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# An investigation of the factors associated with needlestick injuries in two county referral hospitals in Nairobi

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**AN INVESTIGATION OF THE FACTORS ASSOCIATED WITH  
NEEDLESTICK INJURIES IN TWO COUNTY REFERRAL HOSPITALS IN  
NAIROBI**

**FLORENCE AKINYI ACHUNGO**

**SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR  
THE DEGREE OF MASTERS OF BUSINESS ADMINISTRATION IN HEALTH  
CARE MANAGEMENT AT STRATHMORE UNIVERSITY**

**STRATHMORE BUSINESS SCHOOL, INSTITUTE OF HEALTH CARE  
MANAGEMENT  
STRATHMORE UNIVERSITY  
NAIROBI, KENYA**



**APRIL, 2016**

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Florence Akinyi Achungo

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Date:.....

**Approval**

The thesis of Florence Akinyi Achungo was reviewed and approved for examination by the following

Dr Angela Ndunge

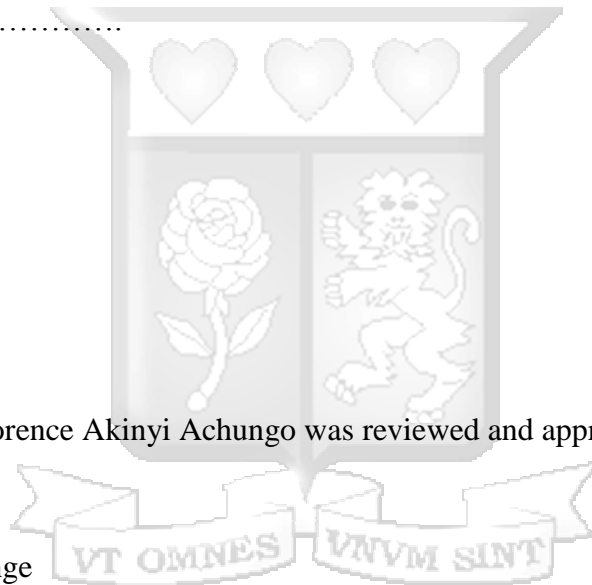
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## **ABSTRACT**

The health care working environment carries with it a considerable risk of occupational hazards. These hazards include biological, physical, chemical, radiation and psychological hazards. Biological hazards is the most prevalent type of hazard within the health care work environment, with needle stick injury being the most prevalent type of biological hazard.

The aim of this study was to investigate the factors causing needle stick injuries in county referral hospitals in Nairobi City County in order to recommend strategies for reducing the injuries. Based on the accident/incident theory, the study investigated the two main categories of causal factors, that is, system failures and human errors, and their association with occurrence of needle stick injuries among health workers in Nairobi.

The study was carried out in the casualty, surgical and pediatric departments of two county referral hospitals in Nairobi. A sample of 140 health care workers was drawn from staff working in these departments. Structured questionnaires were used to collect data from the health care workers.

Descriptive analysis of the data was performed using SPSS. Descriptive analysis revealed that a more than 50% of the health care workers associated the occurrence of needle stick injuries incurred through work pressure and fatigue, and which resulted to human errors.

The study concluded that pressure of work and fatigue were the leading factors associated with needles stick injuries among health care workers in Nairobi County.

The study recommends that hospital management should evaluate ways of relieving health worker pressure and stress in order to reduce occurrence of needle stick accidents. Further studies to establish the presence of system failures within the hospitals is also recommended. Since ordinal test of correlation was not performed on the results of this study, these findings may not be generalizable to other health facilities of similar status.

**Key words:** Needle-stick injury, human errors, system failures

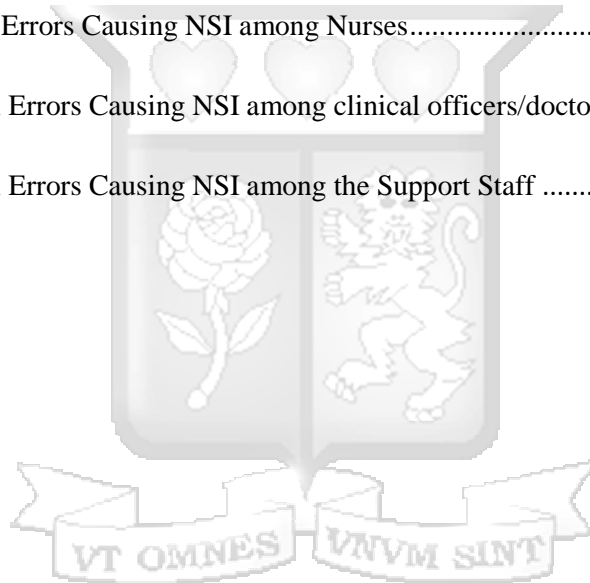
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## ABBREVIATIONS

