for quality of initial resource to late handling of the waste, and to lack of environmental sound protection. In order to minimize the risks to the health and safety of staff, patient, the public and the safety of the environment, managing the waste, which includes prevention, segregation, handling, transport and disposal must be administrated (Hall, 2008). This could only be done if the process is subjected to a continuing revision of the practice, to ensure that the current best practice is being followed (Baillie, 2008). Additionally, many hospitals understand the need improving the current existed practice. However, little is known about the factors that influence medical waste management practice at healthcare institutions (Hult, et al., 2004). Hence the need for further research on factors influencing organization (hospitals) as a best practice.

Since the current study aims at assessing the extent factors that influence medical waste management practices at hospitals in southern Libya, and previous studies have shown that certain internal and external factors of organization do influence best practice of medical waste (example, Elbakosh et al 2009; Tudor et al 2005; Mbarki et al. (2013). This study will not be exhaustive enough without examining certain organization internal and external factors that have been found to influence waste management as a best practice in previous studies. There is there for the need to examine certain organizational internal and external factors found to have influence on medical waste management practices.

Further to assessing the extent of waste management from a multidimensional approach, this research seeks to fill the research gab created by scarcity of literature on medical waste management practices factors in Libyan industry. This research therefore aims at examining the influence of organizational structure, culture, government policy, environmental factors on medical waste management practices in the southern part public hospitals in Libya. Some of the most relevant studies to the current research are simplified in the Figure below.

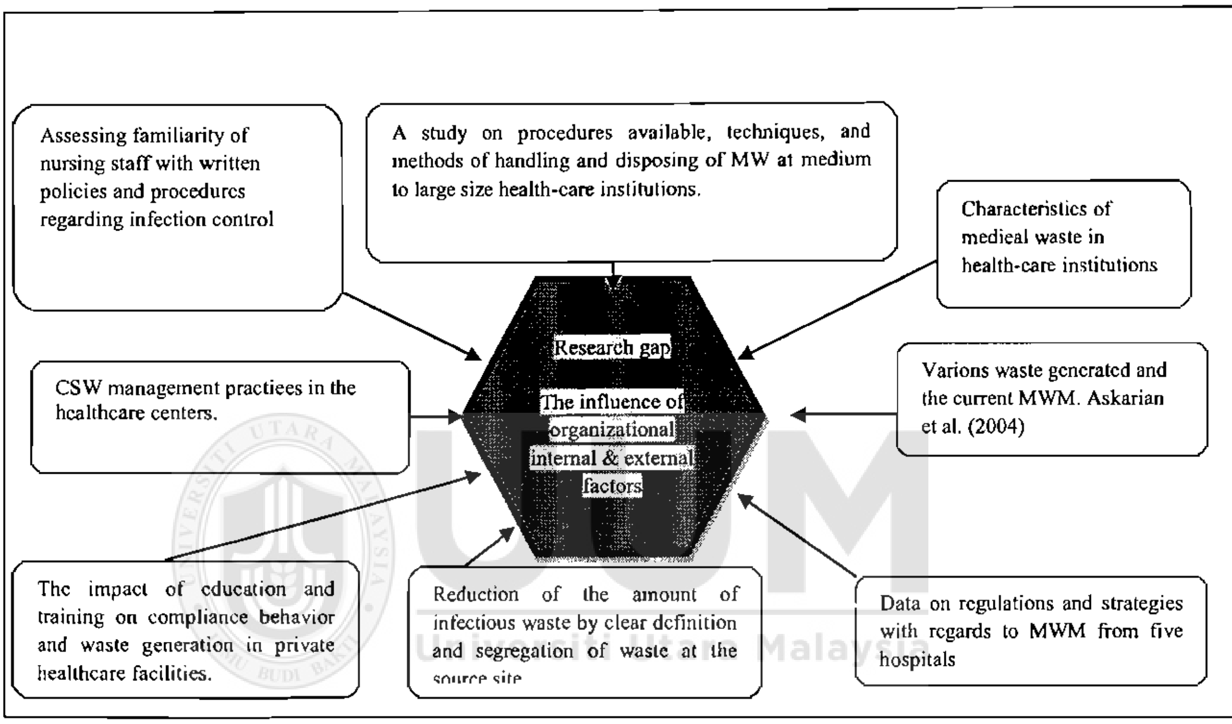


Figure 1.1 Selected Previous Researches Done and The Current Research Gap

However, the following are some additional statistics representing the types, amount generated and method of disposing medical waste in Benghazi city as well as the classification of hazardous health care waste in other cities (Sawalem et al., 2009). This data is presented in Table 1.1 and Figure 1.3 respectively.

Table 1.1 Presents Hospital Waste Generation Rates in the Surveyed 14 Hospitals in Libya

Generation rate (kg/patient/day)	Generated waste (kg/day)	Number of patients	Number of beds	Type	Hospital name
1.3	477	370	480	Teaching	Misturata hospital
1.5	1160	800	920	Teaching	Tripoli medical center
1.3	168.75	135	223	General	Ibn Sina hospital
1.2	105.60	88	120	General	Beni waled hospital
1.2	272.80	220	370	Central	Zliten central hospital
1.4	714	510	600	Central	Tripoli central hospital
1.3	107.50	80	115	Private	Alsaeed hospital
1.2	82	66	85	Private	Alshefa hospital
1.2	92	77	120	Specialist	Thoracic hospital
1.1	108	95	133	Specialist	Eyes hospital
0.9	32.80	38	-	Clinic	Alekha clinic
0.8	38.15	50	-	Clinic	Almowda clinic
0.9	42.40	45	-	Rural health center	Algeran rural health center
0.9	28.50	32	-	Rural health center	Tawerga rural health center
	3429.50	2606			Total
1.3					Average

Source: (Sawalem et al., 2009). Adapted

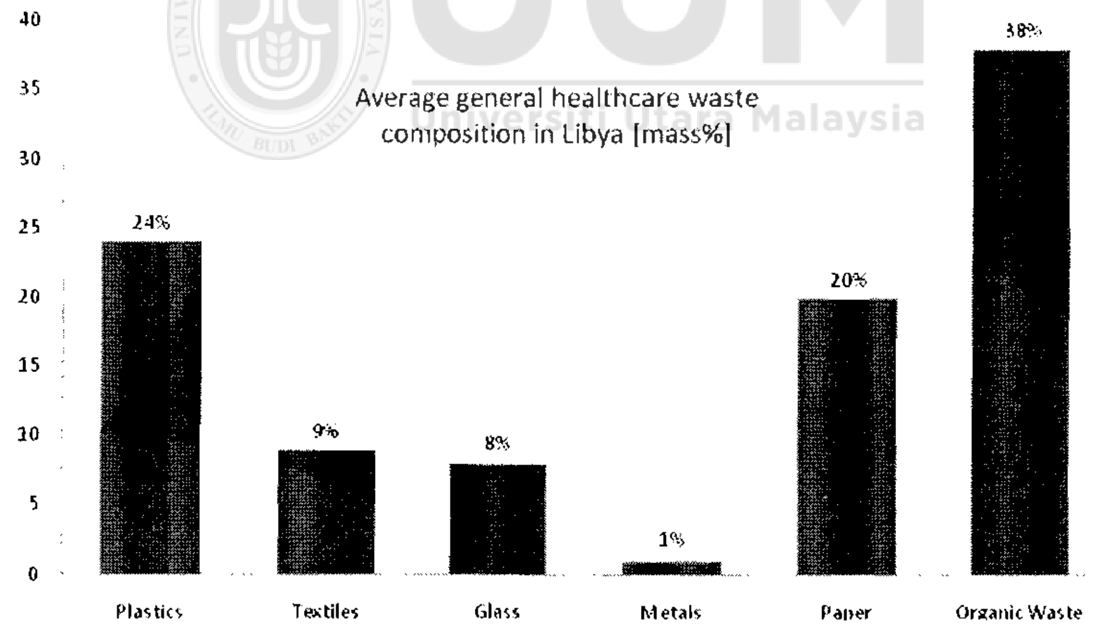


Figure 1.2: Average General Healthcare Waste Composition in Libay (Tripoli, Misurata, and Sirt), Libya (Mass %). Source: Sawalem et al., (2009). Adapted

1.3 Research Questions

1. What is the current medical waste management practices among the public hospitals in Libya?

2. What is the relationship between internal factors and current medical waste management practices in Libyan public hospitals?

3. What is the relationship between external factors and current medical waste management practices in Libyan public hospitals?

4. What is the moderating effect of the organizational size (number of skilled employees) on the relationship between the internal, external factors and current medical waste management practices in Libyan public hospitals?

1.4 Research Objectives

Based on the aforementioned, this research aims to identify the current medical waste management practices in Libyan hospitals and compare it with WHO waste management best practice. However, the study will be focusing on examining the correlation between both the organizational internal and external factors and the current practice of medical waste bearing in mind the apparent effect of Libya's population and how it could affect the current practice.

The specific objectives of this research are formulated as follows:

1. To identify the current medical waste management practices in public Libyan hospitals and compare with WHO waste management best practices.

2. To identify the relationship between internal factors and current medical waste management practices in Libyan public hospitals.

3. To identify the relationship between external factors and current medical waste management practices in Libyan public hospitals.

4. To identify the moderating effects of the organizational size (number of skilled employees) on the relationship between the internal and external factors and current medical waste management practices in Libyan public hospitals.

1.5 Research Scope

Medical waste management is broadly classified into the administrative and technical aspects (Nemathaga et al., 2008). Administrative waste management of healthcare facilities affects the public network system and social group members, like rules, roles, procedures, and structures which relate to communication and exchange among the members. The technical part of medical waste management deals with the operating component that affects the technical system, such as equipment, methods of operation used in their production process. This research was focused on both aspects: administrative and technical.

According to E.Manga et al (2011), medical waste management could be studied based on key hospital staff, general supervisors, sanitation workers and nurses who are responsible for handling different waste streams at individual facilities. Furthermore, Gupta (2009) indicates three main groups, namely the authorities and personnel involved as well as environmental engineers for getting biomedical waste managed. Therefore, this research focuses on managerial aspects in terms of internal and external organizational factors that may affect medical waste management practice.

This research is an improving research which focuses on the influence of internal and external factors on the practices of medical care waste management located in five states of Libya. The conducted area of this research includes all the public hospitals in the southern part of Libya. Literature has shown that data are required on medical waste generation to plan an adequate and efficient medical waste management system. The understanding of practitioners on the safe methods of dumping used syringes is limited, due to the deficiency of medical colleges' curriculum (Gumodoka et al., 1996). A continued support is needed from all the key actors (government, hospital, and waste managers) in executing a safe and sound healthcare waste management approach not only in legislation and policy formulation but also in the monitoring and implementation and responsibility of each of the medical care facilities to guarantee a safe and clean system of healthcare waste management and disposal, with a minimum threat to handlers, public health and environment (Coker et al. 2009).

The southern part of Libya was chosen because of the urgent need for safe handling of medical waste this has effects on human health and other living things, as well as on all natural resources that are necessary for human existence.

The research information is collected from all government hospitals which have been registered with the Ministry of Health. The research was focusing on the biggest, midlist and smallest hospitals. Data were also gathered from all representatives of the organization who have the knowledge of medical waste activities of the hospital concerned.

1.6 Significance of the Study

The significance of this current research could be divided into three parts: academic contribution, contribution in terms of practical issues and policy. The academic contribution can also be divided into three: 1, identifying medical waste management practice and comparing with WHO best practices, 2, research model proposed in this research and 3, expanding the organizational control theory to suit medical waste management, The current research is significant as most of previous researches do not concentrate on (organizational internal and external) factors that influence medical waste management as a part of health service delivery at hospitals specially in low-and-middle-income countries (Pallas et al., 2012). This research attempts to fill this research gap.

The framework tested in this research provides an insight into medical waste management practices in Libya from the points of organizational internal and external factors that may affect medical waste management. Five factors are categorized to develop two main hypotheses and eighteen sub hypotheses based on theoretical and anecdotal arguments. However, from the result obtained, a final theoretical model of medical waste management practice was developed. This model can provide other researchers with a direction for future studies in the field of health care waste management with best practices.

Theoretically, this research uses dependent variable (medical waste management practices) measure that is unique and suitable for medical waste management practices in Libyan public hospitals and is comparable with WHO best practices. In addition to that, the research can provide hospital managers, waste management officers, medical staff and policy makers with an instrument to establish how organizational external factors such as environmental conditions could affect medical waste management practices. Underpinned by organizational control theory, this research provides empirical evidence to bridge the gap identified with respect to measuring the current medical waste management practices in Libyan public hospitals compared with WHO best practices. While other medical waste management researches are underpinned by planned behaviour theory, this research extends organizational control theory to change theory to suit the context of medical waste in management theory.

In practice, identifying the organizational internal and external factors in the context of Libyan public hospitals can serve as a premise for a key execution marker and benchmarking. Also, the present research can serve as a premise for a key performance indicator and benchmarking. Also, the present model could give the right stimulus to change the current inactivity towards medical waste in Libya.

In accordance with the result and findings, a final hypothetical model of medical waste management practices will be developed. The results of this research could practically also be a factor to rectify the current regulation and practicing of medical waste management. It strives to improve the management of medical waste especially in areas such as 1, the establishment of an independent management works on medical waste management among Libyan hospitals consisting of a highly qualified team to achieve goals, 2, the sitting up of direct development of laws to regulate the management, 3, providing model transport vehicles for the transfer of waste at appropriate and frequent times, 4, separating medical waste from domestic waste, 5, the assessment of environmental impact before and after the establishment of any healthcare facilities, 6, providing training courses to all bodies in charge and finally, awareness and bringing about health education and definition of how medical waste is dangerous and must be carefully treated. All these strategies will be useful especially after the presentation of its results to the stakeholders and the officials. Moreover, this research will obviously pave the way for better handling and practical approaches of medical waste management practice.

1.7 Thesis Outline

Chapter 1 commences with some basic information on waste management in different healthcare institution and where the concept of waste management was emerged (hospitals and other healthcare facilities) and communication. Issues that were of concern, and which generated the ideas and input for this research work, are also elaborated upon. The problem statement, the objectives of the current research, research questions, scope of the study and the general flow of the whole research program are also outlined. Chapter Two describes definitions, concepts as well as the process of medical waste management (MWM), while Chapter Three explain the factors influencing medical waste management practices and the underpinned theory. Chapter

Four contains the design of the questionnaire and the method to be used for analysing the findings and data. Chapter Fives discuss the research findings followed by conclusions and recommendations in the final Chapter.

1.8 Summary

The waste produced by different healthcare facilities should have a proper way for treating. This can clearly be applied by providing sufficient trained staff, giving an obvious definition of medical waste, followed by sorting and collecting the medical waste according to its type. Moreover, laws and policies have to be traced by all bodies in charge and transporting the medical waste immediately where they are up-to date. The method used for treating the medical waste must be selected mainly with perspective to minimizing negative effects on wellbeing nature. Overall, even though management of medical waste is worldwide issue for the worldwide community, the nations of developed world appear to have done significant improvement in waste management segregation, collection, storage, transport, transfer and last disposal. As has been the situation, the World Bank and the International Monetary Fund (IMF) have been reliably giving aid to several less advanced counties in terms of advancement of healthcare waste management and common sanitary situations in the urban centers of these less developed counties. In many instances, however, this kind of assistance and support though can bring provisional relief to the waste management segment of the recipient country, has not been sustainable. The method therefore is to find out the factors that affect policy development in the countries of developing world and to find out how these can be oriented for sustainable medical waste management. As by reaching waste management and will be approached from the sustainability perspective. Then, there is no doubt the intended a framework will provide the right direction and necessary focus. This therefore is the focus of this research.

CHAPTER TWO

MEDICAL WASTE MANAGEMENT

2.1 Introduction

This chapter constitutes the review of literature consisting of: an overview of medical waste management at the global level, followed by a short review of medical waste management definitions worldwide and the working definition as well. Next is the source, type of various medical waste as well as policies and regulation of medical waste management within the Libyan context. The chapter then discusses the range of methods for treating and disposing of medical waste. The health consequences of various sites of medical wastes are then presented and finally, methods used of handling different waste are presented at the end of this chapter.

2.2 Hospital Waste Management

Hospitals not only provide patients with health care services, but they are also empowered to look after public health. They discharge these duties in the course of patient care and also by ensuring a safety environment for workers and the public at large. In the course of discharging their responsibilities, hospitals generate a wide variety of wastes including sharp objects, human tissues or body parts and other contagious materials (Patil & Pokher, 2005). Being a complex establishment frequented not only by the sick but also their healthy relatives and friends, enormous wastes are generated. Over the years, the profile of wastes generated in hospitals has increased and become ever more varied due to improved scientific methods and experimental input requirements. These produced wastes impact the environment negatively due to their lethal nature and capacity to aid the spread of microbial diseases to patients and hospital staff when handled improperly.

The safe disposal of medical wastes is very important to overall patient and community health. The processes of handling, storing, transporting and disposing of medical wastes are essential for the safe and scientific management of regulated medical waste in any healthcare facility. One of the most important aspects of safe medical wastes management is effective segregation (separation) and identification (Labelling) of wastes categories depending on their proposed method of disposal and degree of danger resulting from human contact. The way minimize and effectively manage biomedical waste is isolation (partition) and reorganization of proof of the waste. Researchers have argued that the most efficient means of identifying and classifying medical waste is the use of colour-coded plastic bags or containers (Rao et al., 2004; Duan et al., 2008). Recently, the Environmental Authority and Ministry of Health in Libya have worked together to establish formal rules and standard procedures for medical waste management practices which is still in the process of improvement inasmuch as the little information available with respect to separation practices, collection as well as disposal of this kind of waste.

2.3 Definition of Medical Waste

The concept of medical waste management was first discussed at the Earth Summit hosted by the United Nations Conference on Environment and Development

(UNCED, 1992). Since that time, MWM has become an issue among scholars and scientific research because of the potential risk and hazards to both environment and human beings. It also involves policy issues of national interest (WHO, 2001). Moritz (1995) stated that many other alternative synonyms to medical waste exist, and they are utilized interchangeably in a variety of countries and even in scientific journals. Examples of these synonyms are clinical waste, hospital waste, healthcare waste, regulated medical waste, and biomedical waste. Additionally, WHO uses the term "healthcare waste" in publications and some other reports. Furthermore, researchers as well as other global institutions and different countries define medical waste differently. Sohrab et al (2011) claims that the waste generated in healthcare facilities has not yet been defined clearly. For instance, Al-Mutair et al (2004) "*defined medical waste as any solid or liquid waste, capable of causing infectious diseases, generated as a result of patient diagnosis, treatment and through the immunization of humans or animals or in related research*". Other studies defined medical waste as waste arising from the investigation, treatment or medical care of patients, while Abor and Bouwer (2008) "*focuses their definition to include all types of wastes produced by health facilities such as general hospitals, medical centers and dispensaries*". The WHO (2005) definition goes to consider a byproduct of healthcare that includes sharps, non-sharps, blood, body parts, pharmaceuticals, chemicals, medical devices and radioactive materials. The reason behind the differences in these definitions is based on how much leeway the definitions allow for optimized treatment and disposal practices in the hospitals or elsewhere and the amount of considerations given to health and safety of patients and personnel (Muhlich et al, 2003). The main issue with regards to medical waste disposal is its assessment in the real and potential risks emerging from waste with the main focus on the risk of infection, so that is reflected in the various definitions evolved by each country individually (Muhlich et al., 2003).

The following are some other definitions broadly used by different researchers;
There are many definitions suggested for medical waste (hospital or clinical waste).

Medical wastes from hospitals are a source of concern to environmental health workers due to their constituents which include the prevalent toxic biological and chemical pollutants like lead, mercury, cadmium, chlorinated plastics, solvents, and a number of non-conventional toxic materials (Rao et al., 2004). Healthcare waste is the dumping of any human contagious agent or equipment from a medical institution that is capable of transmitting disease to humans. However, the term Medical waste is define as any harmful byproduct, be it in solid or liquid form, that is generated from the diagnosis, treatment or vaccination of both humans and animals in medical, clinical or pharmaceutical institutions that poses a serious health threat to workers, patients and other individuals upon exposure. (Alvim-Ferraz and Afonso, 2003; Jahan, 2005; Al-Khatib, 2007). The primary sources of medical waste include:

1. Human pathological waste such as infected human tissues, organs, body fluids and body parts, excretes, bulk human blood; including serum, plasma and other blood products from infected patients. (Salkin et al., 2000).
2. Animal wastes from animals intentionally or unintentionally exposed to pathogens or used in biological related research, production and testing. This includes contaminated animal carcass, bedding, blood sample and animal excrement. (Al-Khatib, 2006; Duan et al., 2008)

3. Microbiological waste from pathogens, toxins and other infectious and disease-causing micro-organisms. It also includes Culture medium and culture dishes used on micro-organism.

Other sources of medical waste include sharp surgical instruments such as needle, scalp blades, surgical scissors used on infected humans or animals. Also included are objects such as pipette, glass ware, used slides and cover slips that were in contact with infected agents. (Salkin et al., 2000; Al-Khatib., 2006). (Refer to 2.4 for more details about medical waste sources). Table 2.1 presents some more details on terms used to describe medical waste.

Table 2.1: Terms Describing Medical Waste

Author/ Authors	Terms used to describe MW	Definition
Moritz JM (1995)	Clinical waste	Waste produced from healthcare and similar activities that pose a risk of infection or that may prove hazardous
Garcia (1999)	Health care facilities waste	Depending on the regulation cited, geographic location, or facility, various terms such as infectious waste, biohazardous waste, potentially infectious waste, or medical waste have been used to describe waste that is produced by health care facilities and has the potential for transmitting an infectious disease
Bareja *et al (2000)*	Clinical wastes	Differ from any other wastes that are being produced in hospitals. Sharps, human tissues or body parts and other infectious materials contained in clinical waste poses potential health and environmental risks
Taylor DM; Mühlich M, et al; (2003; 2006)	Infectious waste	Infectious substances containing viable microorganisms or their toxins which are known or reliably believed to cause disease in man or other living organisms
Tsakona, (2007)	Hospital waste	Known as special category of waste, which is highly hazardous due to its infectious and/or toxic characteristics. Furthermore, in healthcare units the direct exposure of waste management workers and members of the public to this type of waste increases the hazard that emerges from their treatment
Rong Xie et al (2009)	Medical waste	Defined as any solid waste that is produced in the diagnosis, treatment or immunization of human beings or animals, in related research, biological production or testing

2.3.1 Clinical Waste

The concept of clinical waste refers to any waste that comprises wholly or partly of human or animal tissue, blood or other body fluids, drugs, excretions or other pharmaceutical products, dressings, or swabs, needles, syringes, or other sharp objects, which if not rendered safe, may be hazardous to people coming into contact with it. Also, it consists of any other waste stemming from medical, dental, nursing, pharmaceutical, veterinary or similar practice, investigation, treatment and care, teaching or research or the collection of blood for transfusion, that may cause disease to any one coming into contact with it (Health Regulations Northern Ireland, 2003; Vorapong Manowan, 2009)

2.3.2 Medical Waste

Medical waste refers to all waste materials generated at health care facilities, such as hospitals, clinics, physician's offices, dental practices, blood banks, and veterinary hospitals or clinics, as well as medical research facilities and laboratories (Vorapong Manowan, 2009).

For the purpose of current research, the term **Medical Waste will** be used. Additionally, in this research, medical waste is defined as any dangerous substances or objects of waste that poses hazard to both the environment and human beings and which resulted from various medical activities which are intended or mandatory to be disposed of according to the provisions of the local regulation and policy for medical waste.

2.4 Sources of Medical Waste

According to Abdulla et al (2008), medical wastes result from medical research laboratories, hospitals, clinics, nursing homes, laboratories, veterinary clinics and many other medically related institutions which handle sick people for the purpose of medical care and treatment. With the proliferation of blood, viral and bacterial diseases which are transmitted through contact with bodily fluids of infected persons, more attention is now being paid to the disposal of infectious medical waste. Health-care facilities have to take advantage and be conscious of the possible risks in managing infectious waste by following the highest standards of medical waste management and disposal. Staff Education and training as well as the creation of awareness of patients and the society on the management of contagious healthcare waste is vital for successful medical waste management. With increasing awareness of the risks involved with medical waste, greater importance is now being paid to its regulation and disposal. Recently, there have been public litigations against erring officials. Some landmark policies to rationalize healthcare waste handling have been made in the recent past (Guide, 2005; Verma et al., 2008).

2.5 Medical Waste Types

There are a number of medical waste types. However, they could be divided into a number of categories. The following table presents types and features of medical waste.

Table 2.2: Types of Medical Waste

Types	Features	Source
1) Pathological waste	Tissues or fluids such as blood and some other body fluids.	(WHO, 2005)
2) Infections waste	Waste includes pathogens which derive from e.g., surgeries with infectious diseases, contaminated plastic *items, laboratory cultures*	Mato and Kaseva (1999)
3) Sharps	Any kind of waste that may cause a cut or puncture leading to a wound is known as sharp waste. E.g. needles, syringes, scalpels, knives, broken glass.	(Felicia et al., 2008).
4) Chemical waste	Any waste consisting of discarded chemicals, such as *chimerical substances from* laboratory reagents	(Mato and Kaseva, 1999).
5) Pressurized containers	Full or emptied containers or aerosol cans with pressurized liquids, gas or powdered materials are all included in this waste	(WHO, 2005).
6) Pharmaceutical waste	Waste is known and including pharmaceuticals, e.g unwanted items, expired drugs and so on	(WHO, 2005).
7) Waste with high contents of heavy metals: and derivatives	Broken thermometers and blood pressure gauges are examples of this kind of waste	(WHO, 2005).
8) Highly infectious waste	This includes microbial cultures and stocks of highly infectious agents from medical analysis laboratories. It also includes body fluids of patients with highly infectious diseases	(WHO, 2005).
9) Genotoxic waste	This waste contains substances with genotoxic properties such faeces, vomit and urine from patients treated with cytotoxic drugs. cancer therapy	(WHO, 2005).
10) Radioactive waste	This kind contains radioactive materials liquids, gas absorbent paper and so on.	(Khalaf, 2009).

2.6 Laws and Policies on Medical Waste in Libya

From the early 1980s, a number of environmental decrees and laws were passesd to guide the activities of medical waste in Libya. Such major laws include law of environment No. 7 (1982), law of atmosphere and air protection (1992), and law of transport of hazardous materials (2005). These legal instruments covered municipal wastes and pollution control, but did not extend their mandates to cover the management of medical waste. Consequently, Libya has no clearly defined regulations with respect to the appropriate management and safe disposal of medical wastes.

However, some years back, the Environmental General Authority in Libya worked together with the Ministry of health in order to make regulations and instructions for healthcare waste management. But these regulatory guidelines are still in their early stages due to insufficient information available on generation (quantities and compositions), handling and dumping of hospital waste. A thorough assessment of the present condition concerning medical waste management in Libya is necessary for the design of good regulatory policies.

Later in 2007 both of the Ministries (Ministry of Health and Ministry of Environment) formulated a guideline for medical waste laws and regulations which are summarized as follows:

Since the Ministry of Health and Ministry of Environment of Libya use WHO recommendations for medical waste delivered from different healthcare facilities, these recommendations should outline the rational of legislation, national aims and the main steps toward the achievement of these aims bearing in mind the following steps:

1. Health and safety descriptions resulting from mismanagement of medical waste

2. Clear reasons for safe medical waste management practices in different healthcare facilities
3. Methods being used for treatment and disposal of each waste category
4. Clear warning for unsafe practices, such as disposal of hazardous waste in municipal landfills
5. Responsibilities of management inside and outside health care establishments
6. Appraising of costs of medical waste management
7. The main essential steps of medical waste management: segregation, minimization, handling, identification, treatment and final disposal; technical specifications for the implementation of each step should be exploited in separate technical guidelines
8. Record-keeping and documentation
9. Requirements needed for training
10. Protection rules for the safety and health of workers

However, the Ministry of Health and Ministry of Environment of Libya indicate specific responsibilities on the followings

1. Responsibilities of the health facility director toward medical waste (the waste producer)
2. The medical waste management unit and its responsibilities within the health facility

(Refer to the Appendixes). (MoH and MoE, 2007).

2.7 Medical Waste Management Practices and Method Used for Treatment and Disposal of waste

The WHO has stated that the choosing technology for treatment of medical waste disposal must firstly be taking into consideration financial effectiveness, easiness of implementation as well as environmental concern. Pruss et al (1999) also advocated that minimal hazard assessments for waste management facilities, environmental and human health impacts, cost effective should ideally be counted for chosen any proposed method of disposing of medical waste. Recently, a great attention has increased over the multi-disposal techniques on deactivation micro-organisms in medical waste (Blenkharm, 2006a; Nema and Ganeshprasad, 2002; Salkin, 2003; Park et al., 2009). Consequently, the suggested method for treating waste must have the ability to reduce or inactivate completely infectious mircro-organisms so that the waste no longer carry any harmful diseases for anybody when exposing to it (Tsakona et al., 2007). In the same direction, there is a number of methods and technologies being used to treat the micro-organisms generated from medical waste so that the waste pose no hazard of infectious diseases to the safety of public and environment. The ICRC (2011) declared that there is no universal solution for waste treatment. The option chosen can only be a compromise that depends on local circumstances. As a result, none of these practices are capable to inactivate the micro-organisms fully, since each method has pros and cons accordingly (Nemathaga et al., 2008). Therefore, it is highly urged to find out those kinds of methods that are having the ability to protect human health and environment from the jeopardized effect of such a waste. Literately, the most commonly used method to treat medical waste especially in the less advanced countries of the world including Libya are landfill, open dumping and incineration Al-Khatib and Sato, 2009; Nemathaga et al., 2008;

Sawalem et al., 2009; Shinee et al., 2008). These methods and some other more practiced are discussed below.

2.7.1 Incineration

The advantages of using incinerators have led hospitals over the world to take them as the preferred manner for handling and disposing medical waste (Jang et al., 2006; Lee et al., 2004; Ananth et al., 2010). The mechanism work of incinerator is to alter the waste into residual ash and gases. It is specifically recommended in treating waste such as (sharps and pathological agents), because these components of waste generation are reduced unrecognizable (Hossain et al., 2011). However, this mean of process is preferred to treat waste that could not be reused or disposed of in landfill sites. Incineration on the other hand, emits harmful pollutants such as carbon monoxide, metals and hydrogen chloride dioxins and furan (WHO, 2005). It is reported, in particular, that dioxins could be carried long distance from the stream source emission and accumulate in the ground, body water and source of food, in which as a result will pollute them (Toxics Action Group, 2001). (Rogers and Brent (2006) to have a successful grogram for the treatment of medical waste is depending on the approach of collection containers, energy source, maintenance support, and understanding the operation instructions. Also, a good designed incinerator is capable to burn waste completely and leaves minimum residual in the form of ash and minimizes the risks of emissions through the correct placement of units which relate to the hospitals and the surrounding communities (Nemathaga et al., 2008). As mentioned early, in less developed countries of the world including Libya, most of incinerators are not in good conditions and having operational difficulties (Silva et al., 2005; Coker et al., 2009; Sawalem et al., 2010).

Again, one of the few technologies for getting medical wastes controlled is by incineration, which can be done at high temperatures (over 1000 °C), with the advantage that all types of health-care waste can be properly treated while reducing the volume and weight of wastes treated (ICRC, 2011). On the other hand, modern large-scale processing such as with high-temperature incinerators is not a solution for hospitals; they are designed for centralized networks. Enquiries should be made as to whether there is an infrastructure of this nature in the region, and another possible solution is to utilize a household refuse incineration plant, as this type of plant in general could operate at over 850 °C. But medical waste must be fed directly into the kiln hopper, thus bypassing the bunker. Cement works incinerators or the blast furnaces used in the metal industry can also provide an acceptable local solution, although they are not normally recommended for the incineration of medical waste because the waste-loading system is not secured and the emissions are not treated (ICRC, 2011). Small quantities can be treated by simple incinerator models. Some of them are available on the market, while others have to be built with local materials on the spot according to simple plans. These incinerators include initially one or two combustion chambers (the primary and secondary chambers) and a discharge chimney. The combustion and airborne emission control system is simple; indeed, in some cases there is none. Incinerators can be imported and assembled on the spot without the use of local materials. These facilities are generally more reliable, provided that there is a reliable source of electricity. They guarantee combustion temperatures of over 800 °C and even over 1000 °C. However, they are also more expensive and require more maintenance. In cases where infectious medical waste is treated in small single-chamber or dual-chamber incinerators on site, fractions of waste such as drugs, chemicals, halogenated materials or wastes with high heavy metal content (such as batteries, broken thermometers, etc.) must not be treated in this type of facility. The following best practices must be borne in mind with a view to minimizing pollutant emission (http//www.basel.int/pub/techguid/biomed-e.pdf, 2003):

a) Reduction of waste generated and sorting of wastes at the source;

b) Good incinerator design to ensure optimal combustion conditions: extension of the chimney (if the height of the chimney is doubled from 3 to 6 metres, the concentrations of pollutants in the air are 5 to 13 times lower) (Batterman, 2004);

c) Installation of incinerators far from inhabited or cultivated areas;

d) Best operating practices: appropriate start-up and cooling, care to obtain a sufficiently high temperature before feeding the wastes in, adherence to the correct quantity of waste and fuel, regular removal of ash;

e) The incinerator should be lit with paper, wood or fuel oil; after 30 minutes, small quantities of waste should be loaded at regular intervals (5-10 minutes); wet waste must be mixed with drier waste; sharps containers must be loaded one by one; the incinerator must run for long periods (at least 2 hours); heavy-duty gloves, a body protection and goggles must always be worn as well as a respirator whenever ash is being removed;

f) No incineration of polyvinyl chloride (PVC) plastics or other wastes containing PVC;

g) Regular planned maintenance: replacement of faulty parts, inspection, inventory of spare parts;

h) Regular training for operators, operating manual;

i) Emission control: emissions must not exceed the national limit values and they must comply with the best available technique (BAT) and best environmental practice (BEP) recommendations set out in the Stockholm Convention.

And lastly, the burning of hazardous medical waste (uncontrolled incineration in barrels or at dumps) must be avoided at all times because of the risk for staff, which is due not only to the emission of toxic gases but also to the fact that infectious wastes are not fully burnt. In an emergency, however, incineration in a barrel can be a temporary solution until a better solution is found. In this case, care must be taken to use a barrel with sufficient air intake below the combustion flame and to protect the top with fine wire mesh (to contain the ash). It should be noted that Annex C(See Appendix D) of the Stockholm Convention rejects techniques of uncontrolled incineration in barrels, at dumping sites or in single-chamber incinerators. These techniques must be regarded as provisional arrangements.

2.7.2 Disposal of Liquid Wastes in the Sewage

Generally, this system is not intended to be used for discarded chemicals. It is strictly prohibited to reduce waste-water discharges so that the concentration falls below the exemption thresholds in force in the particular country. Legislative or scientific data on exemption thresholds are rare. The exemption thresholds in effect in Switzerland are presented in Table (2.3) as shown below.

Table (2.3): Permissible limits in force in Switzerland.

Chemicals	Permissible limits	Practical disposal
Acids-alkalis	PH between 6.5 et 9	Exceptions are allowed if the chemicals are mixed with a sufficient quantity of other sewer effluents.
Silver	50 mg/l	If less than 1000 liters are produced per year.
Total hydrocarbons Organic solvents	20 mg/l	Tolerance allowed for products which biodegrade easily and which are disposed of in small quantities, provided there is no noteworthy effect on health or the environment.
Volatile halogenated hydrocarbons Volatile halogenated solvents	0,1 mg/l	No tolerance

Source: ICRC (2011)

Photographic developing liquids should not, as a rule, be poured down the drain, in view of the fact that they contain substances that are toxic or even carcinogenic (silver, hydroquinone, formaldehyde). If it is not possible to recycle them through an approved firm, small quantities may, as an exception, be discharged within the limits mentioned above. Fixers and developers must be mixed and sorted for one day (neutralization process), and then diluted (1:2) and emptied slowly into the sink. Non-hazardous pharmaceutical wastes (syrups, vitamins, eye drops, etc.) may be poured down the drain; unless otherwise stated by national legislation. Small quantities of biological liquid such as blood, rinsing liquids from operating theatres and other liquids can be poured down the drain without being pretreated if the patient does not have an infectious disease. While in the rest of cases, it must first be inactivated-preferable by autoclave, but otherwise by means of a chemical disinfectant (undiluted bleach or chloride dioxide, contact time of more than 12 hours). Where a septic tank is used, the quantity of disinfectant or biocide (bleach, silver, etc.) should be reduced, since these substances can actually disrupt the biological digestion of the wastes. Expired units of blood must not be emptied down the drain. They must be incinerated at high temperature (over 1000 °C) or autoclaved. Where there are no such facilities, they must be disposed of in a waste burial pit. At all times, any national regulations that are more restrictive than the general recommendation must be followed (ICRC, 2011).

2.7.3 Open Dump and Open Burning

One of the common practices for disposing medical waste in the less developed countries is open dumping (Al-Khatib and Sato, 2009; Cooker et al., 2009). This is might be because of financial difficulties and the only option available at these facilities (Hossain et al., 2011). On the contrary, open dumping has historically been known as a potential hazards source of human health and environment (Al-Khatib and Sato, 2009).

Yet, this method is not recommended disposal choice of medical waste inasmuch as the waste is uncontrollable and easiness of access to site from animals and scavengers (Pruss et al., 1999; Coker et al., 2009). This practice unfortunately, is the case of Libyan situation where hospitals transfer their waste along with general domestic waste which later on buried or incinerated occasionally (Sawalem et al., 2010).

2.7.4 Landfill

Generally, landfill is one of the easiest mean of disposal waste because its low cost. But if it not appropriately directed, it could be a source to pose risky to human health, safety staff, patients and environment (But et al., 2008; Narayana, 2009). However, landfill is to be deemed uncomplicated disposal approach, which requires careful separation of waste in order to not to constitute initial health effects on public and environment (Moritz, 1995; Visvanathan, 1996). Apparently, in less advanced countries like Libya, landfill works like open dump. The medical waste is dumped together general domestic waste in the landfill, and then burned occasionally (Nemathaga et al., 2008). It is known that during the waste degradation process, landfill produces waste in the form of solid, liquid and gases (But et al., 2008). In addition, these kind of productions may contaminate the three essential source of life. This means that landfill is not a good choice to treat the medical waste (Hossain et al., 2011). Moreover, in developing countries, disposal of medical waste is usually practiced at low lying areas of an open land, which might prone to flooding and increase the potential ratio of water contamination throughout the rainy season (Narayana, 2009).

In many countries around the world, medical waste is not suggested to be disposed of in landfill unless the waste was firstly treated and disinfected from pathological agents so that waste no longer pose any risk hazard to people (Nema and Ganeshprasad, 2002). Several studies have reported on environmental issues as a result of environmental pollution by landfill leachate and gas. Contrary, few research have been conducted on infectious risk of human health and pathway of infection throughout medical waste landfill (Hossain et al., 2011).

To conclude this, landfill is commonly used to treat general waste. However, it is in addition, used for other kind of waste. Furthermore, landfill continues to be a common choice of waste disposal mean of treating waste despite the high potential risk of pollution the waste may produce, which may result in polluting the environment and human health infection. Therefore, it is necessarily urged to think of appropriate landfill to minimize any risk that may affect negatively human health and the environment (Hossain et al., 2011). Within this context, sanitary landfill is a better option and modern engineering source to dispose of medical waste where the waste allowed to decompose into chemically passive materials in isolated setting away from the folks' environment (Pruss et al., 1999; Chen et al., 2003).

2.7.5 Disposal in a Sanitary Landfill or Waste Burial Pit

Mochungong (2011) pointed out that using landfills remains the most popular method for disposing clinical waste in both developed and developing countries. Diaz et al. (2005) makes a distinction between controlled landfills and sanitary landfills. Their study declared that a controlled landfill is a restricted land disposal facility sited according to hydrological conditions, and in which there is basic record keeping, and when full is ultimately covered with vegetation. On the other hand, a sanitary landfill is an engineered depression built within the ground with special attention given to the geology, hydrology and social characteristics of the area. A sanitary landfill is additionally lined with either natural or artificial synthetic material to prevent permeability. To put it in perspective, a sanitary landfill is like a bath in the ground. Potential build-up of methane is monitored in a sanitary landfill, and in some cases it is piped out for alternative uses. A sanitary landfill is also monitored for leachate seeping into the ground. The leachate is usually extracted from the bottom via pipes and treated before safe disposal. Groundwater around a sanitary landfill is constantly monitored and there is a comprehensive plan for closure and post-closure. However, ICRC (2011) claimed that unwanted and untreated medical wastes must only to be disposed of in a dumping site if it is as a last resort, otherwise it is not recommended at all. The discarded medical waste can be disposed of in a sanitary landfill, subject to determine precaution: It is important to be covered rapidly. One technique is to dig a trench down to the level where old municipal refuse (over three months old) has been buried and to immediately bury health-care waste that is discarded at this level under a 2-metre layer of fresh municipal refuse (ICRC, 2011). The following factors, which are essential in the designing and using of sanitary landfills, should be taken into consideration (Philip and Michael, 1999):

a) Entering has to be restricted and controlled;

b) Knowledgeable and competent staff must be available;

c) The discarding area must be planned;

d) The bottom of the landfill must be waterproofed;

e) The water table must be more than 2 metres below the bottom of the landfill;

f) Drinking water sources or wells must not be on or in the vicinity of the site;

g) Chemicals must not be disposed of on these sites;

h) The waste must be covered daily and vectors (insects, rodents and so on) must be controlled;

i) The landfill must be equipped with a final cover to prohibit rainwater infiltration;

j) Leachates must be collected and treated.

If a municipal landfill is used, water and enviroment engineers must investigate the site before hazardous medical waste is dumped there. The ICRC (2011) stated that the entire pit should be lined with a layer of compacted clay or any other suitable low-permeability material in order to prevent the pollution of shallow groundwater and should be properly fenced in order to keep unauthorized personnel from entering into the area. The author also emphasizes that medical wastes have to be buried under a layer of soil after each the unloading operation. Lime is suggested for spreading over the waste for added health protection, for instance in the event of an epidemic or to eliminate odour. The pit should be covered only when it is filled.

In the absence of controlled and sanitary landfills, medical establishments, according to Pruss et al. (1999), can prepare a small burial pit in a restricted area purposely for disposing only infectious clinical waste. These types of landfills are common within the premises of hospitals in developing countries and are most of the time unfortunately not restricted. The depth of such a pit, according to Pruss et al. (1999), should reach 2 m and the bottom should be at least 1.5 m away from groundwater level. Diaz et al. (2005) added that such a pit should reach approximately 2 m wide and if possible be lined with compacted clay or any other material of low permeability. The sides around the opening of the pit should be elevated to reduce surface water flowing into it. Pruss et al. (1999)

suggested that the pit should be filled to a maximum of 1 – 1.5 m and then the pit should be covered with a soil and/or lime layer, and where there is an outbreak of an especially virulent infection (such as the Ebola virus), both lime and soil should be used to cover the pit.

2.7.6 Chemical Disinfection

Chemical disinfectants have been utilized in the health-care sector for many years to kill micro-organisms on medical tools and have been extended to treat health-care wastes. Chemicals are added to the health-care wastes to kill or prohibit pathogens. However, the chemicals that are used themselves involve a health risk for the people who handle them and a risk of environmental pollution (ICRC, 2011).

This chemical is mainly suitable for treating liquid infectious wastes such as urine, blood, faeces or hospital sewage. The typical solution used is a 1% bleach (sodium hypochloride) solution or a diluted active chlorine solution (0.5%). For liquids with a high protein content, such as blood, a non-diluted solution of bleach is required and also a contact time of more than 12 hours. When the bleach is mixed with urine, toxic gases are formed (integration of chlorine and ammonia). Furthermore, liquid waste that has been disinfected with chlorine must not be discarded into a septic tank (ICRC, 2011). The other gaseous forms (disinfectants) are lime, ozone and ammonium salts. Formaldehyde and ethylene oxide are extremely toxic and must no longer be used because of their toxicity (carcinogenic or sensitizing properties). All strong disinfectants are known for their irritation to the skin and respiratory system, and they need to be handled with caution – in particular, personal protective gear has to be utilized and properly sorted (ICRC, 2011).

Solid medical waste can be chemically disinfected after being shredded. This practice poses a number of safety problems, and the waste is only disinfected on the surface. However, thermal disinfection is preferred over chemical disinfection for reasons of effectiveness and for environmental reasons (ICRC, 2011).

2.7.7 Shredders

Shredders turn the waste into small pieces by cutting it, which requires capable staff in order to operate and maintain their device, in view of the fact that some of these rotary devices are industrial models. This technique has to be built into a closed chemical or thermal disinfection system. Grain mills can be converted into simple shredders, but because of the risk to staff while the shredder is running only disinfected waste should be treated in these devices. In some circumstances, recycling can be an alternative shredding for plastics and needles if they are in huge quantities and a centralized system is required for collecting and transporting wastes from different facilities (ICRC, 2011).

2.7.8 Needle Extraction or Destruction

The ICRC (2011) does not suggest that needles should be destroyed or extracted for safety reasons, even though this practice is followed in certain circumstances, mainly for two reasons: when the needles are discarded from used syringes they cannot be utilized again, and secondly, the volume of sharps is decreased. Some tools run on electricity (destroying the needles by melting) and cannot be utilized extensively in

ICRC contexts, especially in remote areas. In addition, these appliances entail regular maintenance and have to be handled carefully. Needles can, in addition, be removed from syringes immediately after the injection via small manually operated devices. The needles are then transferred into the sharps trench. However, plastic syringes must be disinfected before being disposed of in the household refuse chain or in plastic recycling. More information on needle extractors can be gathered from the Program for Appropriate Technology in Health (PATH, 2012) or from the WHO website (2012).

2.7.9 Encapsulation

Encapsulation is a procedure that has been widely used in the field of hazardous waste management, and it is a procedure that can be used for the treatment of sharps and more specifically hypodermic needles. The process uses containers which can be made out of cardboard, plastic or metal. When the containers are almost full with sharps, chemical or pharmaceutical residues or incinerator ash, a material known to immobilize the sharps is added. The most common materials that are used to immobilize the sharps are cement, plastic foams, resins and clay. Once the immobilizing medium is dry or has hardened, the containers are properly sealed and disposed of in a sanitary landfill or waste burial pit (ICRC, 2011).

One of the main advantages of this process is that of reducing the risk of scavengers' work effectively. However, encapsulation of sharps is not deemed to be a long-term solution and encapsulation of sharps or unwanted vaccines can be envisaged in temporary settings, such as camps or vaccination campaigns (ICRC, 2011).