<b>CHD</b>	Coronary Heart Disease
<b>EHV</b>	Ebola Hemorrhagic Virus
<b>HBV</b>	Hepatitis B Virus
<b>HCV</b>	Hepatitis C Virus
<b>HIV</b>	Human Immunodeficiency Virus
<b>ILO</b>	International Labor Organization
<b>MOH</b>	Ministry of Health
<b>NSI</b>	Needle Stick Injuries
<b>OSH</b>	Occupational safety and health
<b>OSHA</b>	Occupational Safety and Health Act
<b>WHO</b>	World Health Organization

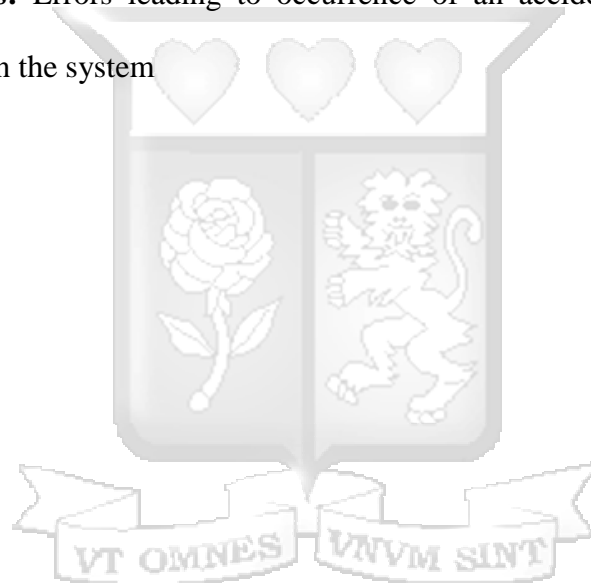
## DEFINITION OF TERMS

**Occupational hazard:** Any condition related to a job that can result in illness or injury

**Human errors:** Errors leading to occurrence of an accident and can be traced to an individual

**Needle stick injury:** An accidental penetrating stab from a needle that may result in the health care worker being exposed to blood or other body fluids

**System failures:** Errors leading to occurrence of an accident and can be traced to insufficiencies in the system



## **CHAPTER ONE: INTRODUCTION**

### **1.0 Introduction**

The theme of this study is occupational safety in the healthcare work environment. The study focused on needle stick accidents, which leads to needle stick injuries to the health care workers. This chapter gives background information on occupational hazards in the health care environment, definition the problem that the study sought to address, outline research objectives, questions, scope and significance.

### **1.1 Background of the Study**

Working environment is an important determinant of health. While studies have suggested that having a job is better for health than not having a job, it has further been stated that the social organization of work, management styles, and social relationships in the workplace all matter for health (Wilkinson & Marmot, 2003). Consequently, physical as well as psychosocial environment at the work place has significant ramifications on the overall well-being of the health care worker.

Physical environment, for instance, can increase the risk of long term illness. Factors such as uncomfortable working positions, lifting or carrying loads, and pushing or pulling loads have been shown to increase the risk of onset of long term sickness (Lund et al, 2006). In addition, there are psychosocial factors associated with job demands. Studies demonstrate that increasing workloads, job insecurity and pressure to perform currently contribute to individuals working longer hours than previous times (Sparks et al, 1997) although this varies from place to place. For instance, people are increasingly working over 40 hours a week in North America, the French have implemented a moderate working schedule of 35-hour working week while workers in India and other up-and-coming nations are ready to work a 35-hour day (Hayden, 2006).

Several health conditions have been associated with stresses of the work environment. Indeed, several aspects of work such as job strain, low decision latitude, low social support, high psychological demands, effort reward imbalance, and high job insecurity have been deemed predictive of common mental disorders (Stansfeld, Candy, 2006). Furthermore, some studies have suggested that work stress increases the risks for coronary heart disease (CHD) by 50% (Kivimaki et al, 2006).

The health care environment is no exception when it comes to occupational risks and hazards. Major categories of risks in the health care environment include biological, musculoskeletal, psychological and chemical risks (European Commission, 2010). Biological hazards refer to organisms or organic matters produced by these organisms that are harmful to human health and include parasites, viruses, bacteria, fungi and protein (Occupational Safety and Health Council, 2016). Numerous organisms have been identified as posing occupational risks to health care workers including blood borne organisms (human immunodeficiency virus, hepatitis B virus, hepatitis C virus, Ebola virus), organisms spread through the oral-fecal route (salmonella, hepatitis A virus), and organisms spread through direct contact (herpes simplex virus, *Sarcoptes scabiei*) (Sepkowitz, 1996). Most of these diseases are associated with outbreaks, during which the transmission rates range from 15% to 40% (Sepkowitz, 1996).

Musculoskeletal disorders are mainly associated with the physical working conditions. They include disorders that are associated with excessive back and shoulder loading due to manual patient handling, applying excessive forces during pushing and/or pulling of objects, required use of awkward postures during patient care, working long hours and shiftwork (Waters et al, 2006) and slip/fall (Ngan et al, 2010). Musculoskeletal occupational disorders in health care mostly affect those workers that are involved in direct patient care such as registered nurses, support service workers and care aides (Ngan et al, 2010).

Another type of occupational hazard faced by health care workers in the course of their work is psychological hazard. Identified psychological hazards in healthcare include discrimination, technological changes, malfunctioning equipment, tight work schedules, downsizing, overwork, understaffing, paperwork, increased facility size and bureaucracy, violence, dependent and demanding patients, and patient deaths (Healthcare Hazards, 2002). Consequently, these factors contribute to stress, fatigue, anger, frustration and the feeling of being isolated and powerless. Health care workers most likely to encounter severe stress are those who work in intensive care units, burn units, emergency rooms and operating rooms (Healthcare Hazards, 2002).

In addition, health care workers are also exposed to various chemical hazards as well as radiation. The chemical hazards include sterilants such as ethylene oxide, formaldehyde and glutaraldehyde, hazardous drugs like the antineoplastic drugs and materials that cause allergic reactions like latex (Occupational Safety and Health Administration, 2016).

These risks make the health care work environment quite hazardous. In order to improve safety, effective preventive measures need to be explored and instituted. This study focuses on biological hazards, and specifically, needle stick accidents, which remain a significant cause of injury in the health care work environment (Occupational Safety and Health Administration, 2016).

### **1.2 Statement of the Problem**

Needle stick injury is the leading type of biological hazard within the health care environment. A study by Wicker et al demonstrated that 31.4% of health care workers in a German University hospital sustained at least one needle-stick injury in twelve months (Wicker, Jung, Allwinn et al, 2008). Earlier on, McCormick & Maki (1981) studied the epidemiology of needle stick injuries in hospital personnel and reported that needle stick injuries accounted for one third of all work related injuries at Pur hospital over a 47-month period from 1975 to 1979.

Locally, a few studies on prevalence of needle stick injuries are available, and the results are varied. For instance, in one study conducted to establish prevalence and factors associated with percutaneous injuries and splash exposures among health care workers in the Rift Valley provincial hospital, it was demonstrated that 25% of health care workers in the hospital had been exposed to blood and body fluids in the preceding 12 months while 19% of the health care workers had been exposed through needle stick injuries (Mbaisi et al, 2013). Another study carried out among dental students at the University of Nairobi established a prevalence of 29% NSI among the respondents (Mungure et al, 2010).

From the researcher's own experience, having worked in a busy maternity hospital in Nairobi, more than 50% of all the nurses and doctors working in labor ward and surgical unit sustained at least one needle stick injury within twelve months.

Needle stick accidents predispose health care workers to infection with blood borne diseases. Literature reports that at least 20 disease causing agents, including hepatitis B virus (HBV), the human immunodeficiency virus (HIV), hepatitis C virus (HCV) have been transmitted through needle stick injuries (Berry & Greene, 1992). According to literature reports (Gunther et al, 2011), one of the mechanisms of transmission of the lethal ebola haemorrhagic virus (EBV) is through needle stick injuries. Besides transmission of infections that can cause severe illness or death (Sepkowitz, 1996), needle stick injuries induce psychological stress and anxiety in affected individuals, especially if the concerned patients are known to have chronic viral infections (Stim et al, 2014). Thus needle stick injuries may lead to loss of highly productive health care workers, incapacitation and demotivation of health care workers, and economic losses to health care organizations as well as affected individual's family.

The impact of needle stick injuries is significant, and effort needs to be put in instituting preventive strategies. In order to do this, a causal factors need to be investigated. This study has adopted the view that a needle stick injury results from occupational accident, and analysis of causes has been done in the context of occupational safety.

In the theories of accident causation, the accident/incident theory divides accident causes into two broad categories; system failures and human errors (Goetsch, 2013). Vincoli (2014), defines human errors as the end result of multiple factors which influence human performance in a given situation. He further mentions that human errors are caused by human factors; that is, underlying circumstances or conditions which directly or indirectly, affect human performance. Some examples of human factors are given as fatigue and pressure (overload factors), incompatible work station, misjudgment (Goetsch, 2013).