2.7.10 Autoclaves

Autoclave has historically been utilized for sterilizing variety kinds of hazardous medical waste (Salkin, 2003). In fact, it has been used since 1876 and it is widely used to treat a number of waste especially, sharps, those items contaminated with bloods, residues from operation surgeries, bandages, gowns, linen, gauze and other infectious medical waste as well as non-chemical laboratory waste. The mechanism of autoclave is to work at a temperature ranged from 50-250 C, but the optimal use is at 160 C in order to get bacteria killed (Hossain et al., 2011).

Autoclave is a good option to treat medical waste and consider an alternative disposal technology comparable to incinerator. However, autoclave would need much financial resources in comparison with incinerator (Jang et al., 2006; Al-Khatib and Sato, 2009), because of autoclave is a double treatment choice of medical waste and requires another approach for final disposal (Jang et al., 2006). On the other hand, one of the disadvantages of this technology is that it cannot be used to handle and treat huge quantities of medical waste. Yet, it could not handle several of chemical and hazardous substances such as (mercury, volatile and semi-volatile organic compounds, waste from chemotherapy wards and radioactive waste (Lee et al., 2004). Furthermore, it is not appropriate option to treat huge scale items, huge body parts and animal carcasses. This is because of their mass and other characteristics, which make it not easy and much time needed for the entire process and materials to reach the prescribed temperatures (Pruss et al., 1999).

2.7.11 Microwaves

Microwave is an electromagnetic wave with frequencies between radio and infrared waves. When using microwaves, waste must essential be in wet condition either as a result of moisture or by adding steam, in order to generate thermal process. It is common that in some cases of treatment process, using microwave to form steam by heating water, which will later be applied to the treatment of medical waste steam (Hossain et al., 2011). Low frequency radio waves are also commonly used to deactivate microorganisms contained within the waste, where microwaves heat the medical waste from inside materials to their external surfaces.

However, a Lee et al (2004) using microwave in the treatment of medical waste is to be competitive economically in the comparison with incinerator method. Though, microwave option is not appropriately feasible for huge quantities treatment. As it is not cheap and not even affordable for country like Libya and other sub-Sahara dissert nation.

2.8 Management of Medical Waste

In the year of 2005, WHO advocated that having a good medical waste management hinged on a committed team of qualified and experienced personnel, proper organization and supervision, careful planning, well-established legislation, and sufficient funding. It has been argued that healthcare waste management consists of a process that helps in ensuring appropriate sanitation in health institutions and the wellbeing of health-care employees (Sanitation Connection, 2002). Johannessen et al. (2000) suggest that a good management of medical waste can drastically curtail the risks within and outside health-care facilities, suggesting, as an initial step, the separation of wastes into reusable and non-reusable, harmful and non-lethal components. They recognized other vital measures, such as the institutionalization of an active management system, eliminating or minimizing undue waste manufacture, evasion of risky substances wherever possible, safeguarding worker's safety, providing secure methods of waste collection and transportation, and setting up a functioning waste treatment and disposal system. The authors went further to enumerate the four important key steps to medical waste management: (1) separation into different components, including reusable and secure storage in proper containers; (2) transportation of waste to treatment and disposal sites; (3) treatment; and (4) final disposal. Acharya and Singh (2000) on the other hand, declared that the medical waste management process involves 7 steps including handling, segregation, mutilation, disinfection, storage, transportation and final disposal. They argue that these are vital measures steps for the safe and scientific medical waste management in any institution. Other authors have advocated other methods of managing medical wastes, including re-use of generated medical wastes (Tsakona, 2007), appropriate techniques for disposal (Lee et al, 2004; Diaz et al., 2005), an internal management system and training program for related personnel (Abdulla, 2008; Silva, 2005). Others on the other hand have argued that having a national regulatory framework would be more beneficial (Askarian et al 2004; Shinee, 2008).

Rao et al. (2004), in addition to that, argue that the key steps to the management of medical waste are segregation and recognition of the waste. They suggest that a more proper method to recognize and classify medical waste according to its categories is to segregate the waste into colour-coded plastic bags or containers. Medical waste should primarily be sorted into containers/bags at the place where it is generated. The World Health Organisation (WHO) on the other hand asserts that hospitals should provide plastic bags and strong plastic containers for infectious waste such as empty containers of antiseptics (WHO., 1999).

While general wastes such as garden refuse, and everyday garbage should be put in the domestic stream refuse; sharps on the other hand should be collected in puncture-proof containers and infectious waste containers should be clearly manifested with the biohazard symbol while waste with highly infectious should be sterilized by autoclaving. Acharya and Singh (2000), however, stressed that cytotoxic wastes should be gathered in leak-proof containers obviously labelled as cytotoxic waste. Some other waste such as needles and syringes should be destroyed with the help of a needle destroyer and syringe cutters provided at the place of production; while infusion sets, bottles and gloves should be cut with curved scissors.

Items requiring disinfection such as sharps, soiled linen, plastics and rubber goods should be disinfected at the place where it is produced by using sodium hypochlorite with a minimum contact of an hour. Also, it should be emphasised among medical staff that on-site collection requires waste bags to be sealed when they are three-quarters full. Furthermore, the storage area should be hard standing and resistant to any kind of drainage and there must be easy access for the collection waste vehicles (Srivastava et al., 2000). According to WHO (1999), the tropical areas would temporarily be suitable for the infectious wastes to be kept at for 24hours during the hot season and up to 48 h in cooler seasons.

Specially dedicated wheeled trolleys should be assigned for the collection and transportation of medical waste, and the trolleys should be cleaned daily and designated to particular wards where such medical wastes are generated within the hospital. In terms of off-site transportation vehicles, they should be obviously labeled with the name and address of the carriers. The vehicles should have the biohazard symbol painted conspicuously on it with an effective method of securing the load during transportation. More importantly, medical waste transportation vehicles should be easy to clean with rounded edges or corners. It has been recommended that transportation of medical waste should be implemented by staff that was provided with appropriate vehicle with closed containers (Johannessen et al., 2000). Moreover, all unwanted plastic should go to shredding before disposal. *Finally, the* final medical waste treatment should be carried out with any available technologies such as incineration, autoclave, hydroclave or microwave (Rao et al., 2004).

Based on the previous discussion, medical waste management can be categorized into the following aspects shown in Figure 2.1.

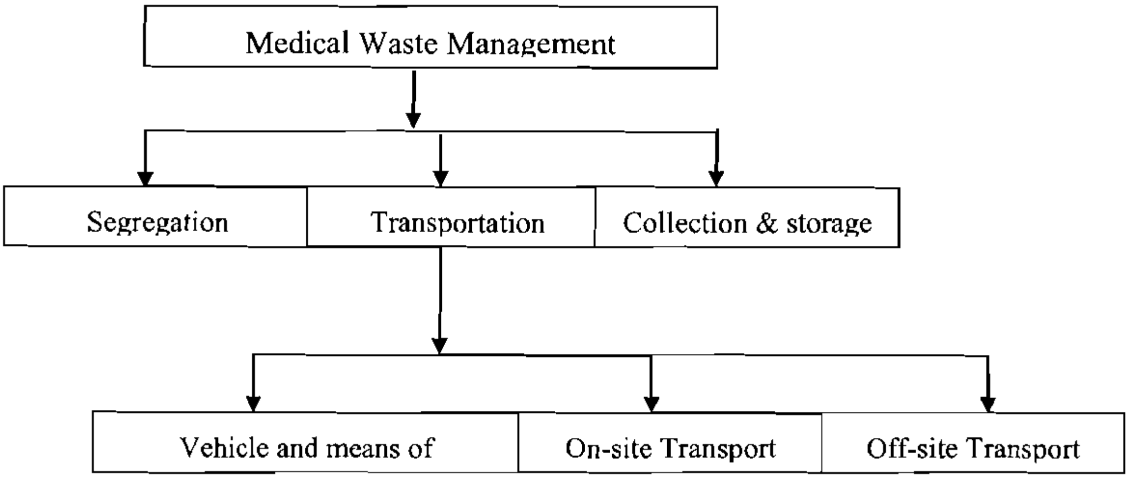


Figure 2.1: Presents Medical Waste Management Categorizations

2.8.1 Medical Waste Collection and Storage

It is important for medical wastes collectors to follow a regular programme for collecting their wastes, and this should be done at least once a day. One point to note is that medical wastes should not be allowed to accumulate where they are generated. According to ICRC (2011), it is essential that medical waste collection is done regularly and systematically with a clear action plan. Infectious wastes (categories 1 and 2) for instance, sharps, bloods, body parts, cultures of infectious agents and so forth have never been collected in places where people have uncontrolled access. The collection company or agents responsible for gathering and transporting medical wastes have to ensure that only the yellow bags and sharps containers which have been closed by the care staff are collected. Additionally, ICRC (2011), staff collecting medical wastes must wear gloves and should quickly replace the filled bags with new ones. A designation of proper area has to be created for storing medical wastes pending collection and this place must meet the following criteria (WHO, 1999).

i) The area must be well closed and entrance is restricted and prohibited for only responsible workers;
ii) The location must be away from food stores;
iii) It must be covered properly;
iv) It must have good drainage and a waterproof floor;
v) The place has to be easily cleaned;
vi) The location must be completely protected from insects, birds and animals;
vii) The location must have easy access for on-site and off-site transportation;
viii) There must be availability of lighting and ventilation;

ix) It has to be isolated;

x) The area must be close to the incinerator in situations where incineration is the method utilized for treating the waste;

xi) There must be wash basins nearby;

xii) An apparent entrance logo must be marked with a sign (for instance, notices like "No unauthorized access", "Toxic", or "Infection risk")

A part from the aforementioned, the right away collection practices of non-risk waste or general waste among the Libyan hospitals is done by private companies where waste is firstly packaged in black plastic bags, and later transported to storage area using uncovered trolleys (Sawalem et al 2010). This practice undoubtedly exposes all folks to potential risks

2.8.2 Segregation of Medical Waste

Segregation of medical wastes refers to the sorting of the wastes into their different types and how their collection can be done separately (ICRC, 2011). The two essential principles that must be adhered to in terms of segregation are as follows:

1) The entity that produces waste are responsible for segregating them;
2) Segregation must be done close to the site where it is produced.

For instance, nursing staff must dispose of sharps waste in needle containers which are placed close to the place where the needles are generated in order to avoid any unnecessary contact with used needles. Ideally, the nursing staff should take the needle container to the patient's bedside and should quickly recap the needles and dispose accordingly after use. Nurses should also avoid removing needles from the syringe as this can be very dangerous and cause transmission of diseases. Further, sorting principles should be maintained throughout the chain (in storage areas and within transport) (ICRC, 2011). Sorting is not necessary for wastes that undergo the same treatment process, except for the sharps, which must at all times be separated at source from other wastes. Since segregation is a very critical process in medical waste management, it is important that all staff undergo regular training, have access to information regularly, and supervision if the sustainability of the system is to be guaranteed. Secondly, by identifying different medical waste according to its type, medical waste can be easily segregated and people are encouraged to dispose of them accordingly in separate containers or colour-coded plastic bags (ICRC, 2011).

2.8.3 Transportation of Medical Waste

Accordingly, Mochungong (2011) indicates that medical wastes generated in medical institutions are transported in two stages, the first being from the stream where it is generated to an on-site storage area. The second stage involves moving the wastes away from a storage source or generation source to an off-site treatment and disposal area.

2.8.3.1 Vehicles and Means of Conveyance

The means for transporting medical wastes are reserved mainly for that purpose only. ICRC (2011), however, indicates that the method used for transportation must be appropriate for the type of medical wastes being transported. These transportation means are expected to meet the following requirements:

1) Ease of loading and unloading;

2) Corners or edges of transportation means must not be sharp so as to avoid tearing and damaging of the bags or containers;

3) The transportation means must be easy to clean with a 5% active chloride solution and must also be clearly marked;

Conversely, off-site means of transport must meet certain requirement as follows:

1) The transportation means must be well closed to avoid spilling on the road;

2) The off-site transportation means must be prepared with a safe loading system so as to avert any spilling inside or outside the vehicle;

3) The off-site transportation means must be marked in accordance with the legislation in force if the load exceeds 333 kg;

4) The vehicle for conveying waste must be cleaned daily.

2.8.3.2 On-site Transport

Coker et al (2009) indicates that the transportation of medical waste depends on the time taken to fill a receptacle. The filling of medical wastes receptacles is also dependent on factors such as the size, services offered by the institute, type of ward or units, and it is usual to find overfilled receptacles. On-site transportation of medical waste in Libya, is carried out by uncovered trolleys (Sawalem et al. 2009), whereas in Nigeria, such wastes are transported on shoulders of staff or with bare hands (Coker et al. 2009). The U.S. EPA (U.S. EPA, 1986) put an effort to minimizing possible risks associated with such crude practices by recommending placing medical wastes in stiff and leak-proof containers while avoiding practices that can puncture medical wastes containers. It is often advisable that medical wastes should be disposed during slacker periods, hence the itinerary should be planned so as to keep away from any incident with patients, visitors, or the institution's employees. ICRC (2011) submitted that care should also be taken not to transport medical wastes through certain clean zones like sterilization rooms, and sensitive areas (such as operating theatres, intensive care units) or public areas.

2.8.3.3 Off-site Transport

It has been argued that the responsibility for packaging, transporting and labelling of medical wastes resides with the institution producing the wastes (ICRC, 2011). According to Luttrell *et al.,* (2003), however, off-site transportation of medical waste is done using vehicles, where there is a likely risk of accidental release of hazardous materials into the environment. Again, these medical wastes are stored in high-volume bulk storage tanks or low-volume storage drums. Nevertheless, storage containers and vehicles transporting medical wastes should be marked with logo indicating bio-hazard while in transit. According to the U.S. Congress Office of Technology Assessment (OTA, 1988), creating and constantly updating a database and keeping track of infectious clinical waste and the containment of the waste at transfer stations are some of the issues in off-site clinical waste transportation that require proper attention

It is advisable that packaging and labeling should follow standards laid out in national legislation on the transportation of dangerous substances. However, where such medical wastes would be transported across national borders, the institutions should ensure compliance with the Basel Convention. Consequently, where national legislations on medical wastes disposal and transportation are not available, the United Nations Recommendations on the Transport of Dangerous Goods or the European Agreement on the International Carriage of Dangerous Goods by Road (ADR) should be referred to (UNECE, 2009). Again, while a vehicle carrying less than 333 kg of medical waste entailing the risk of contamination (UN, 3291) is not required to be marked, it must bear the bio-hazard sign plates. However, with respect to the current Libyan concern, general municipality is in charge of transporting medical waste, and the frequency of collection is done differently from city to another city depending on how serious the regional municipality takes advantages of clearing up this kind of waste. Yet, sadly that the municipal workers deal with all waste produced by hospitals without receiving any primary training which will later on be resulted in a great danger of getting affected to variety of viruses and hazards. Medical waste is disposed of together with domestic waste in an open dumping site away from people exhibition. However, very few hospitals in Libya are provided with incinerators. On the other hand, most of these incinerators are not working effectively and exhibit operation problems as well and they are working without any surveillances.

2.9 World Health Organization (WHO) Waste Management as a Best Practice

Health-care waste-management operations at local, regional and national levels should be organized and planned. WHO in terms of planning, responsibilities and other assignment are discussed below

2.9.1 Medical Waste Management Planning

In order to improve any healthcare facility, planning is to be an essential step at national, regional, and local levels. Planning could be defined as the need of strategies that will facilitate the implementation of the necessary measures and the proper allocation of resources according to the identified priorities.

WHO (2005) classified the national plans for waste management at different medical institutions. These are as follows:

1. Purpose of a national management plan
2. Action plan for the development of a national programme

This national programme of waste management at healthcare facilities could be upgraded through a number of steps as presented in Figure 2.2. For more details, refer to the appendix.

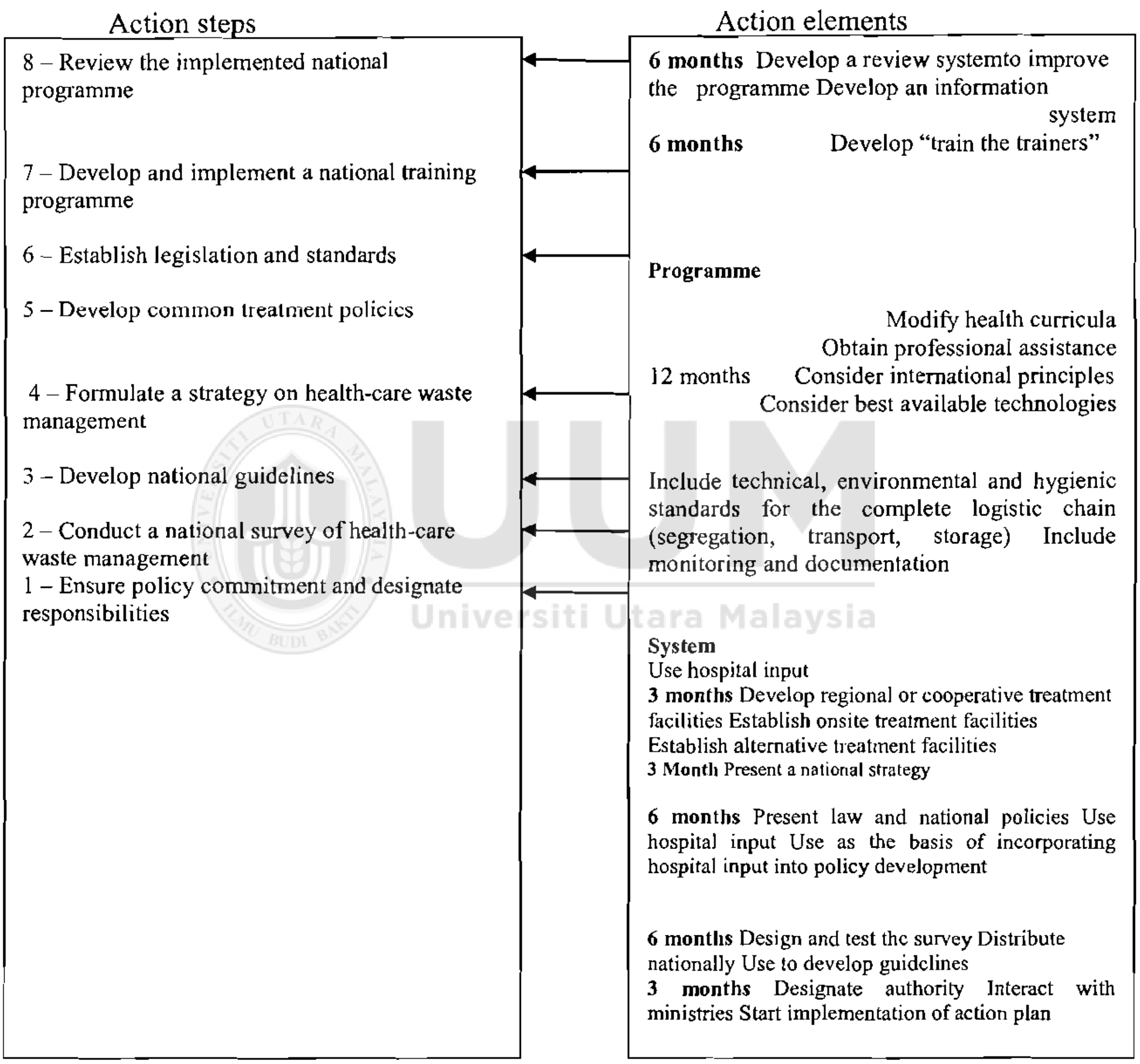


Figure 2.2 Illustrates the Action Plan for a National Programme of Sound healthcare Waste Management
Source: WHO (2005).

2.9.2 Assignment of Responsibilities as a WHO Best Practice

The appropriate management of medical waste management is firstly depending on good organization and proper administration as well as clear legislation and financing, and in addition, active participation by trained personnel.

At the early stage, the head of a hospital or any healthcare facility should take advantage by formulating a team to work and develop a waste management plan. The team should include the following members: Head of hospital, head of hospital departments, infection control officer, chief pharmacist, radiation officer, senior nursing officer, hospital manager, hospital engineer, financial controller, and waste management officer. This management structure is shown in Figure 2.3. Furthermore, for more details regarding the liaison paths and duties of this structure, refer to the appendix.

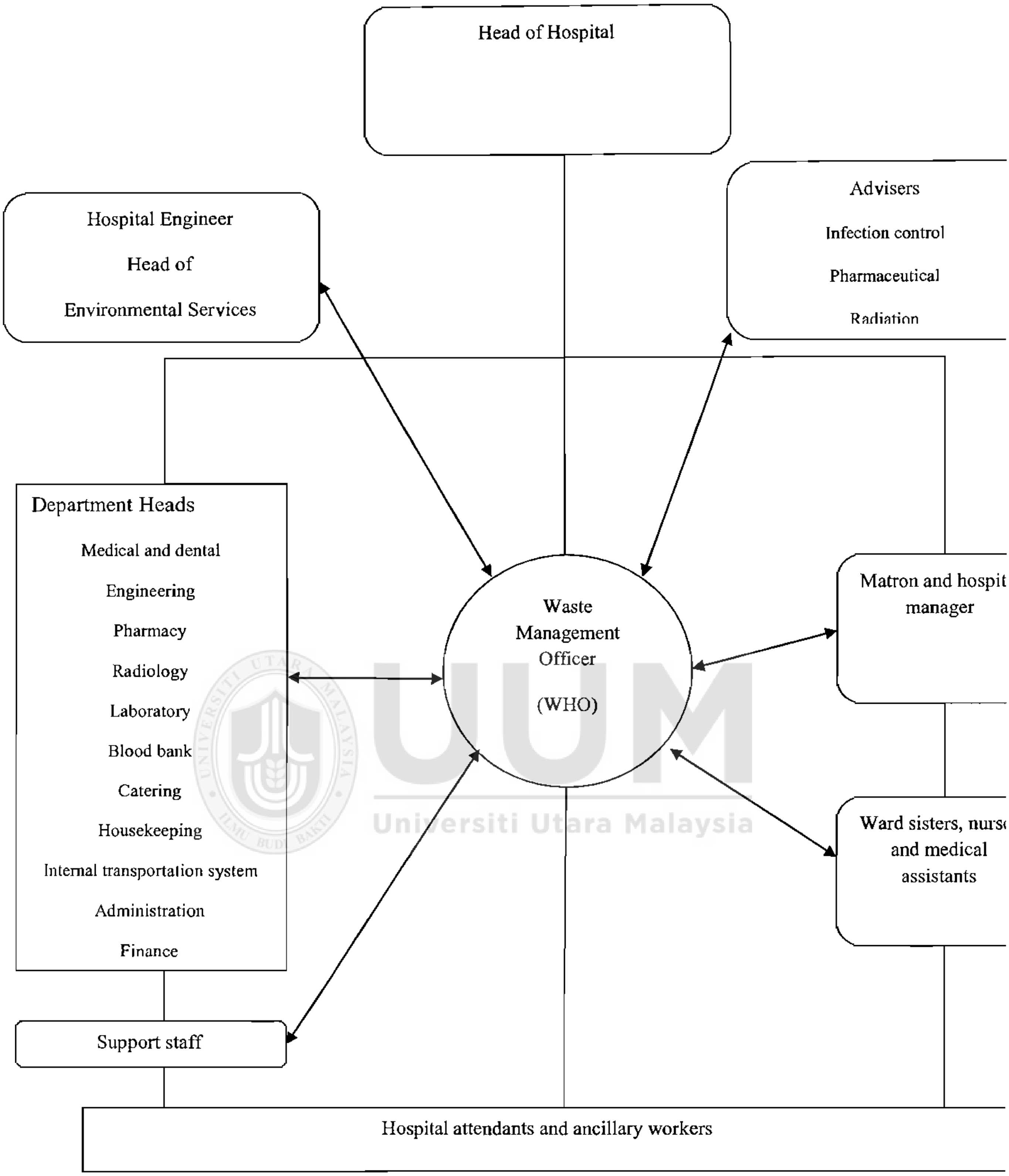


Figure 2.3 Presents Management Structure Team and Liaison Paths

2.9.3 WHO, Handling, Storage and Transportation of Healthcare Waste

Medical waste management practices consists a variety steps and action in terms of collection, transportation and final disposal. These are articulated below.

2.9.3.1 Medical Waste Segregation

In order to minimize risk and have effective medical waste management, segregation must take place where the waste is always generated (WHO, 2005). It is the responsibility of the waste producer. However, identifying the waste categories is to be done by sorting the waste into color-coded plastic bags or containers. WHO (2005) recommendation for color coding scheme is presented in Table 2.4.

Table 2.4: WHO-Recommended Segregation Scheme

Type of waste	Colour of container and markingsa	Type of container
Highly infectious waste	Yellow, marked "HIGHLY INFECTIOUS", with biohazard symbol	Strong, leak-proof plastic bag, or container capable of being autoclaved
Other infectious waste, pathological and anatomical waste	Yellow with biohazard symbol	Leak-proof plastic bag or container
Sharps	Yellow, marked "SHARPS", with biohazard symbol	Puncture-proof container
Chemical and pharmaceutical waste	Brown, labelled with appropriate hazard symbol	Plastie bag or rigid container
Radioactive waste	Labelled with radiation symbol	Lead box
General health-care waste	Black	Plastic bag

3.9.3.2 Medical Waste Collection

The waste should be collected after they are about three-quarter full in proper bags. Nursing and other clinical staffs are in charge of closing bags. Light gauge bags can be closed by tuning the neck, but heaver-gauge bags may need a plastic sealing tag of the self-looking type. However, bags should not be closed by stapling. Sealing sharps containers have to be positioned in a labeled, yellow infectious healthcare waste bag before transporting it from any ward or department. However, the waste must never be allowed to accumulate where it is generated. And as a part of a hospital plan, a clear routine programme for the collection of waste should be established

The additional steps which should be followed by ancillary handlers for waste collection are:

1. Waste should be collected daily or as frequently as needed and transported to the central storage area
2. Bags should be removed only after they are labeled with their kind of waste (hospital and ward or department) and containers
3. The containers or bags must be replaced with new ones of the same kind immediately.

2.9.3.3 Storage

A proper designated area must be in place for having the waste stored and should be inside the research facility or healthcare establishment. However, the designated location must meet the following standards (WHO, 1999, 2005).

i) It has to be well closed and entry restricted to responsible workers only;

ii) It must be away from any food store;

iii) It has to be properly covered and sheltered from the sun;

iv) It has to have good drainage and its floor must be waterproof;

v) It must be easy to clean;

vi) It must be completely protected from insects, birds and animals;

vii) Easy access for on-site and off-site transportation must be available;

viii) Lighting and ventilation must be in place;

ix) It must be segregated (so that different types of waste can be sorted);

x) It must be close to the incinerator in cases where incineration is the method utilized for treating the waste;

xi) There must be wash basins nearby;

xii) A clear entrance logo must be marked with a sign ("No unauthorized access", "Toxic", or "Infection risk".

In case of refrigerator availability for storage of the waste, storage time should not exceed 72 hours in winter climate and 48 hours in summer temperature. During the cool season 48 hours is acceptable and 24 hours in hot season.

Cytotoxic waste has to be stored away from other waste in appropriate designated area (WHO, 1999, 2005).

2.9.3.3.1 On-site and Off-site Transportation of Medical Waste

The hospital or other facility is responsible for transporting the waste by means of wheeled trolleys, containers or carts that are specifically used for this purpose and should meet the following standards:

4) They must be easy to load and unload;

5) Their corners or edges must not be sharp, which could result in tearing the bags or damaging the containers;

6) They must be easy to clean with a 5% active chloride solution;

4. They must be clearly marked.

On the other hand, off-site means of transport must meet the following requirements:

5) They must be well closed to averting any spilling on the road;

6) A safe loading system must be available in order to prevent any spilling inside or outside the vehicle;

7) They must be marked according to the legislation in force if the load exceeds 333 kg;

8) The vehicle and means of conveyance have to be cleaned daily.

For more details on the transportation of healthcare waste, refer to the appendix.

2.10 Public Health Effects of Medical Waste

Medical waste consists of a huge constituent of general waste as well as small quantity of hazardous waste, but any unwanted contact with such waste may consequently result in disease or injury. The hazardous nature of medical waste is due to the fact that it contains infectious, genetoxic agents, toxic or hazardous chemicals, pharmaceuticals, radioactive as well as sharps (WHO, 1999). All people generate hazardous wastes, including those within the health-care facilities, are indeed at possible risk of this kind of waste. The general public and those outside the source of hazardous wastes are exposed to risks as a result of careless management. Meanwhile, medical doctors, nurses, health-care auxiliaries, hospital maintenance personnel, patients in health-care establishments or receiving home care, and visitors to health-care, are the most susceptible people to risks associated with hazardous medical waste.

2.10.1 Infectious Waste Effects and Sharps

According to WHO estimation, the amount of infectious waste and sharp objects in developing countries is about 15% and 1%, respectively (Pruss *et al.,* 1999). For serious viral infections such as HIV/AIDS and hepatitis B and C, nurses are more prone to infection through injuries from contaminated sharps (Abor, 2007). It has also been argued that medical waste that can constitute infections such as contaminated sharps and syringes may cause a major health threat as a result of their exposure to pathogens in blood and other fluids from patients through Percutaneous Injuries (PI), abrasions and cuts in the skin (Mochungong, 2011). Some other hospital staff and waste management operators outside health facilities are also at significant risk as well as individuals who scavenge on waste disposal sites. Abor (2007) also recorded that the risk of infection among patients and the public is greatly lower. Further, more than three million health workers experience the stressful event of a Percutaneous Injuries (PI) with contaminated sharps annually (Prüss-Üstün *et al.,* 2005). Epidemiological studies also revealed that a person who experiences a needle stick injury from a needle used on an infected source patient has risks of contracting HBV, HCV and HIV at the rates of 30%, 1.8% and 0.3% respectively (IHCWS, 2008). The anxiety surrounding HIV, HBV and HCV is as a result of the high prevalence of these pathogens in the poorer regions of the world. This scenario is further amplified by strong evidence of transmission through clinical waste

(Pruss *et al.,* 1999; Sagoe-Moses *et al.,* 2001). HBV and HCV, including the Lassa and Ebola viruses, for example, are already prevalent in sub-Saharan Africa (Sagoe-Moses *et al.*, 2001).

According to Shiao *et al.*, (2002), out of 7,550 needle stick and sharp injuries reported by 8,645 health workers, 66.7% involved a contaminated hollow-bore needle. Also, the study revealed that from 1,805 blood samples from the health workers who have undergone thorough tests, 16.7% was seropositive for hepatitis B surface antigen, 12.7% were positive for anti-HCV and 0.8% was positive for anti-HIV. Hence, the authors concluded that 308 to 924 health workers were at risk of contracting HBV; 334 to 836 were at risk of contracting HCV; while at most, 2 were at risk of contracting HIV. On the other hand, a study conducted by Jahan (2005), at Buraidah Central Hospital in Saudi Arabia submitted that out of 73 identified injuries from needles and other sharp objects, physicians, nurses, technicians as well as non-clinical support staff were involved in 19%, 66%, 10% and 5.5% of those instances respectively. According to the study, most of the injuries occurred during recapping of used needles (29%), during surgery (19%), by accidental contact with sharps (14%), disposal related (11%), and also through concealed sharps (5%) while handling linens or refuse containing improperly disposed needles (Jahan, 2005) .

Further, the risk of occupationally transmitted infection with hepatitis B and hepatitis C among health workers was as a result of the frequent injuries from needle stick containing patients' blood (Berger *et al.*, 2000). Other factors which affect the transmission rates of infections to health workers include the prevalence of virus carrier patient, the immune status of the health worker– in the case of HBV, and the vaccination rate. In a similar study conducted in Egypt about occupational exposure to needle stick injuries and hepatitis B vaccination coverage among health workers, reports revealed that out of 1,485 of health workers interviewed, 529 (representing 35.6%) have been exposed to at least 1 needle stick injury during the past 3 months, with an estimated annual number of 4.9 needle sticks per worker (Talaat *et al.*, 2003). The study also revealed that 3 doses of hepatitis B vaccine were administered to 15.8% of health workers, with the highest coverage among professional staff (38%) and lowest among housekeeping staff (3.5%). The study additionally recorded that about 24,004 HCV and about 8,617 HBV infections occur in Egypt each year as a consequence of occupational exposure. A similar study in the US, found that among vulnerable health workers, 75% had been administered 3 or more doses of the hepatitis B vaccine, equivalent to 2.5 million vaccinated hospital-based health workers. The study went further to report that the coverage level was 81% within staff physicians and nurses and much lower in phlebotomists (71.1%) and nurses' aides and/or other patient care staff (70.9%).

2.10.2 Chemical and Pharmaceutical Waste Effects

So far, there has not been any scientific documentation recording occurrence of widespread illnesses among the general public due primarily to pharmaceutical or chemical waste from healthcare institutions and hospitals. Recorded examples could be found in extensive toxicity caused by industrial chemical waste. Most cases of injury or toxicity are generated from inadequate handling of chemicals or pharmaceuticals in health-care institutions. Health-care workers like nurses, anesthetists, pharmacist, auxiliary staff and maintenance workers are usually at risk of dermal or respiratory diseases caused by exposure to substances such as vapours, aerosols and liquids (Abor, 2007). In order to curtail these occupational risks, less hazardous chemicals should be substituted wherever possible while providing protective equipment to all personnel working in susceptible units or wards. Moreover, Abor (2007) emphasizes that places where hazardous chemicals are used or stored should appropriately be ventilated, and personnel at risk should be provided with training in preventive measures and in emergency care should there be any accident.

2.10.3 Genotoxic Waste Effects

There are limited data and few records on the long-term health impact of genotoxic health-care waste and this is partly due to the difficulties associated with adequately assessing human exposure to these compounds. For instance, a research conducted in Finland, concluded that a considerable correlation exists between foetal loss and occupational exposure to antineoplastic drugs during the first three months of pregnancy (Abor, 2007). Conversely, similar studies conducted in France and the United States failed to confirm this finding. Again, some studies explored the potential health hazard associated with the handling of antineoplastic drugs manifested by the increased levels of urinary or mutagenic compounds in exposed workers and an increased risk of abortion. Another study showed that the level of exposure of personnel cleaning hospital urinals exceeded that of nurses and pharmacists; however, these individuals were less aware of the danger involved in their line of duty and took fewer precautions (Abor, 2007).

2.10.4 General Public Risks throughout Medical Waste

There are numerous health effects associated with exposure to medical waste and infections may be transmitted by contact with excretions of infected patients or body fluids contained in the waste. However, certain infections are transmitted through other media or by more resilient agents thereby posing major risks to patients and the general public. According to Aboh, (2007) uncontrolled sewage discharges from field hospitals treating cholera patients were strongly implicated in cholera epidemics in some Latin American countries (Abor, 2007). Rodents and insects have also been known to distribute pathogens with which they have come in contact with due to improper medical wastes storage. Poor medical waste management is mostly responsible for nosocomial infections when the waste contaminates a patient's items or surfaces. Other possible health effects include skin infections, respiratory infections, gastroenteritis infections, bloodstream infections, effects of radioactive substances and intoxication (WHO, 2005). Pruss *et al.*, (1999) and Franka *et al.*, (2009) argue that mucous membranes, inhalation and ingestion are some other potential routes of exposure to medical waste from different healthcare facilities.

One major source of infection especially in developing countries is the reuse of infectious syringes, and this represents a major threat to public health. WHO estimates that in the year 2000, injections undertaken with contaminated syringes caused about 23 million infections of hepatitis B, hepatitis C and HIV. More often, children are at risk of coming into contact with infectious wastes and accidents may occur when toxic chemicals become accessible to the public. In 2002, WHO conducted an assessment in 22 developing countries. The results revealed that the proportion of health-care facilities that do not use appropriate waste disposal methods ranges from 18% to 64% of handling (WHO, 2005). This led Abor, (2007) to conclude that there would be strong connection between management of medical waste and hospital hygiene.

According to Jahan (2005), understanding the epidemiology of needle stick injuries in a target population is important in designing and implementing appropriate control measures. However, it has been suggested that strategies such as education of health workers on the risks and precautions, reduction of invasive procedures, usage of safer devices and procedure, and exposures management are available to avoid infections resulting from sharps injuries (Prüss-Üstün *et al.,* (2005). The authors argue that reduction in the transmission of blood-borne pathogens in the industrialized world was possible due to proper monitoring of occupational health hazards, while poor surveillance and monitoring systems in developing countries has led to increased risks

2.10.5 Risk of Medical Waste to the Environment

Medical wastes is known for its undesirable effect on the health of human beings by contaminating water bodies during waste treatment, and causing air pollution through emissions of highly toxic gases during incineration. Henry and Heinke, (1996) and Oweis *et al.*, (2005) also argued that medical wastes can have adverse effect on natural resources. Gupta *et al.*, (2009) on the other hand has put the blame on both the affected people and the responsible government authorities, arguing that medical waste impact on human and the natural environment is the result of not receiving the desired attention from either.

The protection of health-care workers in developing countries where basic medical care is difficult to provide does not seem to be a priority among policy authorities. Hence it becomes a formidable challenge (Sagoe-Moses *et al.,* 2001). Health workers and other individuals such as children who either handle such waste or are exposed to them on account of not paying enough attention towards managing the medical wastes further aggravate the challenges. Again, water bodies become contaminated when wastes are disposed of in a pit which is not lined or is too close to such water sources. If health-care waste is burnt openly or in an incinerator with no emission control, dioxins, furans and other toxic air pollutants are released. Inhaling such air-borne pollutants could cause serious illness in people. When selecting a treatment or a disposal method for health workers, the environmental viability of such a disposal method should be a crucial criterion. However, it is comforting that WHO has established tolerable intake limits for dioxins and furans, but they have not set such limits for emissions. Individual countries must therefore set limits for emissions within their national contexts. Several countries have outlined their emission limits ranging from 0.1 ng $TEQm^3$ (Toxicity Equivalence) in Europe from 0.1 ng to 5 ng TEQ/m^3 in Japan depending on incinerator capacity (WHO, 2005). However, in the European Union, incineration is now the least preferred alternative.

2.11 Previous Work Conducted on Medical Waste

Management of medical waste has been conducted at global level for ages in terms of objectives and aims. Therefore, the following is a summary of some previously studies conducted about medical waste management presented in Table 2.5.

Table 2.5: Summarizing some Previous Studies on Medical Waste Done in Different Countries

Author	Objectives	Findings	Location
Houang and Hurley (1997)	Assessing familiarity of nursing staff with written policies and procedures regarding infection control	More familiarity among nurses with written policies and procedures than other medical personnel	Chelsea Hospital in London
García (1999)	Medical waste management	The usage of red bag of waste containers is used increasingly to reduce medical waste risks.	Brookdale University Hospital and Medical Center (BUHMC) of Brooklyn, New York.
Hagen et al. (2001)	Infectious-waste surveys for improvement	Segregation of Infectious-waste may reduce disposal costs, and the load on the hospital incinerator, identifying improper items have significant cost or safety implications, and provide a safer work environment for housekeepers. As a result, infectious waste were reduced by 65% after implementation of waste isolation programme in 1991	Saudi Arabia
Mühlich et al. (2003)	Data on regulations and strategies regards MWM from five hospitals	Different strategies were revealed differently in defining infectious waste at hospital. The infrastructure differentiation played essential roles in the economic and ecological affected by the waste segregation and disposal step	Five different countries
Almuneef and Memish (2003)	Effective medical waste management	In less developed countries, infectious-waste problem is usually caused by the lack of a universally accepted definition of "infectious" rather than by financial and technical difficulties.	Saudi Arabia
Askarian et al. (2004)	Various waste generated and the current MWM	Non-government hospitals are less influenced by financial difficulties than government one. The training courses provided were either ineffective or unsuitable. Non-government hospitals are more concerned about their quality than government hospitals and make capital investments, such as letting specialists assess waste management status in their institution, compiling and enacting rules, establishing standards and providing effective training for personnel	Fars Province, Iran
Nzoupe Ngounou (2004)	Hospitals waste management	He found that there is no operation in efficiency comparison with developed countries, such as the United Kingdom	Cameroon
Mohee (2005)	Characteristics of medical waste in health-care institutions	The amount of hazardous wastes generated in health-care facilities depends on the occupied beds in hospitals	Mauritius
Blenkharn (2006)	Standards of MWM in hospitals	Arrangements for bulk clinical waste handling were noted to get a snapshot of overall standards of performance	Brazil
Jang et al.	Medical-waste management	They found that medical waste is mixed with municipal solid waste and disposed of together with residential waste in inappropriate	Korea

(2006)		treatment facilities.	
Bdour et al. (2007)	A study on procedures available, techniques, and methods of handling and disposing of MW at medium to large size health-care institutions	He concludes that healthcare institutions have not enough practices with regard to handling medical waste in comparison with advanced countries. (Guidelines, methods or regulations for waste segregation, handling classification as well as medical wastes disposal were not applied. The study also concluded that the number of patients, number of beds and hospital types were essential factors in generated hospital waste	Northern part of Jordan
Abdulla et al. (2008)	Medical waste management aspects from 21 different hospitals	Their findings showed that segregation of MW types in hospitals was not applied properly. Different hospital personnel are in need of training from top management down to incinerator operation staff involved in the MWM practices used by hospitals	Northern Jordan
Felicia et al. (2008)	Hospital waste management	The study resulted that the majority of waste recycling was leftover food. There was a chance for other general waste such as plastic bags, plastic containers and cans recycling but is not recycled	South Africa
Sawalem et al. (2009)	Hospital waste management	The investigation showed that the hospitals surveyed had neither guidelines for separated collection and classification, nor methods for storage and disposal of generated waste. This deficiency indicates the need for an adequate hospital waste management strategy to improve and control the existing situation.	Libya
Insa et al. (2010)	Regional legislation in Spain	Certain differenees were detected regarding the criteria used for sorting, collection, storage, transport, treatment and disposal practice. It was found these differences in WM criteria could have health implieations as well as environmental and economic consequences both inside& outside healthcare institutions	Spain
Askarian et al (2010)	Reduction of the amount of infectious waste by clear definition and segregation of waste at the source site	Structured WM concept together with clear definition and staff training can be a key in the implementation of waste reduction which will lead to decreased expenditure in different healthcare facilities	Namazi hospital, Iran
Ruoyan, G et al. (2010)	Investigation of HCWM	The factors that determine the knowledge of medical staff members in healthcare waste management policy are Level of HCF, responsibility for MWM in department and wards, educational background & training experience. Financing and administrative monitoring by local authorities are needed to improve handling practiecs and implementation of off-site centralized disposal in primary health care eentres;	Binzhou District, China
Botelho (2012)	The impact of education and training on compliance behavior and waste generation in private healthcare facilities	It was found that the law applieation is far from ideal and provision of education and training is the strongest policy factor that influence compliance	European countries

2.12 Summary

This chapter summarizes the concept of medical waste management. The different terms being used to describe medical waste are articulated as well as types of various waste. Next, laws and regulation of medical waste management and method used for treating and disposal of waste are also discussed, followed by a discussion of public health effects of medical waste. Finally, the chapter indicates some previous work conducted on medical waste management at global levels.

CHAPTER THREE

ORGANIZATIONAL FACTORS INFLUNCING MEDICAL WASTE MANAGEMENT PRACTICES

3.1 Introduction

This chapter discusses the organizational factors that could influence medical waste management practices. At first, the chapter presents the organizational internal factors with their dimensions. After that, the external organizational factors that could affect medical waste management practices are also discussed as well as the relationship between organizational internal, external factors and medical waste management practices. At the end of this chapter, the theoretical framework, the underpinned theory and hypotheses developed are presented.

3.2 Factors Influencing Medical Waste Management Practice

Based on the literature, there are different factors that have clear influence upon the management of medical waste (Tudor et al., 2005). These comprise both organizational internal and external factors. Many studies in the past gave to issues such as priority to global health funders, policy –makers and practitioners. In terms of health system sector, in fact, considerable attention was given to policy levers such as financing approaches, payment system or regulatory reforms, whereas less attention has been directed to towards the organizations that provide health services such as hospitals, health centers and clinics (Pallas et al.; 2012). Evidence suggests that the impact of organization-level intervention varies by context. However, external factors such as environmental pressure or market competition and role of government will influence an organization to adopting an innovation (Scupola et al., 2003). In the current research, organization structure and characteristics will be examined under internal or external medical waste factors that influence its management.

3.2.1. Internal Organizational Factors

Scholars have identified several factors (internal and external) that influence organizational performance. These factors include incentives for staff (Kipp et al, 2001; Echler and Levine, 2009), staff training and monitoring (Guiscafre et al., 2001; Berglund et al., 2010), health facility accreditation (Bukonda et al., 2002; Cleveland et al., 2011), clinical guidelines (Deen et al., 2003; Smyth and Ridwan, 1998), data feedback (Rowe et al., 2005; Rowe, 2009), creation and implementation of effective standard operating procedures (Kotagal et al., 2009; Bruijns et al., 2008). Additionally, Agha et al (2007) and Ngo et al (2009) point to social marketing as one of the organizational factors that affect successful interventions to improve organizational performance especially in low- and middle-income countries.

Therefore, this research has classified the factors that influence medical waste management (MWM) into two. These are internal and external. The internal factors deal with inside variable in which the organization company (MWM) can control, review and improve upon (Akgun et al., 2007). Therefore, the internal factors that are examined in this research are organization structure and culture. Organization structure has been conceptualized into two dimensions: centralization and formalization. Organization culture has also been conceptualized into two dimensions: individualism and collectivism, and power distance.

3.2.1.1 Organizational Structure

According to Skivington and Daft (1991), organizational structure describes an enduring configuration of activities and tasks. Organizational structure as described in literature refers to an organization's internal way of relationships, communication, and authority (Hage and Aiken, 1967). Organizational structure is defined as the formal allocation of work policies and administrative mechanism for controlling and integrating wok activities (Ghani et al.; 2002; Robbins, 1990). Organizational structure could also be defined as how activities such as task distribution, management and supervision are heading for the achievement of the organizations aims and goals. There are several dimensions discussed in the literature. The most important aspects of Organizational structure consist of centralization, formalization, integration and complexity (Lee and Grover, 2000). Centralization refers to the degree to which the right to make decision and evaluate activities is concentrated (Fry and Slocum, 1984; Mintzberg, 1979), and formalization refers to the degree to which decisions and working relationships are directed by formal rules and standard policies and procedures in an organization (Fredrickson, 1986; pertusa-Otega, 2010). Following Sehanovic and Zugaj (1997) definition, as the organizational structure of an organization stands for things that represent the totality of links and relationships between and within its factors at all levels of the organization in precisely defined quantities. This definition is line with safe management of healthcare facilities from the perspective of managerial to administrative and labour work.

Based on previous studies, this research conceptualizes organizational structure as centralization and formalization (Lee and Grover, 2000). However, this research examines the relationship between the structural dimension and medical waste management practice in Libyan public hospitals.