System failure, on the other hand, is defined as a situation in which a system does not function as initially intended (Vincoli, 2014). Examples of system failures are given as

inadequacy in policy, failure to assign responsibility and failures in addressing training needs, inspection, correction and establishment of standards (Goetsch, 2013).

Causes of needle stick accidents generally fall into the two categories above. For instance, Muralidhar et al (2010), studied needle stick injuries among health care workers in a tertiary hospital in India, and established that health care workers engaged in practices that predisposed them to needle stick accidents. They concluded that there was a direct correlation between occurrence of needle stick injuries and ignorance and apathy among the health care workers. In this case, ignorance and apathy can be addressed by training and motivation, and lack of them, therefore, indicates system failure.

In an earlier study, Jagger et al (2008) established that design of the needle, together with clinical practices such as recapping after use, were associated with a high incidence of needle stick injuries among the health care workers. This illustrates human error in the design of the needles, leading to accidents. Although the prevalence, the impact and the causal factors of needle stick injuries have been examined in many studies, preventive measures have remained largely ineffective, and prevalence remains high year after year. It is the role of management to figure out an effective way of reducing needle stick accidents by instituting measures that reduce system failures as well as human errors.

In order to reduce the prevalence of needle stick injuries among health care workers, specific causes must be addressed. The aim of this study is to investigate the causes of needle stick injuries among health care workers in the two county referral hospitals and consequently recommend strategies that can be used to address the causal factors.

### **1.3 Research Objectives**

- i. To assess the systemic failures associated with occurrence of needle stick injuries
- ii. To determine the human errors associated with occurrence of needle stick injuries
- iii. To make recommendations of strategies to reduce occurrence of needle stick injuries based on study results

#### **1.4 Research Questions**

The research aimed to answer the following questions:

- i. What systemic failures are associated with needle stick injuries in county referral hospitals in Nairobi?
- ii. What human errors are associated with occurrence of needle stick injuries in county referral hospitals in Nairobi?
- iii. What strategies can be used to reduce the incidence of needle stick injuries in county referral hospitals in Nairobi?

#### **1.5 Scope of the Study**

The study was carried out in two county referral hospitals in Nairobi, namely, Pumwani Maternity Hospital and the Mbagathi District Hospital. The target population was staff who have had needle stick injuries and who work in the departments of surgery, pediatrics and the emergency unit.

#### **1.6 Significance of the Study**

The study provided information that could be used by the health sector to target interventions at specific causal factors, thereby reducing the cost of interventions in prevention of needle stick injuries.

Targeted interventions may eventually lead to reduction in the incidence of needle stick injuries, consequently improving productivity of the health care worker by alleviating anxiety, morbidity and mortality associated with needle stick injuries.

Needle stick injuries are associated with transmission of diseases and psychological trauma. This places a financial burden on the health system as the cost of treating or compensating affected individuals is often very high. Information generated from this study would provide useful lead in reducing these costs.

This study was also important to future research in that it considered a wider scope by covering more than one hospital. Most studies in Kenya are usually carried out in one

hospital thus providing a narrow scope of information. Further, the results obtained from the study not only added to the existing pool of knowledge about needle stick injuries but can also be used to generate hypotheses for future research.



## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

Adopting the perspective that needle stick accidents are occupational accidents that occur within the health care work environment, literature review focused on the theories of accident causation and their applicability to the health care work environment. Further, a review of literature providing empirical evidence on various causes of needle stick accidents within health care was presented. Finally, gaps in research in, especially, the local environment, were identified and outlined.

### **2.2 Theoretical Framework**

#### **2.2.1 Accident Causation Theories**

Research data suggests that knowledge of how accident happens has an impact on the intervention strategies (Shealy, 1979). Consequently, several theoretical accident causation models have been developed to show relationships between causes and effects in accident occurrences. These models explain why accidents occur, and are used as techniques for risk assessment, during system development, and for post-accident analysis to study the causes and the occurrence of an accident and further measures to control the accident (Harvey, 1984).

Theories of accident causation include industrial Heinrich's domino theorems, multiple causation theory, the human factors theory, accident/incident, epidemiological, combination and behavioral theories and the industrial revolution theory. Other accident causation factors include drugs, depression, management failures and obesity. Heinrich's domino theorem states that the occurrence of a preventable injury is the natural culmination of a series of events or circumstances which invariably, occur in a fixed or logical order, and that an accident is merely a link in the chain (Models of Causation: Safety, 2012). According to Domino theory, removing a key factor, such as unsafe working conditions or unsafe acts, prevents the start of the chain (Harvey, 1984).