3.2.1.1.1 Centralization

Centralization refers to the concentration of power or decision-making authority in an organization (Schminke et al, 2002). This definition has certain disadvantages in terms of communication prevention (Pertusa-Ortega, Zaragoza-Sáez, and Claver-Cortés, 2010) and reduces essential motivation and employee satisfaction (Zheng, Yang, and McLean, 2010). On the other hand, Matheson (2007) submitted that centralized organizations will enhance work alienation, which will in turn promote employees' workplace friendship (Sias and Cahill, 1998). Friendship in higher workplace has implication on the employee's willingness to assist other colleagues (Bowler and Brass, 2006). Since workplace refer to informal and personal-related interaction in workplace setting (Berman et al., 2002), workplace friendship increases support and resources that help individuals do their jobs. Following the views of some scholars (Hall, 1997; Fry and Slocum, 1984; Mintzberg, 1979) centralization in the context of healthcare service providers relates to in line with the extent to which the right to make decision and evaluate activities is concentrated with regard to the best practice of healthcare waste management.

The purpose of centralization is to ensure standardization, clear documentations, responsibility regarding the best practice, minimizing the interested parties who are facing lack of information or skills; it enables them to utilize the skills of central and specialized experts, and to have a closer control of organizational operations (Katsikea, Theodosiou, Perdikis & Kehagias, 2011).

Additionally, when the organization allows individuals to act autonomously, then it can achieve better business opportunities with regard to services or even new products (Nonaka, 1994, 1988). However, centralized organizations may reduce creative solutions, discourage inter-departmental communication as well as the frequent circulation and knowledge sharing (Souitaris, 2001).

From the perspective of waste management, the responsibility for centralization structures in which only the authority personnel in terms of decision making and full empowerment lies in the hand of top managers. So as a result, the benefit of centralization is to prevent staff members or even managers from being flexible and taking the initiative in the course of performing their duties (Katsikea, et al., 2011).

3.2.1.1.2 Formalization

Formalization refers to the extent to which standard policies, formal rules, and procedures manage decisions and working relationships (Fredrickson, 1986). This definition could be negatively criticized because it provides a restriction when strict formal rules dominate an organization (Lee and Choi, 2003). On the other hand, formalization can well improve cooperation and collaboration among the organizational staff all together (Cordon-pozo *et al.,* 2006). Moreover, formalization could shape interaction structure and scope and provide helpful insights for organizational management improvement (Kern, 2006). Formalization measures the extent to which an organization uses rules and procedures to prescribe behavior (Ghani *et al.*; 2002; Robbins, 1990). However, Feldman and Pentland (2003) suggested that formalization and organizational routines possess certain similarities in the sense that both of them symbolize manner of behavior, action, procedures, or interaction. Also, they differ in a very important way, while routines are a form of implicit knowledge, formalization is explicit and codified (Reynaud, 2005). Both formalization and organizational routines could go contrary to feasibility as they can drive organizations to inflexible, static patterns of action. Organizational routines, according to some theorists are rather more dynamic system than a static objects (Feldman and Pentland, 2003; Becker *et al.*, 2005).

Following Fredrickson, 1986 and pertusa-Otega, 2010), this research defines formalization in the present research is that formalization is referred to the degree to which decisions and working relationships are directed by formal rules and standard policies and procedures in the management of waste healthcare facilities (Fredrickson, 1986; pertusa-Otega, 2010). In the context of medical waste view, medical waste management with proper structure and clear rules and procedures will firstly permit the management to ease the handling the waste properly in where they are produced from deferent departments (Cohendet et al., 2004), and secondly reduce ambiguity (Cordon-pozo et al., 2006). Lastly, with formal procedures, employees tend to deal more effectively with contingencies because they include the best practices learnt from experience and incorporated into the organizational memory (Adler and Borys, 1996). So in this context, formalization control and regulate best practices in order to stabilize and disseminate consistent program that will enable employees to follow it regularly and increase the quality of performance. An example of the positive relationship between formalization and waste management in the literature is the Total Quality Management (TQM). Total Quality Management means the analysis and evaluation of all the activities improved within an organization (pertusa-Otega et al., 2010), so that evaluation may generate ideas and new ways bound to codify in a series of formal documents that lead to the development of the quality in the chain of medical waste management. Meirovich, Brender-Ilan, and Meirovich (2007) and Schrodter (2007) demonstrated that formalization has a positive corelationship with the quality of products or services that the organization offers.

3.2.1.2 Organizational Culture

Scholars and practitioners that recognize that organizational culture has a great impact on the achievement and long-term effectiveness of organizations. The concept of culture has received sufficient attention only at the beginning of the 1980s from the relevant scholars. This is one of the few areas, indeed, in which observers led to practicing managers to identifying a critical factor affecting organizational performance. Organizational culture is deemed to be an area in which conceptual work and scholarship have revealed directions and leadership for managers as they have been looking for ways to boost the effectiveness of their organization (Yildirim and Birinc, 2013). Obviously, there is a number of different kind or levels of culture that affect individual and organizational behavior. Studies have already reported clear distinction between continent and countries based on definite key dimensions (Hofstede, 1980; Aiken and Bachrarach, 1980 and Trompenaars, 1992). Organization culture refers to shared assumptions, values, and norms (Schein, 1985). Bass (1993) defines culture as the glue that holds the organization together as a source of identity and distinctive competence.

Also Organizational culture is a basis of sustained competitive advantage (Barney, 1991). Empirical research shows that it is a main feature of organizational effectiveness (Deal and Kennedy, 1982; Denison, 1990; Gordon and Di Tomaso, 1992; Ouchi and Jaeger, 1978; Peters and Waterman, 1982; Wilkins and Ouchi, 1983).

Within the context of organization, culture represents the behavior of human beings who are considered to be a part of an organization and the meaning that people connect or attach to their actions in the chain of medical waste management. The relationship between culture of an organization and its management was clearly stated in the literature (Fey and Denison, 1986).

According to Davies, Mannion, Jacob, Powell and Marshall (2007), organizational culture refers to the assumption, values, attitudes as well as beliefs that a significant group share among them within the organization. In the line of thought, culture could be also defined as the collective mind program which distinguishes the member of one category or group of people from another (Hofsted, 1991). According to him, this kind of definition is not yet completed, but it covers what he meant to measure. However, culture in his sense consists of systems of values and values are among the building blocks of culture. Furthermore, culture is to be characterized by specific problems arising from the inexhaustible nature of its components. Therefore, in analyzing the cultural impact on the behavior of the members of any particular subculture, to selecting the most dimensions that could be applied to the particular perspective of cultural behavior being studied. This research identifies and adopts four dimensions of culture (Hofsted, 1991). These are

1. Individualism Vs collectivism
2. Large and small power distance
3. Strong and weak uncertainty avoidance
4. Masculinity and feminity

According to the aforementioned dimensions, the first two dimensions (individualism vs collectivism and power distance) are chosen because of, their relevant values for studying the evaluation and management the waste by the leadership style (Hofsted, 1983). Furthermore, they had been developed through empirical measurement and their validity and reliability have been tested (Harrison, 1990; Morris et al., 1993; Pratt, 1986; Bosland, 1984; Hofsted, 1984). In addition, these dimensions are the most comprehensive, famous among cross-culture studies and the most often cited work in culture research because they help to draw a number variety of culture from one organization to another and even from one country to another (Jackson 1995; Chapman 1996; Chow et al. 1996; Radebaugh et al. 1997; Rodrigues 1996; Collins et al. 1999;

Sivakumar et al. 2001; Thompson 2003; Bing 2004; Dahl 2004; Kirkman et al. 2006; Soares et al. 2007; Twati 2007; Harris et al. 2008; Robbins et al. 2008). In the same vain, Hofstede model helps to understand the values that emphasize the cultural function of units as an explanation for understanding other cultural differences, and the simplicity of Hofstede"s (2001) model is also another reason why this research chose to use it because his dimensions are straightforward, not complicated and interesting in terms of business readers and academic researchers cross many field of studies including medical waste management practices. It is also stated that "*the fact that not only academics but also managers can talk about culture-related management issues in terms of Hofstede"s cultural dimensions is indicative of Hofstede"s great influence*". Moreover, Sondergaard 1994; Christie et al., 2003) the dimensions of Hofstede have been broadly accepted and repeatedly validated over time.

Conversely, some other scholars mentioned that organizational culture does not have direct influence on organizational effectiveness, it rather influences behavioural shaping of organizational members in an ambiguous and uncertain world. The most important part of decision-making, however is to absorb the information from the environment to structure the unknown (Waterman, 1990). Therefore, culture refers to the connection of rooted values and beliefs shared by the organization's employees at different levels which is manifested in the characteristics of such an organization. Culture and organization relationship is well recorded in the extant literature (Hurley and Hult, 1998). Sharing values and belief in an organization have a great influence on waste management (Tesluk et al., 1997; Harris, 1998). In the line of thought, when studying the situation in any advanced or less advanced country, it is essential to take into account the cultural beliefs, degree of awareness of health issues as well as the practices and technology in the course of healthcare waste management (WHO, 1992). For instance, some culture tends to keep contact with waste to the least quantity of assignable. Those countries that having such action are having less interest in reusing or recycling waste items, and the risks from certain hazardous components in medical waste as a results are less. However, the same beliefs may dishearten professionals from being included in waste management, so that there is very little control over how medical waste is being kept, handled, and finally disposed of. On the other hand, other cultures may find re-using waste and exploiting their potential more acceptable, and in such cultures there is a great risk that contaminated and hazardous tools will be returned to economy. To conclude this, there are many different approaches in which hazardous constituents of medical waste could pose a threat to both people and environment. However, a review of the literature illustrated that there has not been any studies in the waste management domain that examine the effect of culture on MWMP within the Libyan context.

The current research conceptualize individualism and collectivism and power distance (Hofsted, 1980, 199) as the two main dimensions in medical waste management practice so that the management could be incorporated into an organizational memory. The entire process is conditioned by organizational culture, because according to De Long and Fahey, (2000) the values and behavioral norms held by organizational members serve as a filter in the sense-making and meaning-construction processes.

3.2.1.2.1 Individualism/ Collectivism

Individualism-Collectivism (IC) explains relationships among members of the societies and how they perceive and comprehend these relations. It also describes the relationship between the collectivity and the individual that exists in a given group. Individualism means that members of the society look at themselves and seek their own goals more than the group's goals. Their loyalties to organizations tend to be at a low level and they depend on themselves rather than others. In individualistic societies, members are oriented by "I" (Hofstede et al., 2005). In collectivistic societies members are oriented by "We". The word collectivist does not necessarily have any political sense. It relates to the power of the group and not the power of the state. In collectivistic societies collaboration and "we" are their slogans and the loyalty to the organization is expected to be high. Individual competition is not preferred in collectivist societies. Members depend on the cooperation with each other jointly as a unit or family. Hofstede (2005, p. 213) stated that "The degree of individualism in an organizations depends, obviously, on other factors in addition to the societal norms, such as employees" educational levels as well as an organization's history and organizational culture". Individualism/ collectivism refers to factors which could be essential and important in an ideal organization such as, challenge, training, physical conditions and the use of skills(Hofsted, 1980, 1991).

From the perspective of medical waste management, training and education programmes for instance, must be available for all hospital staff, as proper training will enhance the developing awareness of health, safety and environmental issue (Mohee, 2005). Furthermore, Yong at al (2009) indicate that if the understanding of medical waste disposal methods is increased by the use of skills and advanced technology, medical waste management will be greatly enhanced. Following Hofstede et al (2005, p. 213) individualism is defined as the degree to which organizations depends on the societal norms, such as training, educational levels as well as an organization's history and organizational culture.

3.2.1.2.2 Power Distance

Power distance refers to the formal way or approach that a society or organization handle inequality, and thus the way people build their institutions and organizations. Hofstede and Hofstede (p. 46) defined PD as "*the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally*". Family, school, and community are the basic elements of a society while places where people work are organizations (Hofstede et al. 2005). PD refers to the distribution of power at different levels of organizations in different societies. In addition to that, power distance is divided into parts. These are large distance and small distance. In large distance, an organization or society tend to have an acceptance to a hierarchical order where everybody has a space which does not need any justification. Also, in a high power distance, there are differences between superiors, who consider themselves higher than subordinates; this system is based on inequality. Power is also concentrated in a few hands in organizations. Moreover, in the high power distance society decisions are taken at top levels of organizations and employees must execute and obey orders without objections. Consequently, subordinates like to be told what to do.

On the other hand, in small power distance, an organization or society tends to strive for power equalization and justification for the existence of those power inequalities (Hofsted, 1980, 1991). There is also more equity in relationships among members at various levels. Executives seek their subordinates" suggestions and advice which may later result in participating in the processes of decision making. In terms of medical waste management, power distance may affect the way when MWM is practiced. For example, in terms of centralization when decision is made, consultation of subordinate, equal treatment between manual work and office work. In addition, managers in low and higher distance may also accrue in relaying on experience and formal rules. With regard to the overall relationship between subordinate and superior, it is pragmatic and emotional respectively during the practice of medical waste.

An example of this dimension with regards to medical waste management practices is the classification into the administrative and technical (Nemathaga et al., 2008). The administrative waste management of healthcare facilities is with regard to the components affecting the social system and members of the organization, such as rules, roles, procedures, and structures concerning communication and exchange between the members. The technical part of medical waste management refers to the operating constituent affecting the technical system. Examples of these components are: equipment, methods of operation utilized in their production process.

3.2.2 External Organizational Factors

In this research, external factors are those out of an organization's control. Organization can only react to or management their influence. An organization has a tendency to manage these factors in a strategic way. Following Oliveira and Martins (2010) and Troshani et al (2011) this research conceptualized external factors in this research are; government policy and environmental condition (factors).

3.2.2.1 Government Policy

Government policy refers to the creation or review of standards and guidelines for organizational processes and organizational member behaviors (Pallas et al.; 2012). They also revealed that the policy of the government offer normative guidance on what should happen within existing organizations. A government policy tends to have a significant impact on new ideas in different manners (Harman, 1980). Fundamental elements of the government policy contain identifying processes that can be standardised and developing standard operating procedures. Creating standards and guidelines may also be a first step in an organisation's quality assurance processes, for example in laboratory testing or surgical room procedures. Strategies in this area will be most effective when there is agreement about the best practice for particular organisational tasks, based on scientific evidence or on ethical or legal grounds. This strategy area is therefore most closely associated with disciplinary mentalities from the natural sciences, law and ethics. Examples include clinical care pathways and standardized procedures for tasks such as record-keeping, staff and patient safety, and procurement (Pallas et al.;

2012). Again, in the absence of standards and guidelines for organizational processes and organizational member behaviors, this may result in different types of toxics. For instance, when waste is deposited in a pit or locations close to water sources, contamination may occur in the water bodies. And the burning of health-care waste in an open site or in an incinerator with no emission control (which is a common scenario with most incinerators in many developing countries) could lead to different poisonous chemicals such as dioxins, furans and other toxic air pollutants being released (WHO, 2005).

3.2.2.2 Environmental Factors

The environmental has clear influence on the functions of an organization way in which it is embedded (Crank, 1990). Environment consists of variety types of factors that shape the transformation of existing resources into performance results (Wang and Ellinger, 2011).

Environmental factors as mentioned in the literature, include industry characteristics, government regulation, and infrastructure support (Oliveira and Martins, 2010; Troshani et al., 2011). Pallas et al (2012) stated that drawing a systemic map for an organisation's environmental conditions can reveal potential pitfalls in strategies that otherwise seem well suited to the organisation's internal dynamics. Common methods include soliciting expert external advice to map environmental trends of which organisations may be unaware, and convening discussions internally among organisation members or externally with other organisations in the field. The organisation's history may be thought of as part of the environmental factors; for instance, a hospital established as a country's premier teaching hospital may face particular reputational, institutional and political constraints as it designs and implements performance improvement interventions. Identifying present and possible future trends in environmental conditions can help decision-makers avoid strategies that are likely to become obsolete. More importantly, Ruel (2004) highlighted six environmental characteristics that influence human resource management implementation; there are technological development, completion, HRM state of art, labor market, government regulation and societal developments. In the same way, Taherkhani et al (2011) maintained that in order to adopt feasible strategies by any individual or organization, it is essential to grasp their current position and status (individual or organization) in correlation with the external environment. The four main environmental factors that can be used as a foundation for future planning and strategic management are political, economic, social and technological (Taherkhani et al., 2011). The application of the factors analysis can help a business to understand the variety of macro-environmental factors that they need to take into account when determining the decrease or growth of a particular market. Reference will be made to these factors in the current study is as the investigation of the important factors can have an influence on the Medical Waste Management Practices (MWMP) in Libya. This analysis however, has been conducted to identify the factors that can help in the development and improvement of MWMP in Libyan hospitals.

In the context of medical waste management, following Oliveira and Martins (2010); Troshani at al (2011), environmental factors that have effect on encouraging in waste management are; infrastructure, government, technical support, raising awareness, employee training, support and funding. Gupta et al. (2009) stated that the undesirable impact of medical waste on human health and the environment is felt because it has not yet received considerable attention from either the affected people or the concerned authorities. It is therefore, by establishing these factors that an organization may go global and it becomes necessary to keep a fair balance between global and local elements of the organization.

3.2.3 Organizational Size as a Moderator Variable

According to Baron and Kenny (1986) a moderator functions as a third variables that can be either a qualitative or quantitative variable affecting either the direction and/or strength of the relationship existing between an independent (predictor) variable and a dependent (criterion) variable. In other words, "the moderating variable is one that has a strong contingent effect on the independent variable- dependent variable relationship. That is, the presence of this third variable (the moderating variavle) modifies the original relationship between the independent variable and the dependent variable" (Sekaran & Bougie, 2013).

Organizational size has long been suggested as a significant macro variable in the organizational behavior literature (Blau, 1974; Blau & Schoenherr, 1971; Hall, 1999; Kimberly, 1976). However, literature has advocated some contextual factors that may affect the quality of management implementation. Sila (2007) for instance, studied organization size as a contingency factor by stating that the fit of total quality management practices (TQMP) and the structural relationship between the TQMP vary between small and medium-size organization and large one. In the same direction, Zhao et al. (2004) contended that the organization size is one of the important factors has an influence on the quality system from one level to a higher, more mature level. In the field of healthcare waste management, Vorapong Manowan (2009) associated organization (hospital) size with hospital waste management as a factor in implementing hospital waste management in the public and private medical institution in Thailand.

Organizational size in the present research is defined as the total number of employees working in an organization which have direct or indirect contact with medical waste in each hospital concerned in this research. This conceptualize definition seems to be appropriate for the current purpose because it clearly emphasizes different educational level that might be relevant for medical waste system process (Koene et al., 2002). Pun (2004), however, stated that all sizes of organizations whether they are small, medium, or large are operating in dynamic, complex and unpredictable environment worldwide.

To justify the potential role of number of skilled of employees as a moderator variable in this research, the proposition of earlier studies of Zhao et al. (2004); Vorapong Manowan (2009) were considered. Number of knowledgeable or skilled employees have been noticed to have a noticeable influence on the processes and outcomes of both new and established organizations, because according to Sharkey (1989) the number of employees seems to be relatively more stable where there is adequate management which allocates certain people to one specific task.

Additionally, according to Buesa and Molero (1998); Cohen and Klepper (1996); Scherer (1991), organizational size could be measured through a number of dimensions. These are turnover, number of employees and workforce. In the present research, we focus on the second dimension (number of employees) as most indicator of organization size is likely to be related to waste management. Following Gupta (1980) the number of employees is selected in the current research as a measure of hospital size (number of employees). This decision depended on two reasons. The first is that the targeted hospitals are public which are not profit-oriented and secondly, the number of employees seems to be relatively more stable where there is adequate management which allocates certain people to one specific task (Sharkey, 1989). This can clearly be seen when a worker is given more than one duty out of his/her domain. A delay of certain steps with regard to proper medical waste management practice will obviously accrue and later on affect the smoothness of the system followed.

3.2.4 Relationship between Organizational Internal Factors and Medical Waste Management Practices

Previous studies have illustrated that centralization may reduce the creative solutions and impede interdepartmental communication as well as the frequent circulation and sharing of ideas (Souitarris, 2001) because of the existence of time-consuming formal communication channels. This may clearly be noticed when a healthcare facility has accumulated expired medications and have to be handled. On the other hand, emphasis is placed on the significance of empowerment by decentralized organizations. This is known to facilitate the assimilation of new attitudes and behavior and as a result, it gives support to an atmosphere where workers are not hindered from not being participating in the building process more spontaneously (Lee and Choi, 2003).

However, since formalization refers to the extent to which standard policies, formal rules, and procedures manage decisions and working relationships (Fredrickson, 1986). So, formalized organization can improve the level of cooperation and teamwork among the organizational staff as a whole (Cordon-pozo *et al.*, 2006) and could shape the structure and scope of the interactions while providing helpful insights for improving the management of an organization (Kern, 2006).

This current research tries to identify the relationship between centralization, formalization, and current medical waste management practice in the Libyan public hospitals. The term centralization in this research refers to the concentration of power or decision-making authority in an organization. Formalization refers to the degree to which standard policies, formal rules, and procedures manage decisions and working relationships.

The extent to which an organization could be noticed for its achievement and long-term effectiveness will be influenced by its culture (Yildirim and Birinc, 2013). Hofsted (1991) identifies two types of organizational culture: Individualism vs collectivism, large and small power distance. Individualism/ collectivism stand for factors which could be essential and important in an ideal job in organization such as, challenge, training, physical conditions and the use of skills. As with regards to healthcare management, it is the capacity of a hospital to provide sufficient training for the hospital staff and to act fast to changed circumstances. It is therefore an open system that is able to fit its behavioral feature according to changes in its environment or in part of the system itself will lead to proper management of medical waste.

Power distance refers to the formal way or approach that a society or organizationhandle inequality, and thus the way people build their institutions and organizations. For instance, two classification of medical waste management (administrative and technical parts) will present inequalities in making decision in the absence of any written policies and regulations with regards for example, the protective equipments. Applying this kind of dimension will also provide a path and framework within which the medical waste management is formulized inside the healthcare facility.

To Hurley and Hult (1998), organizational culture is the connection of rooted values, and beliefs shared by the organization's employees at different levels, and manifested in the characteristics of this organization. In addition, the relationship between culture and an organization is well recorded in the literature. Sharing values and belief in an organization has a great influence on management (Tesluk et al., 1997; Harris, 1998).

For measuring the culture, the current research adopts a measurement tool proposed by Hofsted, (1980, 1991). The aim is to measure the extent of the two dimensions of culture (Individualism & Collectivism and Power distance) practiced by waste management authorities. Following Hofsted (1980, 1991), organizational culture is conceptualized as Individualism & Collectivism and Power distance.

3.2.5 Relationship between External Factors and Medical Waste Management Practices

The government regulation and control could be in the form of policies that encourage and reward organizations. As the policy is to be the course of a governmental body, it translates in the form of tools, strategies or other public decision (Helfand and Loomis, 2001). National legislation comprises a basis which has to be drawn on to improving the practices of waste treatment in a country. National medical waste management plans have been prepared by several countries. And within this context, the Global Alliance for Vaccines and Immunization (GAVI) is financing a project in collaboration with WHO since 2006. This is aimed at helping different countries to adopt a policy, strategy and plan for waste management produced in different activities at medical institutions.

The management of medical waste could be considered as industrial symbiosis since it aims to organize self-business among organizations that are ready to cooperate to develop their economic and environmental performance. Therefore, the adoption of such cooperative strategies is linked to the increase costs of waste management, which are governed by policy and legislative requirements (Ineˆs Costa et al., 2010).

Moreover, government policies are also deemed to being capable of influencing a number of factors (Misra, 2005; Bass, 2006; Gibbs and Deutz, 2007). Fundamental elements of government condition contain identifying processes that can be standardised and developed into standard operating procedures. On the other hand, in the absence of standards and guidelines for organisational processes and organisational member behaviors, this may result in different types of toxics. For instance, when waste is disposed of in a pit or place which is close to water sources, the water bodies may become contaminated. However, if health-care waste is burnt in an open site or in an incinerator with no emission control (which is the case with the majority of incinerators in developing countries), different gages such as dioxins and furans and other toxic air pollutants may be produced (WHO, 2005).). The purpose of providing regulation policies is to administrate practice and establish rules that will respond to changes in both technological and market conditions (Breyer, 1982). Because government can help in the development of new ideas to sustain the countries' innovations through the direct support of Research and Development (R&D).

Scholars have investigated the influence of external environment of an organization on the adoption of medical waste management. Scholars and researchers' findings are found to be consistent as far as the influence of environment on medical waste management adoption is concerned. For example, Troshani (2011) found that the environmental factors that influence the adoption medical waste management are infrastructure, government, technical support, raising awareness, employee training, support and funding. In order to protect our environment, it is important to regulate such hazardous waste in an environmentally reasonable and sound manner (Misra and Pandey, 2005).

3.2.6 Relationship between Organizational Size (Number of employees) and Medical Waste Management Practices

Organizational size has long been suggested as a significant macro variable in the organizational behavior literature (Blau, 1974; Blau & Schoenherr, 1971; Hall, 1999;

Kimberly, 1976). However, literature has advocated some contextual factors that may affect the quality of management implementation. Sila (2007) for instance, studied organization size as a contingency factor by stating that the fit of total quality management practices (TQMP) and the structural relationship between the TQMP vary between small and medium-size organization and large one. In the same direction, Zhao et al. (2004) contended that the organization size is one of the important factors has an influence on the quality system from one level to a higher, more mature level. In the field of healthcare waste management, Vorapong Manowan (2009) associated organization (hospital) size with hospital waste management as a factor in implementing hospital waste management in the public and private medical institution in Thailand.

According to Buesa and Molero (1998); Cohen and Klepper (1996); Scherer (1991), organizational size could be measured through a number of dimensions. These are turnover, number of employees and workforce. In the present research, we focus on the second dimension (number of employees) as most indicator of organization size is likely to be related to waste management. Following Gupta (1980) the number of employees is selected in the current research as a measure of hospital size (number of employees). This decision depended on two reasons. The first is that the targeted hospitals are public which are not profit-oriented and secondly, the number of employees seems to be relatively more stable where there is adequate management which allocates certain people to one specific task (Sharkey, 1989). This can clearly be seen when a worker is given more than one duty out of his/her domain. A delay of certain steps with regard to proper medical waste management practice will obviously accrue and later on affect the smoothness of the system followed. Furthermore, smaller population is easier to convince and control to adapt MWMP in which can be seen in small hospitals in compare to large one. However, the lack of staff could also influence MWMP since it is behavioral attitude. For example, insufficient segregation of medical waste by untrained workers would result in mixing the waste in terms of hazardous and non-hazardous components ending with environmental issues and air pollution. Dealing with medical waste without protective gear would also exposure waste management parties to serious problems such as HIV or HCV and so.

3.2.7 Theoretical Framework Development

The current research chooses the internal and external variables (Factors) to establish their relationship with current medical waste management practice in public Libyan Hospitals. These factors stem from other empirical studies (example Fobil et al, 2008; Tudor et al., 2005; North, 1999, Pun, 2004; Vorapong Manowan, 2009). While Fobil (2008) linked environmental factors such as human factors, technical and administrative factors with waste management, Caniato at al (2014) linked all stakeholder groups involved with the management of infectious waste internally and externally. These are: governmental authorities (government, policymakers, local and national authorities), private sector (service suppliers, technology suppliers, economic and financial performance of healthcare facilities), and academia which includes universities, education, training institutions and research centers, and a civil society (non-governmental organization, local community and media). Tudor (2005) also associated organizational structure with healthcare waste management as well as with variation in staff habits and acceptance of waste issues. Furthermore, North (1999) associated the organizational culture with human interaction and organizational arrangements, whereas Vorapong Manowan (2009) connected organization (hospital) size with hospital waste management. Organizational size in the present research is defined as the total number of employees working in an organization which have direct or indirect contact with medical waste in each hospital concerned in this research. This conceptualize definition seems to be appropriate for the current purpose because it clearly emphasizes different educational level that might be relevant for medical waste system process (Koene et al., 2002). Pun (2004), however, stated that all sizes of organizations whether they are small, medium, or large are operating in dynamic, complex and unpredictable environment worldwide. Although different challenges face different individual country regarding healthcare facility management, many of these organizations have determined new different ways of conducting their work through appropriate kind of management. To conclude this, it is essential to consider the influence of the system components on each other to arrive at an optimal plan for hazardous waste management system (Misra and Pandey, 2010).

For the purpose of this research, the organizational structure and culture are considered as internal factors, while the external factors are government policy and environmental conditions upon which will influence medical waste management practices in Libyan public hospitals.

The organizational control theory is well discussed in the literature (Cardinal, 2001; Eisenhardt, 1985; Govindarajan and Gupta, 1985; Jaeger and Baliga, 1985; Kerra, 1985; Langfield-Smith, 1977; Ouchi, 1977, 1979; Snell, 1992). In this present research, this theory supports the relationship between independent variables and dependent variables. This research however, admits that it is not possible to seize all the factors that contribute to medical waste management within a single model presented here. However, a general model to measure and identify factors that influence medical waste management has been presented. The conceptual framework identifies the network of relationships among the variables that a researcher is investigating in a study (Sekaran, 2006). Therefore, the conceptual framework that describes the relationship between organizational structure, culture, external factors and medical waste management practice is shown in Figure (3.1).

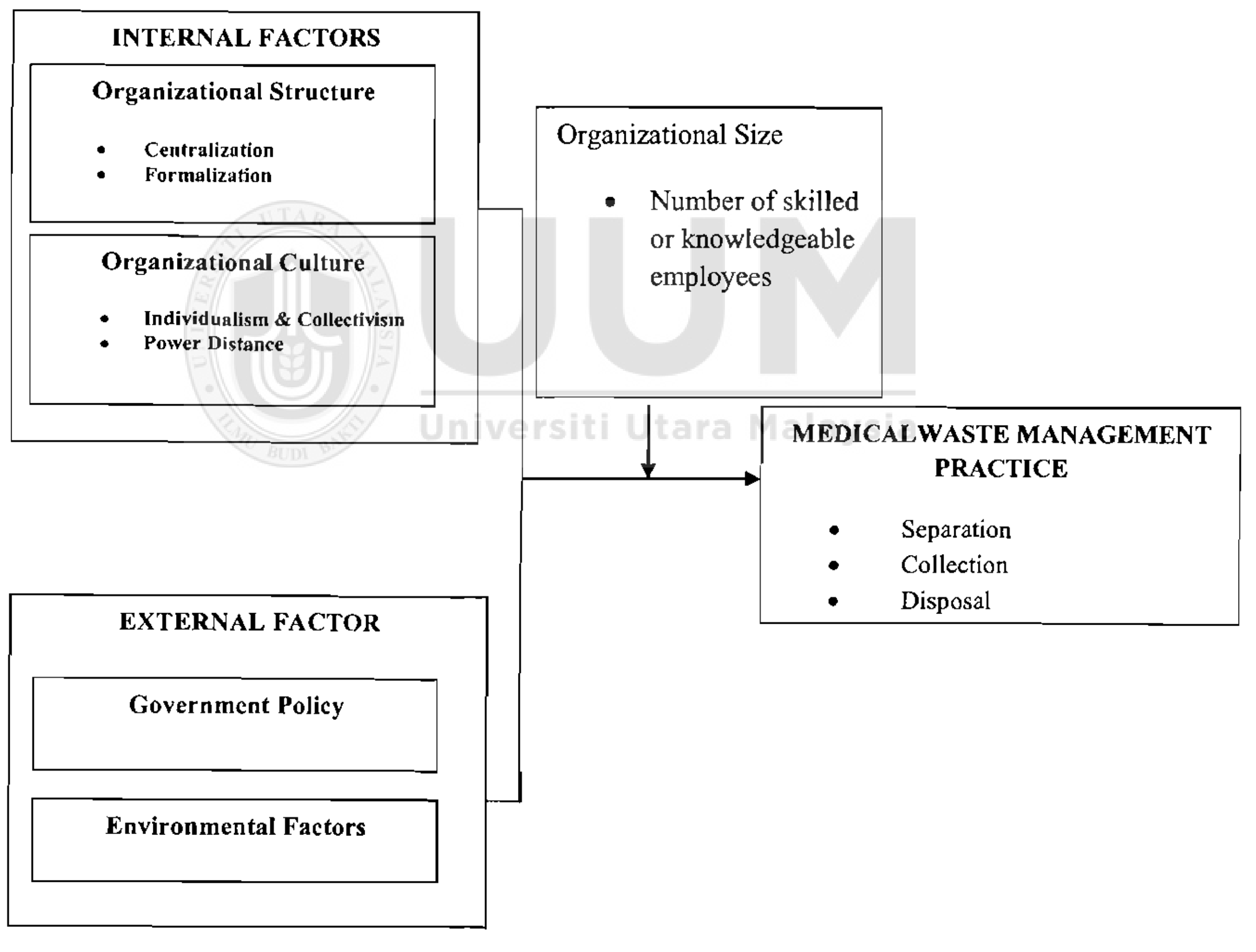


Figure 3.1: Proposed Conceptual Framework for Factors Influencing Medical Waste Management Practice in Public Libyan Hospitals.

3.2.8 Organizational Control Theory

The organizational controls are to be well discussed in the literature and defined as the way used by top managers to govern to the attention and motivation of employees within an organization in order to achieve its objectivs (Cardinal, 2001; Eisenhardt, 1985; Govindarajan and Gupta, 1985; Jaeger and Baliga, 1985; Kerra, 1985; Langfield-Smith, 1977; Ouchi, 1977, 1979; Snell, 1992). However, there are a number of different types of controls highlighted in the literature, and it might be useful to think of control theory in terms of waste management to establish structures and rewards that motivate instead of the colloquial notion of control. The manner where process is managed is depending on successful advancement of the technology. Consequently, the management of multiple new technology depends on a number of policies based on organizational control (Cardinal, 2001; Eisenhardt, 1985). Medical waste management practices is defined as any dangerous substances or objects of waste that poses hazard to both the environment and human beings and which resulted from various medical activities which are intended or mandatory to be disposed of according to the provisions of the local regulation and policy for medical waste. As such, organizational control theory (OCT) could be an important lens through which to study and manage the practice of medical waste management within Libyan hospitals.

The control differences that have been highlighted in the literature: structural control which is also known as bureaucratic or behavior control (Blau and Scott, 1962; Lebas and Weigenstein, 1986), input control (Merchant, 1985; Mintzberg, 1979, 1983), output control (Jaworski, 1988; Merchant, 1985), culture control (Wanous, 1980), market control (Ouchi, 1979; Williamson, 1975) and integrative control (Roth et al., 1994).

Among the aforementioned types of control, input control and behavior control are to be relevant in the field of medical waste management practices. For example, the mechanism of input control implies control the initial introduction of a human resource into the hospital "It could be deemed a form of resource allocation because it regulates the antecedent conditions of performance" (Cardinal, 2001, p.22). In any healthcare facility, input control can include the specific skills needed, experiences and attitudes of individual members (Mintzberg, 1979, 1983). Input controls associate with the notion of group control or socialization (Ouchi, 1980) as by controlling what inputs are brought into the process the overall culture and belief system of those within the process might be better managed. This is the fundamental aspect of hiring the 'right' people, who will 'fit in' at an organization. As such, the notion of 'professionalization' in which the agent takes on the beliefs and practices of a profession also become important to input control. Higher levels of professionalism can indicate increasing input control (Cardinal, 2001).

Behavior control derives from an agency theory treatment of the organization, in which involves surveillance of the members activities and behaviors within an organization (Eisenhardt, 1985; Ouchi, 1977; Snell, 1992). Behavior control however, has a long history of research and it is often connected with regulations and rules designed to assure that the organizational members behavior line up with the objectives of top management (managers). Hospitals can be an environment for research and development. A useful model of organizational control might be created using two categories of control mechanism; input and behavioural (Cardinal, 2001). This two model of control is useful as it is parsimonious framework in which other manifestations like culture control and market control.

Centralization and formalization are to be the most two aspects of behavior control which are in line with this current research (Henderson and Cockburn, 1994; March, 1991). Formalization refers to the extent to which standard policies, formal rules, and procedures manage decisions and working relationships as formalized organization (hospital) can improve the level of cooperation and teamwork among the organizational staff as a whole (Cordon-pozo et al., 2006) and could shape the structure and scope of the interactions while providing helpful insights for improving the management of an organization (Kern, 2006). However, Centralization refers to the concentration of power or decision-making authority in an organization as centralized organization (hospital) can ensure standardization, clear documentations, responsibility regarding the best practice and however, minimizing the interested parties who are facing lack of information or skills; and enable them to utilize the skills of central and specialized experts, and to have a closer control of organizational operations (Katsikea, Theodosiou, Perdikis & Kehagias, 2011). Table 3.1 demonstrates the differences of control theory and the related variables to this research.

Table 3.1 Presents the Differences of Control theory and the Related Variables to this Research

Types of Control Theory	Authors
Structural control or Behavior control Centralization Formalization	Blau and Scott (1962), Lebas and Weigenstein (1986)
Input control Specialist diversity	Merchant (1985) (Mintzberg) (1979, 1983)

Professionalization	
Output control	Jaworski (1988), Merchant (1985)
Culture control	Wanous (1980)
Market control	(Ouchi (1979), Illiamson (1975)
Integrative control	Roth et al (1994)

3.2.9 Hypothesis Development

In hypothesis, Sekaran (2006) recognizes two types of relationships among variables. These are directional and nondirectional. The directional hypothesis deals with the effects of one variable on another. Conversely, nondirectional relationship indicates that a relationship exists between two variables, but does not specify the direction of the relationship.

The current research will adopt the second type which is a nondirectional hypothesis approach. In order to test the influence of organizational internal factors, and external factors on medical waste management practice, the following two main and twenty four subhypotheses are formulated. The hypotheses are presented below. Alternative hypotheses are indicated by "A".

H_A 1: There is a significant relationship between organizational structure, and culture and medical waste management practice in Libyan public hospitals.

H_A 1: (1) There is a significant relationship between centralization and segregation in public Libyan hospitals.

H_A 1: (2) There is a significant relationship between centralization and collection in Libyan public hospitals.

H_A 1: (3) There is a significant relationship between centralization and disposal in Libyan public hospitals.

H_A 1: (4) There is a significant relationship between formalization and segregation in Libyan public hospitals.

H_A 1: (5) There is a significant relationship between formalization and collection in Libyan public hospitals.

H_A 1: (6) There is a significant relationship between formalization and disposal in Libyan public hospitals.

H_A 1: (7) There is a significant relationship between individualism/collectivism and segregation in Libyan public hospitals.

H_A 1: (8) There is a significant relationship between individualism/collectivism and collection in Libyan public hospitals.

H_A 1: (9) There is a significant relationship between individualism/collectivism and disposal in Libyan public hospitals.

H_A 1: (10) There is a significant relationship between power distance and segregation in Libyan public hospitals.

H_A 1: (11) There is a significant relationship between power distance and collection in Libyan public hospitals.

H_A 1: (12) There is a significant relationship between power distance and disposal in Libyan public hospitals.

H_A 2: There is a significant relationship between environmental factors and government policy and medical waste management practices in Libyan public hospitals.

H_A 2: (1) There is a significant relationship between government policy and medical waste management practices in Libyan public hospitals.

H_A 2: (2) There is a significant relationship between environmental condition and medical waste management practices in Libyan public hospitals.

H_A 3: The relationship between organizational internal factors and medical waste management practices in Libyan public hospitals is moderated by organizational size

H_A 3 (1): The relationship between centralization and medical waste management practices in Libyan public hospitals practices is moderated by organizational size

H_A 3 (2): The relationship between formalization and medical waste management practices in Libyan public hospitals practices is moderated by organizational size

H_A 3 (3): The relationship between formalization and medical waste management practices in Libyan public hospitals practices is moderated by organizational size

H_A 3 (4): The relationship between individualism/collectivism and medical waste management practices in Libyan public hospitals practices is moderated by organizational size

H_A 3 (5): The relationship between power distance and medical waste management practices in Libyan public hospitals practices is moderated by organizational size

H_A 4: The relationship between organizational external factors and medical waste management practices in Libyan public hospitals is moderated by organizational size

H_A 4 (1): The relationship between government policy and medical waste management practices in Libyan public hospitals practices is moderated by organizational size.

H_A 4 (2): The relationship between environmental factors and medical waste management practices in Libyan public hospitals practices is moderated by organizational size.

3.2.10 Summary

This chapter elaborates the concept of the "organizational factors" as they are related to this current research. This chapter also discusses how organizational internal and external factors were measured in the literature; and how they will be measured in this research. Furthermore, the concept of medical waste management in tandem with organizational control theory were additionally examined and deliberated. The influences of organizational factors of medical waste management practice were in addition, divided into two categories: internal and external factors and their relationships with medical waste management were also discussed. Finally, the theoretical framework and hypotheses development were also presented.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

As stated earlier in chapter one, the main objectives of the present research are: (1) to identify the current medical waste management practice in public Libyan hospitals and compare with WHO waste management best practice; (2): to identify the relationship between internal factors and current medical waste management practice in Libyan public hospitals; (3): To identify the relationship between external factors and current medical waste management practice in Libyan public hospitals; (4): to identify the moderating effect of organizational size (number of skilled employees) on the relationship between the internal and external factors and current medical waste management practices in Libyan public hospitals. Specifically, the discussions here with revolve around all pertinent matters that address the research approach, sampling design, variables and measurements, data collection technique, and methods for data analysis.

Generally, research methodology presents how research was conducted and the method being used to ensure the investigation achieved its goals. The current chapter discusses the current methodology of this research which consists of four main headings. The first part shows the study area, the design of the research, sampling size and procedure. The following part presents the instrument for collecting the relevant data measurement. Appropriate methods, approaches, and techniques are adopted in this current research to present an explanation of these tools. The final section presents the statistical analysis used to examine the data relevant. Figure 4.1 shows the process of the whole research.

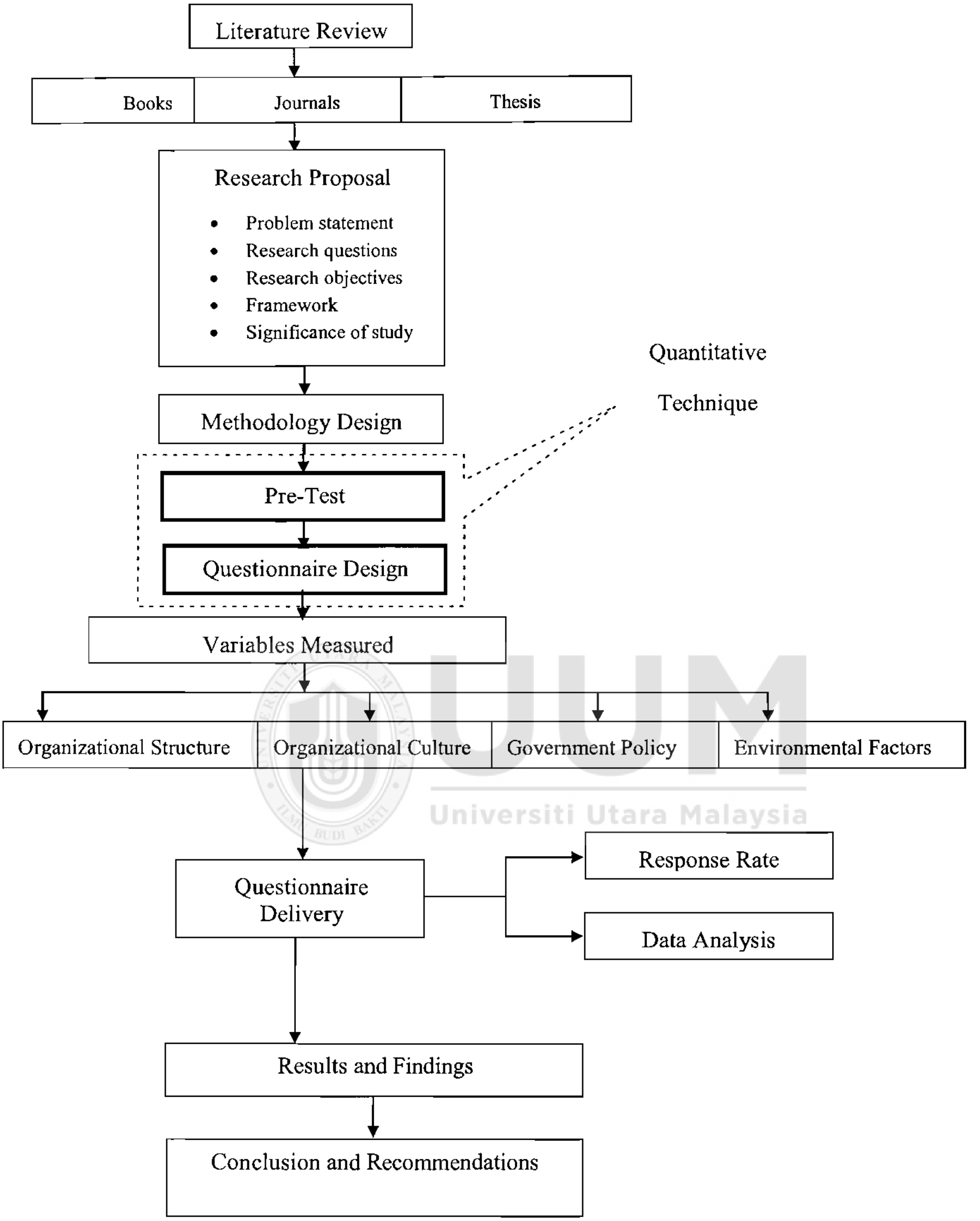
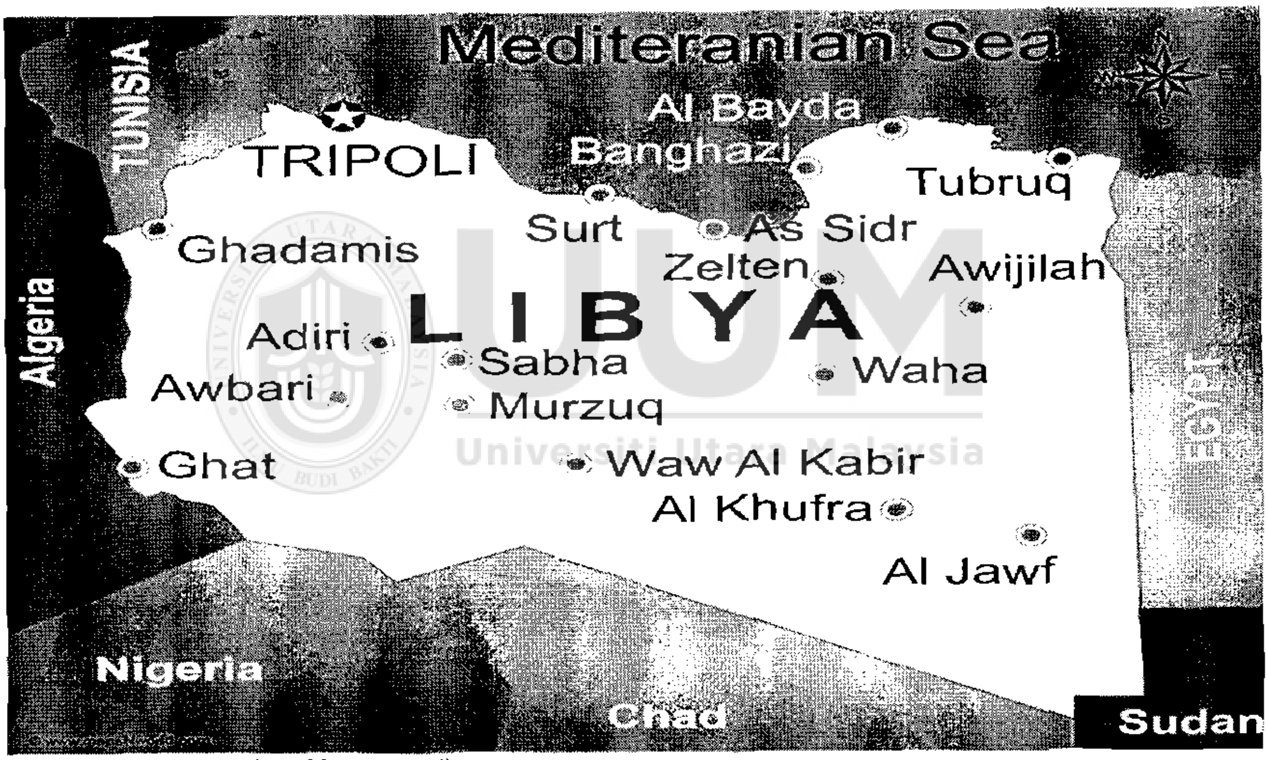


Figure 4.1 : Work Flow of the Research

4.2 Study Area

This research was carried out among hospitals located in south Libya. The collection of data regarding medical waste facilities at these areas is gathered throughout field study. The health care facilities were classified into two main groups, government and private hospitals. However, the targeted hospitals are only the public one. Map of Libya is at (Figure 4.2).



Source: (www.mapsoftworld.com, 2014)

Figure 4.2: Map of Libya

4.3 Research Design

Research design entails the methods and strategies which would be employed in achieving the objectives of the proposed study. The main thrust of this research is to identify the current waste management practices in Libyan hospitals compared with WHO waste management best practice as well as establishing the relationship between organizational internal, external factors and current waste management practices in Libyan hospitals.

The present research is a combination of a correlational and descriptive research, that is, establishing the relationship between organizational internal, external factors; and identifying the current medical waste management practices in Libyan hospitals compare with WHO waste management best practice, a descriptive type of study.

Identifying the current medical waste management practice in Libyan public hospitals compared with WHO waste management best practice is a descriptive kind of research. Descriptive statistics, such as the mean score, standard deviation, frequencies, cross tabulations, and measures of central tendency of the data, describes what has been gathered. However, Cooper and Schindler (2001), De Vaus (2002) articulate that correlation research try to investigate what things such as causal or correlational field study aims at establishing the relationships between predictor and criterion variables. This research is a cross sectional research, so the data was gathered by means of questionnaire at one-shot of time (Sekaran, 2006).

Data collection has been designed to be collected at different departments in each hospital to obtain the perceptions of the respondents regarding the relationship between organization internal, external factors and practice of medical waste management in the

Libyan public hospitals. So the unit of analysis for the present research is hospitals (Libyan public hospitals). Previous studies had shown various perspectives questions and respondents. For example Mochungon (2011) the involved respondents were doctors and nurses of all categories, midwives, laboratory technicians, waste pickers and incinerator operators. All of his respondents were issued the same questionnaire irrespective of job experience and level of education. This kind of questionnaire ignored workers in support services such as laundries, waste handling, and transportation. However, different level of education and job responsibilities should have different questions since there are technical and administrative parts or departments. Ferreira and Teixeira (2010) conducted a study on healthcare waste management practice using different methods to collect the data; a questionnaire was formulated to evaluate the knowledge and waste management practices of only doctors, nurses, and housekeeper. This is not a comprehensive enough tool for getting such relevant information.

Site visits were broadly well emphasized in the literature (Azage and Kumie, 2010; E.Manga et al., 2011; Ferreira and Teixeira, 2010; Gupta et al., 2009; Abdulla et al., 2008; Zhang Yong et al., 2009). This is to support and supplement the information gathered in the survey and they are helpful to obtain information about medical waste management.

The survey method for gathering data is one of the most common globally practiced especially as it relates to management research. Survey methods are also beneficial for studying large populations of people across large areas as they can be posted to remote areas. According to Naoum, (2007, p. 44) there are two types of surveys, descriptive and analytical survey, the current research uses the analytical survey option. An analytical survey seeks to ascertain relationship and association between the attributes/objects of the questionnaire.

Surveys are relevant where a large number of respondents are required during a short time and the outcomes are intended to generalize the sampled population (Naoum, 2007, p. 44). This assertion is in line with the intent of this study which aims to survey medical staff (administrative) and across many medical institutions. Additionally, previous studies in the field of management research have also used survey questionnaires to collect the data they relied upon. Survey methodology also has the advantage of posing the same questions across hundreds of respondents at the same time without creating a bias against any particular respondent. Group dynamics do not come into play in surveys unlike brainstorming sessions. There are some other reasons for adopting survey methodology. These are as follows:

1. Large areas can can be covered, particularly with the e-mail based questionnaire techniques reducing both financial, human and other resources (Naoum, 2007, p. 44)
2. Surveys can also suggest new explanations that have not been previously examined by academic researchers (Graham, Harvey and Rajgopal, 2005)
3. The typical large-sample archival analysis provides statistical power and cross-sectional variation (Graham, Harvey and Rajgopal, 2005)
4. Questionnaires also have the advantage of speed, as the researcher can start expecting responses within a few weeks of posting them (Naoum, 2007, p. 44)
5. Increased reliability of data emanates from surveys. Respondents have the liberty to answer at their own time creating opportunity to verify certain facts before responding unlike interviews where answers are required on the spot.

6. The findings from survey could be generalized to the whole population under consideration. Essentially, one of the main purposes of carrying out this research is to generalize the finding to national hospitals buildings in Libya as practicable as possible.
7. It is not expensive in comparison with other kind of approaches like case study and experimental approach for this research.
8. Surveys are responded to away from the influencing eyes of the researcher; hence, there is a likelihood of sincere opinions being expressed.

Zikmund (2000) further emphasizes some other reasons which consist of 1) organization as the unit of analysis, 2) the variables to be measured based on perception of medical waste handlers, 3) minimizing the bias of the researcher and testing hypotheses. Kerlinger (1973) suggested that epistemological position of the researcher should also be considered when deciding on which method of data collection to employ in a proposed study. The strategy should be able to integrate all the constituents of a good research including method of data collection and analysis, all of this chain should be fit together.

A typical medical waste management structure team should be in line with management responsibilities and liaison paths between key personnel in charge of medical waste handling. However, to have an appropriate medical waste management practices is largely dependent on a committed team of qualified and experienced personnel, proper organization and supervision, well-established legislation and financing (WHO, 2005).

This research adopts the recommendation provided by WHO (2005) for medical waste management practices in the countries of the developing world, so a single representative from each department in the hospitals is sufficient as a respondent. Therefore, the respondents who had participated in the survey were as follows:

1. Head of Hospital (as chairperson)
2. Heads of Hospital Departments
3. Infection Control Officer
4. Chief Pharmacist
5. Radiation Officer
6. Senior Nursing Officer
7. Hospital Manager
8. Hospital Engineer
9. Financial Controller
10. Waste Management Officer (if already designated).
11. Doctors

Nemathaga et al (2008) respondents on hospital solid waste management practices are infectious control nurses, hospital managers, and occupational and public health officers. Their reason for choosing this group was mainly because they were familiar or responsible for SWM at the respective sources within the hospitals. In the same direction, .Manga et al (2011) collected their data via interviews and structured questionnaires from key hospital staff, general supervisors, sanitation workers and nurses who are responsible for handling different waste streams at individual facilities. Gupta (2009) gathered the relevant data on rules and biomedical waste management from three main groups namely the authorities and personnel involved as well as environmental engineers. When it comes to characterization of medical waste management and the assessment of working conditions at hospitals in Tabriz, Iran, Taghipour and Mosaferi (2009) looked for environmental health officers to be their main group involved in such a project, whereas determining the general status of healthcare waste management guide Ruoyan et al (2010) to waste management officers and infection control officers to be the most relevant respondents could achieve their objectives.

4.3.1 Sampling Procedure

Sampling refers to a process that involves the selection of participants for a proposed study. The result from the sample, if well selected can be used to predict the behavious of the larger population from which it was sampled (Gay and Airasian, 2000). For the proposed study, the survey respondents would be selected from medical waste management (MWM) personnel working in hospitals located in the southern part hospitals in Libya. This research is designed to explore the internal organizational and external factors that either positively or negatively affect medical waste management practices in Libyan public hospitals, to which the questionnaires are delivered besides the site visits by the researcher.

To Sekaran (2006), sampling refers to a research process to select an appropriate population member under study. The probability sampling design is adopted in this research. Probability sampling is preferred to non- probability sampling inasmuch as each element in the population has a known probability for being selected, and the characteristics of the sample chosen could be generalized and conclusion drawn on the population implying that the finding of this research is a representative of all the public hospitals in Libya. Thus, the finding of this research can be generalized on to the whole population of Libyan public hospitals.

With regards to the sampling technique for this research, proportionate stratified random sampling as employed by Sekaran (2006) in which the research population was divided into mutually exclusive group would be adopted. Proportionate stratified random sampling was used because it is probably the most efficient among all probability design and the whole group chosen were adequately sampled.

The sample frame consists of names and addresses of hospitals obtained from (www.health.gov.ly) published in 2010. However, the appropriate sample size is to be represented in dealing with the medical waste management practices in the targeted hospitals would be (181), (Krejcie and Morgan, 1970; Sekaran, 2006). Table (4.1) illustrates the population or as it is known the sample frame. Therefore, the sample frame is adopted from the Ministry of Health published in 2010.

Table 4.1: The Number of Public Hospitals Located in the Five Districts in the South of Libya

Number of Hospitals Located in the southern part of Libya				
Regions	Number of Hospitals	Location	name of hospital	Number of beds
Wadi Al-shati	3	Edri	Edri general hospital	60
		Bergin	Bergin general hospital	60
		Brak	Brak general hospital	120

Cont,,,,,,

,,,,,,Cont

Table 4.1: The Number of Public Hospitals Located in the Five Districts in the South of Libya

Sabha	6	Sabha	Sabha medical teaching centre	480
		Al-jadeed	Al-jadeed healthcare centre	60
		Al-gorda	Al-gorda healthcare specialist centre	60
		Al-gorda	Consolidated clinic	60
		Aljofra	Aljofra Teaching Hospital	120
		Al-menshia	Medical Laboratory Sabha	60
Wadi Al-haya	3	Obari centre	Obari general hospital	120
		Jarma	Jarma general hospital	60
		Al-graifa	Red Crescent	50
Murzeg	3	Murzeg Center	Murzeg general hospital	120
		Tragin	Tragin general hospital	60
		Samno	Samno public hospital	50
Gat	3	Gat centre	Gat Teaching hospital	120
		Algatron	Algatron Hospital	
		Al-Ewainat	Al-Ewainat hospital	60

Source: Ministry of Health, 2010

According to the suggestion of Krejcei and Morgan (1970) to give for a 5% margin of error, the appropriate sample size of 181 would be needed to present a population of 340 for medical waste dealers. The following table presents the corresponding needed sample size to the population of medical waste management in the Libyan public hospitals.

Table 4.2: Population and Recommended Sample Size for the Present Research

Organization	Population (*N*)	Required Sample (*n*)
Hospital	340	181

Source: Krejcie and Morgan (1970); Sekaran (2006) sample guide.

4.3.2 Procedure of Data Collection

The questionnaire was distributed among the five southern states in Libya from 20 January and the survey has taken 5monthes to be completed. The population for the current research included different level of medical waste respondents (Top management, head departments, administration and doctors). In addition to that, the questionnaire was physically being distributed to all selected hospitals in the five states (Wadi Al-shati, Sabha, Murzeg, Wadi-Alhaya and Gat). There are some reasons for doing physical distribution for the questionnaires. Firstly, to take the opportunity of interpersonal contact to impress upon the respondents the importance attached to the survey. A second reason is to be able to provide immediate response to any inquiries or questions the respondents may have regarding the survey. Lastly, it is to have a good response rate and not to take much time to receive back the questionnaires. Besides that, in order for the respondents to reveal a good response rate, the respondents will be given a small gift to reciprocate their kind gesture of sparing their time to complete the survey (Dillman, 1978). Each of these gifts incur the logo of Universiti Utara Malaysia

The questionnaire is designated with a nice looking cover page that bears the logo the university and was produced in booklet sheet (see appendix). The questionnaire was basically in Arabic language and translated by Turjuman Bureau Office, Tripoli, Libya.

4.4 Response Rate

Response rate means or refers to the number of returned and completed questionnaires classified on by the number of sample members which are eligible for the survey (Frohlich, 2002). Past managerial studies showed that 32% has been the average response rate for survey research (Frohlich, 2002). Consequently, some methods have been suggested to improve the response rate in survey.

1) Be sure that the items are well managed and formatted
2) Conduct a pre-test study and use existing scale for survey
3) The respondents should be informed before conducting the survey
4) Mailed the questionnaire more than one time
5) Make continuous follow ups
6) Provide a sincere appeal on the cover letter
7) Put through more effort to providing result at the end of research
8) Include prepaid postage

9) Deliver the questionnaire to the most appropriate respondent

10) have printed third party logo (such as Ministry of Health logo) on the questionnaire

This research is about to adopt all the strategies above with the exceptions for number 4 and 8 as the questionnaire was delivered by hand for the all respondents. The response rate yielded 171 usable questionnaires.

4.5. Questionnaire Design

This research aims to establish the relationship between organizational internal, external factors and medical waste management practice and the moderating effects of population size on the relationship between internal, external factors and medical waste management practice in Libya public hospitals. However, it tries to identify the current medical waste management practices in public Libyan hospitals compared with WHO waste management best practice. Consequently, the questionnaire designated contains the following items:

1. The first page is the cover page
2. Section 1: General information about respondents
3. Section 2: Internal factors

    2.1: Information regarding organizational structure.

    2.2: Information regarding organizational culture

4. Section 3: External factors

5. Section 4: Information concerning medical waste management practices

In order to have a concise and straight- forward questionnaire devoid of ambiguities, the researcher has applied the suggestions of Dillman (1987) in questionnaire development design, and scale items development. Furthermore the questionnaire was made in booklet sheet with a cover page that bears the logo of Universiti Utara Malaysia and instructions on how to complete it.

According to Sekaran (2006), the questionnaire has been designed ideally, it pays attention to the wordings, the variables have been grouped for easier analysis with the use of appropriate scales and coding. Consideration has also been given to the general appearance of the questionnaire. In developing the questionnaire, ambiguous questions, technical terms, double-barreled questions, and jargons have been avoided. Since the researcher seeks full understanding of respondents for the items objectives, close-ended questions are chosen over open-ended questions. This will enhance the accuracy of data analysis (Sekaran, 2006). The questionnaire has five independent variables and one dependent variable of interest of this research.

4.5.1 Measurement and Operationalization of Variable

According to Sekaran (2006) the relationship between the independent variable and the dependent variables in the study could be positive or negative. This current research has two independent variables (organizational structure and organizational culture) and external factors, and moderating variable, whereas the dependent variable for this research is medical waste management practices. This is summarized in the table below.

Table 4.3: Summary of Variables and Measurement of Instrument

Variables & Dimensions	Scale	No. of questions
Organizational Structure		
Centralization	5 points	6
Formalization	5 points	8
Organizational Culture		
Individualism/collectivism	5 points	14
Power distance	5 points	3
External Factors		
Government policy	5 points	8
Environmental factors	5 points	11
Medical Waste Management Practice		
Segregation	5 points	4
Collection	5 points	5
Disposal	5 points	4
Total number of questions		61

4.5.2 Organizational Structure

There are two dimensions of organizational structure: centralization and formalization. The research uses a five-point scale to measure all variables and are thus: ordered 1= "strongly disagree," 2= "disagree, " 3= "neutral, " 4= "agree, " 5= " strongly agree. " Regarding the organizational structure for instance, respondents will be asked to score their perception of centralization and formalization by indicating 1 to 5 scale. In order to measure centralization and formalization, the researcher had used items which are adapted from (Lee and Choi, 2003; Nonaka ,1988 ; Liao at al, 2011). The five-point scale is shown in Table 4.4

Table 4.4: Presents Variables Measurement by five-point scale

Measurement of Variables	The five-point scale
Organizational Structure	1= "strongly disagree," 2= "disagree, " 3= "neutral, " 4= "agree, " 5= " strongly agree.
Organizational Culture	1= "strongly disagree," 2= "disagree, " 3= "neutral, " 4= "agree, " 5= " strongly agree.
Government Policy	1= "strongly disagree," 2= "disagree, " 3= "neutral, " 4= "agree, " 5= " strongly agree.
Environmental Factors	1= "strongly disagree," 2= "disagree, " 3= "neutral, " 4= "agree, " 5= " strongly agree.

4.5.3 Organizational Culture

The organizational culture is divided and conceptualized into two dimensions (Individualism vs collectivism and power distance). Items which will be used to measure the two mentioned dimensioned are adapted from (Hofstede, 1980, 1991).

4.5.4 Government Policy

Items which will be measuring government policy are adapted from (WHO, 1999; Sawalem et al., 2010).

4.5.5 Environmental Factors

Environmental factors are measured by the items adapted from (Warszawski 1999; Badir et al 2002; Chung, 2006; CIDB, 2003; Junid ,1996; Esa & Nurudin,1998; Kamar et al 2009; Abd Shukor et al., 2011; Hamzah et al., 2010; Peng, 1986; Lessing, 2006).

4.5.6. Medical Waste Management Practices

Medical waste management practices is measured by using twelve questions. The items used to measure medical waste management in this research are adapted from (WHO, 1999; Vorapong Manowan, 2009). Table 4.5: below shows the summary of the source of items used for measuring the variables studied in this research

Table 4.5: Source of Measurement Instrument

Variables	Source	Remark
1. Centralization	Jaworski & Kholi (1993)	Adapted
2. Formalization	Jaworski & Kholi (1993)	Adapted
3. Individualism & collectivism	Hofstede (1980,1991)	Adapted
4. Power distance	Hofstede (1980,1991)	Adapted
5. Government policy	(WHO ,1999; Sawalem ,2010)	Adapted
6. Environmental factors	(Warszawski 1999; Badir et al 2002; Chung ,2006; CIDB, 2003; Junid ,1996; Esa & Nurudin,1998; Kamar et al 2009; Abd Shukor et al., 2011; Hamzah et al., 2010; Peng, 1986; Lessing, 2006)	Adapted
7. Medical waste management practices	Vorapong Manowan (2009); WHO (199; 2005)	Adapted

4.6 Pilot Study

Pre-test is very important before using the questionnaire to gather data (Cresswell, 2008). Those who conduct pre-test are a prudent researcher (Cavana, Delahaye & Sekaran, 2001). The scholars state that among the most important pre-test exercise are face validity, content validity, and a pilot study. Researcher should make sure that questions in the instrument are understood, appropriate and reflect the goal of the research. Sekaran (2002) clarifies that pre-testing survey questions is the test of the understand ability and appropriateness of the questions planned to be included in a regular survey.

The purpose of pilot study is to test and improve reliability of the research instrument. This procedure is necessary before performing the actual data collection to ensure that respondents understood the instructions and the questions asked. The main reason for performing a pilot test is to reduce the measurement error and increase reliability and validity of the research, and in particular of the research design and methodology.

The instrument was piloted by administering it to 50 hospital employees selected randomly. According to Sekaran (2003), the minimum reliable subjects to run the pilot are 30 respondents. It is expected that the pilot study provides an opportunity for the researcher to improve both the format and the language features of the research instrument before using it for actual data collection.

The reliability of an instrument refers to its ability to produce consistent and stable measurements. Sekaran (2003) explains that reliability can be seen from two sides:

reliability (the extent of accuracy) and unreliability (the extent of inaccuracy). To test the reliability of the pilot study, the test employed internal consistency method measured by Cronbach's alpha. The reliability is expressed as a coefficient between 0 and 1.00. The higher the coefficient the more reliable is the test. The most common reliability coefficient is the Cronbach's alpha which estimates internal consistency by determining how all items on a test relate to all other items and to the total test - internal coherence of data.

As the measurement of instrument used in this research was the questionnaire constructed in several questions, the measurement instrument used is the internal consistency by Cronbach's coefficient. Cronbach's alpha implies positive relationship of one item to another. Acceptable Cronbach's alpha is .65 (Zickmund, 2009; Sekaran, 2003; Hair, et al., 2010). Alpha score for each dimension for all variables are as shown in Table 4.6. It is found that Cronbach's alpha for all dimensions ranged from 0.70 to 0.87, indicating the acceptable values.

Table 4.6: Reliability Analysis of the Instrument

Dimensions	Number of Items	Alpha
Medical Waste Management	14	0.758
Organisational Structure		
Centralization	6	0.754
Normalisation	8	0.838
Organisational Culture		
Individualism & Collectivism	14	0.869
Power Distance	3	0.702
External Factors		
Environmental Factors	11	0.759
Government Policy	8	0.708

4.7 Statistical Analysis

The data collected was analyzed using the Statistical Package for Social Science (SPSS) program for Windows (Version 20.0). The analysis consist of different tests as follows: frequency distribution of items and descriptive statistics were employed in presenting the general information about the hospitals being studied and demographic characteristics of the respondents. Secondly, a reliability test is used in this research in order to determine the credibility of the data collected while correlation analysis and multiple regression analysis would be used to examine the strength and direction of the linear relationships among the various variables. The second part illustrates more details the statistical analysis used for the current research.

4.7.1 Measuring Medical Waste Management Practices

Descriptive statistics was used to describe the characteristics of collected data in a logical manner that would assist in identifying hidden patterns. Descriptive statistics involves a number of simple scores which provide clues on the behaviour and nature of the collected data; these include results such as mean score, standard deviation, cross tabulations, and measures of central tendency. . Descriptive analysis is often employed in presenting raw data in a logical and easy to understand manner. Descriptive statistics was employed to "get a feel" of the data, determine the types of statistical tests to perform on the data, identify errors associated with the results. In this research, the 5-poit likert-scale had been adopted. However, its format shall be consistent with Alstone (2001)'s interpretation of his 5-point scale. In his interpretation, the values (range) of the

5-point Liker scale are as follows: 1= not at all (1.0-1.49); 2= slightly true (1.5-2.49); 3= moderately true (2.5-3.49); 4= mostly true (3.5-4.49; 5= completely true (4.5-5.00). However, in the current research, a descriptive statistics test will be used to obtain the means, frequencies, standard deviation, maximum, minimum and percentages of respondents who participate in the survey. Lastly, this research determines the extent of medical waste management investigating the values mentioned above to the mean score in SPSS outlines.

4.7.2 Factor Analysis

The factor analytic technique has a number of uses. It is used widely by researchers involved in the development and evaluation of tests and scales. Factor analysis can however, be used to reduce a large number of related variables to a more manageable number, prior to using them in other analyses such as multiple regression or multivariate analysis of variance (Pallant, 2005). The two main approaches to factor analysis being disrobed in the literature are exploratory and confirmatory. In this research, exploratory factor is the main analytic technique used as it is much referenced and often used to collect information about the interrelationships among a set of variables. Moreover, it is used to identify the factors and their related items into the same component for each construct and to find out whether the respondent has dimensionalized the items into the component of previous researchers.

4.7.3 Reliability Test

Reliability is an important research process in survey-based studies. It is important that a scale be assessed for its reliability prior to being interpreted; and a measure is reliable if it yields consistent scores across administrations (Green & Salkind, 2004, p. 325). The SPSS reports the reliability of a scale as a co-efficient alpha called the 'Cronbach's coefficient alpha'. This figure ranges from 0-1 with many researchers asserting that anything above. 70 is considered reliable (Nunnally, 1978). A very significant point with regards to the necessity of reliability tests is that like a larger sample, it contributes relatively less errors to the statistical analysis thereby increasing statistical power (Devellis, 2003, p. 38). Moreover, what is important is achieving a high Cronbach's alpha value. The more internal consistency in response to items, the higher the coefficient alpha (Green and Salkind, 2004, p. 327). Cronbach's alpha is however sensitive to the number of items on the scale, short scales may give low alpha co-efficient. Low alpha values can be an indication that the item is measuring something diverse from the scale as a whole and under such conditions it is advisable to remove such an item (Pallant, 2005, p. 92).

4.7.4 Correlation Analysis

To determine whether or not there is a linear relationship between two variables and the strength of the relationship, a Correlation analysis is adopted (Pallant, 2005). Furthermore, there are two types of correlation analysis depending on the type of data or normality of the data. Spearman's rank correlation (rho) is a non-parametric test measuring the difference in ranking between two groups of respondents scoring a number of items or factors (Naoum, 1998, p. 123). However, Pearson product-moment correlation is utilised for parametric procedures. It is chosen for this study given that the expected data would consist of continuous variables. In determining correlations, the Pearson correlation coefficient (r) shows the direction of the relationship which could either be positive or negative while at the same time showing the strength of the correlation. The classification of Cohen as presented in Table 4.5 below assists in interpreting the values derived from correlation analysis

. The classification of Cohen is as presented in Table 4.7 below.

Table 4.7: Strengths of correlation coefficient

Correlation Coefficient	Relationship strength of the variables
.10-.29	Small
.30-.49	Medium
.50-1.0	Strong/large

Source: (Cohen, 1988, pp. 79-81)

4.7.5 Standard Multiple Regression

Standard multiple regression assist researchers in examining how a set of independent variable is capable of predicting dependent variable on certain outcomes. Pallant (2005) states that a number of different multiple regressions could be employed for analysis depending on the objectives of the research and the questions the researcher seeks to address. Some of the types of regression available include standard or simultaneous, hierarchical or sequential, and stepwise regression. In this study, the standard multiple regressions will be used, the reason is not far-fetched-it is the most commonly used multiple regression analysis technique. The approach tells a researcher how much variance in the dependent variable is explained by the independent variables. Furthermore, for this study, the multiple regression would indicate how internal and external factors of different organizations (hospitals) are capable of predicting medical waste management practices. It would also guide the researcher towards the best predictor of medical waste management.

4.8 Summary

This research examines the current medical waste management practices in Libyan public hospitals. In the same direction, the research tries to establish the relationship between internal-external factors and medical waste management in Libya. The research is however a combination of the correlational and descriptive types of research. The descriptive part focuses on medical waste management and information of the hospitals targeted and demographic characteristics of the respondents, whereas the correlational analysis focuses mainly on the relationship between the variable studied in this research. The data will be collected from all interested parties dealing with medical waste in the targeted hospitals. Data will be gathered on the basis of representation that is one representative for each hospital participating in the study would be required to complete the questionnaire on behalf of his organisation. However, care would be taken to ensure that the likely respondent would be someone who has adequate knowledge of medical waste disposal in the organisation and is involved in the day-to-day management of medical waste in the hospital concerned. Since this research is a quantitative one, proportionate stratified random sample method will be used to select the respondents in this survey bearing in mind all the selected hospitals registered with the Ministry of Health.

Before conducting the real survey, pilot test was conducted, so that the questionnaire will be given to an expert in the field of waste management seeking the validity of the questionnaire. After making the amendments suggested and at the end of the pilot study, the real survey has been conducted.

The questionnaire includes six sections: Section 1 is about hospitals and profile respondents, Section 2 seeks information about organizational strucure, while ection 3 asks for organizational culture. This is followed by the external factors in section 4 and finally, Section 5 is about medical waste management practices.

The main sources for the operationalization variables examined in this research is the litrature. Organizational strucure is operationalization as centralization and formalization. Organizational culture is operationalization as individualism/ collectivism and power distance. External factors are operationalization as government policy and environmental condition. All the aforementioned variables will be mesured using a 5-point Likert scale; 1= "strongly disagree," 2= "disagree, " 3= "neutral, " 4= "agree, " 5= " strongly agree.

With regards to data analysis, it will be achieved in the following order: descriptive statistics is going to be representitive at first, then the factor analysis will be performed thereafter followed by the correlation test and finally, the regression analysis.

CHAPTER FIVE

DATA ANALYSIS AND RESULTS

5.1 Introduction

This chapter demonstrates in details all related analysis conducted in this research. The first section illustrates background of the respondents. The next section presents the data screening procedures, followed by the validity and reliability of the construct. Assumptions of multiple regressions, descriptive statistics and the interpretation of Likert scale to determine the extent of medical waste management practices among Libyan public hospitals are presented in the following sections. The chapter also presents the results of Pearson correlations analysis in which the relationships between organizational structure, culture, external factors, and medical waste management practice were examined.

5.2 Background of the Respondents

171 useable questionnaires were returned and used for the analysis. Table 5.1 describes the background of the participants. 70.7% of the participants were from the district general hospitals, while 7.0 % from a teaching hospital and 5.7 % were from a specialist hospital. They held various positions in the hospital. The majorities of them were head of department (41.1%) and doctors (12.5%). 55.2 % of the respondents were male compared to 44.8 % female. Most of the participants had finished their tertiary education and had more than 8 years of experience. It could also be found that that most of the hospitals were old hospitals, established for more than 20 years. According to the number of skilled employees, the majority of the participants were from hospitals with more than 300 employees. Details on respondents' background are presented in Table5.1

Table 5.1: Background of the Respondents

	Frequency	Percentage
Type of the Hospital		
Teaching Hospital	11	7.0
Specialist Hospital	9	5.7
District General Hospital	111	70.7
Others	26	16.6
Position		
Head Of Hospital	3	1.8
Hospital Manager	8	4.8
Head Of Hospital Department	69	41.1
Inflection Control Officer	11	6.5
Hospital Engineer	6	3.6
Chief Pharmacist	13	7.7
Radiation Officer	7	4.2
Senior Nursing Officer	11	6.5
Financial Controller	6	3.6
Waste Management Officer	3	1.8
Doctor	21	12.5
Others	10	6.0
Gender		
Male	74	55.2
Female	60	44.8
Education		
High School	5	3.6
High Diploma	49	35.8
University	83	60.6
Experience		
1-3 years	17	11.4
4-7 years	32	21.5
>8 years	100	67.1
Years of Established		
<10	24	14.0
10-20	15	8.8
21-30	88	51.5
31-40	43	25.1
>40	1	.6
Number of Employees		
<100	9	5.3

Cont,,,,,,

,,,,,,*Cont*

Table 5.1: Background of the Respondents

100-200	13	7.6
201-300	18	10.5
301-400	45	26.3
401-500	54	31.6
>500	32	18.7

5.3 Data Preparation and Screening

This section discusses the data screening procedures which include the detection of missing detection of outliers, normality distribution and reliability. 210 questionnaires were distributed and 171 questionnaires were returned making the response rate of 81.43 %.

5.3.1 Detection of Missing Data

Hair, et al. (2006) described missing data as "*information not available for a case about whom other information is available*". Missing data for this research was reduced by checking for errors in all the variables at the point of time they were collected. For the surveys, unanswered questions were referred back to the respondent. To ensure that all the data were cleaned, frequency distribution and missing value analysis for each variable were conducted.

5.3.2 Detection of Outliers

Outliers are defined by Hair et al (2010) as an observation with a "*unique combination of characteristics identifiable as distinctly different*" from the other observations. In addition, Tabachnick and Fidell (2001) and Field (2009) also recommended graphic methods of detecting outliers such as histograms and normal probability plots. For this research, outliers were also detected using mahalanobis Chi-square (D^2) method. From the analysis adapted, two cases were found to have the characteristics of outliers and these two cases were eliminated.

5.4 Validity and Reliability of the Construct

The following section discusses the instruments used in this research as presented below.

5.4.1 Validity Test

Validity tests were conducted to ensure the measurement scales were accurately measured. The two validity tests used were content or face validity and construct (Zikmund, 2003). Content or Face Validity: It is concerned with the degree the scale items represent the domain of the concept under study (Davis & Consenza, 1988) and it involves a systematic and subjective assessment (Hair et al., 2007). This test was carried out during the pre-test stage where the measurement scales were reviewed by a university professor, who is a research specialist in the area of entrepreneurial management. The reason this was done was to solicit feedback if any revision or modification was needed to the scale. Upon receipt of the feedback, changes were made accordingly.

Construct Validity: It deals with the degree to which the construct or "scale represents and acts like the concept being measured" (Davis & Consenza, 1988). The construct validity was assessed from both the theoretical and statistical perspective. The instruments for the variables in this research were established from previous studies that supported the theoretical construct validity.

The principal technique that was performed on all the constructs to support the statistical construct validity was to examine the Varimax rotation principal components analysis (PCA). Tabachnick and Fidell (2001) fully supported the PCA for the factor extraction over the explanatory factor analysis (EFA) especially for the empirical summary of data set. All the factors for variables in this research were considered as multi-dimensional. The purpose is to validate the scales and to determine the factor loading.

All the independent and dependent variables were submitted to PCA to determine their factor loading. As a rule of thumb, Tabachnick & Fidell, (2001) suggested that only a variable with a loading of 0.32 and above should be considered. Nevertheless, Comrey and Lee (1992) interpreted that any loading that exceeds 0.71 is considered excellent, 0.63 as "very good", 0.55 as "good", 0.45 as "fair", and 0.32 as "poor". However, Tabachnick and Fidell (2001) indicated that the cut off point for size of loading is a matter of the researcher's preference. For this research, based on the size of loadings which were influenced by homogeneity of scores in the samples, a factor loading which is higher than 0.45 will be considered.

Tabachnick and Fidell (2001) have indicated that in order to conduct factor analysis, a total number of more than 150 samples would be ideal. For this research, a usable sample size of 210 was employed. Another consideration for factor analysis as suggested by Tabachnick and Fidell (2001) is that the Maiser-Meyer-Olkin (KMO) statistics should be a minimum of 0.6 (Kaiser, 1970, 1974). If this value falls below the minimum value, it is recommended that either more data be collected or that other variables should be included (Field, 2009). Hutchson and Sofroniou (1999) interpreted the KMO values at being between 0.5 and 0.7 as "mediocre", 0.7 and 0.8 as "good", values between 0.8 and 0.9 "are great" and value above 0.9 as "superb".

5.4.2 Organizational Structure

The measurement scales for organizational structure consisted of 14-items. The Varimax rotated principal components factor analysis was conducted. Prior to performing the principal components analysis (PCA), the suitability of the data for factor analysis was assessed. Correlation matrix indicated item coefficients were 0.3 and above. There were a total of two statistical measures to assess the factorability of the data conducted through 1) Kaiser-Meyer-Olkin (KMO) to determine the "measure of sampling adequacy" value. The value reported was 0.843, exceeding the recommended value of 0.6 (Kaiser, 1970, 1974); 2) Barlett's test of sphericity (Barlett, 1954) is significant at $p<0.001$. Since the KMO value is reported as 0.843, it was interpreted as in the range of "great" (Hutchinson & Sofroniou, 1999). Therefore the sample size here is adequate for factor analysis. The total variance explained is reported as 47.69%. Only factors with a loading value of 0.40 and above were considered. One item was deleted prior to anti-image analysis. Factor loading accepted all two factors based on the original items. Table 5.2 shows the factor loading value for this scale. It ranges from 0.468 to 0.784.

Table 5.2: Factor Analysis of Organisational Structure

Factor/Item	Loading	
	1	**2**
Factor 1: Formalization		
b1b	.702	
b2b	.646	
b3b	.701	
b4b	.543	
b5b	.606	
b6b	.784	
b7b	.612	
b8b	.638	
Factor 2: Centralization		
b1a		.585
b3a		.472
b4a		.482
b5a		.468
b6a		.750
Eigenvalues	4.81	1.33
Percentage	37.06	10.23
KMO	0.843	
Barlett's test of sphericity	683.97	
Sig.	0.000	

5.4.3 Organizational Culture

The measurement scales for organisational culture consisted of eighteen-items. The Varimax rotated principal components factor analysis was conducted. Prior to performing the principal components analysis (PCA), the suitability of the data for factor analysis was assessed. Correlation matrix indicated item coefficients were 0.3 and above. There were a total of two statistical measures to assess the factorability of the data conducted through i) Kaiser-Meyer-Olkin (KMO) to determine the "measure of sampling adequacy" value. The value reported was 0.887, exceeding the recommended value of 0.6 (Kaiser, 1970, 1974); ii) Barlett's test of sphericity (Barlett, 1954) is significant at $p<0.001$. Since the KMO value is reported as 0.887, it is interpreted as in the range of "great" (Hutcheson & Sofroniou, 1999). Therefore, the sample size here is adequate for factor analysis. The total variance explained is reported as 49.43%. Only factors with a loading value of 0.40 and above were considered. Therefore, no items were deleted. Factor loading accepted all two factors based on the original items. Table 5.3 below shows the factor loading value for this scale. It ranges from 0.433 to 0.749.

Table 5.3: Factor Analysis of Organizational Culture

Factor/Item	Loading	
	1	2
Factor 1: Power Distance		
c1b	.749	
c2b	.684	
c3b	.686	
Factor 2: Individualism & Collectivism		
c1a		.615
c2a		.553
c3a		.493
c4a		.433
c5a		.588
c6a		.660
c7a		.692
c8a		.743
c9a		.702
c10a		.716
c11a		.669

Cont,,,,,

,,,,,,,,,Cont

Table 5.3: Factor Analysis of Organizational Culture

c12a		.504
c13a		.570
c14a		.770
Eigenvalues	6.75	1.65
Percentage	39.71	9.72
KMO	0.887	
Barlett's test of sphericity	**1195.47**	
Sig.	0.000	

5.4.5 External Factors

The measurement scales for organisational external consisted of 19-items. The Varimax rotated principal components factor analysis was conducted. Prior to performing the principal components analysis (PCA), the suitability of the data for factor analysis was assessed. Correlation matrix indicated item coefficients were 0.3 and above. There were a total of two statistical measures to assess the factorability of the data conducted through i) Kaiser-Meyer-Olkin (KMO) to determine the "measure of sampling adequacy" value. The value reported was 0.835, exceeding the recommended value of 0.6 (Kaiser, 1970, 1974); ii) Barlett's test of sphericity (Barlett, 1954) is significant at $p<0.001$. Since the KMO value is reported as 0.835, it is interpreted as in the range of "fair" (Hutcheson & Sofroniou, 1999). Therefore, the sample size here is adequate for factor analysis. The total variance explained is reported as 48.42%. Only factors with a loading value of 0.40 and above were considered. Anti-image correlation matrix suggested 7 items to be deleted. The items were c1ba, c4b, c6b, d8b, c7b, and c10a, c11a. Factor loading accepted all two factors based on the original items. Table 5.4 below shows the factor loading value for this scale. It ranges from 0.576 to 0.865.

Table 5.4: Factor Analysis of Organizational External Factors

Factor/Item	Loading	
	1	2
Factor 1: Environmental Factors		
c1a	.865	
c2a	.768	
c3a	.800	
c4a	.576	
c5a	.714	
c6a	.773	
c7a	.826	
c8a	.777	
c9a	.743	
Factor 2: Government Policy		
c2b		.670
c3b		.679
c5b		.749
Eigenvalues	4.20	1.61
Percentage	34.99	13.43
KMO	0.835	
Barlett's test of sphericity	646.67	
Sig.	0.000	

5.4.6 Medical Waste Management Practices

The measurement scales for medical waste management consisted of 14-items. The Varimax rotated principal components factor analysis was conducted. Prior to performing the principal components analysis (PCA), the suitability of the data for factor analysis was assessed. Correlation matrix indicated item coefficients were 0.3 and above. There were a total of two statistical measures to assess the factorability of the data conducted through 1) Kaiser-Meyer-Olkin (KMO) to determine the "measure of sampling adequacy" value. The value reported was 0.788, exceeding the recommended value of 0.6 (Kaiser, 1970, 1974); 2) Barlett's test of sphericity (Barlett, 1954) is significant at $p<0.001$. Since the KMO value is reported as 0.788, it is interpreted as in the range of "fair" (Hutchinson & Sofroniou, 1999). Therefore, the sample size here is adequate for factor analysis. The total variance explained is reported as 55.01%. Only factors with a loading value of 0.40 and above were considered. Two item was deleted prior to anti-image analysis. Factor loading accepted all two factors based on the original items. Table 5.5 shows the factor loading value for this scale. It ranges from 0.523 to 0.793.

Table 5.5: Factor Analysis of Medical Waste Management Practices

Factor/Item	**Loading**		
	1	**2**	**3**
Factor 1			
e10	.523		
e11	.530		
e12	.711		
e14	.635		
Factor 2			
e5		.757	
e6		.793	
e7		.725	
e8		.604	
Factor 3			
e1			.704
e2			.672
e3			.528
e4			.701
Eigenvalues	1.837	1.696	1.069
Percentage	31.976	14.130	8.906
KMO	0.788		
Barlett's test of sphericity	533.202		
Sig.	0.000		

5.5 Reliability Analysis

To ensure the reliability of the scales, internal consistency confirmation of the scales was performed by checking the Cronbach's alpha coefficient. The cut-off point for measuring the reliability for the current research is coefficient alpha of above 0.65 as recommended by Nunnally and Berntein (1994) and Nunnally (1978). Table 5.6 exhibits the Cronbach coefficient alpha of the variables. All the variables in this research have values of more than 0.65.

Table 5.6: Reliability Coefficients for Variables

Variable	N of Item	Cronbach Alpha
Medical Waste Management	14	0.714
Organizational Structure		
Centralization	5	0.723
Formalization	8	0.825
Organizational Culture		
Individualism & Collectivism	14	0.891
Power Distance	3	0.695
External Factors		
Environmental Factors	11	0.796
Government Policy	8	0.782

5.6 Assumptions of Multiple Regressions

Prior to using multiple regression analysis to explore the relationships among variables, all the assumptions recommended by Tabachnick and Fidell (2011) have been fulfilled, such as 1) normality, 2) multicollinearity and singularity, 3) outliers, normality and homodescedascity of residuals, and 4) linearity.

5.6.1 Normality Test

The normality of distribution of data was examined by the skewness and kurtosis values for each variable. Skewness values present the summery of the distribution score and a skew variable's mean will not be at the center of this distribution; while kurtosis confer information about the "*peakness*" of distribution, it can be either too peaked (with short and thick tail) or too flat (with long and thin tail) (Tabachnick & Fidell, 2001).

Normal distribution is considered when value of skewness and kurtosis is at zero (0). Positive skewness value will have a cluster of cases to the left at a low value and negative skewness will have the score cluster or pile at the right side with a long left tail (Tabachnick & Fidell, 2001). Kurtosis with values of below zero (0) will indicate a relative flat distribution known as "*playkurtic*" and the kurtosis values above zero (0) indicate a peak distribution or "*leptokurtic*". However, Hair et al. (2010) recommended the rejection of the normality assumptions at absolute values of ±3.29 at $p<0.01$ significant level, ± 2.58 at $p<0.01$ significant level and ± 1.96 at $p<0.05$ significant level.

To assess the normality of the variables, the above suggestions were applied and noticeably none of the variables fell outside the ±3.29 at $p<0.001$ probability range level. Table 5.7 is a summary of the kurtosis and skewness for all the variables. The data show the variables as normally distributed. Therefore, in conclusion, all the variables do not deviate from the normality test requirement.

Table 5.7: Normality Test of the Variables

	Skewness		Kurtosis	
	Statistic	**SE**	**Statistic**	**SE**
Medical Waste Managemt	-.466	.187	.438	.371
Organisational Structure	-.193	.187	-.512	.371
Centralization	-.111	.187	-.320	.371
Formalisation	-.079	.187	-.927	.371
Organisational Culture	-.235	.187	-.554	.371
Individualism & Collectivism	-.213	.187	-.683	.371
Power Distance	-.025	.187	-.983	.371
External Factors	-.554	.187	.035	.371
Environmental Factors	-.404	.187	-.482	.371
Government Policy	-.753	.187	.283	.371

The other step in analyzing the data for this research is to examine the normality of the data by assessing the shape of distribution. A test was conducted to determine the variable done through visual inspections. An informal approach to testing normality is to compare a histogram of the sample data to a normal probability curve. The empirical distribution of the data (the histogram) should be bell-shaped and resemble the normal distribution. Figures 5.1, Figure 5.2, Figure 5.3 and Figure 5.4 illustrate the histogram to examine the normality distribution for the variables. It was found that the data were within the normal curve distribution. Hence, it suggested that all of the variables were normally distributed.