Contrary to the Domino theory which traces an injury and accident to a single causal factor, the multiple causation theory states that there may be more than one cause of an accident, not only occurring in sequence, but can occur at the same time leading to the accident (Harvey, 1984).

In the system's theory model, any situation in which an accident might occur is viewed as a system with three components; person (host), machine (agency) and environment (Pearson Education, 2010).

The human factors theory, on the other hand, attributes accidents to a chain of events ultimately caused by human error. According to this theory, three main factors that lead to human error include overload, defined as an imbalance between a person's capacity at any given time, inappropriate response, which refers to situational responses that lead to accidents and finally inappropriate activities, which refers to activities that if undertaken by the individual can lead to accidents.

Epidemiological theory attempts view causes of accidents from a broader perspective by considering the issues of industrial hygiene, that is, environmental factors that can lead to impaired health.

This study is based on the accident/incident theory, which states that accidents are a consequence of human error as well as system failure (Goetsch, 2013). The choice of this theory was informed by the findings by Tamuz and Harrisonl (2006), which demonstrated that by applying accident theory and high reliability theory frames, health care researchers and administrators could identify health care settings in which new and existing patient interventions were likely to be effective. Further research findings have also demonstrated that accidents are caused by technical failures and human errors or organizational problems, and that the use of accident theory, among others, contribute to discourses on occupational safety management approaches (Hovden & Albrechtsen, 2010).

### **2.2.2 Accident/Incident Theory**

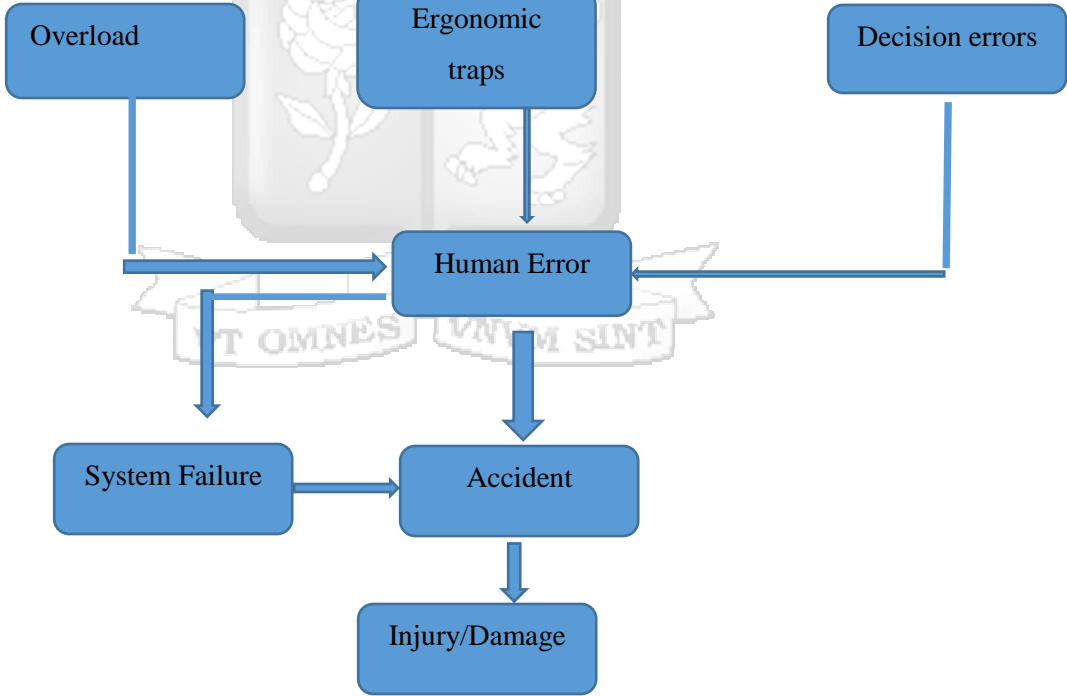
The accident/incident theory was put forward by Dan Petersen, and it states that accidents are a consequence of human error and system failures (Goetsch, 2013). Human errors include overload factors such as fatigue and pressure, ergonomic traps such as incompatible work stations and incompatible expectations, and decision to err which is a consequence of misjudgment of risk or unconscious desire to err (Goetsch, 2013).

This study focused on pressure, instrument state, fatigue, work physical environment and misjudgment as human errors. Questions were designed to evaluate the degree to which each of these factors could have contributed to occurrence of the accident.