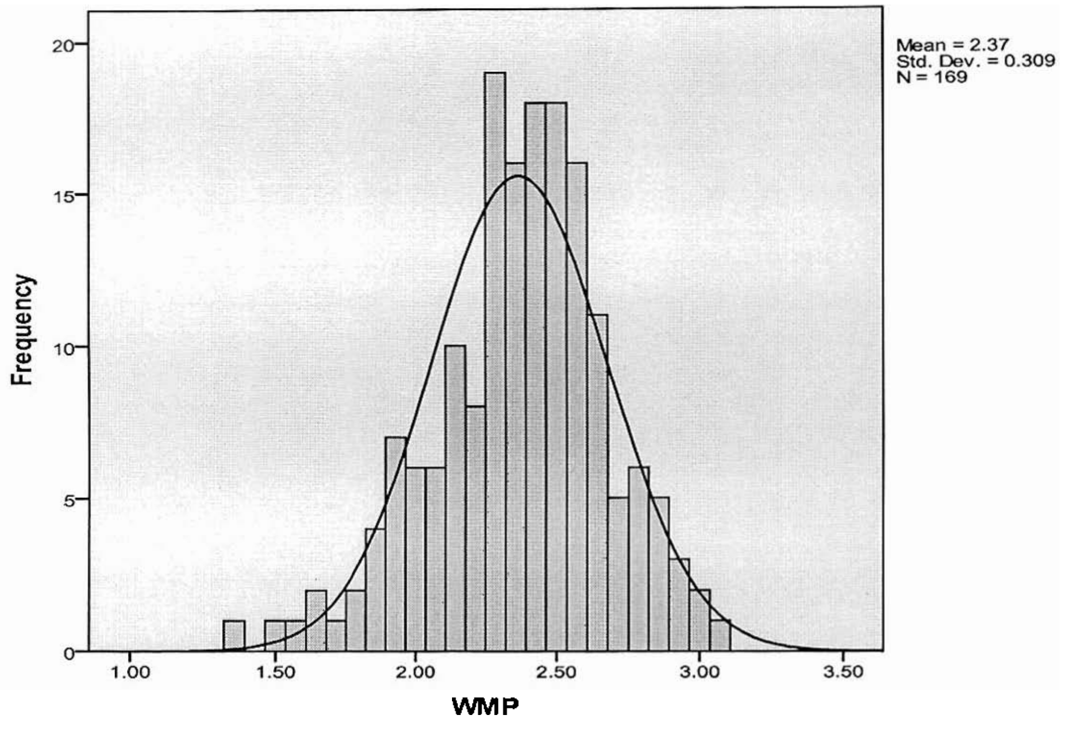


Figure 5.1: Histogram of Medical Waste management

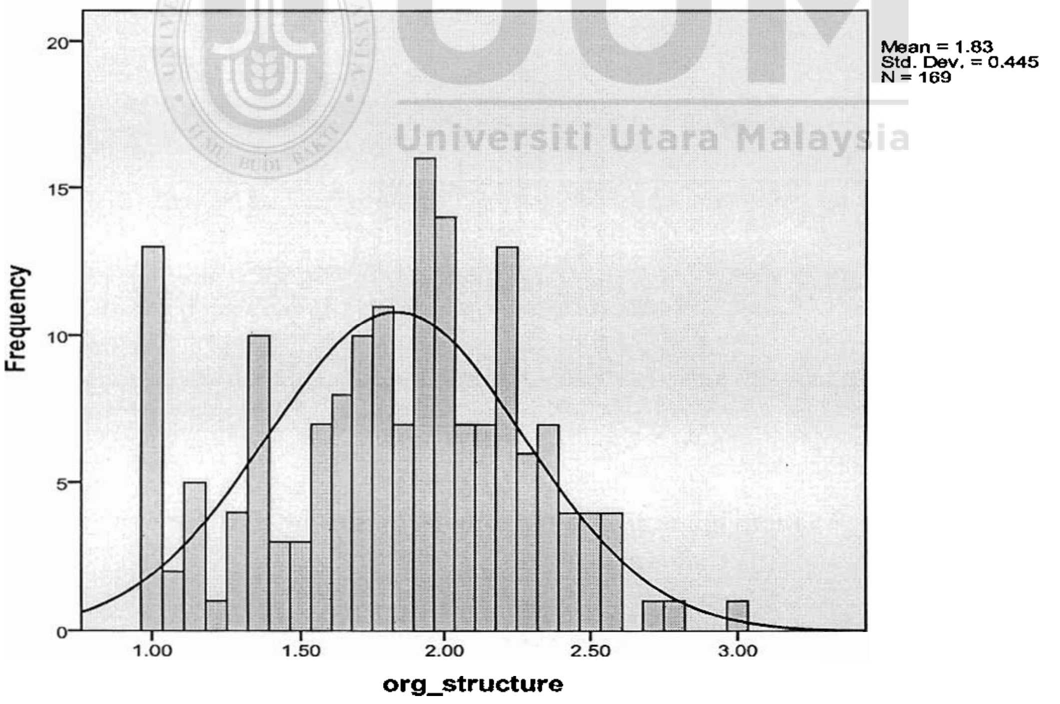


Figure 5.2: Histogram of Organizational Structure

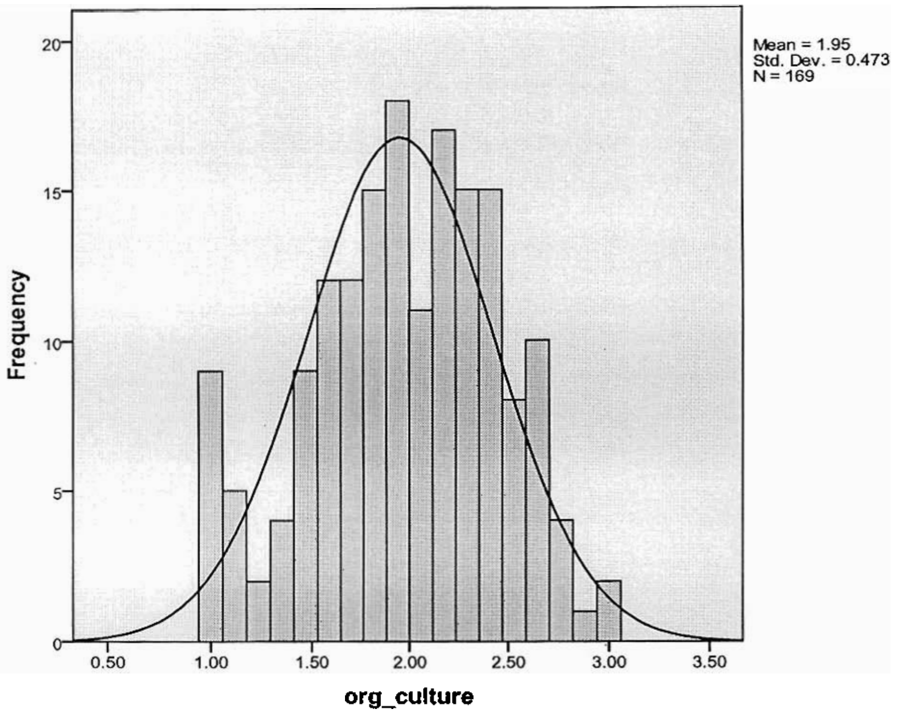


Figure 5.3: Histogram of Organizational Culture

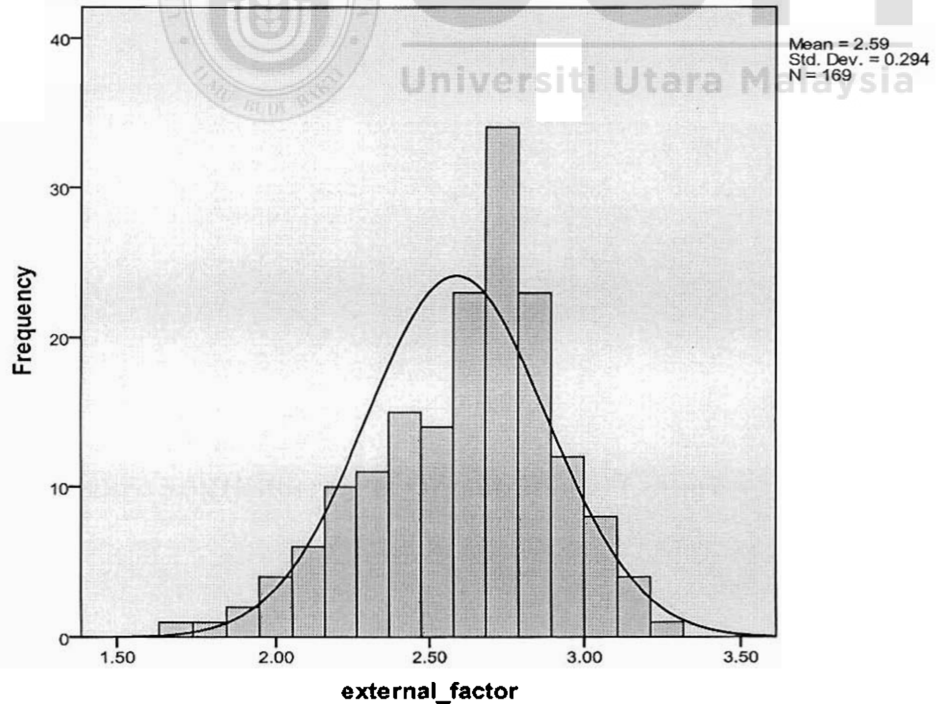


Figure 5.4: Histogram of External Factors

5.6.2 Linearity

Another assumption to meet is the linearity of data which is the relationship between the residuals against the predicted values. Linearity refers to the error term of distribution. Linearity is important for the regression analysis because correlation can capture only the linear association between variables. If there is substantial non-linear relationship, it will be ignored in the analysis because it will underestimate the actual strength of the relationship (Tabachnick & Fidell, 2007).

Linearity can be observed by examining the scatterplots (Hailr et al., 2006). The results of linearity through scatter plot diagrams for various variables indicate no clear relationship between the residuals and the predicted values. Assessment of all scatterplots of the standardized residual versus standardized predicted values revealed that in all the plots the residual were scattered with no systematic or curvilinear pattern (U shape distribution) or clustering or residuals as indicated by Tabachnick and Fidell (2007). The randomized pattern of the scatter plots indicated that the assumption of linearity was met. Therefore, the linearity could be assumed.

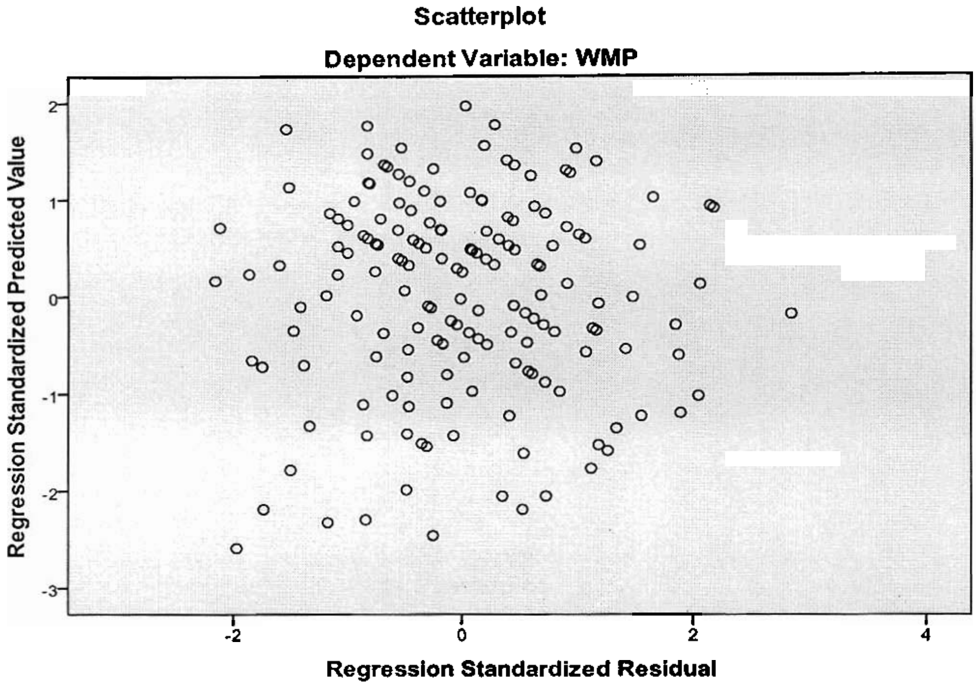


Figure 5.5: Scatterpolts of Standardized Residuals against the Predicted Values

5.6.3 Homoscedasticity

Homoscedasticity refers to the constant variance of the error term and the variance of the dependent variable is approximately the same different level as the explanatory variable (Hair et al., 2006). Homoscedasticity is indicated when the width of the band of the residuals is approximately the same as the different level of the dependent variables and the scatter plot shows a pattern of residual normally distributed around the mean. To check the homoscedasticity, the scatterplots of studentized residual against the predicted values were used (Hair et al., 2006). There is a need to inspect the plots of residual against the predicted values to reveal that the residuals were scattered randomly with no obvious systematic pattern. If there is no systematic pattern of decreasing of increasing residuals, it can be assumed that the assumption of homoscedasticity is not violated.

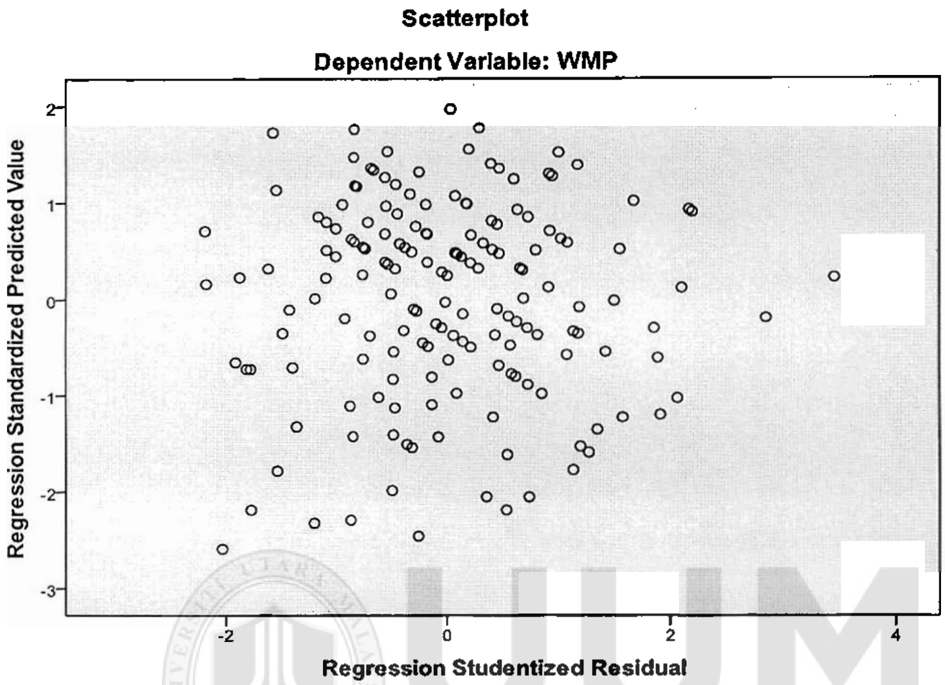


Figure 5.6 Scatterpolts of Studentized Residuals against the Predicted Values

5.6.4 Multicollinearity

The next assumption pertains to multicollinearity and singularity which are related to the correlations between the predictors' variables. Singularity occurs when one of the independent variable merged with other independent variables (Tabachnick & Fidell, 2001). Multicollinearity poses a problem for multiple regression when the independent variables are highly correlated (r = 0.8 and above). When such a case happens, the regression coefficients would not be significant due to high standard error. According to Tabachnick and Fidell (2001), tolerance values approaching zero (0) specify the presence of high multicollinearity. The cut-off value for Variance Inflation

Factor (VIF) is less than 10 and tolerance value of more than 0.1. Hence, as reported, there is no violation of the assumption for this research. All the independent variables' tolerance value of more than 0.1 and VIF value of less than 10 are acceptable. Refer to Table 5.8 for more details.

Table 5.8: Test of Multicollinearity

	Tolerance	VIF
Organizational Structure	.559	1.788
Organizational Culture	.489	2.044
External Factors	.677	1.478

5.7 Descriptive Analysis

There were 171 usable samples taken from the survey. All the variables were measured on a five (5) internal scale. According to Hair et al, (2006), mean values can be categorized into 3 levels: low, moderate and high. For this research, the categories were divided as shown in Table 5.9.

Table 5.9: Scores on Mean Values

Category	Value
Low:	*1.00 to 2.33*
Moderate	*2.34 to 3.66*
High	*3.67 to 5.00*

Descriptive analysis was carried out to answer the research question (RQ): What is the current medical waste management practices among the Libya public hospitals in comparison with WHO best practice? As reflected in Table 5.9, the majority of the means were less than three (3). They ranged from 1.6 to 4.47. This suggests that respondents perceived that the current medical waste management practices in Libyan hospital were still low. However, all the standard deviations were low, suggesting the variability on the data (Sekaran, 2005). Since this section seeks to examine the current practices of MWMP in Libyan public hospitals to compare with WHO best practices, more details on this aim provided below. Refer to Table 5.10 and Table 5.11

Table 5.10: Descriptive Analysis of the Variables

	Mean	Standard Deviation	Level
e1	1.9290	.76044	*Low*
e2	1.9349	.78028	*Low*
e3	1.9290	.76822	*Low*
e4	2.0118	.78671	*Low*
e5	2.2485	.59543	*Low*
e6	4.4734	1.04121	*High*
e7	2.0473	.69702	*Low*
e8	2.0592	.68751	*Low*
e9	1.5917	.74334	*Low*
e10	1.8757	.74957	*Low*
e11	1.9822	.75965	*Low*
e12	2.0533	.77352	*Low*
e13	2.3432	.69904	*Low*
e14	4.6568	.69904	*High*

Table 5.11: Comparison between WHO Model and Current Practices in Libyan Hospitals

WHO waste management model as a best practices and the principle involved	Current practices among the Libyan public hospitals
Medical waste management planning Planning should cover • develop the legal and regulatory framework • rationalize the waste-management practices within hospitals • develop specific financial investment and operational resources • launch capacity building and training measures • Set up a monitoring plan • Reduce the pollution associated with waste management	• Considering the latest guidelines of WHO and do not follow it by the department of health and hospitals • Most of the hospitals were not capable to implement medical waste system recommended by WHO
National policy • Active government intervention needed a cross a country • Legislation and supporting regulation • Conducting assessment before choosing method of handling • Government should allocate a budget to cover costs of establishment and maintenance of sound hospital waste system • Government should implement and monitor sound hospital waste system	• Based on the finding of this research • The perception of the current medical waste management practices in most of Libyan hospitals was low where the mean score was ranged from 1.6 to 4.7 and standard deviations were also low suggesting the variability on the data • Low: 1.00 to 2.33 • Moderate: 2.34 to 3.66 • High: 3.67 to 500 (Hair et al,. 2006; Sekaran, 2005) • Most of the hospitals do not clearly define procedures for collection and handling the waste from specific units
In terms of segregation, collection and disposing of medical waste • Waste should be segregated into different fractions, based on their • potential hazard and disposal route • Separate containers should be available for each segregated waste fraction • Hazardous and non-hazardous wastes should not be mixed during collection, transport or storage • Staff should understand the risks and safety procedures for the wastes they are handling • The waste should be collected after the bag is filled with three-quarter • Containers used must be easy to load and unload, easy to clean, clearly marked according to the legislation, well closed; vehicles must be cleaned daily	• Most of the surveyed hospitals do not segregate the waste at the point it is generated • Few of the hospitals use specific sharps box and containers
Training waste management handlers • The minimum training for health-care Waste handlers should include: • information on the techniques and risks associated with the handling of health-care waste • Procedures for dealing with spillages and other accidents • Instructions on the use of protective clothing.	• Only three hospitals were found to have standard operation procedures to newly hired staff recommended by WHO

Source Adapted (WHO, 2005)

5.8 Correlation Analysis

In order to identify the factors that have an association with Medical Waste Management Practices, a correlation analysis was conducted where the correlation coefficient illustrates the relationship between the independent and dependent variables. According to Hair et al., (2006), the number representing the Pearson correlation is referred to as a correlation coefficient. It ranges from – 1.00 to + 1.00, with zero representing absolutely no association between the two metric variables. The larger the correlation coefficient the stronger the linkage or level of association. A strong correlation is represented by a coefficient exceeding the value of 0.5 whereas a medium or modest correlation is when the coefficient has a value of between 0.2 and 0.5. Any coefficient possessing a value of less than 0.2 is deemed as showing a weak correlation. Benny and Feldman (1985) suggested a rule of thumb, that the correlation coefficients that exceed 0.8 (very strong correlation) will likely result in multicolinearity. Cohen (1988) has put forward a guideline on the effect sizes of the correlation coefficients in social science studies as: small effect size, $r = 0.1 - 0.29$, medium: $r = 0.30 - 0.49$, and large: $r = 0.50$.

In the same vain, correlation analysis was also carried out to answer research question two (RQ 2) and research question three (RQ 3) and test the related hypotheses.

5.8.1 Organizational Structure

Table 5.12 summarizes the results of the correlation analysis to examine the relationship between medical waste management practices and organizational structure.

It was found that there was a significant relationship between both variables ($r=0.609$, $p<0.01$). Table 511 also indicated the significant relationship between centralization and collection ($r=0.525$, $p<0.01$) and disposal ($r=0.193$, $p<0.05$). Another significant relationship, can also be found between formalization and collection ($r=0.486$, $p<0.01$), formalization and disposal ($r=.208$, $p<0.01$). Centralization and formalization were found to have no significant relationship with separation. This findings supported H_A1, $H_A1(2)$, H_A (3) , $H_A1(4)$, $H_A1(5)$ and $H_A1(6)$.

This finding is consistent with previous research regarding medical waste practices such as collection, segregation and disposal. For example, in order to have a successful programme with respect to MWM, a good plan must be available at the source of segregation, disinfection at the earliest opportunity, safe handling during transportation (within or outside the premises), and eco-friendly disposal (Verma et al 2008). In order to have an effective medical waste management strategy, it is essential to understand current hospital practices concerning the segregation of a variety of waste category streams (Abdullah et al., 2008).

Table 5.12: Relationship between Waste Management Practices and Organizational Structure

	WNP	Separation	Collection	Disposal	Organizational structure	Centralization	Formalization
WMP	1						
Separation	.485**	1					
Collection	.643**	.272**	1				
Disposal	.699**	.319**	.180*	1			
Organizational Structure	.609**	-.001	.549**	.220**	1		

Cont,,,,,,,,

Cont,,,,,

Table 5.12: Relationship between Waste Management Practices and Organizational Structure

Centralization	.548**	.016	.525**	.193*	.879**	1	
Formalization	.563**	-.013	.486**	.208**	.940**	.663**	1

Note: **p<0.01, *p<0.05

5.8.2 Organizational Culture

Table 5.13 summarizes the results of correlation analysis to examine the relationship between waste management practices and organizational culture. It was found that there was a significant relationship between both variables ($r=0.739$, $p<0.01$). Table 5.13 also indicated the significant relationship between individualism and collection ($r=0.506$, $p<0.01$) and disposal ($r=0.374$, $p<0.05$). Another significant relationship can also be found between power distance and collection ($r=0.282$, $p<0.01$) and disposal ($r=.436$, $p<0.01$). Individualism/collectivism was found to have no significant relationship with separation. This findings supported H_A1 (8), H_A1 (9).

This finding is consistent with previous research regarding medical waste practices indicated align to definition of waste practices such as collection, segregation and disposal. For example, when studying the situation in any advanced or less advanced country, it is essential to take into account the cultural beliefs, degree of awareness of health issues as well as the practices and technology in the course of healthcare waste management (WHO, 1992). As entire process is conditioned by organizational culture, because according to De Long and Fahey, (2000) the values and behavioral norms held by organizational members serve as a filter in the sense-making and meaning-construction processes.

Table 5.13 Relationship between Waste Management Practices and Organizational Culture

	WNP	Separation	Collection	Disposal	Organizational Culture	Individualism & Collectivism	Power Distance
WMP	1						
Separation	.485**	1					
Collection	.643**	.272**	1				
Disposal	.699**	.319**	.180*	1			
Organisational Culture	.739**	.102	.491**	.414**	1		
Individualism & Collectivism	.697**	.086	.506**	.374**	.985**	1	
Power Distance	.672**	.130	.282**	.436**	.751**	.623**	1

Note: **p<0.01, *p<0.05

5.8.3 External Factors

Table 5.14 summarizes the results of correlation analysis to examine the relationship between medical waste management practices and external factors. It was found that there was significant relationship between both variables ($r=0.739$, $p<0.01$). Environmental factors were found to have significant relationship with separation ($r=0.190$, $p<0.05$), collection ($r=0.372$, $p<0.01$) and disposal ($r=0.500$, $p<0.01$). The government policy also showed significant relationship between separation ($r=0.296$, $p<0.01$), collection ($r=0.176$, $p<0.05$) and disposal ($r=0.209$, $p<0.01$). This finding supported all H_A3.

The current finding is also consistent with that of Taherkhani et al (2011) who addressed the four important external factors that should be adopted by any organization in building up suitable strategies (social, technological, economic and political). These factors can be used as the basis for good future planning and strategic management. Their application would help organizations to grasp the various macro-environmental factors needed by organizations in order to when determining any particular market in regards.

Table 5.14: Relationship between Medical Waste Management Practices and Organizational External Factors

	WNP	Separation	Collection	Disposal	External Factors	Environmental Factors	Government Policy
MWMP	1						
Separation	.485**	1					
Collection	.643**	.272**	1				
Disposal	.699**	.319**	.180*	1			
External Factors	.633**	.367**	.384**	.503**	1		
Environmental Factors	.610**	.190*	.372**	.500**	.883**	1	
Government Policy	.296**	.451**	.176*	.209**	.604**	.159*	1

Note: **p<0.01, *p<0.05

5.9 Linear Regression

The basic idea of regression analysis is to use data on a quantitative independent variable to predict or explain variation in a quantitative dependent variable. The regression equation is as follows:

$$Y = \beta 0 + \beta 1\, X + \varepsilon i$$

$\beta 0$ is the intercept of the regression line and $\beta 1$ is the slope of that line. The other quantity εi represents random error term. A hypothesis can be defined as a tentative, yet testable, statement, which predicts what the researchers expect to find in their empirical data. Hypothesis are derived from the theory on which the conceptual model is based and are often relational in nature (Sekaran and Bougie, 2010). This weight, given in terms of a probability, is called the level of significance (or alpha p-value) of the statistical test. More formally, the level of significance is defined as the probability of obtaining a value of the test statistic that is as likely or more likely to reject H_o as the actual observed value of the test statistic. For the instance of this research, linear regression was carried out to examine the effect of independent variables (Organizational Structure, organizational Culture and External Factors) on dependent variables (Medical Waste Management Practices). Hierarchical regression was also carried out to examine the effect of organizational size (number of skilled employees) as a moderating variable on the relationship between task independent variable and dependent variable.

5.9.1 Organizational Structure

Results of regression analysis to examine the effect of organizational structure on medical waste management practices are illustrated in Table 5.15. Organizational structure explained 37.1 percent of MWMP (R^2=37.1, F=49.03, p<0.01). Both dimensions significantly predicted MWMP in public hospital in Libya as follows:

Centralization (B=0.313, t=3.805, p<0.01) and formalization (B=0.355, t=4.316, p<0.01).

Table 5.15: Effect of Organizational Structure on Medical Waste Management Practices

	B	t	Sig.
Centralization	.313	3.805	.000
Formalization	.355	4.316	.000
R^2	0.371		
F	49.03		
Sig.	0.000		

5.9.2 Organizational Culture

Table 5.16 illustrates the effect of organizational culture on medical waste management practices. Overall, organizational culture explained 57.8 percent of MWMP (R^2=0.578, F=113.655, p<0.01). Both dimensions were also significantly predicted MWMP in public hospital in Libya as follows: individualism and collectivism (B=0.455, t=7.508, p<0.01) and power distance (B=0.388, t=6.018, p<0.01).

Table 5.16 Effect of Organizational Culture on Medical Waste Management Practices

	B	t	Sig.
Individualism and Collectivism	.455	7.058	.000
Power Distance	.388	6.018	.000
R^2	0.578		
F	113.655		
Sig.	0.000		

5.9.3 External Factors

Table 5.17 illustrates the effect of external factors on medical waste management practices. Overall, external factors explained 64.2 percent of WMP (R^2=0.642, F=57.27, p<0.01). Both dimensions were also significantly predicted MWMP in public hospitals in Libya as follows: environmental factors (B=0.577, t=9.576, p<0.01) and government policy (B=0.205, t=3.399, p<0.01).

Table 5.17: Effect of External Factors on Waste Management Practices

	B	t	Sig.
Environmental Factors	.577	9.576	.000
Government Policy	.205	3.399	.001
R^2	0.642		
F	58.27		
Sig.	0.000		

5.10 Effect of Moderating Variables

To test the hypothesis that the organizational size (number of skilled employees) is the function of MWMP, and more specifically whether organizational size moderates the relationship between organizational structure, organizational culture and external factors and MWMP, a hierarchical multiple regression analysis was conducted.

5.10.1 Organizational Structure

Table 5.18 illustrates the results of hierarchical regression to test the moderating effect of organizational size (number of skilled employees) on the relationship between organizational structure and MWMP. In the first step, the results indicated that organizational structure were accounted for 37.1 percent of the significant amount of MWMP (R^2=0.371, F=49.026, p<0.01). In the second step, one variables was added; organizational size. These variables accounted for 37.2 percent of the significant amount of variance in WMP (R^2=0.37.2, F=32.537, p<0.01). Organizational size failed to predict MWMP.

Next, the interaction term between the dimensions of organizational structure and organizational size were added to the regression model (Step 3), which accounted for a significant proportion of the variance in MWMP (R^2 =0.374, F =19.489, p<0.01). Both interactions terms also failed to predict MWMP. This finding indicated that the moderation effect of an organizational size did not occur in the relationship between organizational structure and MWMP. Hence, the hypothesis related to this effect was rejected. For more detail, refer to Table 5. 18.

Table 5.18: Moderation Effect of Organizational Size in the Relationship between Organizational Structure and MWMP

Variable	B (model 1)	B (model 2)	B (model 3)
Dependent variable			
Centralization	.313**	.310**	.315**
Formalization	.355**	.357**	.356**
Moderating Variable			
Organizational Size		.019	.008
Interaction Term			
Centralization X Size			.024
Formalization X Size			.031
R^2	*0.371*	*0.372*	*0.374*
F	*49.026*	*32.537*	*19.489*
Sig.	*0.000*	*0.000*	*0.000*

Cont,,,,

,,,,,,,Cont

Table 5.18: Moderation Effect of Organizational Size in the Relationship between Organizational Structure and MWMP

R^2 change	*0.371*	*0.000*	*0.002*
F change	*49.026*	*0.095*	*0.320*
Sig. F Change	*0.000*	*0.758*	*0.727*

Notes: **p<0.01; *p<0.05

5.10.2 Organizational Culture

Table 5.19 illustrates the results of hierarchical regression in testing the moderating effect of the organizational size (number of skilled employees) on the relationship between organizational culture and MWMP. In the first step, the results indicated that organizational culture accounted for 57.8 percent of a significant amount of MWMP (R^2=0.578, F=113.655, p<0.01). In the second step, one variables was added; organizational size. These variables accounted for 57.8 percent or a significant amount of variance in WMP (R^2=0.578, F=75.373, p<0.01). Organizational size failed to predict MWMP in this model.

Next, the interaction term between the dimensions of organizational culture and organizational size were added to the regression model (Step 3), which accounted for a significant proportion of the variance in MWMP (R^2 =0.586, F =46.187, p<0.01). Both interaction terms also failed to predict MWMP. This finding indicated that the moderation effect of an organizational size did not occur in the relationship between organizational culture and MWMP. Hence, the hypothesis related to this effect was rejected. For more detail, refer to Table 5. 19.

Table 5.19: Moderation Effect of Organizational Size in the Relationship between Organizational Culture and MWMP

Variable	B (model 1)	B (model 2)	B (model 3)
Dependent variable			
Individualism and Collectivism	.455**	.457**	.449**
Power Distance	.388**	.386**	.395**
Moderating Variable			
Organizational Size		.014	.009
Interaction Term			
Individualism X Size			-.041
Power X Size			.110
R^2	*0.578*	*0.578*	*0.586*
F	*113.655*	*75.373*	*46.187*
Sig.	*0.000*	*0.000*	*0.000*
R^2 change	*0.578*	*0.000*	*0.008*
F change	*113.655*	*0.076*	*1.594*
Sig. F Change	*0.000*	*0.783*	*0.206*

Notes: **p<0.01; *p<0.05

5.10.3 External Factors

Table 5.20 illustrates the results of hierarchical regression to test the moderating effect of organizational size (number of skilled employees) on the relationship between external factors and MWMP. In the first step, the results indicated that external factors accounted for 41.2 % or a significant amount of MWMP (R^2=0.412, F=58.265, p<0.01). In the second step, one variable was added; organizational size. These variables accounted for 42.4 percent or a significant amount of variance in MWMP (R^2=0.424, F=40.507, p<0.01). Organizational size failed to predict MWMP in this model.

Next, the interaction term between the dimensions of external factors and organizational size were added to the regression model (Step 3). This accounted for a significant proportion of the variance in MWMP (R^2 =0.440, F =25.630, p<0.01). One interaction terms was able to predict MWMP that is Government X Size. This finding indicated that the moderation effect of an organizational size (number of skilled employees) did occur in the relationship between the government policies and MWMP. Hence, the hypothesis related to this effect was supported. For more detail, refer to Table 5. 20.

Table 5.20: Moderation Effect of Organizational Size in the Relationship between External Factors and MWMP

Variable	B (model 1)	B (model 2)	B (model 3)
Dependent variable			
Environmental Factors	.577	.591	.569
Government Policy	.205	.199	.216
Moderating Variable			
Organizational Size		.109	.070
Interaction Term			
Environmental X Size			-.079
Government X Size			.132*
R^2	*0.412*	*0.424*	*0.440*
F	*58.265*	*40.507*	*25.630*
Sig.	*0.000*	*0.000*	*0.000*
R^2 change	*0.412*	*0.012*	*0.016*
F change	*58.265*	*3.344*	*2.333*
Sig. F Change	*0.000*	*0.069*	*0.100*

Notes: **p<0.01; *p<0.05

5.11 Summary

This chapter presents the outcome of validity test, reliability analysis, multiple regression analysis, descriptive analysis as well as Pearson's correlation analysis. The result of factor analysis illustrated that one items had been deleted from centralization dimension.

The results of reliability analysis produced that all of the variables are reliable for this research by checking the Cranach's alpha coefficient which held values more than 0.65 to variables.

The regression analysis illustrated that all of the variables (internal and external) significantly predicted MWMP in the Libyan public hospitals.

The results of correlation analysis demonstrated that there is significant relationship between organizational structure, organizational culture, government policy, environmental factors and MWMP. On the other hand, organizational size (number of skilled employees) failed to predict MWMP as a moderator variable between organizational structure and MWMP, organizational culture and MWMP. In the same way, organizational size failed to predict environmental factors as an external factor with an exceptional of government policy where the findings indicate that the moderation effect of organization strategy did occur in the relationship between government policy and MWMP.

The results of descriptive analyses for mean score ranged from 1.6 to 4.7 and all the standard deviations were low except (Q6 & Q14) which suggested that the perception of the current medical waste management practices in Libya is low and the variability on the data.

The following chapter will concentrate on discussion concerning research questions and the hypotheses tested in this research. A re-emphasizing of the objectives of this research will also be discussed. Finally, the limitation of the current research and suggestion for further studies will be presented.

CHAPTER SIX

DISCUSSIONS AND CONCLUSIONS

6.1 Introduction

This chapter recapitulates research aims and research questions. The main findings of this research and its justifications are also discussed and presented. Highlights of the theoretical implications of this research, limitation as well as suggestions for future studies are also presented at the end of this chapter.

The current research was conducted with five main objectives in mind. Firstly, it identifies the current medical waste management practices in Libyan public hospitals compared with WHO best practice. Secondly, it identifies the relationship between organizational internal factors (organizational structure and culture) and current medical waste management practices in Libyan public hospitals. Next, identifying the relationship between organizational external factors (government policy and environmental factors) and current medical waste management practices in Libyan public hospitals. After that, the research identifies the moderating effects of the number of employees on the relationship between organizational internal and external factors and current medical waste management practices in Libyan public hospitals.

Internal factors consist of organizational structure and culture. In the present research, organizational structure was conceptualized as centralization and formalization. Organizational culture was conceptualized as individualism & collectivism and power distance. Organizational external factors were conceptualized as government policy and environmental factors.

The population for the current research is the southern Libyan public hospitals. Simple stratified random sampling was utilized for the hospitals selected. Also, self-administrated structured questionnaires were physically distributed to 210 to all selected hospitals in the five states followed with phone calls and reminders, seeking to get back a good feedback. A total of 171 respondents were returned. The data were then analysed using a number of different analysis such as correlation, regression analysis and descriptive analysis with the assistance of Statistical Package for Social Sceince program for Windows (Version 20.0).

6.2 Implications of the Research

Since the current research lean towards practice as a part from its implications, the findings of this research suggest that the propensity to adopt medical waste management practices (segregation, collection and disposal) in Libyan public hospitals is high. In addition, organizational internal factors (such as centralization and formalization) and organizational external factors (such as environmental condition and government policy are having significant influence on MWMP. This implies that medical waste management in Libyan public hospitals could be enhanced when all of the parties interested (such as hospital managers, waste management officers and medical staff) consider all the above mentioned factors seriously which later on , will help them in understanding the importance of an efficient, effective and integrated waste management practices.

By identifying the organizational internal and external factors in the context of Libyan public hospitals will serve as a premise for a key execution marker and benchmarking. And will offer the right drive for changing the current inactivity towards better medical waste management practices. In the same way, organizational internal and external factors are the factors to rectify the current regulations and practicing of medical waste management among the Libyan public hospitals, and to provide policy makers an instrument to assess how external factor such as government policy could affect adoption of a good management system.

The Libyan authorities should dedicate its support for the all stakeholders in regards with an independent management workers on medical waste management consisting of a highly qualified team to achieve goals, 2, the sitting up of direct development of laws to regulate the management, 3, providing model transport vehicles for the transfer of waste at appropriate and frequent times, 4, separating medical waste from domestic waste, 5, the assessment of environmental impact before and after the establishment of any healthcare facilities, 6, providing training courses to all bodies in charge and finally, awareness and bringing about health education and definition of how medical waste is dangerous and must be carefully treated.

6.3 Conclusions Based on Research Objectives

In the following section, a discussion will be held on the achievement of the five objectives mentioned early in chapter one by using different statistical analyses.

6.3.1 Medical Waste Management Practices in Libyan Public Hospitals Compared with WHO Best Practice (Objective 1)

The first objective for this research which is identifying the current medical waste management practices in Libyan public hospitals comparing with WHO best practices was identified by performing descriptive analysis in order to get the mean score of current medical waste management practices in Libyan public hospitals. The results had shown that the mean score of medical waste management practices in Libyan public hospitals is ranged from 1.6 to 4.7 and all the standard deviations were also low suggesting the variability on the data with an exception to (Q6 & Q14). This actually suggests that the perception of the current medical waste management practices in Libya is low.

The current practices of medical waste management among Libyan hospitals are indicating of what has been mentioned early by WHO (2011) where there were emphasizing on some of the major and priority needs in primary healthcare structure and hospitals in Libya. WHO (1999; 2005) reports that in order to improve medical waste produced by hospitals, national legislation has at first to be established. There should also be a clear designation of responsibilities before the law is made. The law itself should be supported by a policy document, and technical guidelines for implementation this law as well as clear regulation on treatment for variety categories of medical waste, separation, collection, storage, transportation disposal and yet, the legal framework to be met for the safe management of health-care waste and how the guidance improves hospital hygiene, and occupational health and safety. In addition, it should take into consideration training of selected staff, resources and local available facilities and any cultural aspects of waste handling. These may go to include in detail scaling up hygiene standards and technical support for disposal large amount of expired drugs and other hazardous waste. In a study consistent with this research conducted by Alagoz and Kocasoy (2007) determined that in most of the healthcare facilities surveyed in Turkey, top management, managers of the hospitals senior nurses did not pay any attention to hospital waste, due to their insufficient knowledge and the significance of medical waste and their lack of interest. In the same way, another study conducted in Manyele and Lyasenga (2010) in Tanzania, the authors revealed that the level of medical waste management practice was poor in most of the surveyed hospitals. Also, no specific sites for medical wastes disposal, no designated vehicles for waste transportation, and yet some of the waste collectors carry the waste on hands.

The respondents were asked as whether they clearly define procedures for collection and handling of waste from specified units in hospitals and having specific containers according to WHO recommendation. They recorded that the procedures were below satisfaction by 1.9 and 2.0 of main value respectively. The variable practice within the surveyed hospitals can be explained by poor communication between hospital communities. Ruoyan et al (2010) indicate that national regulations are followed by all secondary and tertiary surveyed hospitals in China. They have internal plan and organized team for medical waste management involving related professionals such as hospital directors, infection control officers, directors of departments and wards, senior nurses, and

medical technicians. Supervision by the local government and the hospital director regularly occurred in most HCF surveyed.

It could be noticed and concluded that the current practice of medical waste management among the Libyan hospitals is far away from ideal. This refers to some likely reasons such as unclear definition of medical waste including according to its various categories, missing in establishing precisely legal obligations of waste producer concerning safe handling, establishing specific inspection system to ensue penalties for misfollowing standard operation procedures.

6.3.2 Factors Influencing Medical Waste Management Practices in Libyan Public Hospitals

As stated early, there is a number influencing medical waste practices. These are discussed as follows.

6.3.2.1 Organizational Structure (Objective2)

Linear regression and Pearson correlation analysis were carried out to figure out the relationship between organizational structure and MWMP; and how well organizational structure could predict the practice of medical waste management in Libyan public hospitals. Organizational structure explained 37.1 percent of MWMP (R2=37.1, F=49.03, p<0.01). Both dimensions significantly predicted MWMP in public hospital in Libya as follows: Centralization (B=0.313, t=3.805, p<0.01) and formalization (B=0.355, t=4.316, p<0.01).

The relationship between organizational structure (as measured by centralization and formalization) and MWMP was examined using Pearson correlation coefficient (*r*) and coefficient (*R2*). There was a significant relationship between the two variables (r =.609; *P*<0.01). The results of the linear regression demonstrated that organizational structure significantly contributes to explain the practice of medical waste management in Libyan hospitals where the power of organizational structure found to be 37.1%. To ensure reliability of the scale, Cronbach coefficient of organizational structure (centralization and formalization) was performed with a value of 0.723 and 0.825 respectively. Meaning that the variables are reliable. The strong relationship between organizational structure and MWM was previously highlighted. Tudor et al. (2005) mention that the main challenges and issues such as collection infrastructure that can affect waste management by National Health Service (NHS) is organizational structure. Furthermore, Mbarki et al. (2013) argue that the differences in medical waste management practice in terms of generation rate may be due to living habits, standards, availability of treatment facilities as well as ways to categorizing wastes. Marincovic et al. (2008) also reported that the medical waste generation rate depends on the size and the type of the medical institution, and level of economic development. To have better practice of medical waste management, Libyan hospitals need to put into considerations employee training for old and new works, providing continuous education, management evaluation process for system and workers. Waste management practices were dimensionalised in this research as (segregation, collection and disposal). The important of these process were highly reported in literature. For example, In order to have a successful programme with respect to MWM, a good plan must be available at the source of segregation, disinfection at the earliest opportunity, safe handling during transportation (within or outside the premises), and eco-friendly disposal (Verma et al 2008). In order to have an effective medical waste management strategy, it is essential to understand current hospital practices concerning the segregation of a variety of waste category streams (Abdullah et al., 2008).

To sum up, as mentioned above, the current research summarizes that organizational structure has significant influence on MWMP in Libya. This might be due to the fact that strength of relationship in which correlation coefficient ($r = 0.609$) between organizational structure and medical waste management practice. This is to conclude that a centralized structure limits the authority of the managers, in terms of decision-making and sole decision power lies in the hands of the waste management officer or directors. Consequently, centralization prevents the staff members or even managers to be flexible or to take the initiative in the course of performing their duties (Katsikea, et al., 2011).

6.3.2.2 Organizational Culture (Individualism & Collectivism and Power Distance –Objective 2)

Linear regression and Pearson correlation analysis were carried out to figure out the relationship between organizational culture and MWMP; and how well organizational culture could predict the practice of medical waste management in Libyan public hospitals. Overall, organizational culture explained 57.8 percent of MWMP ($R2=0.578$, $F=113.655$, $p<0.01$). Both dimensions were also significantly predicted MWMP in public hospital in Libya as follows: individualism and collectivism ($B=0.455$, $t=7.508$, $p<0.01$) and power distance ($B=0.388$, $t=6.018$, $p<0.01$).

The relationship between organizational culture (as measured by individualism & collectivism and power distance) was examined using Pearson correlation coefficient (r). There was a significant relationship between the two variables ($r = .739$; $P<0.01$). The results of the linear regression demonstrated that organizational culture significantly contributes to explain the practice of medical waste management in Libyan public hospitals where the power of organizational culture found to be 57.8%. To ensure reliability of the scale, Cronbach coefficient of organizational culture (individualism & collectivism and power distance) was performed with a value of 0.891 and 0.695 respectively. Meaning that the variables are reliable and implying that medical waste management practice in public hospitals in Libya exhibit high level of culture to attain waste management practice.

The current research summarizes that organizational culture has significant influence on MWMP in Libya. This might be due to the strength of relationship in which correlation coefficient between the two variables is (r =739). This is to conclude that when studying the situation in any advanced or less advanced country, it is essential to take into account the cultural beliefs, degree of awareness of health issues as well as the practices and technology in the course of healthcare waste management (WHO, 1992). As entire process is conditioned by organizational culture, because according to De Long and Fahey, (2000) the values and behavioral norms held by organizational members serve as a filter in the sense-making and meaning-construction processes.

6.3.2.3 External Factors (Government Policy and Environmental Factors – Objective 3)

Linear regression and Pearson correlation analysis were carried out to figure out the relationship between organizational external factors and MWMP; and how well organizational external factors could predict the practice of medical waste management in Libyan public hospitals. Overall, external factors explained 64.2 percent of MWMP ($R2=0.642$, $F=57.27$, $p<0.01$). Both dimensions were also significantly predicted

MWMP in public hospitals in Libya as follows: environmental factors (B=0.577, t=9.576, p<0.01) and government policy (B=0.205, t=3.399, p<0.01).

The relationship between organizational external factors (as measured by government policy and environmental factors) was examined using Pearson correlation coefficient. There was a significant relationship between the two variables (r =.633; P<0.01). The results of the linear regression demonstrated that organizational external factors significantly contribute to explain the practice of medical waste management in Libyan hospitals where the power of organizational external factors found to be 64.2%. To ensure reliability of the scale, Cronbach coefficient of organizational external factors (government policy and environmental condition) was performed with a value of 0.796 and 0.782 respectively. Meaning that the variables are reliable. This research is consistent with some previous studies in terms of the strengthening of the relationship between organizational external factors and medical waste management practice. For example, Tudor et al. (2005) indicated to some of the most common barriers that affect MWM are social category (such as perception of all contaminated MW from healthcare facilities, staff habits, public perception) and economic categories (such as lack of viable markets for recyclable. In addition, Wahab and Adesanya (2011) conducted a study on the factors that influence the choice of methods and facilities used in managing medical waste generated in Nigeria. They found that financial capability, technical know-how of the manpower and waste characteristics (waste load, waste reduce time, temperature, pH and pressure); cultural and social basis, logistics, institutional framework and type/size of hospitals are the main factors that mostly influenced the type of facilities and methods they could use to manage medical waste generated in public and private hospitals.

To prevent the environment from reversible damage, it is important to consider the development of a policy in reducing waste production, recycle, and reuse material hospital appliances (McVeigh, 1993).

The current research summarizes that organizational external factors have significant influence on MWMP in Libya. This might be due to the strength of relationship in which correlation coefficient between the two variables is (r =0.633). To conclude this, it is important to consider the influence of the system components on each other to arrive at an optimal plan for hazardous waste management system (Misra and Pandey, 2010).). The purpose of providing regulation is to govern practice and establish rules that will respond to changes in both technological and market conditions (Breyer, 1982). As government can help in the development of new ideas to sustain the countries' innovations through the direct support of Research and Development (R&D).

6.3.2.4 Moderating Effect of Organizational Size (number of skilled employees) on the Relationship between the Internal, External Factors and MWMP – objective 4)

The finding of the relationship between organizational structure and MWMP moderated by organizational size indicated that the moderation effect of number of employees did not occur in the relationship between organizational structure and MWMP. Hence, the hypotheses related to this effect were rejected. The finding of the relationship between organizational culture and MWMP moderated by organizational size indicated that the moderation effect of number of employees did not occur in the relationship between organizational culture and MWMP. Hence, the hypotheses related to this effect were also rejected. On the other hand, the finding of the relationship between external factors and MWMP moderated by organizational size indicated that the moderation effect of number of employees did occur in the relationship between government policies, environmental factors and MWMP. Hence, the hypothesis related to this effect was supported.

This to conclude that, since the targeted hospitals are public which are not profit-oriented and secondly, the number of employees seem to be relatively more stable where there is adequate management which allocates certain people to one specific task (Sharkey, 1989), understanding the organization' or individual's current status and position with regard to the external factors such as (regulation and technological factors) should be adopted by any organization or individual (Taherkhani et al., 2011).

6.4 Contributions to Knowledge

This research has made a number of contributions to theory as well as practice in the field of medical waste management. More details are explained below.

6.4.1 Multiple Dimensions

In some recent and past studies, the focus was on type of healthcare facilities, thereby identifying medical waste management practices from one-dimensional approach, such as organization structure (Tudor et al., 2005), organizational culture (North., 1999), organizational size (Vorapong Manowan., 2009). This one–dimensional concept may have brought about outcomes on the definition of medical waste management and research instruments that do not gather all the dimensions influencing the management of medical waste in the context of best practices. Therefore, this research empirically established the relationship between organizational structure, organizational culture, environmental factors, government policy and medical waste management practice.

The definition of medical waste management practice provided in this research captures the adoption of segregation, collection and disposing of medical waste. Thus, the definition perhaps suits the context of the waste management practices.

Based on the outcome of factor analyses of medical waste management practice, the current research capture segregation, collection and disposing of medical waste as highly correlated. The three dimensions (segregation, collection and disposing of medical waste) were classified as one broad dimension that exhibits medical waste management towards practice.

In addition, the research identifies the current medical waste management practice in Libyan public hospitals and compare with WHO waste management best practices, thus consent the notion that medical waste in Libyan public hospitals is far away in terms of practices comparable with WHO best practice (WHO, 2005, 2011). The research in addition, succeeded in positioning medical waste management in Libyan context as far as the practice is concerned. The method used in identifying the current medical waste management practices in this research could be useful in ranking hospitals in accordance with their level of waste management practices.

Second, the current research focuses on factors influencing medical waste management practices. Previous studies focused on organizational internal factors (Tudor et al., 2005; North., 1999; Manyele and Lyasenga, 2010); organizational external factors (Troshani, 2011), the current research investigates both of the factors (internal and external) that can affect medical waste management practices. Based on the objectives and findings of this research, a new model suggested for medical waste management practices among the Libyan public hospitals. Refer to Figure 6.1.

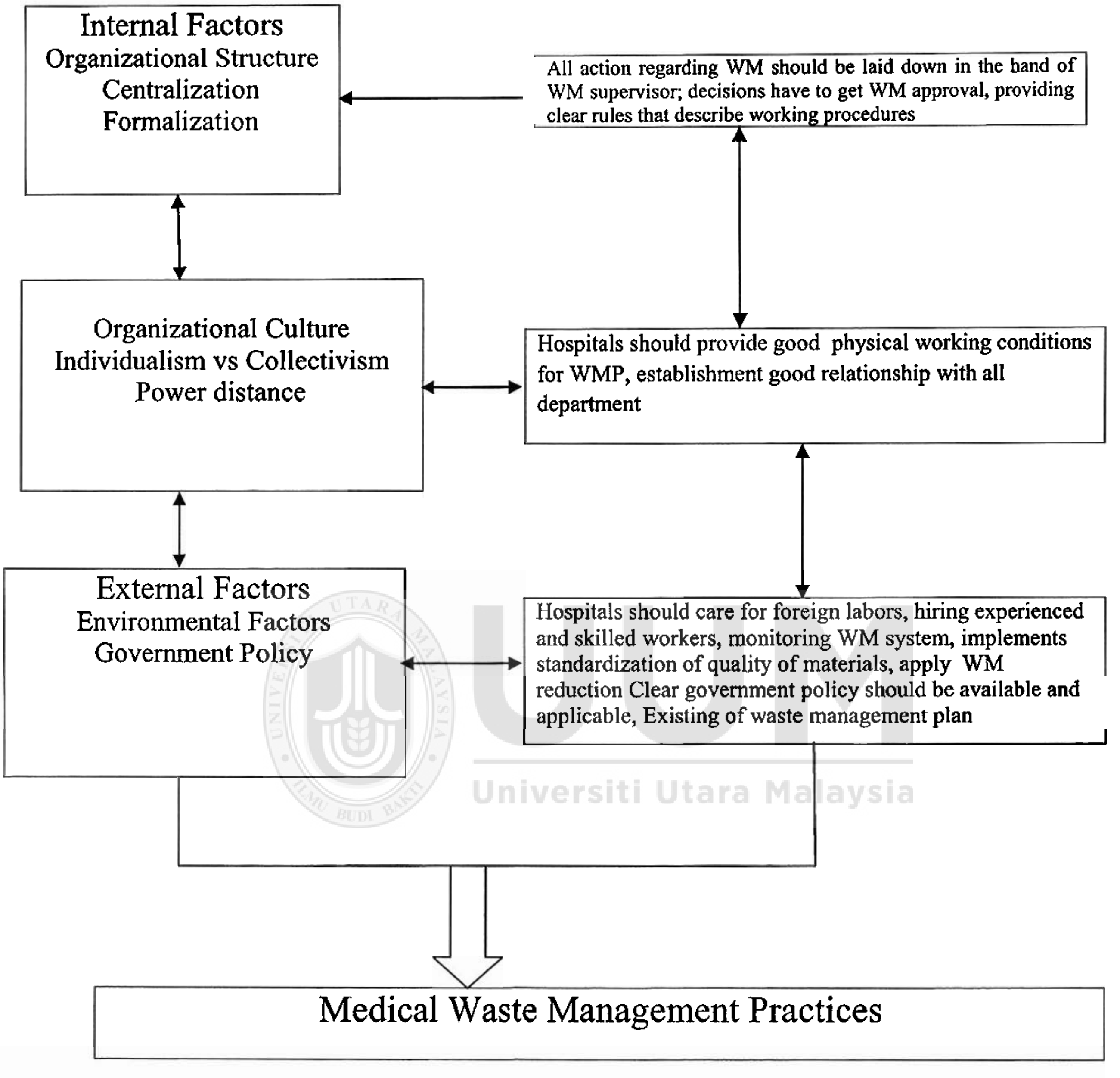


Figure 6.1: The New Model Suggested for Medical Waste Management Practices in Public hospitals in Libya

6.4.2 Organization Control Theory Underpinning Waste Management Practices

Theoretically, this research has been able to provide some theoretical implications by giving additional empirical evidence in the domain of organizational control theory. The theory basically assumes that using control by top management to govern to the attention and motivation of employees within an organization in order to achieve its objectivs (Cardinal, 2001; Eisenhardt, 1985; Govindarajan and Gupta, 1985; Jaeger and Baliga, 1985; Kerra, 1985; Langfield-Smith, 1977; Ouchi, 1977, 1979; Snell, 1992).

However, instead of focusing on control in innovative settings such as research and development process (Cardinal, 2001; Kirsch, 1996; Snell, 1992), the current research extends the theory to examine the influence of organizational internal and external factors on medical waste management practice.

In addition, the research also tested the moderating role of number of skilled employees on the relationship between organizational internal, external factors and medical waste management practice. Following the suggestion of Baron and Kenny (1996), which indicate that "moderator variables are basically introduced when there is an expected or consistent relationship between a predictor and a criterion variable" (p.1178). Therefore, this present research attempted to fill this research gap by introducing number of skilled employees to further enhance our understanding on the influence of organizational structure, organizational culture, government policy, environmental factors and medical waste management practice. In this context, the finding revealed that it is only the relationship between government policy and medical waste management practice was moderated by (number of skilled employees) organizational size which lend to support this theory.

It can be concluded that the propensity toward waste management segregation, collection and disposing played a significant role in explaining their effect in waste management practice execution. However, the research demonstrates all factors have significant impact on medical waste management practice. The results may be have boosted new understanding to the present organizational control theory.

6.4.3 Significant Moderating Role of Number of Skilled Employees

This research also provided some empirical contributions on the significant of organizational size (number of skilled employees) as a moderator variable on the relationship between medical waste management practices and government policy. According to Buesa and Molero (1998); Cohen and Klepper (1996); Scherer (1991), organizational size could be measured through a number of dimensions. These are turnover, number of employees and workforce. This present research focuses on the second dimension (number of employees) as most indicator of organization size is likely to be related to waste management and following Gupta (1980) the number of employees is selected in the current research as a measure of hospital size (number of skilled employees). This decision depended on two reasons. The first is that the targeted hospitals are public which are not profit-oriented and secondly, the number of employees seems to be relatively more stable where there is adequate management which allocates certain people to one specific task (Sharkey, 1989). Base on the finding of this research, there were three main hypotheses formulated, two of them that examine the relationships between internal, external factors and medical waste management practices were supported. However, the hypotheses relates to moderator variable (number of skilled employees) was rejected, and did only occur with that hypnotized in relationship between government policy and medical waste management practice. As can be seen in Figure 6.2 below.

HA 4 (1): The relationship between government policy and medical waste management practices in Libyan public hospitals practices is positively and significantly moderated by organizational size (number of skilled employees).

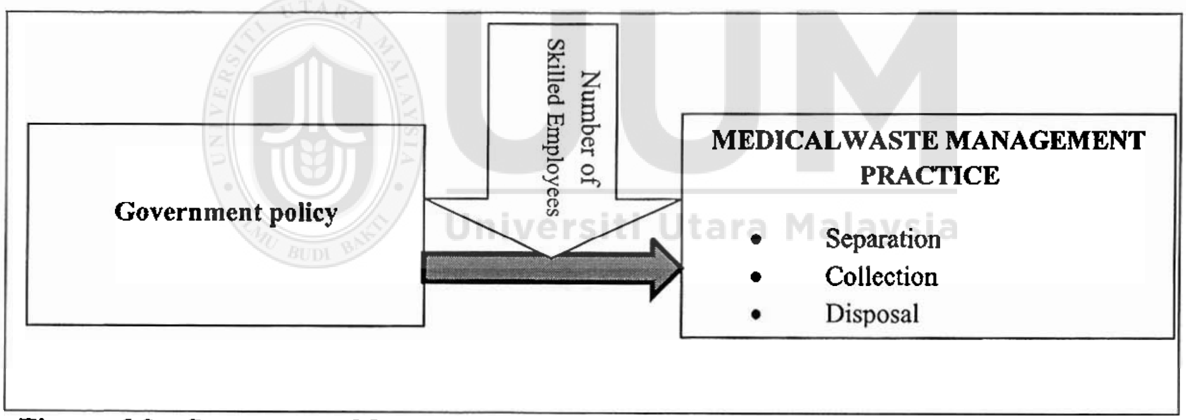


Figure 6.2: Summary of Supported Hypotheses Testing Result

6.5 Limitation of the Study and Suggestion for Future Research

During the process of this research, a number of limitations have come cross to hinder the flow of the study in terms of technical and theoretical limits. Some other limitations are formulated as follows:

Firstly, as recorded in past research, the current research is cross sectional study on account of duration for the collection of data is within six months. As the nature of information required which has been considered sufficient using cross-sectional manner for the collection of the data. The mentioned method did not affect this result unsympathetically, and some previous research had successfully been found by depending on the cross sectional method. Yet, linear method may have been capable to seize waste management handling at variety duration of time.

Secondly, this research counts on method of survey, due to the complications chain of medical waste management field. Even though, it might be useful for future researcher in the meant field to conduct personal interviews, visit sites and observations to the destination of different waste treatment in order to complete the information gathered through the survey method. Our response rate for the current research is deemed high (81.43%) in comparison with other research. In addition, by using a mixed method (quantitative and qualitative) for collection the data might by more efficient to enhance response rate.

Thirdly, although this research examines the moderating effect of number of employees as a moderator variable, the finding indicated that moderation effect of organizational size (number of skilled employees) did only occur in the relationship between government policy and medical waste management practice. Therefore, it is suggested for future studies to add one more internal or external variable so that moderation effect appears in regard.

Fourthly, the framework proposed in this research is not capable to capture all factors influencing medical waste management practice due to depending on only quantitative approach of data collection, so that future research should rely on mixed method (quantitative and qualitative) to capture new variables which may affect medical waste management practices.

6.6 Summary

This research identify the following research gaps based on which five research objectives, research questions and two main hypotheses had been developed:

At first, there has been little attention to study the identification of relationship between organizational internal and external factors and medical waste management practices among the Libyan public hospitals. Also, most of previous work on medical waste management in Libya focused on a one-dimensional approach only. In addition, scholars in the field of medical waste management have revealed less attraction to provide a holistic and clear strong definition of medical waste in the context of healthcare waste institutions. Lastly, previous work and research however, focused on internal, barriers, or method of waste handling; little attention has been given to such a research that focusing on the relationship between internal and external factors and medical waste management practice in Libyan public hospitals.

This research has successfully achieved and filled these research gaps identified as followed. 1) Identifying the current medical waste management practice in Libyan public hospitals and compare with WHO best practice, 2) the research identify medical waste management practice from a multidimensional approach. 3) A definition of medical waste in the context of healthcare waste facilities has been provided by this research. 4) the relationship between internal and external factors and medical waste management practice in Libyan public hospitals has been determined.

This research provided answers to the five research questions mentioned in chapter one. In addition, the fifth research objectives have been met and however, the three hypotheses were tested and were supported as well with an exception to the moderator variable which was only supported by government policy.

As with respect to the first question, this research found that the current medical waste management practice in Libyan public hospitals falls behind WHO best practice.

As with respect to the second and third questions, this research found that organizational structure, organizational culture, environmental condition and government policy have a significant relationship and positive impact on medical waste management practices in Libyan public hospitals.

As with respect to the fourth question, this research found that the moderating effect of the organizational size on the relationship between the internal-external factors and medical waste management practice has only significant relationship and positive impact between government policy and MWMP.

Summarily, this research meets all the relevant originality requirements of a thesis (Hart, 1998, p. 24). The research is an empirical work that has not been conducted before in the field of healthcare waste management. The research also used already known concept as well as practice, but with new interpretation. Additionally, the research has brought new proof to bear on the concept about medical waste management within the Libyan hospital context. Finally, the research looked at fields that previous researcher in medical waste management had not been looked yet.

Bibliography

Abilia, K., Thanib , F., aranak Mokhtarianc, F., Rashidid, M. (2011). The role of effective Factors on Organizational Knowledge Sharing. *Social and Behavioral Sciences,* (29): 1701 – 1706.

Yildirim, N., Birinci, S. (2013). Impacts of organizational culture and leadership on business performance: A case study on acquisitions. *Social and Behavioral Sciences* (75) 71 – 82.

Liao, C., Chuang, S. Lai To., P. (2011). How knowledge management mediates the relationship between environment and organizational structure. *Journal of Business Research.* (64) 728–736.

Gómez, O., Ortiz, J. (2013). Modeling the Organizational Style Structure in Five. *Procedia Technology* (7)384 – 390.

Walter, F., Bruch, H. (2010). Structural impacts on the occurrence and effectiveness of transformational leadership: An empirical study at the organizational level of analysis. *The Leadership Quarterly.* (21) 765–782.

Sadeghi, D. (2011). Alignment of organizational change strategies and its relationship with increasing organizations' performance. *Procedia Social and Behavioral Sciences.* (20) 1099–1107

References

Abdulla, F., Abu Qdais, H., and Rabi, A. (2008). Site investigation on medical waste management practices in northern Jordan. *Journal of Waste Management*, 28(2): 450-458.

Abo, A. B. (2010). A project report on mobile incinerator for medical waste. Bachelor project. Universiti Teknologi Malaysia

Abor, P. A. (2007). Medical waste management at Tygerberg hospital in the Western Cape, South Africa. Master Theses & Dissertations, Cape Peninsula University of Technology CPUT, South Africa, 52. http://dk.cput.ac.za/td_cput/52

Abor, P.S., Bouwer, A. (2008). Medical waste management practices in a Southern African hospital. International Journal of Health Care Quality Assurance, 21(49); 356-364.

Acharya, D. B., & Singh, M. (2000). The Book of Hospital Waste Management, Minerva Press, New Delhi, 15, 47.

Adler, P.S., Borys B, Q. (1996). Two types of bureaucracy: enabling and coercive. Adm Sci ;41(1): 61–89.

Ahmad, S., & Schroeder, R. G. (2003). The impact of human resource management practices on operational performance. Recognizing country and industry differences. *Journal of Operations Management*, 21, 19–43.

Aiken M, Bacharach S, French JL. (1980). Organizational structure, work process, and proposal making in administrative bureaucracies. *Acad Manage J*;23(4):631–52.

Agha S, Karim AM, Balal A, Sosler S. (2007) The impact of a reproductive health franchise on client satisfaction in rural Nepal. Health Policy Plan ;22:320–8.

Akgun, A. E., Keskin, H., Byrne, J. C., & Aren, S. (2007). Emotional and learning capability and their impact on product innovativeness and firm performance. Technovation, 27, 501-513

Alavi M, Leidner D. E. (2001). Review: knowledge management and knowledge management systems: conceptual foundations and research issues.MIS Quart;25(1):107–36.

Al-Khatib, I.A., & Khatib, R. A. (2006). Assessment of medical waste management in Palestinian hospital. *Eastern Mediterranean Health Journal*, 12(3-4), 359-371.

Al-Khatib, I. A. (2007). Medical waste management in healthcare centers in the occupied Palestinian territory. *Eastern Mediterranean Health Journal*, 13(3), 694-705.

Almuneef, M. & Memish, Z. A. (2003). Effective medical waste management: it can be done. *American journal of infection control*, 31, 188-192.

Al-Mutair, N., Terro, M., Al-Khaleefi, A. L. (2004). Effect of recycling hospital ash on the compression properties of concrete: statistical assessment and predicting model. Building Environment, 39; 557-566.

Alvim-Ferraz, M. C. M., & Afonso, S. A. V. (2003). Incineration of different types of medical wastes: emission factors for particulate matter and heavy metals. *Environmental science & technology*, 37, 3152-3157.

Appelbaum, E., Bailey, T., Berg, P., & Kalleberg, A. L. (2000). Manufacturing advantage: Why high-performance work systems pay off. Ithaca, New York: ILR Press.

Argote L, McEvily B, Reagans R. (2003). Managing knowledge in organizations: an integrative framework and review of emerging themes. Manage Sci ;49(4):571–82.

Askarian, M., Vakili, M.., & Kabir, G. (2004). Results of hospital waste survey in private hospitals in Fars province, Iran. *Waste Management*, 24, 347–352.

Badir, Y.F., M.R. Abdul Kadir and A.H. Hashim. (2002). Industrialized building systems construction in Malaysia. *Journal of Architectural DOI* 10.1061/~ASCE!1076-0431~2002!8:1~19!

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17, 99–120.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical consideration. *Journal of personality and social psychology*, 51(6), 1173.

Bass, B.M. and Avolio, B.J., (1993). Transformational Leadership and Organizational Culture. Public Administration Quarterly, 17(1), pp. 112 117.

Bass, B. M., & Riggio, R. E. (2006). Transformational leadership, 2nd edition. Mahaw, NJ: Lawrence Erlbaum.

Batterman, S. (2004). Finding on an Assessment of Small-scale Incinerators for Health

careWaste,WHO.http//www.who.int/water_sanitation_health/medicalwaste/en/smincinerator stoc.pf.

Bdour, A., Altrabsheh, B., Hadadin, N., & AL-Shareif, M. (2007). Assessment of medical wastes management practice: A case study of the northern part of Jordan. *Waste Management*, 27, 746-759.

Becker M, Lazaric N, Nelson R, Winter S. (2005). Applying organizational routines in understanding organizational change. *Ind Corp Change*;14(5):775–91.

Beecham, S., Baddoo, N., Hall, T., Robinson, H., Sharp, H. (2008). Motivation in software engineering: a systematic literature review. *Information and Software Technology* 50 (9–10), 860–878.

Becker, B., & Gerhart, B. (1997). The impact of human resource management on organizational performance. Progress and prospects. *Academy of Management Journal*, 39, 779–801.

Berger, D., Kirchner, G.O., & Labenz, J. (2000). Needle stick injuries and hepatitis risk among healthcare workers. Gastroenterology, 118(4). Abstract no 3904.

Berglund A, Lefevre-Cholay H, Bacci A, Blyumina A, Lindmark G.(2010). Successful implementation of evidence-based routines in Ukrainian maternities. Acta Obstet Gynecol Scand ;89:230–7.

Berman, E. M., West, J. P., & Richter, M. N. (2002). Workplace relations: friendship patterns and consequences (according to managers). Public Administration Review, 62(2), 217e230.

Berry, W. D., & Feldman, S. (1985). Multiple Regression in Practice. Sage University Paper Series on Quantitative Applications in the Social Sciences, series no. 07-050). Newbury Park, CA: Sage.

Bhatt ,G. D (2001). "Knowledge work and organization: an overview and interpretation", organization studies , 16 (6):1021-1046.

Bing, J, W. (2004). 'Hofstede's consequences: The impact of his work on consulting and business practices', *Academy of Management Executive*, vol. 18, no. 1, pp. 80-7.

Blau, P., Scott, R. (1962). Formal Organizations: A Comparative Approach Callender Publishing Companey, San Francisco, CA

Blau, P. M. (1974). On the nature of organizations. New York: Wiley.

Blau, P. M., & Schoenherr, R. A. (1971). The structure of organizations. New York: Basic Books.

Blenkharn, J.I. (2006). Standards of clinical waste management in UK hospitals. *Journal of Hospital Infection*, 62, 300-303.

Boehm, B.W. (1981). Software Engineering Economics. Prentice Hall, Englewood Cliffs, NJ.

Bosland, N. (1984). Some Studies on the Value Survey Module. Thesis, K.H Tilburg.

Bowler, W. M., & Brass, D. J. (2006). Relational correlates of interpersonal citizenship behavior: a social network perspective. *Journal of Applied Psychology*, 91(1), 70e82.

Breyer, S. (1982). Regulation and Its reform. London: Havard University Press

Bruijns SR, Wallis LA, Burch VC. (2008). Effect of introduction of nurse triage on waiting times in a South African emergency department. Emerg Med J;25:395–7.

Buesa, M. and Molero, J. (1998). ``La regularidad innovadora en empresas espanÄ olas", Revista de Economia Aplicada, Vol. 6 No. 17, pp. 111-34.

Bukonda N, Tavrow P, Abdallah H, Hoffner K, Tembo J. (2002). Implementing a national hospital accreditation program: the Zambian experience. Int J Qual Health Care;14(Suppl 1):7–16.

Cameron, K. S., & Quinn, R. E (1999). Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework. New York, NY: Addison-Wesley.

Cardinal, L.B. (2001. Technological innovation in the pharmaceutical industry. Organization Science 12 (1), 19–36.

Chang, P. L., & Chen, W. L. (2002). The effect of human resource management practices on firm performance. Empirical evidence from high-tech firms in Taiwan. *International Journal of Management*, 19(4), 622–631.

Caniato, M Vaccari, M Visvanathan, C, Zurbrugg, C. (2014). Using social network and stakeholder analysis to help evaluate infectious waste management: A step towards a holistic assessment. *Journal of Waste Management*, (34) 938-951

Cardinal, L.B. (2001). Technological innovation in the pharmaceutical industry. Organization Science 12 (1), 19–36.

Chapman, M. (1996). 'Social Anthropology, Business Studies, and Cultural Issues. (cover story)', *International Studies of Management & Organization*, vol. 26, no. 4, pp. 3-29.

Chow, CW. Shields, MD. Chan, YK. (1996). The use of organizational controls and their effects on data manipulation and management myopia: A Japan vs U.S. comparison', *Accounting, Organizations and Society*, vol. 21, no. 2-3, pp. 175-92.

Christensen, C. M., (2006). What is an organization's culture, Boston: Havard Business Press, August 2.

Christie, P, M, J, K. won, I-W, G. Stoeberl, P, A. Baumhart, R. (2003). A Cross-Cultural Comparison of Ethical Attitudes of Business Managers: India Korea and the United States', *Journal of Business Ethics*, vol. 46, no. 3, pp. 263-87.

Chemers, M. M. (1997). An integrative theory of leadership. Mahwah, NJ: Lawrence Erlbaum Associates.

Chung, L. (2006). Implementation strategy for industrialized building system (ibs). In: Faculty of Civil Engineering. Universiti Teknologi Malaysia, Johor Bharu, Malaysia.

Churchill, G. A., Jr. (1979). A Paradigm for Developing Better Measures of Marketing Constructs, *Journal of Marketing Research* , 16 (February), 64–73.

CIDB. (2003). Industrialised building system (ibs) roadmap 2003-2010. Construction Industry Development Board (CIDB), Kuala Lumpur, Malaysia.

CIDB. (2010). Roadmap for industrialised building system (ibs) in malaysia 2011-2015. Construction Industry Development Board (CIDB), Kuala Lumpur, Malaysia.

Cleveland EC, Dahn BT, Lincoln TM, Safer M, Podesta M, Bradley E. (2011). Introducing health facility accreditation in Liberia. Glob Public Health ;6:271–82.

Coakes, S. J. and L. G. Steed (2003). SPSS Analysis without anguish, version 11.0 for windows, John Wiley & Sons Australia

Cohen, J. (1988). Statistical Power Analysis for the behavioral sciences. New York: Academic Press.

Cohen, W.M. and Klepper, S. (1996). ``Firm size and the nature of innovation within industries: the case of process and product R&D", Review of Economics Statistics, Vol. 78 No. 2, pp. 232-43.

Cohen, W., Levinthal D. (1990). Absorptive capacity: a new perspective on learning and innovation. Adm Sci Q;35(1):128–52.

Cohendet P, Creplet F, Diani M, Dupouët O, Schenk E. (2004). Matching communities and hierarchies within the firm. J Manage Gov;8(1):27–48

Collins, F. (1999). Budget Games and Effort: Differences Between the United States and Latin America', *Journal of International Accounting, Auditing & Taxation*, vol. 8, no. 2, p. 241.

Coker, A., Sangodoyin, A., Sridhar, M., Booth, C., Olomolaiye, P., Hammond, F. (2009). Medical waste management in Ibadan, Nigeria: Obstacles and prospects. *Waste management*, 29(2), 804-811.

Cordón-Pozo E, García-Morales VJ, Aragón-Correa JA. (2006). Inter-departmental collaboration and new product development success: a study on the collaboration between marketing and R&D in Spanish high-technology firms. *Int J Technol Manag* ;35(1/2/3/4): 52–79.

Crank, J. P. (1990). The influence of environmental and organizational factors on policy style in urban and rural environment. *Journal of Research in Crime and Delinquency*, 27, 166-189.

Dahl, S. (2004). 'Intercultural Research: The Current State of Knowledge', SSRN.

Davies, H. T. O., Mannion, R., Jacobs, R., Powell, A. E., & Marshall, M. N. (2007). Exploring the relationship between senior management team culture and hospital performance. *Medical Care Research and Review*, 64, 46-65.

Davis, J.A.(1971).Elementary Survey Analysis. Parentice Hall

DDS Research, Inc. (2004). Sampling error in survey research. Researcher's Resource Center. White Papers Library.

Deal TA, Kennedy A., A. (1982). Corporate culture. Reading, MA: Addison-Wesley.

Deen JL, Funk M, Guevara VC, Saloojee H, Doe JY, Palmer A, et al. (2003). Implementation of WHO guidelines on management of severe malnutrition in hospitals in Africa. Bull World Health Organ ;81:237–43.

Delaney, J. T., & Huselid, M. A. (1996). The impact of human resource management practices on perceptions of organizational performance. *Academy of Management Journal*, 39(4), 949–969.

De Long D., W, Fahey L. (2000). Diagnosing cultural barriers to knowledge management. Acad Manage Exec;14(4):113–27.

Devellis, R. F. (2003). Scale Development: Theory and Applications. Second Edition. Thousand Oaks: Sage Publications

Diaz, L., Savage, G. and Eggerth, L. (2005). Alternatives for the treatment and disposal of healthcare wastes in developing countries. *Waste Management*, 25, 626-637. doi:10.1016/j.wasman.2005.01.005

Dillman, D. A. (2000). Mail and internet surveys: The tailored design method. New York: John Wiley & Sons, Inc.

Duan, H., Huag, Q., Wang, Q., Zhou, B. and Li, J. (2008). Hazardous waste generation and management in China: A review. *Journal of Hazardous Materials*, 158, 221-227.

Duygulu, E., & Ozeren, E (2009). The effect of leadership style and organizational culture on firm's innovativeness. *Afircan Journal of Business Manegemnet*, 3(9), 475-485.

Dwivedula, R., Bredillet, C.N.(2010). Profiling work motivation of project workers. *International Journal of Project Management* 28, 158–165.

Eichler R, Levine R, editors. (2009). Performance incentives for global health: potential and pitfalls. Washington, DC: Center for Global Development.

Eisenhardt, K. (1985). Control: organizational and economic approaches. *Management Science* 31 (2), 134–149.

Edgar, H Schein., (1988). Organizational Culture: Sloan School of Management, *Massachusetts Institute of Technology*, Vol. 45, No. 2, 109—119.

Ellis, R. A., Endo, C. H., & Armer, J. M. (1970). The use of potential nonrespondents for studying nonresponse bias. Pacific Sociological Review, 13(2), 103-109.

Esa, H. and M.M. Nurudin. (1998). Policy on industrialised building systems.

Elbakosh, M.M., Frank, E., Elzoka,., Hussein, A.H. (2009). Hepatitis B Virus and hepatitis C virus in medical waste handlers in Tripoli, Libya. *Journal of Hospital Infection*, 72, 258-261.

Feldman, M, Pentland B. (2003). Reconceptualizing organizational routines as a source of flexibility and change. Adm Sci Q ;48(1):94-118

Fey CF, Denison DR. (1986). Organizational culture and effectiveness: Can American theory be applied in Asia? Organ Sci ;14(6):686–706.

Fields, D., Chan, A., & Akhtar, S. (2000). Organizational context and human resource management strategy: A structural equation analysis of Hong Kong firms. *International Journal of Human Resource Management*, 11(2), 264–277

Fook, C.K. (2007). Clinical waste management and disposal. A case study: Hospital Tengku Ampuan Rahimah, Klang, Selangor. Bachpler project. Universiti Teknologi Malaysia

Fobil, J, N., Armah, N, A., Hogarh, N, J., & Carb. D. (2008). The influence of institutions and organizations on urban waste collection systems: An analysis of waste collection system in Accra, Ghana (1985–2000). *Journal of Environmental Management* 86, 262–271

Fredrickson, JW. (1986). The strategic decision process and organizational structure. Acad Manage Rev;11(2):280–97.

Fry, L. W. and Slocum J. W. (1984). Technology, Structure, and workgroup effectiveness. A test of contingency model. *Academic Management Journal.*, 27, 221-246.

Garcia, R., BS., MT (ASCP). CIC. (1999). Effective cost-reduction strategies in the management of regulated medical waste. *American journal of infectious control.*

Ghani, KA, Jayabalan V, Sugumar M. (2002). Impact of advanced manufacturing technology on organizational structure. *J Tech Manage Res* ;13:157–75.

Gordon, GG, Di Tomaso N. (1992). Predicting corporate performance from organizational culture. *J Manag Stud* ;29:783–98.

Gooijer ,de. Jinette. (2000)," Designing a knowledge management performance framework", *Journal of knowledge management*, vol 4, pp 303-310.

Govindarajan, V., Gupta, A.K. (1985). Linking control systems to business unit strategy: impact on performance. Accounting, Organization and Society 10, 51–56.

Graham, J. R., Harvey, C. R., & Rajgopal, S. (2005). The Economic implications of Corporate Financial Reporting. *Journal of Accounting and Economics*, 40 (1–3), 3–73.

Grant, R. M. (2002). Contemporary Strategy Analysis: Concepts, Technique, Applications (4 ed.). Cambridge, MA: Blackwell.

Green, S. B., & Salkind, N. J. (2005). Using SPSS for Windows and Macintosh, 4th Edition. Upper Saddle New Jersey: Prentice Hall.

Gumodoka, B, J. Vos', Z. A. Berege', H. A. van AstenZr, W. M. Dolmans and M. W. Borgdorff. (1996). Injection practices in Mwanza Region, Tanzania:

prescriptions, patient demand and sterility . *Tropical Medicine a n d International Health*, VOI .UMF T N O . 6 P P 874-880

Guest, D. E. (1997). Human resource management and performance. A review and research agenda. *International Journal of Human Resource Management*, 8(3), 263–276.

Guide, A. D. M. (2005). Management of Solid Health-Care Waste at Primary Health-Care Centres.

Guiscafré, H, Martínez H, Palafox M, Villa S, Espinosa P, Bojalil R, et al. (2001). The impact of a clinical training unit on integrated child health care in Mexico. Bull World Health Organ ;79:434–41.

Gupta, S., Boojh, R., Mishra, A., & Chandra, H. (2009). Rules and management of biomedical waste at Vivekananda polyclinic: A case study, *Waste Management*, 29, 812-819.

Gupta, A, Govindarajan V. (2000). Knowledge flows within multinational corporations. Strateg Manage J ;21(4):473–96.

Gupta, N. (1980). "Some Alternative Definitions of Size", *Academy of Management Journal*,Vol. 23 No. 4, pp. 759-66.

Hage, J and Aiken, M. (1967). Program change and organizational properties. *American journal of sociology*. 72, 503-518.

Hair, J. F., Tatham, R. L., Anderson, R. E., & Black, W. C. (2006). Multivariate data analysis (6th ed.). New York: Prentice Hall

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate Data Analysis: A Global Perspective (Seventh Edition ed.). Upper Saddle River, New Jersey: Person Education Inc.

Halbwachs, H. (1994). Solid waste disposal in district facilities. World Health Forum 15: 363-367.

Hall, T., Baddoo, N., Beecham, S., Robinson, H., Sharp, H. (2009). A systematic review of theory use in studies investigating the motivations of software engineers.ACM Transactions on Software Engineering andMethodology 18 (3), 48–77.

Hall, R. H. (1999). Organizations structures, processes, and outcomes. Upper Saddle River, NJ: Prentice-Hall.

Hall, R. H. (1977). Organizations; structure and process, Englewood Cliffs, Prentice-Hall, Englewood Cliffs, NJ,

Hamzah, N.H., M.N.A. Nafi, J. Yacob, A.H. Ashari, Z. Daud and A.S. Bin Sulain. (2010). A study on the acceptance of ibs in construction industry in kelantan: Application of logistic regression analysis. pp: 297-306.

Harrison, G. L. (1990). Reliance on Accounting Performance Measure in Superior Evaluative Style- The Influence of National Culture. Unpublished PhD. Dissertation: Macquarie University.

Harel, G. H., & Tzafrir, S. D. (1999). The effect of human resource management practices on the perceptions of organizational and market performance of the firm. *Human Resource Management*, 38(3), 185–200.

Harman, A. J. (1980). Industrial Innovation and Government Policy: A review and proposal Based on Observation of the U.S. Electronic Sector. *Technological Forecasting and Social Change*, 18, 15 37.

Haron, N., S. Hassim, M. Kadir and M. Jaafar. (2005). Building costing comparison between conventional and formwork system. *Journal of Technology*, UTM, Johor, Malaysia., 43(B).

Harris, R. J. (1998). The Nature Assumption. New York, NY: Free Press.

Harris, S. Chris, C. (2008). 'National Cultural Values and The Purpose of Businesses', *International Business Review*, vol. 17, no. 1, pp. 103-17.

Hart, C. (1998). Doing a Literature review: Releasing the Social Science Reaserch Imagination. London: SAGE Publications

Henry, G., & Heinke, G. (1996). Environmental science and engineering. Prentice-Hall, Englewood, NJ, USA.

Herzberg, F., Mausner, B., Snyderman, B.B. (1959). The Motivation to Work. John Wiley, New York.

Heimovics, R., Brown, F.G. (1976). Municipal employee behavior as an exchange process. Midwest Review of Public Administration 10 (4), 201–215.

Herzberg, F., Mausner, B., Snyderman, B.B. (1959). The Motivation to Work. John Wiley, New York.

Hofstede, G. (1980a). Culture's consequences. Beverly Hills, CA: Sage.

Hofstede, G. (1980b). Culture's Consequences: International Differences in Work Related Values. Sage Publication, Inc., Beverly Hills, California.

Hofstede, G. (1983). Dimensions of National Cultures in Fifty countries and Three Regions. In J. B. Deregowsky, S. Dziurawieck & R. C. Annis (Eds.), Expiscations in Cross Culture Psychology. Swets & Zeitlinger.

Hofstede, G. (1984). The Cultural Relativity of The Quality of Life Concept. *Academy of Management Review*, 9(3), 389-398.

Hofstede, G.(1991). Management in Multicultural Society. *Malaysian Management Review*, 26(1), 3-12.

Huang, T. C. (2000). Are the human resource practices of effective firms distinctly different from those of poorly performing ones? *International Journal of Human Resource Management*, 11(2), 436–451.

Hurley, R., & Houang, E.T.S. (1997). "Anonymous questionnaire survey on the knowledge and practices of hospital staff in infection control." *Journal of Hospital Infection*, 35, 301-306.

Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation and organizational learning: an integration and empirical examination. *Journal of Marketing*, 62(3), 42-54.

Huselid, M. A. (1995). The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal*, 38(3), 635–672.

Hutcheson, G. D., and Sofroniou, N. (1999). The Multivariate Social Scientist: an introduction to generalized linear models. Sage Publications.

ICRC (2011). Medical waste management. International Committee of the Red Cross.

Ismail, E. (2001). Industrialised building system for housing in Malaysia.

Jackson, T. (1995). Cross-cultural management, Management readers, Butterworth Heinemann, Oxford England ; Boston

Jaeger, A.M., Baliga, B.R.(1985). Control systems and strategic adaptation: lessons from the Japanese experience. *Strategic Management Journal* 6, 115

Jahan, S. (2005). Epidemiology of needle sticks injuries among health care workers in a secondary care hospital in Saudi Arabia. Annals of Saudi Medicine, 25(3), 233-238.

Jaworski, B. J., & Kholi, A. K. (1993). Market Orientation: Antecedents and Cosequences. Journal of marketing, 57, 53-70.

Jaworski, B.J. (1988). Toward a theory of marketing control: environmental context, control types and consequences. *Journal of Marketing* 52, 23–39

Johannessen, 1. M., Dijkman, M., Bartone, C., Hanraban, D., Boyer, G., & Chandra, C (2000). Healthcare Waste Management Guidance Note, Health Nutrition and Population Discussion Paper. Junid, S.M.S. (1986). Industrialised building systems.

Kamar, K., M. Alshawi and Z. Hamid. (2009). Barriers to indusrialized building system (ibs): The case of malaysia In: BuHu 9th International Postgraduate Research Conference (IPGRC). Salford, United Kingdom.

Kane, A., Lloyd, J., Zaffran, M., Simonsen, L., & Kane, M. (1999). Transmission of Hepatitis B, Hepatitis C and Human Immuno-deficiency Viruses through Unsafe Injections in the Developing World: Model-based Regional Estimates, Bulletin of the World Health Organisation, 77(10), 801-807.

Katsikea, E., Theodosiou, M., Perdikis, N., & Kehagias, J. (2011). The effect of organizational structure and job characteristics on export sales managers' job satisfaction and organizational commitment. *Journal of World Business*, 46, 221-233.

Kern, A. (2006). Exploring the relation between creativity and rules: the case of the performing arts. *Int Stud Manage Org*;36(1):63–80.

Kerr, J.L. (1985). Diversification strategies and managerial rewards: an empirical investigation. *Academy of Management Journal* 28, 155–179.

Khalaf, A. (2009). Assessment of medical waste management in Jenin district hospitals. Master dissertation, An-Najah National University.

Kimberly, J. R. (1976). Organizational size and the structuralist perspective: a review, critique, and proposal. *Administrative Science Quarterly*, 21, 571–597.

Kipp, W, Kamugisha J, Jacobs P, Burnham G, Rubaale T. (2001). User fees, health staff incentives, and service utilization in Kabarole District, Uganda. Bull World Health Organ ;79:1032–7.

Koene, B. A. S., Vogelaar, A. L. W., & Soeters, J. L. (2002). Leadership effects on organizational climate and financial performance: Local leadership effect in chain stores. *Leadership Quarterly*, 13, 193–215.

Kogut B, Zander U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. Organ Sci ;3(3):83–97.

Kotagal, M, Lee P, Habiyakare C, Dusabe R, Kanama P, Epino HM, et al. (2009). Improving quality in resource poor settings: observational study from rural Rwanda. BMJ ;339:b3488.

Labor Relations Institute. (1946). Do you know your workers' wants? Foremen Facts IX (21), 1–3.

Langfield-Smith, K., (1997). Management control systems and strategy: a critical review. *Accounting, Organization and Society* 22, 207–232.

Lebas, M., Weigenstein, I. (1986). Management control: the roles of rules, markets and culture. *Journal of Management Studies* 23, 259–272.

Lee CC, Grover V. (2000). Exploring mediation between environmental and structural attributes: the penetration of communication technologies in manufacturing organizations. *J Manage Inform Syst* ;16(3):187–217.

Lee H, Choi B. (2003). Knowledge management enablers, processes, and organizational performance: an integrative view and empirical examination. *J Manag Inf Syst* ;20(1):179–228.

Lee, M. J. Ellenbecker and R. Moure-Eraso (2004). "Alter- natives for Treatment and Disposal Cost Reduction of Regulated Medical Waste," *Waste Management*, Vol. 24, No. 2, pp. 143-151. doi:10.1016/j.wasman.2003.10.008

Lee, K.B., Ellenbecker, M.J., & Eraso, R.M. (2002). Analyses of the recycling potential of medical plastic wastes. *Waste management*, 22, 461–470.

Lessing, J. (2006). Industrialized house-building - concept and processes. Department of Construction Sciences: Lund Institute of Technology, Sweden.

Linder, R. L., Murphy, T. H., & Briers, G. E. (2001). The handling nonresponse in agricultural education. Papers presented at the 28th Annual National Agricultural Education Research Conference (pp. 233 – 245).

Luttrell, W.E., Bisesi, M.S., Bisesi, C.A. (2003). Hazardous waste management. (In. The Occupational environment: its evaluation, control and management. (2nd Ed.) AIHA Publications, Fairfax, VA.

Marincovic, T. Pavic, K. Vitale, N. J. Holcer and A. Dzakula. (2008). Magement of Hazardous Medical Waste in Coatia," *Waste Management*, pp. 1049-1056. doi:10.1016/j.wasman.2007.01.021

Mbarki, A., Kabbachi,B., Ezaidi,A., Benssaou,A. (2013). Medical Waste Management: A Case Study of the Souss-Massa-Drâa Region, Morocco, *Journal of Environmental Protection*, 914-919

Marsono, A., M. Tap, N. Ching and A. Mokhtar (2006). Simulation of industrialized building system (ibs) components production. In: Proceedings of the 6th Asia-Pacific Structural Engineering and Construction Conference (APSEC 2006) Kuala Lumpur Malaysia.

Matheson, C. (2007). In praise of bureaucracy? A dissent from Australia. Administration & Society, 39(2), 233e261.

Matin, K. (2006). University of California, Irvine Medical Waste Management Plan.pp.1-5 www.ehs.uci.edu/programs/biosafety/medwastemgmtprog.pdf, Accessed, April,15.2008.

Mato, R.R.A.M., & Kaseva, M.E. (1999). Critical review of industrial and medical waste practices in Dar es Salaam City. Resources, Conservation and Recycling 25, 271–287.

Meirovich G, Brender-Ilan Y, Meirovich A. (2007). Quality of hospital service: the impact of formalization and decentralization. *Int J Health Care Qual Assur* ;20(3): 240–52.

Merchant, K.A. (1985). Control in Business Organizations. Pitman, Boston, MA.

Mintzberg, H. (1979). The Structuring of Organizations. Prentice Hall, Englewood Cliffs, NJ.

Mintzberg H. (1979). The structuring of organizations: a synthesis of the research. New Jersey: Prentice-Hall.

Mintzberg, H. (1983). Structure in Fives: Designing Effective Organizations. Prentice-Hall, Englewood Cliffs, NJ.

Misra, V., and Pandey, S.D. (2005). Hazardous waste, impact on health and environment for development of better waste management strategies in future in India. *Environment International* 31 417– 431.

Mochungong, B.L.K. (2011). Environmental exposure and public health impacts of poor clinical waste treatment and disposal in Cameroon. Ph.D dissertation, Faculty of Health Sciences University of Southern, Denmark.

Mohee, R. (2005). Medical wastes characterization in healthcare institutions in Mauritius. *Journal of Waste Management* 25, 575-581.

Manyele and Lyasenga. (2010). Factors affecting medical waste management in low-level health facilities in Tanzania. *African Journal of Environmental Science and Technology* Vol. 4(5), pp. 304-318,

McVeigh P.(1993). Nursing and environmental ethics. Medical waste reduction, reuse and recycling. Today's OR Nurse, 15:13-18

Moritz, J.M. (1995). Current legislation governing clinical waste disposal. *Journal of Hospital Infection*, 30 (supplement), 521-530.

Morris, M. H., Avila, R. A. & Allen, J. (1993). Individualism and Modern Corporation: Implication for Innovation and Enterpreneurship. *Journal of Management*, 9(3), 595-612.

Muhlich, M., M. Scherrer, and F.D. Daschner. (2003). "Comparison of Infectious Waste Management in European hospitals." *Journal of Hospital Infection* 55, 260- 268.

Naoum, S. (1998). Dissertation Research and Writing for Construction Students, 2nd Edition. Amsterdam: Elsevier-Butterworth-Heinemann.

Naoum, S. (2007). Dissertation Research and Writing for Construction Students, 2nd Edition. BUrlington, MA: Elsevier Butterworth-Heinemann.

Nel, P.S., Gerber, P.D., Van Dyk, P.S., Haasbroek, G.D., Schultz, H.B., Sono, T., Werner, A., (2001). Human Resources Management5th ed. Oxford University Press, Cape Town, South Africa.

Nemathaga, F., Sally, M., & Luke, C. (2008). Hospital solid waste management practices in Limpopo Province. *Waste Management* 28, 1236–1245.

Nicholson, N. (2003). How to motivate your problem people. Harvard Business Review 81, 56-67

Ngo A, Alden D, Hang N, Dinh N. (2009). Developing and launching the government social franchise model of reproductive health care service delivery in Vietnam. Soc Mar Q ;15:71–89.

Nicholson, N. (2003). How to motivate your problem people. Harvard Business Review 81, 56 67.

Nonaka, I, Takeuchi H. (1995). The knowledge-creating company. New York: Oxford University Press.