System failure, on the other hand, is a situation in which a system does not function as initially intended (Vincoli, 2014). In accident causation theory, system failure may result from inadequacies in policy, responsibility, training, inspection, correction and standards (Goetsch, 2013).

In order to measure system failure, questions were designed to show the extent to which each systemic failure contributed to incident occurrence. Systemic failures that were considered in this study include lack of policy, failure to train health care workers, lack of standard operating procedures, lack of supervision and corrective measures.

**Petersen’s Accident/Incident Theory**



Source: Construction Safety and Health, Goetsch L David (2013)

Petersen’s accident/incident theory has been applied in several studies to investigate the cause of accidents, and to develop accident causation models for different industries and

this was a reason the researcher choose to use the model in this research. For instance, Kim & Yoon (2013) applied the model to accident causation in the railway industry, where a study of 80 rail accident investigation reports in the UK revealed that accidents were mitigated by human responses as well as responses by protective systems.

In health care, the accident/incident theory has been applied in designing strategies aimed at increasing safety in the health care environment. For instance, Miller et al (2014), observed that preventable or avoidable adverse events can often be attributed to a failure to follow recognized, evidence-based best practices or guidelines at the individual and/or system level. Based on this knowledge, the Department of Veteran Affairs (VA) National Center for Patient Safety (NCPS) have designed training modules aimed at improving patient safety. These modules are design to address human factors as well as system thinking among health care workers (Miller, 2014).

## **2.3 Empirical Evidence**

### **2.2.1 Human Errors**

#### **2.2.1.1. Fatigue**

Several studies have shown that fatigue increases the risk of accidents in an individual. For instance, in a study to describe the prevalence of needle stick injuries among health care workers in a Tertiary Care Hospital in Delhi, India, Sharma et al (2010) demonstrated that 79.5% of health care workers had had at least one needle stick injury in their career, 50.4% of whom ascribed fatigue as a cause of the needle stick accident. An earlier study by Folkard and Lombardi (2006), observed that a number of industrial accidents were attributable to fatigue and/or human error.

Long working hours predispose to fatigue and loss of concentration. Indeed, it has been observed that long working hours predispose workers to increased risk of accident and injury and recommendations that changes in scheduling practices as well as job redesign strategies could reduce accidents have been made (Dembe et al, 2004).

### **2.2.1.2. Pressure**

In addition to fatigue, performing procedures under pressure has also been shown to predispose the health care workers to accidents, one of them being a needle stick accident. In a study to examine the association between working conditions and needle stick injuries among registered nurses, Trinkoff et al (2007) established that physical demands of the job were among the key factors that were associated with increased rate of needle stick injuries. In a more or less similar study, Kakikazi et al (2011) demonstrated that health workers who administered more than 10 injections in one day had a higher risk of needle stick accident occurrence compared to those who had lower work load.

### **2.2.1.3. Ergonomic traps**

Human errors can also result from ergonomic traps. Ergonomics has been defined as the study of interactions between human, machine and/or working environment interface, and the impact of such interactions on human performance (Vincoli, 2014). Design of the work environment and equipment has been shown to have an impact on the risk of accidents. For instance, in a study to evaluate the role of flooring as a design element affecting patient and health worker safety, Harris and Detke (2013), established a direct correlation between some types of floor designs and the risk of accidents. Meanwhile, Jagger et al (1988) studied the rates of needle stick injuries caused by various devices in a University hospital and established that certain devices, especially those that required disassembly, had up to 5 times higher rates of accidents than disposable needles.

### **2.2.2 System Failures**

According to literature, system failures may result from inadequacies in policy, responsibility, training, inspection, correction and standards (Goetsch, 2013). Literature review focused on finding empirical evidence that demonstrate that these factors contribute to occurrence of needles stick injuries within the health care work environment.

### **2.2.2.1. Policies and standards**

Following the first needle-stick-transmitted HIV reported in the Lancet in 1984, it is reported that the U.S. federal government was put under pressure to develop policy guidelines aimed at improving health worker safety (Jagger et al, 2008). The report further indicates that following federal legislation requiring the use of safety-engineered sharp devices, along with an array of other protective measures, healthcare workers' (HCWs) risk of occupational exposure to bloodborne pathogens reduced substantially. The report indicates that, in one large network of U.S. hospitals using the Exposure Prevention Information Network (EPINet) sharps injury surveillance program, overall injury rates for hollow-bore needles declined by 34%, with a 51% decline for nurses. The researcher concludes that the U.S. experience demonstrated the effectiveness of safety-engineered devices in reducing sharps injuries, and the importance of national-level regulations (accompanied by active enforcement) in ensuring wide scale availability and implementation of protective devices to decrease healthcare worker risk.