Nonaka, I, Toyama R, Konno N. (2000). SECI, Ba and leadership: a unified model of dynamic knowledge creation. Long Range Plann ;33(1):5-34.

Nonaka, I. A (1994). dynamic theory of organizational knowledge creation. Organ Sci ;5(1): 14–37.

Nonaka I. (1988). Toward middle-up-down management: accelerating information creation. MIT Sloan Manag Rev;29(3):9-18.

North, C.D. (1999). Institutions, institutional change and economic performance. In: Alt, J., North, D. (Eds.), The Political Economy of Institutions and Decisions. Cambridge University Press, Cambridge.

Nunnally, J. C. (1978). Psychometric Theory. McGraw-Hill.

Nzoupe Ngounou, S.A. and Viktor Popov. (2004). Hospital waste management in Britain: Good practices to be implemented in Cameroonian hospitals. In Proceedings of the International Conference on Waste Management and the Environment No2. Southampton, United Kingdom: WIT Press.

Oliveira, T., & Martins, M. F. (2010). Understanding e-business adoption across industries in European countries. *Industrial Management & Data Systems*, 110(9), 1337-1354.

Oroeia, M, Momeni, M, Charles J. Palenik, , Danaei, M, Askarian, M. (2014). A qualitative study of the causes of improper segregation of infectious waste at NemazeeHospital, Shiraz, Iran. *Journal of infection and Public Health.* 7, 192-198

Quintas, P, Lefrere P, Jones G. (1997). Knowledge management: a strategic agenda. Long Range Plann ;30(3):385–91.

Ouchi, WG, Jaeger AM. (1978). Type Z organization: stability in the midst of mobility. Acad Manag Rev ;3(2):305–14.

Ouchi, W.G. (1977). The relationship between organizational structure and organizational control. *Administrative Science Quarterly* 22 (1), 95–113.

Ouchi, W.G., 1979. A conceptual framework for the design of organizational control mechanisms. *Management Science* 25 (9), 833–848.

Ouchi, W.G. (1980). Markets, bureaucracies, and clans. Administrative Science Quarterly 25, 129–141.

Oweis, R., Mohamad, A. and Ohood, A. (2005). Medical waste management in Jordan: A Study at the King Hussien Medical Centre, *Waste Management*, 25, 622-625.

Pallant, J. (2005). SPSS Survival Manual: A Step by Step Guide to Data Analysis Using SPSS. Australia: Allen & Unwin

Pallant, J. (2010). SPSS Survival Manual: A step by step guide to data analysis using SPSS version 12. Maidenhead, Berkshire: Open University Press

Pallas, W., Curry, L., Bashyal, Ch., Berman, P., & Bradley., H. (2012). Improving health service delivery organizational performance in health system: A taxonomy of strategy areas and conceptual framework for strategy selection. *International Health*, 20-29.

Patil, Gayathri V. and K. Pokhrel. (2005). Biomedical solid waste management in Indian hospital: A case study. *Journal of Waste Management*, 25: 592-599.

Paul, A. K., & Anantharaman, R. N. (2003). Impact of people management practices on organizational performance. Analysis of a casual model. *International Journal of Human Resource Management*, 14(7), 1246–1266.

Penrose, E. (1959). The theory of the growth of the firm. New York: Wiley.

Peng, C.S. (1986). The scenario of industrialised building systems in malaysia. In: Proceedings of a UNESCO/FEISEAP Regional Workshop. Malaysia, UPM, Serdang.

Peterson, T.M. (2007). Motivation: how to increase project team performance. *Project Management Journal* 38 (4), 60–69.

Peters T, Waterman R. (1982). In search of excellence. New York: Harper and Row.

Pertusa-Ortega, E. M., Zaragoza-Sáez, P., & Claver-Cortés, E. (2010). Can formalization, complexity, and centralization influence knowledge performance. *Journal of Business Research*, 63(3), 310e320.

Peterson, T.M. (2007). Motivation: how to increase project team performance. *Project Management Journal* 38 (4), 60–69.

Pinder, C.C. (1998). Work Motivation and Organizational Behavior. Prentice Hall, Upper Saddle River, NJ.

Porter, S. R. (2004b). Raising response rates: What works? In S. R. Porter (Ed.), Overcoming survey research problems, New directions for institutional research (Vol. 121). San Francisco: Jossey-Bass.

Pratt, J. (1986). Performance Evaluation in Public Accounting: A Work Value Perspective. Working Paper, School of Business, University of Washington.

Procaccino, J.D., Verner, J.M. (2006). Software Project Managers and project Success: an exploratory study. *The Journal of Systems and Software* 79 (2), 1541–1551.

Prokesch SE. (1997). Unleashing the Power of Learning: an interview with British petroleum's John Browne. Harvard Bus Rev ;75(5):146–68.

Pruess-Ustun, A., Rapiti, E., Hutin, Y. (2005). Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *American Journal of Industrial Medicine*, 48; 482-490.

Pruess, A. Giroult, E. and Rushbrook, P. (1999). Safe management of wastes from healthcare activities, Handbook, World Health Organisation, Geneva.

Pun, K. F. (2004). A conceptual synergy model of strategy formulation for manufacturing. *International Journal of Operations & Production Management*, 24(9), 903-928.

Radebaugh, L. Gray, SJ. Arpan, JS. (1997), International accounting and multinational enterprises, 4th edn, Wiley, New York

Rao, S.K.M., Ranyal, R.K., and Sharm, V.R. (2004). Biomedical Waste Management: An Infrastructural Survey of Hospitals, MJAFI, 60, 379-382.

Rastogi, PN. (2000). Knowledge management and intellectual capital — the new virtuous reality of competitiveness. Hum Syst Manage ;19(1):39–49.

Raudeliuniene, J, Kavaliauskiene, I. (2014). Analysis of factors motivating human resources in public sector. Procedia –Social and Behavioral Science. 110, 719-726.

Reynaud, B. (2005). The void at the heart of rules: routines in the context of rule-following. The case of the Paris Metro Workshop. Ind Corp Change;14(5):847–71.

Robbins, SP. (1990). Organization theory: structure, design, and applications. (3rd ed.). New Jersey: Prentice Hall.

Robbins, S, P. Judge, T, A Millet, B. Waters-Marsh, T. (2008). Organisational behaviour, 5th edn, Pearson Education Australia, Frenchs Forest.

Rodrigues, C. (1996). International management : a cultural approach, West Pub. Co. Minneapolis/St. Paul.

Rodriguez, J. M., & Ventura, J. (2003). Human resource management systems and organizational performance. An analysis of the Spanish manufacturing industry. *International Journal of Human Resource Management*, 14(7), 1206–1226.

Roth, N.L., Sitkin, S.B., House, A. (1994). In: Sitkin, S.B., Bies, R.J. (Eds.), Stigma as determinant of legalization. The Legalistic Organization. Sage Publications, Thousand Oaks, CA.

Rowe, AK, de Savigny D, Lanata CF, Victora CG. (2005). How can we achieve and maintain high-quality performance of health workers in lowresource settings? Lancet;366:1026–35.

Rowe, A. K. (2009). Potential of integrated continuous surveys and quality management to support monitoring, evaluation, and the scale-up of health interventions in developing countries. *Am J Trop Med Hyg*;80:971–9.

Rowley, J. (2001). Knowledge management in pursuit of learning: the learning with knowledge cycle. *J Inf Sci* ;27(4):227–37.

Ruel, H., Bondarouk, T., and Looise, J. K. (2004). E-HRM: Innovation or irritation: An explorative empirical study in five large companies on web webbased HRM. *Management Revue*, 15(3), 364-380.

Ruoyan, G., Lingzhong, Xu., **Huijuan, Li.**, Zhou Chengchao, Z., Jiangjiang, H., Shirayama, Y., Yoshihisa, S., Wei, T., Chushi, K. (2010). Investigation of health care waste management in Binzhou District, China. *Journal Waste Management* 30 246–250.

Sagoe-Moses, C., Pearson, R.D., Perry, J., Jagger, J. (2001). Risks to health care workers in developing countries. N Engl J Med, 345(7); 538 – 540.

Salhofer and Isaac. (2002). Importance of public relations in recycling strategies. Principles and case studies, *Environmental Management*.

Sansone, C., Harackiewicz, J. (2000). Intrinsic and Extrinsic Motivation—the Search for optimal Motivation and Performance. Academic Press, San Diego, CA.

Sanitation Connection, (2002). Healthcare Waste Management, http://www.sanicon.net/titles/topicintro.php3?topic1d=43. accessed, 12 June, 2006.

Sati, B (2004). Medical waste management in Benghazi hospitals. Msc, Unpublished dissertation.

Sawalem, M., SELIC, E. and Herbell, J. D. (2009). Hospital waste management in Libya: A case study. *Waste Management*, 29, 1370-1375.

Schein, E, H. (1985). Organizational culture and leadership: a dynamic view. San Francisco, CA: Jossey-Bass; 1985.

Schminke, M., Cropanzano, R., & Rupp, D. E. (2002). Organizational structure and fairness perceptions: the moderating effect of organizational level. Organizational Behavior and Human Decision Processes, 89(1), 881e895.

Sehanovic, J., & Zugaj, M (1997). Information technologies and organizational structure. *Library Management*, 18(2), 80–87.

Sekaran, U. & Bougie, R. (2010). Research Methods for. Business: A Skill Building Approach. UK: John Wiley & Sons.

Sekaran, U. (2006). Research Method for Busines, A skill Building Approach (4 ed.). New delhi, India: John Willey & Sons.

Sekaran, U., & Bougie, R. (2013). Research Method of Business-A Skill-Building Approach: John Wiley & Sons.

Shaari, S. and E. Ismail. (2003). Promoting the usage of industrialized building system (ibs) and modular coordination (mc) in malaysia. . In: Construction industry in engineers (board of engineer malaysia).

Sias, P. M., & Cahill, D. J. (1998). From coworkers to friends: the development of peer friendships in the workplace. *Western Journal of Communication*, 62(3),273e299.

Sila, I. (2007). "Examining the effects of contextual factors on TQM and performance through the lens of organizational theories: an empirical study", *Journal of Operations Management*, Vol. 25 No. 1, pp. 83-109

Silva, A. E. Hoppe, M. M. Ravanello and N. Mello, "Medical Wastes Management in the South of Brazil," *Waste Management*, Vol. 25, No. 6, 2005, pp. 600-605. doi:10.1016/j.wasman.2004.03.002

Sivakumar, K. Nakata, C. (2001). 'The Stampede Toward Hofstede's Framework: Avoiding the Sample Design Pit in Cross-Cultural Research', *Journal of International Business Studies*, vol. 32, no. 3, p. 555.

Simard, E.P., Miller, J.T., George, P.A., Wasley, A., Alter, M.J., Bell, B.P., Finelli, L. (2007). Hepatitis B vaccination coverage levels among healthcare workers in the United States, 2002-2003. Infect Control Hosp Epidemiol, 28(7):783-90.

Scupola, A. (2003). The adoption of internet commerce by SMEs in the south of Italy: an environmental perspective. *Journal of Global information technology Management*, 6(1), 52-71.

Sharkey, T.W., Lim, J.S. and Kim, K.I. (1989). "Export Development and Perceived Export Barriers: An Empirical Analysis of Small Firms", *Management International Review*, Vol. 29 No. 2, pp. 33-40.

Sharp, H., Baddoo, N., Beecham, S., Hall, T., Robinson, H. (2009). Models of motivation in software engineering. Information and Software Technology 51 (1), 219–233.

Shiao, J., Guo, L., McLaws, M.-L. (2002). Estimation of the risk of blood borne pathogens to health care workers after a needle stick injury in Taiwan. Association for Professionals in Infection Control and Epidemiology, Inc., 30(1); 15-30.

Shinee, E. Gombojav, A. Nishimura, N. Hamajima and K. Ito. (2008). "Healthcare Waste Management in the Capital City of Mongolia," *Waste Management*, Vol. 28, No. 2, pp. 435-441. doi:10.1016/j.wasman.2006.12.022

Skivington, J. E, Daft R. L. (1991). A study of organizational framework and process modalities for the implementation of business-level strategic decisions. *J Manag Stud* ;28 (1):45–68.

Smyth A, Ridwan R, Cairns J. (1998). Impact of a case management protocol for childhood pneumonia in a rural Zambian hospital. Ann Trop Paediatr ;18:155–60.

Snell, S.A. (1992). Control theory in strategichumanresource management: the mediating effect of administrative information. *Academy of Management Journal* 35, 1–36.

Soares, AM. Farhangmehr, M. Shoham, A. (2007). 'Hofstede's dimensions of culture in international marketing studies', *Journal of Business Research*, vol. 60, no. 3, pp. 277-84.

Sohrab, H, MD. Santhanam, A. Norulaini, N, N.A, Omar, A.K. (2011). Clinical waste management practices and its impact on human health and environment- A review. *Journal of Waste Management*, (31) 754-766.

Soliman F, Spooner K. (2000). Strategies for implementing knowledge management: role of human resource management. *J Knowl Manag* ;4(4):337–45.

Sondergaard, M. (1994). Research Note: Hofstede's Consequences: A Study of Reviews, Citations and Replications', *Organization Studies*, vol. 15, no. 3, pp. 447-56.

Souitaris V. (2001). Strategic influences of technological innovation in Greece. *Br J Manage* ;12(2):131–47.

Srivastava, J. N. (2000). Hospital Waste Management Project at Command Hospital, Air Force, Bangalore. National Seminar on Hospital Waste Management, A Report 27 May 2000.

Tabachnick, B. G., & Fidell, L. S. (2001). Using multivariate statistics (4th ed.). New York: HarperCollins.

Talaat, M., Kandeel, A., El-Shoubary, W., Bodenschatz, C., Khairy, I., Oun, S., & Mahoney, F.J. (2003). Occupational exposure to needle sticks injuries and hepatitis B vaccination coverage among health care workers in Egypt. *Am J Infect Control*, 31(8):469-74.

Taherkhani, R., Saleh, A., L., Nekooie., M., A., Mansur., S., A. (2011). External factors influencing on industrial building system (IBS) in Malaysia. *International Journal of Sustainable Development & World Policy* 1 (2): 66-79

The United Nations Economic Commission for Europe (UNECE) (2009a). Recommendation on the Transport of Dangerous Good, sixteenth revised edition, Accessed World Wide Website: http://www.unece.trans/danger/publi/unrec/rev16files_e.html [12/2/2014]

The United Nations Economic Commission for Europe (UNECE) (2009b). The European Agreement on the International Carriage of Dangerous Good by Road, sixteenth revised edition, Accessed World Wide Website: http://www.unece.org/trans/danger/publi/adr/adr2009/09ContentE.html [12/2/2014]

Thompson, F. (2003). 'An Action Research Analysis of Factors Involved In Australian Small -To Medium - Sized Enterprises Planning and tendering For Overseas Development Aid Projects', PhD thesis, Southern Cross University.

Troshani, I., Jerram, C., & Hill, S. R. (2011). Exploring the public sector adoption of HRIS. *Industrial Management & Data Systems*, 111(3), 470- 488.

Tsakona, M, E. Anagnostopoulou and E. Gidarakos, "Hos- pital Waste Management and Toxicity Evaluation: A Case Study," *Waste Management*, Vol. 27, No. 7, 2007, pp. 912-920. doi:10.1016/j.wasman.2006.04.019

Tseng, Y. F., & Lee, T. Z (2009). Comparing appropriate decision support of human resource practices on organizational performance with DEA/AHP model. Expert System with Applications, 36 6548–6558

Trikha, D. (1999). Industrialized building systems. In: Prospects in Malaysia Proceedings World Engineering Congress. Malaysia.

Tudor, T., Noonan, C. and Jenkin, L. (2005). Healthcare waste management: a case study from the National Health Service in Cornwall, United Kingdom. *Waste Management*, 25, 606-615.

Twati, J, M. (2007). 'Societal and Organisational Culture and The Adoption of Management Information Systems in Arab Countries ', PhD thesis, Griffith University.

Tzafrir, S. S. (2005). The relationship between trust, HRM practices and firm performance. *International Journal of Human Resource Management*, 16(9), 1600–1622.

Uma Sekaran (2003). Research method for business: A skill building approach, 4th edition, John Wiley & Sons.

United Nations Conference on Environment and Development (UNCED). Proceedings of the United Nations Conference on Environment and Development, Rio de Janeiro, Brazil: Agenda 21. http://www.un.org/geninfo/bp/enviro.html

Ujang Z . (2004). Hazardous waste management in Malaysia. UNESCO Encyclopedia of Life Support System for Hazardous Waste Management In developing Countries. UNESCO, Paris.

U.S. Environmental Protection Agency. (U.S. EPA, 1986). Guide for infectious waste Management, EPA/530-SW-86-014. Washington, DC.

Verma Lalji, K. (2008). Biomedical waste management in nursing homes and smaller hospitals in Delhi. *Waste Management*, 28, 2723-2734

Verma, A. (1995). Employee involvement in the workplace. In M. Gunderson & A. Ponak (Eds.), Union-management relations in Canada (pp. 281–308). Reading, Massachusetts: Addison-Wesley.

Von Krogh, G, Ichijo K, Nonaka I. Enabling knowledge creation. How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation. Oxford University Press, Inc; 2000.

Vorapong Manowan. (2009). Awareness and management of hospital waste in developing countries: A case study in Thailand.

Wagner, A. J. (1994). Participation's effects on performance and satisfaction: A reconsideration of research evidence. *Academy of Management Review*, 19, 312–330.

Wang, Y. L., and Ellinger, A. D. (2011). Organizational learning: Perception of external environment and innovation performance. *International Journal of Manpower*, 32, 5/6, 512-536.

Wanous, J.P. (1980). Organizational Entry: Recruitment Selection and Socialization of Newcomers. Addison-Wesley, Reading, MA.

Wahab, A.B., Adesanya, D.A. (2001). Medical Waste Generation in Hospitals and Associated Factors in Ibadan Metropolis, Nigeria. *Research Journal of Applied Sciences, Engineering and Technology*, 3(8): 746-751

Warszawski, A. (1999). Industrialized and automated building system. Technion-Israel Institute of Technology, E & FN Spoon.

Waterman RH. (1990). Adhocracy: the power to change. Memphis, TN: Whittle Direct Books.

WHO (1999). Safe Management of Wastes from Health-Care Activities. World Health Organization, Geneva.

WHO (2005). Safe Management of Wastes from Health-Care Activities. World Health Organization, Geneva.

World Health Organization (WHO, 2001). Review of health impacts from microbiological hazard in health-care wastes. WHO, Geneva, (Draft). http://www.who.int/docstore/water_sanitation_health/Environmental_sanit/Healthcarewaste/himpacts.pdf. Accessed 14/10/2010.

WHO (2005). Healthcare waste management (HCWM): healthcare waste and its safe management. http://www.healthcarewaste.org/en/115_overview.html. Accessed, April 14, 2011.

WHO (2011). Country cooperation Strategy for WHO and the Libyan Arab Jamahiriya. 2010-2015

Wiig K. (1997). Knowledge management: an introduction and perspective. J Knowl Manag ;1(1):6-14.

Wiley, C. (1997). What motivates employees according to over 40 years of motivation surveys. International Journal of Manpower 18 (3), 263–280.

Williamson, O. (1975). Markets and Hierarchies: Analysis and Antitrust Implications. The Free Press, New York.

Wilkins AL, Ouchi WG. (1983). Efficient cultures: exploring the relationship between culture and organizational performance. Adm Sci Q ;28:468–81.

.Yildirim, N., Birinc, S. (2013). Impacts of organizational culture and leadership on business performance: A case study on acquisitions. 2nd International Conference on Leadership, Technology and Innovation Management, 75, 71-82.

Youndt, M. A., Snell, S. A., Dean, J. W., & Lepak, D. P. (1996). Human resource management, manufacturing strategy and firm performance. *Academy of Management Journal*, 39(4), 836–866.

Yong, Z., Gang, X., Guaxing, W., Tao, Z., Dawei, J. (2009. Medical waste management in China: A case study of Nanjing, *Waste Management Journal*. (29), 1376-1382.

Zhao, X., Yeung, A.C.L. and Lee, T.S. (2004). "Quality management and organizational context in selected service industries of China", *Journal of Operations Management*, Vol. 22 No. 6, pp. 575-87.

Zheng, W., Yang, B., & McLean, G. N. (2010). Linking organizational culture, structure, strategy, and organizational effectiveness: mediating role of knowledge management. Journal of Business Research, 63(7), 763e771.

Zikmund, W. G. (2000). Business Research Methods (6 ed.): The Dryden Press.

Appendix A

Survey Questionnaire (English & Arabic Version)

Pusat Pengajian Pengurusan Teknologi dan Logistik
SCHOOL OF TECHNOLOGY MANAGEMENT AND LOGISTICS
Universiti Utara Malaysia

School of Technology Management and Logistic

UNIVERSITI UTARA MALAYSIA
06010 SINTOK, KEDAH

Dear respondent,

A QUESTIONNAIRE ON MEDICAL WASTE MANAGEMENT PRACTICES IN THE PUBLIC LIBYAN HOSPITALS

I am a doctoral student at Universiti Utara Malaysia (UUM), and I am conducting a survey to investigate medical waste management practices in the Public Libyan Hospitals. This study is to fulfill requirements for the degree of doctoral of philosophy in technology management and logistic at the university.
I am seeking your assistance in completing the questionnaire attached. Your participation in this study is completely voluntary and you may decline from participating whenever you wish to do so. However, as this study is important for me and for the public Libyan hospitals in improving your practice and have better understanding of medical waste management, I would like you to spend a little time to answer the questions.

Your answers are very important to the accuracy of my study. Information gathered will be kept strictly confidential, and your identity will remain anonymous. Once you have completed the questionnaire, please return it by using the preaddressed envelope attached herewith.

If you wish to know more about this study, please do not hesitate to contact me at this email address: e-mail: real86real86@yahoo.com, or alternatively, you can speak to me directly at this number: **00601121434374 (Malaysia), or 00218910773039 (Libya).**

Thank you again for your kind help and assistance.

Mohammed Khalifa Abdelsalam

SECTION ONE: GENERAL INFORMATION ON RESPONDENT AND THE HOSPITAL

Please place an (√) the one that describe your hospitals

1. RESPONDENT'S BACKGROUND

Q1. Our hospital is characterized as a (check one)

Teaching Hospital ……………….. Specialist Hospital……………..
District General Hospital ………..... Other (please specify): ………………..

Q2. Which of the following describe your position in the hospital?

[ ] Head of Hospital

[ ] Hospital Manager

[ ] Heads of Hospital Departments

[ ] Infection Control Officer

[ ] Hospital Engineer

[ ] Chief Pharmacist

[ ] Radiation Officer

[ ] Senior Nursing Officer

[ ] Financial Controller [ ] Doctor

[ ] Waste Management Officer

[ ] Doctor

[ ] Others…please state [ ]

Q3. What is your gender?

[ ] Male [ ] Female

Q4. What is your education level?

[ ] High School [ ] High Diploma [ ] University

Q5. Working Experience

[ ] 1-3 years [ ] 4-7 years [ ] 8 years & above

Q6. When was your hospital established? ……………………………….

Q7. How long has your hospital established? ....

Q8. What is the number of your fulltime employees in your hospitals? ....Staff members

SECTION TWO: INFORMATION ABOUT ORGANIZATIONAL STRUCTURE:

Centralization and Formalization

Please place an (√) the one that describe your hospitals

1= Strongly disagree	2= Disagree	3= Neutral	4= Agree	5= Strongly agree

2.1 Centralization

Q1. In our hospital, there can be little action taken until a supervisor approves a decision	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q2. In our hospital, even small matters have to be referred to top management for final endorsement.	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q3. In our hospital, I have to ask my boss before I do almost anything	1 2 3 4 5 [ ][ ][ ][ ] []
Q4. In our hospital, any decision I make has to have my boss' approval	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q5. In our hospital, I feel that I have the right to apply order priority without referring to top management for final endorsement?	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q6. A staff member who wants to make his own decision would be discouraged in our hospital.	1 2 3 4 5 [ ][ ][ ][ ][ ]

2.2 Formalization

	1 2 3 4 5
Q1. In our hospital, there are rules and regulation describing working procedures	[ ] [ ] [ ] [ ] [ ]
Q2. In our hospital, I can make my own rules on the job	[ ] [ ] [ ] [ ] [ ]
Q3. In our hospital, I feel that I am my own boss in most matters	[ ] [ ] [ ] [ ] [ ]
Q4. In our hospital, a staff can make decisions without checking with any other person	[ ] [ ] [ ] [ ] [ ]
Q5. In our hospital most employees make their own rules on the job.	[ ] [ ] [ ] [ ] [ ]
Q6. In our hospital, how work is done is up to the person doing the work.	[ ] [ ] [ ] [ ] [ ]
Q7. In our hospital, employees are constantly being checked on for rule violation.	[ ] [ ] [ ] [ ] [ ]
Q8. In our hospital, employees feel as though they are constantly being watched to see that they obey all the rules..	[ ] [ ] [ ] [ ] [ ]

SECTION THREE: INFORMATION ABOUT ORGANIZATIONAL CULTIRE:

3.1 Individualism and Collectivism

	1 2 3 4 5
Q1. Our hospital puts challenges task to do from which I can get a personal sense of accomplishments	[ ] [ ] [ ] [ ] [ ]
Q2. In our hospital, there is little tension and stress on the job of medical waste management	[ ] [ ] [ ] [ ] [ ]
Q3. In our hospital, I have good physical working conditions regarding medical waste management (good ventilation and lighting, adequate work space, etc	[ ] [ ] [ ] [ ] [ ]

Q4. In our hospital, I have good relationship with my director waste management superior	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q5. In our hospital, I have a considerable freedom to adopt my own approach to the job	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q6. In our hospital, I work with people who cooperate well one another	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q7. In our hospital, I am consulted by our director superior in his/her decisions	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q8. I make a real contribution to the success of our hospital	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q9. In our hospital, I have an opportunity for high earnings.	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q10. In our hospital, I have an opportunity for advancement to higher level job.	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q11. In our hospital, I have an element of variety and adventure in the job.	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q12. In our hospital, I work in prestigious, successful organization.	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q13. In our hospital, I have an opportunity for helping other people	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q14. In our hospital, I work in a well-defined job situation where the requirements are clear.	1 2 3 4 5 [ ][ ][ ][ ][ ]

3.2 Power Distance

Q1. In our hospital, superior makes decisions promptly without communication them to his/her subordinates.	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q2. In our hospital, subordinates should not refuse any decision made by their superior	1 2 3 4 5 [ ][ ][ ][ ][ ]
Q3. In our hospital, superior is not expected to delegates important jobs to his/her subordinates.	1 2 3 4 5 [ ][ ][ ][ ][ ]

SECTION FOUR: INFORMATION ABOUT EXTERNAL FACTORS

Government Policy and Environmental Factors

(Please tick [√] the one that describe your hospital)

5.1 Environmental Factors	**1 2 3 4 5**
Q1. Our hospital cares for employment issues such as dependency of foreign labors	[ ][ ][ ][ ][ ]
Q2. Our hospital requires experienced and skill workers	[ ][ ][ ][ ][ ]
Q3. Our hospital seeks to increase professional work force by training	[ ][ ][ ][ ][ ]
Q4. Our hospital seeks to increase professional work force development for workers	[ ][ ][ ][ ][ ]
Q5. Our hospital seeks to increase professional work force skill level of medical waste management practice section employees and work force	[ ][ ][ ][ ][ ]
Q6. In our hospital, there is an acceptance and perceived image of MWM system and methods used for application medical waste management practices	[ ][ ][ ][ ][ ]
Q7. Our hospital provides communication and advertisement to supp ort awareness about medical waste management	[ ][ ][ ][ ][ ]
Q8. In Libya, the safety, health and living standard are implemented at hospitals	[ ][ ][ ][ ][ ]
Q9. In our hospital, I participate in a hospital infection surveillance system on international levels.	[ ][ ][ ][ ][ ]
Q10. Our hospital implements standardization of manufacturing process and quality of materials an better finishes	[ ][ ][ ][ ][ ]
Q11. In our hospital, there is optimized use of material and reduce material wastage	[ ][ ][ ][ ][ ]

5.2. Government Policy

Q1. In Libya, there is government policy on medical waste management 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q2. Medical waste management plan exists in Libya and specifically in our hospital 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q3. In Libya, administrative departments for medical waste management exist in the ministry of health 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q4. In our hospital, I am aware of environmental legislation in Libya. 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q5. In our hospital, I am aware of specific legislation applicable to medical waste 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q6. In our hospital, I am aware of regulations, guidelines, and documents on management of medical waste in Libya. 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q7. In our hospital, I am responsible for enforcing and controlling the legislation and regulation 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q8. Our hospital compiles regular reports regarding medical waste management. 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

SECTION FIVE: INFORMATION ABOUT MEDICAL WASTE MANAGEMENT PRACTICES

Q1. Our hospital sincerely seeks to implement medical waste management system recommended by WHO 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q2. In our hospital, we are capable to implement medical waste system recommended by WHO 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q3. Our hospitals defines clearly procedures for collection and handling of waste from specified units in the hospital 1 2 3 4 5 [ ] [ ] [ ] [ ] [ ]

Q4. Our hospital has sharps box and biohazard collection containers recommended by WHO — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q5. Our hospital provides standard operation procedures (SOP) to newly hired waste management staff recommended by WHO — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q6. Our hospital always segregates the waste at the point it is generated. — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q7. In our hospital, I know the total patient beds in our department. — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q8. In our hospital, the most significant factor is Lack of knowledge and skill. — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q9. In our hospital, the most significant factor is staff cooperation. — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q10. In our hospital, the most significant factor is policy. — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q11. In our hospital, the most significant factor is strategy — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q12. In our hospital, the most significant factor is tools and equipments — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q13. In our hospital, the most significant factor is budget — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

Q14. In our hospital, there will be penalized for misfollowing Standard Operation Procedures (SOP) on medical waste management — 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ]

THANK YOU FOR YOUR KIND ASSISTANCE AND COOPERATION
HAVE A NICE DAY!

Pusat Pengajian Pengurusan Teknologi dan Logistik
SCHOOL OF TECHNOLOGY MANAGEMENT AND LOGISTICS
Universiti Utara Malaysia

مدرسة إدارة التكنولوجيا واللوجستية
جامعة اوتارا ماليزيا
06010 سينتوك ، كيدا

بعد التحية،،،

استبيان بشأن الممارسات الخاصة بإدارة النفايات الطبية في المستشفيات الليبية العامة

أنا طالب الدكتوراه في جامعة اوتارا ماليزيا (UUM)، وأقوم إجراء مسح للتحقيق في الممارسات الخاصة بإدارة النفايات الطبية في المستشفيات الليبية العامة. هذه الدراسة هي للوفاء بمتطلبات للحصول على درجة الدكتوراه في الفلسفة في إدارة التكنولوجيا واللوجستية في الجامعة.

أسعى إلى مساعدتكم في ملء الاستبيان المرفق. هذه الدراسة هي مهمة بالنسبة لي وبالنسبة للمستشفيات الليبية العامة في تحسين الممارسة الخاصة بك و لفهم أفضل لإدارة النفايات الطبية، فإنني أريد منكم قضاء القليل من الوقت للإجابة على الأسئلة.

إجاباتكم مهمة جدا لدقة دراستي. سيتم الاحتفاظ بالمعلومات التي يتم جمعها بالسرية التامة، وسوف تبقى هويتكم مجهولة. بمجرد انتهائكم من الاستبيان، يرجى إعادته باستخدام المظروف المسبق العنونة المرفقة طيه.

إذا كنتم ترغبون في معرفة المزيد عن هذه الدراسة، من فضلكم لا تترددوا في الاتصال بي على عنوان البريد الإلكتروني التالي:

البريد الإلكتروني: real86real86@yahoo.com، أو بدلا من ذلك، يمكنكم التحدث معي مباشرة على هذا الرقم:

006011112304223 (ماليزيا)، أو 00218924593011 (ليبيا).

شكرا لكم مرة أخرى على مساعدتكم الكريمة

أتمنى لكم نهارا سعيدا.

محمد خليفة عبد السلام

<u>القسم الأول: معلومات عامة عن المستفتي و المستشفى</u>

يرجى وضع علامة (√) بجانب التي تصف مستشفياتك

1. خلفية المستفتي:

سؤال 1. يتميز مستشفانا بأنه (اختر واحدة)

مستشفى تعليمي ....   مستشفى تخصصي ....

مستشفى منطقة عام.................. غيره (يرجى التحديد............

سؤال 2. أي مما يلي يصف وضعك في المستشفى؟

[ ] رئيس مستشفى

[ ] مدير مستشفى

[ ] رؤساء أقسام المستشفى

[ ] مسئول مكافحة العدوى

[ ] مهندس المستشفى

[ ] رئيس صيادلة

[ ] مسئول الإشعاع

[ ] مسئول أقدم للتمريض

[ ] المراقب المالي

[ ] مسئول إدارة النفايات

[ ] طبيب

[ ] غيره ... يرجى البيان [ ]

سؤال 3. ما هو جنسك؟

[ ] ذكر [ ] أنثى

سؤال 4. ما هو مستوى تعليمك؟

[ ] مدرسة ثانوية [ ] دبلوم عالي [ ] جامعة

سؤال 5. الخبرة العملية

[ ] 1- 3 سنوات [ ] 4-7 سنوات [ ] 8 سنوات فأكثر

سؤال 6. متى تأسس مستشفاك ؟

سؤال 7. متى أنشأ مستشفاك ؟

سؤال 8. ما عدد الموظفين بدوام كامل في مستشفاك ؟ .... موظف

القسم الثاني: معلومات عن الهيكل التنظيمي:

المركزية وإضفاء الطابع الرسمي

يرجى وضع علامة (√) بجانب التي تصف مستشفياتك

1 = أختلف بشدة	2 = أختلف	3 = محايد	4 = أوافق	5 = أوافق بشدة

2.1 المركزية

سؤال 1 في مستشفانا، قد يكون هناك القليل من الإجراءات تتخذ إلى أن يوافق المشرف على قرار. 5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]

سؤال2 في مستشفانا، حتى الأمور الصغيرة يجب أن تحال إلى الإدارة العليا لإقرارها بشكل نهائي. 5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]

سؤال 3	في مستشفانا، علي أن أسأل رئيسي قبل أن أفعل أي شيء تقريبا	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 4	في مستشفانا، أي قرار يتخذ لا بد أن يوافق عليه رئيسي	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 5	في مستشفانا، أشعر أن لدي الحق في تطبيق ترتيب الأولوية دون الرجوع إلى الإدارة العليا لإقرارها بشكل نهائي؟	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 6	عدم تشجيع الموظف الذي يريد أن يتخذ قراره الخاص به	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]

2.2 إضفاء الطابع الرسمي

سؤال 1	في مستشفانا، هناك قواعد وإجراءات تصف التنظيم العمل	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 2	في مستشفانا، يمكنني أن أضع قواعدي الخاصة بي فيما يخص الوظيفة	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 3	في مستشفانا، أشعر بأنني أن رئيس نفسي في معظم المسائل	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 4	في مستشفانا، يمكن للطاقم اتخاذ قرارات دون أخذ رأي أي شخص آخر	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 5	في مستشفانا، معظم الموظفين يضعون القواعد الخاصة بهم فيما يخص الوظيفة	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 6	في مستشفانا، كيفية القيام بالعمل متروكة للشخص القائم بالعمل	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 7	في مستشفانا، باستمرار يجري فحص الموظفين فيما يخص انتهاك القواعد	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 8	في مستشفانا، يشعر الموظفين كما لو أنهم مراقبون باستمرار للتأكد من مراعاتهم لكافة القواعد	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]

القسم الثالث: معلومات حول الثقافة التنظيمية:

3.1 الفردية والجماعية

سؤال 1	يضع مستشفانا تحديات للقيام من خلالها يمكنني الحصول على شعور شخصي بالإنجازات	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 2	في مستشفانا، هناك القليل من التوتر والإجهاد على وظيفة إدارة النفايات الطبية	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 3	في مستشفانا، لدي ظروف عمل طبيعية جيدة فيما يتعلق بإدارة النفايات الطبية (تهوية جيدة	5 4 3 2 1

وإضاءة، ومساحة ملائمة للعمل...الخ)

[ ] [ ] [ ] [ ] [ ]

سؤال 4	في مستشفانا، لدي علاقة جيدة مع مديري للإدارة المتفوقة للنفايات	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 5	في مستشفانا، لدي حرية كبيرة لتبني منهجي الخاص بي فيما يخص الوظيفة	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 6	في مستشفانا، أعمل مع أناس يتعاونون بشكل جيد مع بعضهم البعض	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 7	في مستشفانا يتم استشارتى فى القرارت المتخدة من قبل مديرى	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 8	أنا أساهم فى نجاح مستشفانا	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 9 7	في مستشفانا لدى قرصة للربح العالى	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 10	في مستشفانا لدي فرصة للتقدم إلى وظيفة أعلى مستوى	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 11	في مستشفانا لدي عنصرا من العناصر المتنوعة والمغامرة في العمل	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 12	في مستشفانا أنا أعمل في مؤسسة مرموقة وناجحة	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 13	في مستشفانا لدي فرصة لمساعدة الآخرين	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 14	أنا أعمل في وضع وظيفي واضح المعالم حيث الشروط واضحة	

3.2 مسافة السلطة

سؤال 1	في مستشفانا تتخد الادارة العليا القرارات دون الرجوع إلى المرؤوسين	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 2	في المستشفى، يجب على المرؤوسين ألا يرفض أي قرار يتخذ من قبل رؤسائهم	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 3	في المستشفى، ليس من المتوقع أن تحال إلى المندوبين وظائف هامة	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]

<u>القسم الرابع: معلومات حول العوامل الخارجية</u>

4.1 العوامل البيئية

5 4 3 2 1

سؤال 1	يهتم مستشفانا بتوظيف العمالة الاجنبية	[ ] [ ] [ ] [ ] [ ]
سؤال 2	يتطلب مستشفانا عمالا من ذوي الخبرة والمهارة	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 3	يسعى مستشفانا لزيادة القوة العاملة المهنية من خلال التدريب	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 4	يسعى مستشفانا لزيادة تنمية القوى العاملة المهنية للعمال	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 5	**يسعى مستشفانا لزيادة مستوى مهارات القوى العاملة المهنية لموظفي القسم وقوة العاملة به لممارسة إدارة النفايات الطبية**	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 6	**في مستشفانا، هناك قبول وصورة إدراك لإدارة النفايات الطبية و الأساليب المستخدمة في ممارسات تطبيق إدارة النفايات الطبية**	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 7	**يقدم مستشفانا اتصالات وإعلان لدعم الوعي حول إدارة النفايات الطبية**	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 8	في ليبيا، يتم تنفيذ السلامة، الصحة ومستوى المعيشة في المستشفيات	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 9	في مستشفانا، أشارك في نظام مراقبة العدوى في المستشفيات على المستويات الدولية.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 10	ينفذ مستشفانا التوحيد القياسي لعملية التصنيع وجودة المواد لتشطيبات أفضل	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 11	في مستشفانا، هناك استخدام أمثل للمواد وتقليل من هدر المواد	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]

4.2 سياسة الحكومة

سؤال 1	في ليبيا، هناك سياسة حكومية بشأن إدارة النفايات الطبية	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 2	توجد خطة لإدارة النفايات الطبية في ليبيا وتحديدا في مستشفانا	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 3	في ليبيا توجد أقسام لإدارة النفايات الطبية في وزارة الصحة	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 4	في مستشفانا، أنا على علم بالتشريعات البيئية في ليبيا.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 5	في مستشفانا، أنا على علم بتشريعات محددة تنطبق على النفايات الطبية	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 6	في مستشفانا، أنا على علم باللوائح و التوجيهات، والوثائق حول إدارة النفايات الطبية في ليبيا.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]

القسم الخامس: معلومات عن ممارسات إدارة النفايات الطبية

سؤال 1	يسعى مستشفانا بإخلاص لتنفيذ نظام إدارة النفايات الطبية الموصى بها من قبل منظمة الصحة العالمية.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 2	في مستشفانا، نحن قادرون على تنفيذ نظام النفايات الطبية الموصى بها من قبل منظمة الصحة العالمية.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 3	مستشفياتنا تحدد بوضوح إجراءات لجمع ومعالجة النفايات من وحدات محددة في المستشفى	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 4	مستشفانا لديه صندوق للأدوات الحادة وحاويات جمع المواد الخطرة حيويا الموصى بها من قبل منظمة الصحة العالمية.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 5	يقدم مستشفانا إجراءات معيارية عملية (SOP) لموظفي إدارة النفايات المعينين حديثا الموصى بها من قبل منظمة الصحة العالمية.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 6	مستشفانا يقوم دائما بعزل النفايات عند نقطة تكونها.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 7	في مستشفانا، أعلم العدد الإجمالي للأسرة بالأقسام التابعة لنا.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 8	في مستشفانا، العامل الأهم هو غياب المعرفة والمهارة.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 9	في مستشفانا، ، العامل الأهم هو تعاون الموظفين.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 10	في مستشفانا، العامل الأهم هو السياسة.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 11	في مستشفانا، العامل الأهم هو الإستراتيجية.	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 12	في مستشفانا، العامل الأهم هو الأدوات والمعدات	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]
سؤال 13	في مستشفانا، العامل الأهم هو الميزانية	5 4 3 2 1 [ ] [ ] [ ] [ ] [ ]

سؤال 14 في مستشفانا، ستكون هناك عقوبة ضد سوء اتباع الإجراءات المعيارية على إدارة النفايات الطبية. 1 2 3 4 5
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شكرا لكم على مساعدتكم القيمة وتعاونكم

أتمنى لكم يوما سعيدا

Appendix B

Best practice: WHO healthcare waste management

(segregation, storage and transport of health-care waste)

BEST PRACTICE: WHO HEALTHCARE WASTE MANAGMENT

Segregation, storage and transport of health-care waste

1.1 Guiding principles

Health-care facility managers have a "duty of care" (often required by national regulations) to ensure that waste is kept under control at all times within a health-care facility and disposed of safely either onsite or offsite. Proper segregation, onsite storage and transportation systems are described in this chapter and provide a continuous sequence of safe keeping at each step in the process, from the point of generation of waste to its final treatment or disposal. Each step in the concept of managing the "waste flow" is given below.

The following general principles of waste segregation, storage and transportation relate to the control of waste flow from generation to disposal:

Health-care waste is generated in a medical area and should be segregated into different fractions, based on their potential hazard and disposal route, by the person who produces each waste item;

- Separate containers should be available in each medical area for each segregated waste fraction;
- Waste containers when filled should be labelled to help managers control waste production;
- closed local storage inside or near to a medical area may be needed if wastes are not collected frequently;
- Hazardous and non-hazardous wastes should not be mixed during collection, transport or storage;

- Collected waste is often taken to central storage sites before onsite or offsite treatment and disposal;
- Staff should understand the risks and safety procedures for the wastes they are handling.

1.2 Segregation systems

The correct segregation of health-care waste is the responsibility of the person who produces each waste item, whatever their position in the organization. The health-care facility management is responsible for making sure there is a suitable segregation, transport and storage system, and that all staff adhere to the correct procedures.

Segregation should be carried out by the producer of the waste as close as possible to its place of generation, which means segregation should take place in a medical area, at a bedside, in an operating theatre or laboratory by nurses, physicians and technicians. If classification of a waste item is uncertain, as a precaution it should be placed into a container used for hazardous health-care waste.

The simplest waste-segregation system is to separate all hazardous waste from the larger quantity of non-hazardous general waste. However, to provide a minimum level of safety to staff and patients, the hazardous waste portion is commonly separated into two parts: used sharps and potentially infectious items. In the latter, the largest components are typically tubing, bandages, disposable medical items, swabs and tissues. Consequently, the segregation of general, non-hazardous waste, potentially infectious waste and used sharps into separate containers is often referred to as the "three-bin system". Further types of containers can be used for other categories of wastes, such as chemical and pharmaceutical wastes, or to separate out pathological waste, where it is to be handled and disposed of in different ways from the other portions of the waste flow

1.2.1 Waste containers, colour codes and labels

Ideally, the same system of segregation should be in force throughout a country, and many countries have national legislation that prescribes the waste segregation categories to be used and a system of colour coding for waste containers. Where there is no national legislation, a World Health Organization (WHO) scheme is available (Table 7.1). Colour coding makes it easier for medical staff and hospital workers to put waste items into the correct container, and to maintain segregation of the wastes during transport, storage, treatment and disposal. Colour coding also provides a visual indication of the potential risk posed by the waste in that container.

1.2.2 Beyond basic segregation

Non-hazardous waste

Within each major category (e.g. non-hazardous, potentially infectious, used sharps), further segregation may be advantageous. For example, general non-hazardous waste can be broken down into recyclables, biodegradable waste and non-recyclable portions. If these are mixed at the point of generation, it may prevent recyclables from being recovered.

Food wastes can be collected from medical areas and returned directly to the kitchens. Kitchen wastes can be composted or, where regulations allow, sterilized and used for animal feed. Non-hazardous biodegradable wastes (e.g. flowers) may be disposed of with kitchen waste.

Hazardous waste

Highly infectious waste, such as diagnostic laboratory samples and waste from infectious patients in isolation, should be collected separately and autoclaved at the point of generation. Once disinfected, the waste would leave a medical area in the infectious health-care waste container.

Anatomical waste, particularly recognizable body parts or fetal material, should be handled according to prevailing religious and cultural preferences (most commonly, authorized burial or cremation). In low-resource areas, placentas and other non-recognizable anatomical waste can be disposed of in a pit where it can biodegrade naturally.

Sharps waste (needle and syringe combination) should be placed directly into a sharps container. In some places, it is permitted for syringes to have their needles removed or destroyed before placing the syringe in an infectious waste bin. Any removed needles are placed in a puncture-proof container and dealt with accordingly. This approach is not universally accepted as best practice.

Policies regarding the use of needle cutters (also known as hub cutters) or needle pullers, and destroyers vary from country to country. A needle puller is a type of pliers that removes the needle from the syringe – a process called defanging. (Luer-lock needles do not require a puller to defang them – they can simply be unscrewed from the syringe.) In some countries, needle cutters or pullers, or destroyers are mandatory for vaccination programmes. A WHO study investigated the advantages and risks of needle cutters (Ahmed, 2010); the study group used needle cutters or destroyers, and the comparison group used usual practice. There was no statistically significant difference in the number of needle-stick injuries among the injection providers and waste handlers, or blood exposures among the injection providers; however, injuries and exposures were slightly lower in the group using the needle cutters/needle pullers. The use of hub cutters/needle pullers did not increase the amount of time required to give the vaccinations. The overall amount of waste produced during the study was slightly less in the group that used the hub cutters/needle pullers, but less than 0.2% of it was sharps waste

Various chemical and pharmaceutical wastes should be segregated and collected separately: subcategories include mercury, batteries, cadmium-containing wastes, photochemicals, stains and laboratory reagents, cytotoxic drugs and other pharmaceuticals. All should be clearly labelled with the type of waste and the name of the major chemicals, with any necessary hazard labels attached to corrosive, flammable, explosive or toxic chemicals. Liquid chemical wastes should never be mixed or disposed of down the drain, but should be stored in strong leak-proof containers. It may be possible to recover silver from photochemicals at a profit, and return of chemicals to suppliers should be practised where possible. Silver is increasingly being used in medical products, but is rarely segregated due to a lack of dedicated disposal or metals recovery facilities. Low-energy light bulbs (compact fluorescents) contain small amounts of mercury. Both these and batteries should be segregated and treated by recycling processes, where suitable facilities exist.