### **2.2.2.2. Training**

Training has been shown to reduce the risk of accidents in the health care work environment by improving knowledge and attitude toward safety practices. In a study conducted to assess anesthesia personnel's knowledge of, attitude towards and practice to prevent NSI, it was demonstrated that although the prevalence of NSI among the anesthetists was 56.8%, only 32.2% reported their injuries (Motavaf et al, 2014). The study noted that the knowledge and prevention practices of the anesthesia personnel in relation to needles and other sharps was not satisfactory and concluded that the health care providers not only needed appropriate training on standard precautions but also needed administrative oversight in order to improve their practices (Motavaf et al, 2014).

Certain training methods have been shown to be more effective than others in enhancing safety practices among health care workers. Burke et al (2006) carried out a study on relative effectiveness of worker safety and health training methods and observed that as training methods became more engaging, workers demonstrated greater

knowledge acquisition, and reductions were seen in accidents, illnesses and injuries. They further demonstrated that all methods of training produced meaningful behavioral performance improvements and concluded that training involving behavioral modeling, a substantial amount of practice and dialogue is generally more effective than other methods of safety and health training.

### **2.2.2.3. Supervision and Correction**

It is the direct role of management to create and implement an efficient working system that eventually leads to realization of safety environment. Indeed, Yule and Flin (2007) observed that management commitment, supervisor involvement, knowledge and training are key in achieving work place safety.

In order to demonstrate management role in accident reduction, Sheena (2014) carried out a study to establish whether ward and department managers knew their responsibilities in relation to the management of sharps, and whether that was reflected in the way that they practiced sharps management. The study established that although the managers did acknowledge a high degree of responsibility overall for the prevention and management of NSIs, they did not ensure that all staff received up to date training on the safe use and disposal of sharps and not disseminate information on NSI incidences and outcomes to staff in their clinical areas. The study recommended implementation of training schedules that relate NSI prevention and management, in order to improve corporate strategic commitment to reducing NSI across the organization.

In conclusion, management has a role in sharing information (Fletcher, 2000), including updating adoption of set policies and guidelines, staffing and scheduling of duties to ensure flexibility in working hours, and in addressing health worker training needs.

## 2.4 Conceptual Framework

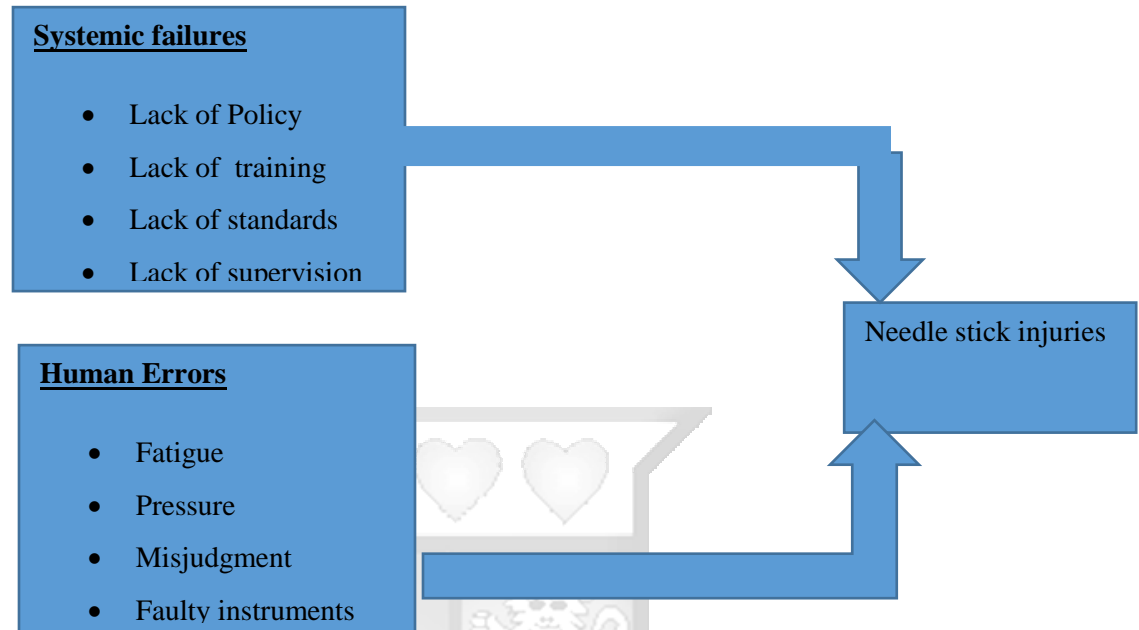


Figure 2.1: Conceptual framework (*Modified from accident/incident theory model*)

## 2.5 Gaps in Research

Although prevalence and causes of needle stick injuries has been extensively studied, and prevention strategies recommended, local data is lacking in this field. Health care emphasizes on evidence basis for clinical interventions in order to minimize the problems of overuse, underuse and misuse (Walshe & Rundall, 2001). Yet, in the local set up, the same emphasis on evidence basis for clinical practice is not placed on management practices.