Mercury use is being reduced in health care and other applications around the world because of its toxicity and pollution potential. Since it is volatile, spilled mercury can be inhaled by staff and patients if it is not cleaned up properly, but a simple spill kit can be cheap and effective. Where mercury thermometers and sphygmomanometers are still in use, medical staff should be supplied with a spill kit and trained in how to use it. Any spill larger than a thermometer should be dealt with in consultation with the local health and safety authority. Brushes and vacuum cleaners should never be used for spilled mercury. Mercury can be cleaned up easily from wood, linoleum, tile and similar smooth surfaces. It cannot be completely removed from carpets, curtains, upholstery or other absorbent materials. The affected portion should be isolated and disposed of in accordance with official guidelines. For more information on spill clean-up, see section 11.3.2.

Unused pharmaceuticals should go back to the pharmacy for return to the manufacturers or dispatched to specialist waste-treatment contractors. Pharmaceuticals should be kept in their original packaging to aid identification and prevent reaction between incompatible chemicals. Spilt and contaminated chemicals and pharmaceuticals should not be returned to the pharmacy but should go directly from the point of production to a waste store. Typically, they are stored and transported within a health-care facility in brown cardboard boxes and must be kept dry.

Where specialist disposal services exist, they should collect and handle radioactive wastes. Otherwise, waste may be stored in secure, radiation-proof repositories (leak-proof, lead-lined and clearly labelled with the name of the radionuclide and date of deposition) where it should be left to decay naturally.

1.2.3 Waste containers: specifications and sitting

Waste containers can come in many shapes and sizes and be made from different materials. Many modern waste containers are designed for automated systems that empty their contents into the waste-disposal system and wash and disinfect them mechanically. At the other end of the scale, waste containers may also be made out of reused plastic and metal containers. In all cases, they should be sturdy and leak-proof, and (except for sharps containers) lined with a sturdy plastic bag. The recommended thickness of bags for infectious waste is 70 μm (ISO 7765 2004). Plastics used for either containers or bags should be chlorine-free. Not all plastic bags can withstand temperatures of 121 °C, and some can melt during an autoclave process.

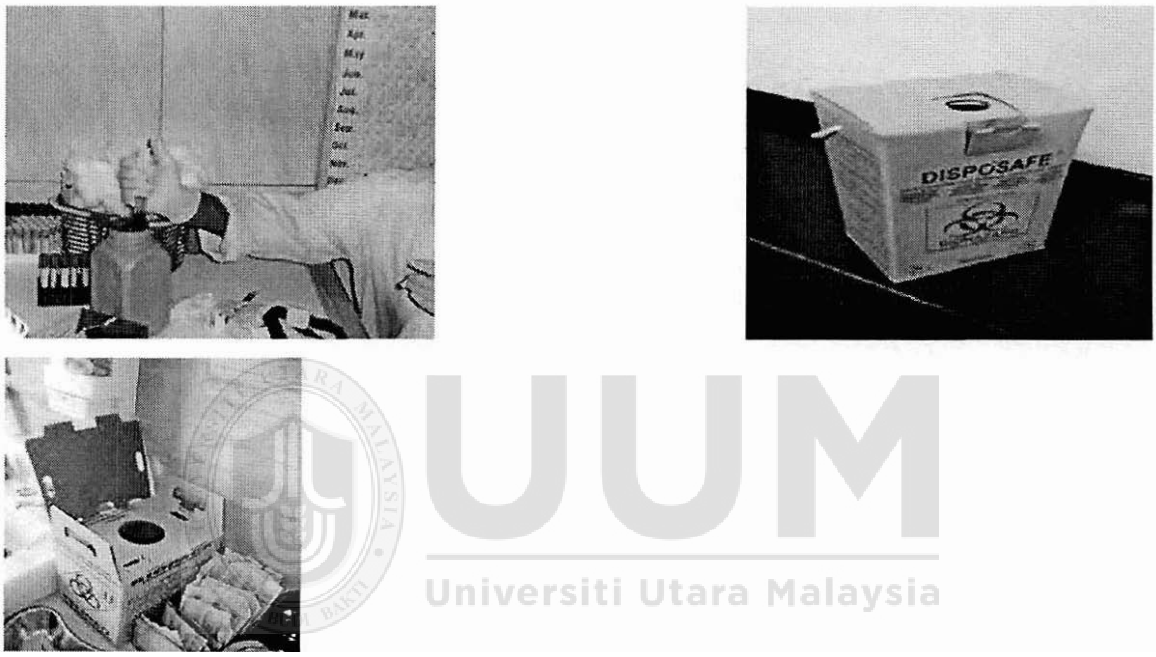
Containers should have well-fitting lids, either removable by hand or preferably operated by a foot pedal. Both the container and the bag should be of the correct colour for the waste they are intended to receive and labelled clearly. Mixing colours – such as having yellow bags in black bins – should be avoided, because it will increase the potential for confusion and poor segregation.

Since sharps can cause injuries that leave people vulnerable to infection, both contaminated and uncontaminated sharps should be collected in a puncture-proof and impermeable container that is difficult to break open after closure. Performance specifications for these containers are given in WHO (2007).

Sharps containers may be disposable or designed for disinfection and reuse. Disposables are boxes made of plasticized cardboard or plastic (Figure 7.3); reusable designs are plastic or metal. Low-cost options include the reuse of plastic bottles or metal cans. If this is to be done, the original labels should be removed or obscured, and the containers should be clearly relabelled as "Sharps containers".

The appropriate waste receptacle (bags, bins, sharps boxes) should be available to staff in each medical and other waste-producing area in a health-care facility. This permits staff to segregate and dispose of waste at the point of generation, and reduces the need for staff to carry waste through a medical area. Posters showing the type of waste that should be disposed of in each container should be posted on walls to guide staff and reinforce good habits.

Segregation success can be improved by making sure that the containers are large enough for the quantity of waste generated at that location during the period between collections. Up-to-date waste audit data can be used to assess the volume and type of waste containers necessary, since waste managers also need to spend time with staff in medical areas identifying the type of work that is undertaken. No two areas will be the same.



Proper disposal of used syringes into hospital   A proper cardboard sharps container   Sharps box in a Peruvian

a designated sharps container

Figure 7.3 Cardboard safety boxes

Medical staff should be encouraged to think of waste disposal as part of a patient's treatment, so all aspects of the care process are completed at the bedside or treatment room. If intervention at the bedside is required, a waste container should be taken to the bed. Sharps bins are also sometimes taken to a patient for drug administration or blood sampling. A mobile trolley with infectious waste and sharps containers may therefore be more versatile and should be given serious consideration. The alternative is establishing a limited number of locations in a medical area where general waste (black bags) and infectious health-care waste (yellow bags and sharps containers) are placed. The locations should be away from patients; typical sites are the sluice (utility) room, treatment room and nurses' station.

Where containers for segregating hazardous and non-hazardous health-care wastes are in use, they should be located close together, wherever possible. Containers for infectious waste should not be placed in public areas because patients and visitors may use the containers and come into contact with potentially infectious waste items. Static bins should be located as close as possible to sinks and washing facilities, because this is where most staff will deposit gloves and aprons after treating patients. If the general waste container is closest to the sink or under a towel dispenser, it will encourage staff to place towels into the non-infectious receptacle. Containers should be of similar size to overcome the observed tendency for staff to put waste in the largest receptacle.

Unless patients are known or suspected to have readily transmitted infections, the assumption should be that general waste generated in a medical area is of low risk. However, if there is a known communicable infection (e.g. methicillin-resistant *Staphylococcus aureus*, tuberculosis or leprosy), all waste used in and around the patient should be classed as an infection risk and placed in the yellow, potentially infectious waste container. This "blanket" approach to all waste being assumed to be infectious can be avoided where there is a high level of training and communication between the clinical and support staff. Waste from each patient should be treated according to their known infection status.

1.2.4 Setting and maintaining segregation standards

Segregation methods should be clearly set out in the waste-management policy of a health-care facility. It is important that the waste-management policy is supported and enforced by senior staff and managers. Managers and medical supervisors should know the relevant legislation and understand how to implement waste audits, foresee possible problems and take pre-emptive remedial action. Medical staff and waste handlers should understand the reasons for, and operation of, segregation practices, waste auditing, spill management, and accident and injury reporting. Training should be repeated periodically to ensure that all staff are reminded of their responsibilities.

The waste-management committee is responsible for seeing that segregation rules are enforced and waste audits carried out to quantify the amount of waste being produced. Also, segregation posters for medical and waste workers help to raise knowledge about segregation practices and improve the quality of separated waste components (Figure 7.4).

Figure 7.4 Example of a waste-segregation poster

Waste that has been poorly segregated should never be re-sorted, but instead should be treated as the most hazardous type of waste in the container. Corrective action taken should concentrate on ensuring that waste is segregated properly in the future.
As well as confirming that waste is being segregated properly, waste audit data can be used to indicate the type, size and number of containers needed in each area. It should be used to estimate disposal capacity requirements and the amount of recyclables generated. Both are essential pieces of data for good waste management and cost control. It can also be used to track the entire waste stream through to final disposal. In some countries, this is a legal requirement. Hospital managers have a duty to prove that all wastes have been disposed of in accordance with the law, and health-care facilities have to obtain proof of treatment from authorized waste-disposal contractors.

Reuse of medical products is common in some countries. Although it is not recommended practice, disposable gloves are often reused in resource-limited facilities, where they may be autoclaved and repacked for non-clinical use. Alternatively, they may be pilfered from the waste stream for illicit reuse. Similarly, used syringes and other medical devices may be washed and repackaged for resale. To prevent this, it may be necessary to ensure that staff mutilate gloves and other used equipment before placing them in the appropriate waste container.

1.3 Collection within the health-care facility

Collection times should be fixed and appropriate to the quantity of waste produced in each area of the health-care facility. General waste should not be collected at the same time or in the same trolley as infectious or other hazardous wastes.

Waste bags and sharps containers should be filled to no more than three quarters full. Once this level is reached, they should be sealed ready for collection. Plastic bags should never be stapled but may be tied or sealed with a plastic tag or tie. Replacement bags or containers should be available at each waste-collection location so that full ones can immediately be replaced.

Waste bags and containers should be labelled with the date, type of waste and point of generation to allow them to be tracked through to disposal. Where possible, weight should also be routinely recorded. Anomalies between departments with similar medical services or over time at one location can show up differences in recycling opportunities, or problems such as poor segregation and diversion of waste for unauthorized reuse.

Collection should be daily for most wastes, with collection timed to match the pattern of waste generation during the day. For example, in a medical area where the morning routine begins with the changing of dressings, infectious waste could be collected mid-morning to prevent soiled bandages remaining in the medical area for longer than necessary. Visitors arriving later in the day will bring with them an increase in general waste, such as newspapers and food wrappings; therefore, the optimum time for general and recyclable waste collection would be after visitors have departed.

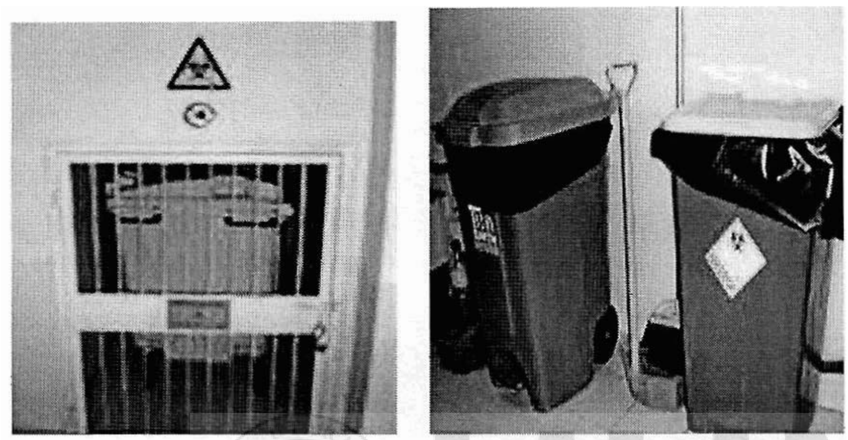
In comparison with this general type of medical area, a theatre would generate a high proportion of potentially infectious waste and could have several collections during the day to fit in with the schedule of operations. A child and maternal health clinic might generate primarily sharps waste from injections, which would be collected at the end of each working day.

1.4 Interim storage in medical departments

Where possible, hazardous waste generated in medical areas should be stored in utility rooms, which are designated for cleaning equipment, dirty linen and waste. From here, the waste can be kept away from patients before removal, then collected conveniently and transported to a central storage facility. This is known as interim or short-term storage (Figure 7.5).

If utility rooms are not available, waste can be stored at another designated location near to a medical area but away from patients and public access. Another possibility for interim storage is a closed container stationed indoors, within or close to a medical area.

A storage container used for infectious waste should be clearly labelled and preferably lockable.



Interim waste storage ready Waste bins in a dirty utility room

Photo source: ETLog Health GmbH, Germany

Figure 7.5 Examples of interim waste storage places

1.5 Onsite transport of waste

1.5.1 General requirements

Onsite transport should take place during less busy times whenever possible. Set routes should be used to prevent exposure to staff and patients and to minimize the passage of loaded carts through patient care and other clean areas. Depending on the design of the health-care facility, the internal transport of waste should use separate floors, stairways or elevators as far as possible. Regular transport routes and collection times should be fixed and reliable. Transport staff should wear adequate personal protective equipment, gloves, strong and closed shoes, overalls and masks.

Hazardous and non-hazardous waste should always be transported separately. In general, there are three different transport systems:

Waste transportation trolleys for general waste should be painted black, only be used for non-hazardous waste types and labelled clearly "General waste" or "Non-hazardous waste".

Infectious waste can be transported together with used sharps waste. Infectious waste should not be transported together with other hazardous waste, to prevent the possible spread of infectious agents. Trolleys should be coloured in the appropriate colour code for infectious waste (yellow) and should be labelled with an "Infectious waste" sign.

Other hazardous waste, such as chemical and pharmaceutical wastes, should be transported separately in boxes to central storage sites.

The use of waste chutes in health-care facilities is not recommended, because they can increase the risk of transmitting airborne infections.

1.5.2 Transport trolleys

Health-care waste can be bulky and heavy and should be transported using wheeled trolleys or carts that are not used for any other purpose (Figure 7.6). To avoid injuries and infection transmission, trolleys and carts should:

1. be easy to load and unload
2. have no sharp edges that could damage waste bags or containers during loading and unloading
3. be easy to clean and, if enclosed, fitted with a drainage hole and plug
4. be labelled and dedicated to a particular waste type
5. be easy to push and pull
6. not be too high (to avoid restricting the view of staff transporting waste)
7. . be secured with a lock (for hazardous waste)
8. be appropriately sized according to the volumes of waste generated at a health-care facility

Waste, especially hazardous waste, should never be transported by hand due to the risk of accident or injury from infectious material or incorrectly disposed sharps that may protrude from a container.

Spare trolleys should be available in case of breakdowns and maintenance. The vehicles should be cleaned and disinfected daily. All waste bag seals should be in place and intact at the end of transportation.

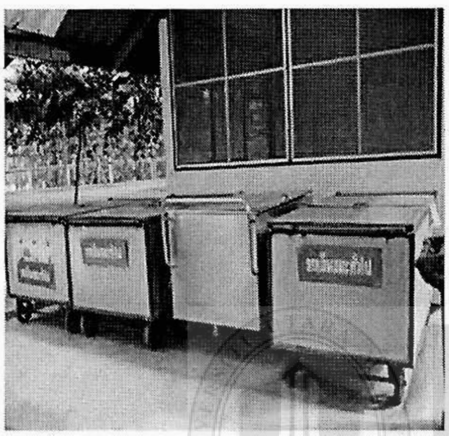


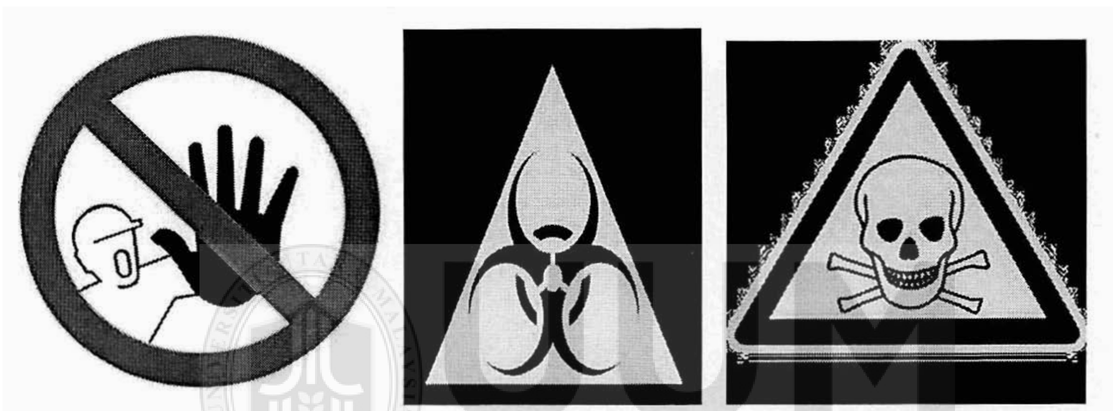
Figure 7.6 Medical waste transport trolleys outside a hospital in Thailand

General requirements on Waste Storage Area

A storage location for health-care waste should be designated inside the health-care facility. Space for storing wastes should be incorporated into a building design when new construction is undertaken; for an example, see the *Guidelines for design and construction of hospitals and health care facilities* (Facility Guidelines Institute, 2010). These storage areas should be sized according to the quantities of waste generated and the frequency of collection. The areas must be totally enclosed and separate from supply rooms or food preparation areas. Loading docks, space for compactors and balers for cardboard, staging areas for sharps boxes, recycling containers and secure storage (e.g. for batteries) should all be provided.

Storage facilities should be labelled in accordance with the hazard level of the stored waste. Figures 7.8 and 7.9 show typical signs advising the hazard posed by waste. In general, there are four different kinds of waste-storage areas:

1. non-hazardous or general waste
2. hazardous waste
3. infectious and sharps waste
4. chemical and hazardous pharmaceutical waste
5. radioactive waste.

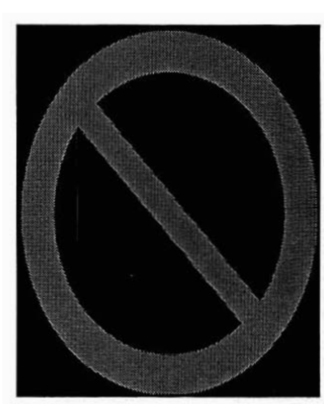


No entry for unauthorized persons for all storage areas

Biohazard sign for infectious and sharps waste

Toxic sign for chemical and hazardous pharmaceutical waste

Figure 7.8 Example labels outside the storage facility



No eating or drinking

No smoking

Figure 7.9 Example labels inside the storage facility

Hazardous waste storage

Further specifications should be considered for the storage of hazardous waste, in addition to the general requirements.

Infectious waste storage

The storage place must be identified as an infectious waste area by using the biohazard sign. Floors and walls should be sealed or tiled to allow easy disinfection. If present, the storage room should be connected to a special sewage system for infectious hospital wastewater. The compacting of untreated infectious waste or waste with a high content of blood or other body fluids destined for offsite disposal (for which there is a risk of spilling) is not permitted. Sharps can be stored without problems, but other infectious waste should be kept cool or refrigerated at a temperature preferably no higher than 3 °C to 8 °C if stored for more than a week. Unless a refrigerated storage room is available, storage times for infectious waste (e.g. the time gap between generation and treatment) should not exceed the following periods:

temperate climate	warm climate
72 hours in winter	48hours during the cool season
48 hours in summer	24 hours during the hot season

Pathological waste storage

Pathological waste and the growth of pathogens it may contain are considered as biologically active waste, and gas formation during storage should be expected. To minimize these possibilities, the storage places should have the same conditions as those for infectious and sharps wastes.

In some cultures, body parts are passed to the family for ritual procedures or are buried in designated places. They should be placed in sealed bags to reduce infection risks before release to the public. More information about pathological waste handling can be found in Chapter 8 and in Annex 6. Figure 7.10 shows an example of a label for a pathological waste storage room.

Figure 7.10 Label for a pathological waste storage room

Pharmaceutical waste storage

Pharmaceutical waste should be segregated from other wastes and local regulations followed for final disposal. In general, pharmaceutical wastes can be hazardous or non-hazardous, and liquid or solid in nature, and each should be handled differently. The classification should be carried out by a pharmacist or other expert on pharmaceuticals. The pharmaceutical waste streams that are listed below can be distinguished (WHO, 1999):

Pharmaceutical waste with non-hazardous characteristics that can be stored in a non-hazardous storage area ampoules with non-hazardous content (e.g. vitamins);

1. fluids with non-hazardous contents, such as vitamins, salts (sodium chloride), amino salts;
2. solids or semi-solids, such as tablets, capsules, granules, powders for injection, mixtures, creams, lotions, gels and suppositories;
3. aerosol cans, including propellant-driven sprays and inhalers.

Hazardous waste that should be stored in accordance with their chemical characteristics (e.g. genotoxic drugs) or specific requirements for disposal (e.g. controlled drugs or antibiotics)

- controlled drugs (should be stored under government supervision);
- disinfectants and antiseptics;
- anti-infective drugs (e.g. antibiotics);
- --genotoxic drugs (genotoxic waste);
- --ampoules with, for example, antibiotics

Genotoxic waste is highly toxic and should be identified and stored carefully away from other health-care waste in a designated secure location. It can be stored in the same manner as toxic chemical waste, although some cytotoxic waste may also carry a risk of infection.

Chemical waste storage

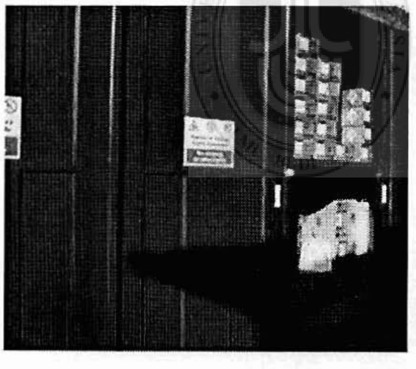
When planning storage places for hazardous chemical waste, the characteristics of the different chemicals to be stored and disposed of must be considered (inflammable, corrosive, explosive). The storage place should be an enclosed area and separated from other waste storage areas (Figure 7.11). When storing liquid chemicals, the storage should be equipped with a liquid- and chemical-proof sump. If no sump is present, catch-containers to collect leaked liquids should be placed under the storage containers. Spillage kits, protective equipment and first-aid equipment (e.g. eye showers) should be available in the central storage area. The storage area itself should have adequate lighting and good ventilation to prevent the accumulation of toxic fumes.

To ensure the safe storage of chemical wastes, the following separate storage zones should be available to prevent dangerous chemical reactions. The storage zones should be labelled according to their hazard class. If more than one hazard class is defined for a specific waste, use the most hazardous classification:

- explosive waste
- corrosive acid waste
- corrosive alkali waste (bases)
- toxic waste
- flammable waste
- oxidative waste
- halogenated solvents (containing chlorine, bromine, iodine or fluorine)
- non-halogenated solvents.

Liquid and solid waste should be stored separately. If possible, the original packaging should be taken for storage too. The packaging used to store and transport chemical wastes offsite should also be labelled. This label should have the following information: hazard symbol(s), waste classification, date, and point of generation (if applicable).

The storage area for explosive or highly flammable materials must be suitably ventilated above and below, with a bonded floor and constructed of materials suitable to withstand explosion or leakage.



Advanced storage of chemicals in different safety compartment

Storage of liquid chemical waste in chemical-resistant plastic containers

Figure 7.11 Examples of storage places for chemical waste

Radioactive waste

Radioactive waste should be stored in containers that prevent dispersion of radiation, and stored behind lead shielding. Waste that is to be stored during radioactive decay should be labelled with the type of radionuclide, date, period of time before full decay and details of required storage conditions.

1.6 Offsite transport of waste

Offsite transport is the carriage of health-care waste on the public streets away from a health-care facility. Transporting hazardous health-care waste should comply with national regulations, and with international agreements if wastes are shipped across an international frontier for treatment (Secretariat of the Basel Convention, 1992). Where there are no national regulations, responsible authorities may refer to recommendations on the transport of dangerous goods published by the United Nations. These are available in English, French, Spanish, Russian, Arabic and Chinese (UN, 2009).12

1.6.1 Logistic staff

Drivers of vehicles carrying hazardous health-care waste should have appropriate training about risks and handling of hazardous waste. Training on the following issues should be included:

- relevant legal regulations
- waste classifications and risks
- safe handling of hazardous waste
- labelling and documentation
- emergency and spillage procedures.

In addition, drivers should be declared medically fit to drive vehicles.

In case of accident, contact numbers or details of the emergency services and other essential departments should be carried in the driver's cab. For safety reasons, vaccination against tetanus and hepatitis A and B is recommended, and vaccination and training details of staff should be recorded.

1.6.2 Vehicle requirements

A fundamental requirement is for the vehicle transporting hazardous waste to be roadworthy and labelled to indicate its load, and its payload to be secured to minimize the risk of accidents and spillages. Any vehicle used to transport health-care waste should fulfil several design criteria:

- The body of the vehicle should be of a suitable size commensurate with the design of the vehicle.
- There should be a bulkhead between the driver's cabin and the vehicle body, which is designed to retain the load if the vehicle is involved in a collision.
- There should be a suitable system for securing the load during transport.
- Empty plastic bags, suitable protective clothing, cleaning equipment, tools and disinfectant, together with special kits for dealing with liquid spills, should be carried in a separate compartment in the vehicle.
- The internal finish of the vehicle should allow it to be steam-cleaned and internal angles should be rounded to eliminate sharp edges to permit more thorough cleaning and prevent damage to waste containers.
- The vehicle should be marked with the name and address of the waste carrier.
- An international hazard sign should be displayed on the vehicle and containers, as well as an emergency telephone number.
- The driver should be provided with details of the waste being carried.

An example of a specially designed vehicle used for transporting health-care waste is shown in Figure 7.14. Vehicles or containers used for transporting health-care waste should not be used for transporting any other material. Vehicles should be kept locked at all times, except when loading and unloading, and kept properly maintained. Articulated or demountable trailers (temperature-controlled if required) are particularly suitable, because they can easily be left at the site of waste production. Other systems may be used, such as specially designed large, closed containers or skips. Open-topped skips or containers are unsuitable because they fail to isolate waste from the general public during transportation, and should not be used for health-care waste.

Where the use of a dedicated vehicle cannot be justified, a bulk container that can be lifted onto a vehicle chassis may be considered. The container may be used for storage at the health-care facility and replaced with an empty one when collected. Refrigerated containers could be used if the storage time exceeds the recommended limits described previously, or if transportation times are long. The same safety measures should apply to the collection of hazardous health-care waste from scattered small sources, such as clinics and general practice surgeries.

Figure 7.14 Example of a vehicle used for transporting health-care waste in the United Kingdom

1.6.4 Cleaning of container and vehicle

Vehicles and transporting containers used for the transportation of waste should be cleaned and disinfected daily after use. Mechanical cleaning, combined with soaps and detergents, which act as solubility promoting agents, can be used. Cleaning and disinfection have to be carried out in a standardized manner or by automated means that will guarantee an adequate level of cleanliness. A standard operating procedure for cleaning should be prepared and explained to cleaning staff. In addition, a schedule for preventive maintenance should be set up for all equipment and vehicles used in the transportation process.

Appendix C

Laws and Regulations of Medical Waste in Libya

Responsibilities

(Item 4)

1. Responsibilities of the health facility director toward medical waste (the waste producer):-

1. Supervise the preparation of a Integrated plan to manage medical waste within the health facility and its attachments.
2. Supervise the perpetration of a training and development training program to rehabilitate and train the employees on how to handle medical waste within the medical facility.
3. Provide protection methods for working personal according to specific standards.
4. Establishing a unit within the organizational Structure of the health facility which assigned to manage the medical waste within the health facility by deciding and giving responsibilities and selecting the personnel in writing where this unit will be responsible on establishing general plan for the health institute, the director of health facility shall specify the duties of all employees at the health institute from medical and non medical staff.
5. Assign a responsible employee on this until to control the medical waste handling, his duties contains a direct supervising on all cleaning employees at the facility and to also watch medical waste collection, classification, and Disposal of medical waste by according with the other specialties at the health facility of technical, and medical staff and others.
6. Develop and upgrade the general plans for the disposal of medical waste.
7. Working on providing enough budget and financial cover to success the medical waste program.
8. Control the general plan and the executed procedures by the medical waste management and its Effectiveness and success in order to avoid mistakes and to find out the defect and fix it to develop and improve the program in the future.
9. Following up with the training program for the employees working at the medical waste management, and select the qualified individuals to give that programs.
10. Must notify the Environment Public Authority when any emergency occurred.

2- The medical waste management unit and its responsibilities within the health facility:

2.1 tasks related to the medical waste unit advisor:

1. To be the direct in charge on the classification, collection, transporting, disposing the medical waste (waste management) and direct supervising the cleaning staff within the health facility.
2. To be in a direct contact with all medical and nonmedical staff.
3. He shall be allowed to seek advises and use a control specialist to manage the Infection, and pharmacy specialist, and x-ray specialist to coordinate with the regarding the Proper procedures shall be followed when transporting and disposing the medical waste of all kind, chemical, Contagious, Pharmaceutical, and Radioactive.
4. To be the direct responsible for the director of health facility in managing the medical waste specially for the following:

A. for waste collection:

1. Organize the method of collecting the waste bags and containers and transporting it to the collection progress every day.
2. Supply the staff with the required materials for the waste collection, for example:- garbage bags, containers specified for sharp waste and other material used for cleaning and floor Sterilizing and uniforms for the staff personal protection, he shall be in direct contact with the supplies unit at the medical facility to provide the previously mentioned materials.
3. Direct supervise on the method of transporting the waste from the temporary collection points and out of the medical facility and coordinate with the cleaning company which is assigned to transport the waste to the safe disposal location according to the standards and environment regulations.

B. waste storage

Guaranteeing the safe use and collection at the health facility by providing an easy access to the cleaning staff and transporting the waste, and at the same time, collecting point must be closed and hard to reach by visitors and passers, and selecting various collecting points separately for medical and non medical waste and banding the disposal of medical waste without a supervisor.

C. regarding waste disposal

1. Coordinate and control and the medical disposal process and the medical facility.

2. Control the methods used for transporting the medical waste to the safe disposal location including watching the vehicles used for that and its validity and safety on the environment.
3. Guarantee the storage period at the phased collection in order to prevent medical waste accumulation, and to work with the local authorities or contracted cleaning companies.

D. Waste sorting

1. Coordinate with the director of health facility and managements of medical and administrational affairs to guarantee the understanding of the working medical staff toward their responsibilities to sort and classify the medical waste when produced at the departments and to guarantee separating the medical waste from the normal garbage at the health facility. And the duties of the cleaning staff are to collect this medical waste not sort it, and also to build knowledge for the allowed period to store these wastes.
2. Assure that the cleaning staff is not involved in any way in the process of sorting this waste and their duties are limited to medical waste collection only. To prevent the accidents related to the lack of knowledge in dealing with these medical wastes.

E. in case of emergency

1. Take all necessary precaution to deal with the waste of accident and emergency departments considering that its contagious and dangerous material.
2. Assuring the providing of materials used to prevent damages in case of emergency like the leaking of contagious liquids or chemical or radioactive waste.
3. Assuring the knowledge of the cleaning staff regarding the safe methods used to handle these dangerous materials when cleaning it, and following up and investigating the reasons of these accidents to prevent it from happening in future.

Separating the medical waste

(Item 5)

- Separation is the effective management for medical wastes because it guarantees the method of safe disposal has been used and the staff safety was in consideration, and the environment damage was limited to its maximum level and the recycling procedures uses the minimum amount of materials.

- The Producer parties shall separate the medical waste and collect it according to the followed methods for treatment or disposal, and it must be close to the point of producing and this separation must be executed by the person who cause this waste like the nurse, doctor, which must be separated according to the type of wastes mentioned in this list.
- All the waste producers must follow the standards and warnings used according to the authorized procedures for waste management.
- The separation process must be applied in all around the country, and shall be executed from the point of producing point and through the level of waste flow until the final disposal.
- All the separated wastes must be collected In "easy to identify containers" to guarantee the easiness of identifying it.

(Item 6)

To guarantee and prevent the risk there must be classification system to allocate and assign a name for each container and code it according to the following table:

Type of waste	Color of bags and containers	Type of container
Contagious medical waste	Red color + warning signs	Plastic Bags or Airtight Non-Leaked containers and can be possibly Sterilized via steam
Other Contagious medical waste like human flesh or parts	Red or yellow color	Plastic bags or Airtight containers
Sharp waste	Red or yellow color and warning signs	Airtight Reinforced Plastic containers
Chemical and Pharmaceutical waste	Brown color	Plastic Bags or Airtight Non-Leaked containers

Radiant waste	---	Plastic Bags or Airtight Non-Leaked containers
Non medical waste	Black	Plastic bags
cytotoxic waste	Purple color	Plastic Bags or Airtight Non-Leaked containers

Item (7)

A- Collection bags must be as the following:

1. Manufactured from non Halogen materials.
2. Anti leaking.
3. Combustible
4. Non-perforated bags
5. Non liquid leaking.
6. Can be sterilized with steam

B- Separation container requirement:

1. From solid plastic
2. Non leaking container
3. Non-perforated
4. Airtight

Item (8)

- The person produce waste must assure that the waste bags are Three-quarters full only.
- The products must be provided according to the type of waste and according to the place of producing this type of wastes.

Item (9)

- All information must be written on the containers (bags or containers) includes the waste type, date of manufacturing, weight, and producing department.

Collecting and storage of medical waste

(Item 10)

- All responsibilities of this waste are the responsibility of the producer of this waste.
- The waste must be collected daily according to the number of patient and nature of work in each department and to be transported to the partial stage collection point.
- No bags shall be allowed without the international sign which shows the type of waste and place of producing.
- After collecting medical waste from all departments it shall be collected at the storage point until the final disposal process.

The Requirements which shall be available at the partial collection location.

(Item 11)

A- The following conditions must be available at the partial collection location.

1. The space size must be convenience for the size of waste produced at the location.
2. The storage point must be separated and far from the supplies storages and food preparation location.
3. Easy access to the cleaning staff at the facility.
4. Must have hard floor, easy to clean and sterilize, and shall have water resource and sewage system.
5. Must be closed and non authorized personals shall be banned from entering the location.
6. To have easy access for the waste transport vehicles to remove the waste to the disposal areas.
7. Assuring no access for birds and animals or bugs to reach the collection point location.
8. Must have good lighting and ventilation.
9. Must be close to the room contains cleaning materials.
10. Must be known as storage collection points for dangerous and contagious waste materials by placing the required international signs.
11. Only medical waste shall be stored at this storage point.
12. The floors and walls must be sterilized and cleaned regularly.
13. Must cooperate with the specialists at the community health and contagious specialist at the health facility for the best methods of cleaning and sterilizing.

B- Unless cool rooms are provided for the storage collection point, then the storage period must be as the following:-

In mild weather:

- Maximum of 72 hours in winter
- Maximum 48 hours in summer

In warm weather:

- Maximum of 48 hours in winter
- Maximum 48 hours in summer

C- When storing radioactive waste it shall be treated according to the methods mentioned in Implementing Regulations for law No. (2) Related to radioactive waste.

Transportation of medical waste

Item (12)

The responsibilities of transporting the medical waste are related to the producer of this waste if the final treatment and disposal are executed outside of the medical facility.

1. Must use all the conditions and regulations used according to the implemented regulations mentioned above for the type of bags and containers used when transporting this medical waste, and to take all necessary procedures for each type of medical waste.
2. The company or party assigned to transport the medical waste must be an authorized and registered at the related authorities of the country to entitle it legally to handle and transport this waste.
3. Shall not allow any party to handle and transport the dangerous medical waste unless is licensed from the Environment Public Authorities.
4. Must pay attention and care for the staff and individuals involved in medical waste handling and transporting.

(Item 13)

All waste transportation must be accompanied with shipping card from the partial collection point and until the final disposal, the transporting party must complete this card and keep a copy and bring the original back to the party produced this medical waste according to Appendix (A) of this list.

The conditions must be provided in the medical waste transportation vehicle.

(Item 14)

A- The conditions required in medical waste transportation vehicles <u>inside the medical facility.</u>

1. The material used to manufacture the vehicle must be made of Erosion resistant materials to be able to handle chemical and cleaning materials.
2. Must have easy access to load and offload.
3. Must not contain any sharp objects on the sides or corners in order to prevent tearing the plastic bags when transported.
4. Must be easy to clean and sterilize.
5. All the vehicles must be kept in a safe designated location until needed.
6. The vehicle must be cleaned regularly to prevent the smell from spreading and must be cleaned immediately in the event of leaking or accident.
7. The vehicle must contain clear and visible warning signs.

B- The conditions required in types of vehicles used for <u>external transportation</u> of medical waste.

1. Must be if enough space to prevent stacking up the medical waste inside the medical facility.
2. Must be anti-leaking.
3. Must not be Compressive.
4. Must be supplied with protection devices for the staff safety.
5. Shall be cold vehicle when needed.
6. Must contain all international signs.

Processing the medical waste

(Item 15)

Each health facility must take the necessary actions to guarantee the minimum producing of medical waste within the facility as must as possible.

(Item 16)

If required, reusing or recycling some of the medical wastes via specialized parties to assure the safety of this recycling or reuse.

(Item 17)

Must Neutralizing the dangerous medical waste and convert it to safe wastes before the final disposal when possible using of the following methods.

A. Dry heat sterilization

B. Autoclave

C. Chemical sterilization

Article (18)

Waste management decision shall be made taking into consideration the following guidelines:

A. Type and nature of generated wastes.
B. Waste hazard level.
C. Waste management efficiency.
D. Operational conditions for waste management in compliance with occupational safety procedures.

Article (19)

Management techniques shall be subject to careful inspection and equipped with surveillance, measurement and documentation equipments.

Article (20)

Incinerators used to dispose of medical wastes shall have the below detailed requirements, and in accordance with emission standards listed in schedule (b) attached hereto.

Requirements of Incinerators used to dispose of medical wastes:

1. Incinerators Temperature shall be adequate for the wastes quality.
a) For pharmaceutical wastes, temperature shall be not be less than (1200 Celsius) so to avoid toxic vapors emission.
b) For pathological infectious wastes, temperature shall be not be less than (850 Celsius).
2. Incinerators shall have an adequate capacity.
3. Incinerators shall be equipped with necessary tools to reduce emission.
4. Incinerators shall be equipped with surveillance and control equipments.
5. Incinerators shall be equipped with ash transfer automated system to be finally disposed to avoid environmental impact.
6. The last option shall have the ability for final disposal.

Article (21)

Medical wastes dumping shall be made in accordance with the following "safe dumping' standards:

1. Dumping site isolation to avoid any pollution for the soil and ground water.
2. Setting up an assembly system for infiltrating materials to be treated by an environmentally friendly techniques.
3. Setting up an assembly system for released gases to be treated by an environmentally friendly techniques.
4. Covering the site daily and finally.

5. Setting up a surveillance and control system.

Article (22)

Response to Emergencies

A. Waste Management Unit personnel shall be trained on how they respond in emergency situations and inform immediately about any accident.
B. For appropriate emergency response, the following shall be taken into consideration:
1) Staff shall be trained on how they respond in such emergency situations and accidents.
2) Emergency equipments shall be provided to deal with these situations.
3) Emergency response training for any accident to them in the future.
C. Infections and hazardous spills are among the most emergencies in medical facilities which requires the application of emergency response procedures to deals with any spills as per paragraph (C).
D. Every medical facility shall have guideline on how to deal with emergency situations.

Article (23)

Training

Medical facility administration shall have a training plan for their personnel, each one according to his/her duties in dealing with medical wastes, which shall include the following:

1. Identification of wastes types and its risks.
2. Medical wastes sorting operations.
3. Medical wastes assembly, sorting, transport, treatment and disposal.
4. Occupational safety and health procedures.

These training courses shall be implemented periodically within an acceptable timeframe and to be updated accordingly.

Article (24)

Training courses for trainers and supervisors in Medical Wastes Management shall be approved the General Board of Environment.

Article (25)

Medical facilities shall be educated and motivated to obtain the environmental management system certificate (ISO 14001).

Article (26)

Medical facility administration shall prepare educational leaflets and pamphlets showing the medical wastes management to help raise the awareness of medical staff and the public (visitors)

Schedule (A) medical wastes shipping note

<table>
<tr><td>Supervising entity name:</td><td>Serial number:</td></tr>
<tr><td>Address and phone of Supervising entity</td><td></td></tr>
<tr><td>A. Product certificate</td><td>(1) materials listed in B to be collected by: …..
(2) to be sent to……………
Signature…………………name………………..
On behalf of……………………..title…………..
Address……………………….phone………………
Date………expected date for collection ……</td></tr>
<tr><td>B. Wastes description</td><td>1. General description & physical nature of wastes
2. Chemical and biological compounds and their concentrations
3. Wastes quantity, size and number containers
4. Processes that made these wastes</td></tr>
<tr><td>C. Wastes transport certificate</td><td>I certify that I collected the wastes shipment and that the information listed in A, 2, 1 & B, 3, 1 are true and subject to the amendment detailed below:
I collected this shipment on (day)……time……….
Signature…………………name……date……
On behalf of………………..vehicle No……..
Address……………………….phone………………</td></tr>
<tr><td>D. Wastes products certificate</td><td>I certify that the information listed in B, C are true and the transporter has been instructed about the safe handling procedures</td></tr>
</table>

	Signature…………..name…… phone…………… Date…..
E. Wastes disposal handling certificate	I certify that the Wastes disposal handling certificate No……………..issued by………… (name of issuing entity) authorizes this facility to process and handle the wastes listed in B (as may be amended in C) Name and address of facility ……………………………… These wastes is delivered to Vehicle No………..time……….day…………date……. Transporter name………… ………….. On behalf of……………………..he has been instructed to carry the wastes to………….. Signature…………………name……job…… Date:………………

Schedule (C)

General guidelines for spills cleaning procedures:

1. Contaminated area shall be vacated
2. Contamination or infection shall be removed immediately from affected persons.
3. Notify the unit responsible for medical wastes management in the medical facility.
4. Identify the spill nature.
5. Evacuating all staff who are not involved in the cleaning process in case the contamination was serious.
6. Provide protective clothes for people involved in the cleaning process.
7. Provide first aid and medical care for injured people.
8. Secure the area to avoid more accidents.
9. Limiting the spill spread.
10. Control the spill and collecting the contaminated materials, sharp objects shall not be picked by special tools and not by hands, contaminated materials shall be placed in appropriate bags and containers.
11. Drying and disinfecting the contaminated area and equipments used.
12. Remove protective clothes and disinfecting them afterwards.

13. Seek medical care in case of exposure to serious materials during management.

Form for Spills cleaning requirements

Procedure	Tools or requirements
Approaching spills	Protective equipments
Spills containing	Using absorbing material (sponges, towels and gauze)
Neutralizing or disinfecting spills	For infectious materials: antiseptic
Hard material: forceps, brooms or garbage containers	Acids: sodium or calcium carbonate or any other alkaline
	For toxic cellular materials: chemical analysis
	For alkaline: citric acid powder or any other acid
Spills collection	For liquids: sponges, gauze, wood sawdust, calcium bentonite or river alga sands
	For solid materials: forceps, brooms and garbage container
Containing for disposal	Mercury: sponges or suction device
	Plastic bag (red – yellow or brown) and sharp objects container
Area disinfection	For infectious materials: antiseptic (A) For dangerous chemicals: appropriate solvent or water

Schedule (B) emission standards for public health facilities - incinerators

Emission	Maximum mg / m^3	Duration
Remaining materials	10 30	Daily 30 minutes
Organic materials	10 20	Daily 30 minutes
Hydraulic acid	10 60	Daily 30 minutes
Hydrofluoric acid	20 40	Daily 30 minutes
Sulfur dioxide	300 50	Daily 30 minutes
Nitrogen oxides	200	Daily
Carbon monoxide	100	Daily
Dioxins and furans	0.1 nanogram / m^3	8 hours max
Heavy metals		
Cadmium compounds	0.1	8 hours max
Thallium compounds	0.1	8 hours max
Mercury compounds	0.1	8 hours max
Antimony compounds	0.1	8 hours max
Arsenic compounds	0.1	8 hours max
Lead compounds	0.1	8 hours max
Chrome compounds	0.1	8 hours max
Cobalt compounds	0.1	8 hours max
Copper compounds	0.1	8 hours max

Manganese compounds	0.1	8 hours max
Nickel compounds	0.1	8 hours max
Vanadium compounds	0.1	8 hours max
Tin compounds	0.1	8 hours max
Overall Heavy metals	0.5	8 hours max

Appendix D

Decision on PhD Proposal Defense by the Panel Reviewers' Committee

UUM
Universiti Utara Malaysia

School of Technology Management and Logistics (STML)
UUM College of Business
Universiti Utara Malaysia
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'KEDAH AMAN MAKMUR·BERSAMA MEMACU TRANSFORMASI'

Ref.No :UUM/COB/STML/A-3
Date :19 October 2014

Mohammed Khalifa Abdelsalam Mohammed (95361)
No 28-7-3A Desa Airmas
Sungai Dua 11700
Gelugor,Pulau Pinang.

Dear Mr,

PROPOSAL DEFENCE Ph.D(Technology,Operations & Logistics)

We refer to your proposal defence presentation on 15 October 2014. Based on your presentation, the Panel Reviewer Committee has decided that :

1. You are given the status of **Pass with minor revision**.
2. You may now proceed with the data collection. Attached herewith is the feedback from the Panel Reviewer Committee for your further action.

Congratulations and we wish you all the best in pursuing your Ph.D.

Thank you.

"ILMU BUDI BAKTI"

Yours sincerely,

ASSOC.PROF.DR.ZULKIFLI MOHAMED UDIN
Dean
School of Technology Management & Logistics
College of Business
Universiti Utara Malaysia

Appendix E

List of Publications

1. Abdelsalam, M. K, Bahaudin, A. Y., Kamaruddeen, A. M. (2016). The Influence of Organizational Factors on Medical Waste Management Ppractices among Libyan hospitals. International Journal of Current Research ,8(05), 30599-30608.