From the literature review above, it is evident that causes of needle stick accidents vary from institution to institution. Knowledge of causes attributed to individual institutions would therefore be important. This study was considered important, as it was meant identify causes that are associated with needle stick accidents in the local set up, and make recommendations that are tailored to addressing these specific causal factors. The

use of two referral hospitals gives more information on the topic as compared to earlier local studies that focus on a single hospital.



## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter describes the design used by this study, the target population and the method that was used to determine the sample. It further describes the type of data that was collected and the data collection instruments that was used. Finally, it outlines how research quality was ensured, how data was presented and analyzed, and the ethical issues that were taken into consideration in the course of the study.

### **3.2 The Research Design**

The study design was a quantitative research design which is of a cross sectional type that uses descriptive statistics. The choice of design was informed by the fact that descriptive studies are known to literally describe the phenomenon of interest and observed associations in order to estimate certain population parameters (Bowling, 2002). The interest of this study was to quantitatively describe the factors that cause needle stick injuries in the two county referral hospitals, and cross sectional survey deemed appropriate. Quantitative approaches have been used in previous studies to establish the prevalence of needle stick injuries in a Rift Valley hospital (Mbaisi et al, 2013).

### **3.3 Population and Sampling**

Owing to time and financial constraints, the study was restricted to two main hospitals in Nairobi, namely Mbagathi and Pumwani Maternity hospitals. These hospitals were selected because they were the main public referral hospitals in Nairobi City County; the remaining public facilities being health centers and dispensaries.

A study by Wicker et al (2008) demonstrated that 31.4% of all health care workers have an incident of needle stick injury within 12 months, with a majority of injuries occurring in pediatric, surgical and emergency departments. Based on this study, the three departments were selected from each of the two hospitals. Only health care workers with a previous history of needle stick injury were included in the study.

### **3.4 Sample Size Determination**

Non probability sampling technique was used in this study. This method is of sampling is often used because it is much easier, cheaper and quicker when compared to probability sampling (Lund Research Ltd, 2012). A minimum sample of 51 participants per group are required for a causal/comparative study (Onwuegbuzie & Collins, 2007). Based on this, the researcher selected seventy participants with a history of needle stick injury from the casualty, surgery and pediatrics departments in each of the two hospitals. This resulted in a sample size of one hundred and forty participants from each hospital.

### **3.4 Data Collection Methods**

The instrument of data collection for this study was structured questionnaires. Structured questionnaires were preferred in this study owing to their ability to collect unambiguous and easy to count answers, leading to quantitative data for analysis (Bowling, 2002). Additionally, this instrument was preferred as it leads to ease of data collection and analysis, thus enabling collection of large amount of data within a short time. The questionnaire was structured to capture demographic data of the participant, as well as their belief on what could have been the cause of accident in their situation. A five-point Likert scale was used to enable the participant tick the response which they believed was most appropriate.

### **3.5 Data Analysis**

The study yielded ordinal quantitative data. Data analysis was mainly descriptive. Data was entered into SPSS, cleaned and analyzed. Analysis included frequency counts and conversion of frequency to percentages. First, analysis of responses for the whole population of participants was carried out. This was followed by analysis of responses for the different sub groups in order to investigate whether there were any differences between the groups.

### **3.6 Research Quality**

Three aspects of research quality, namely, validity, reliability and objectivity was considered.

### **3.6.1 Validity**

Validity is defined as the degree to which a test measures what it is supposed to measure (Key, 1997). In this study, measures were taken to ensure two main types of validity; content validity and construct validity.

Content validity refers to the degree to which the test items represent the domain or universe of the trait or property being measured (Key, 1997). In this study, the traits being measured are causes of needle stick accidents. In order to ensure that the test items represent the causes of needle stick accidents, extensive literature review has been carried out, and empirical evidence of the causes outlined. The test items are, therefore, based on findings of previous studies.

Construct validity, on the other hand, is corroboration that the instrument is measuring the underlying concept it purports to measure (Bowling, 2014). In order to ensure construct validity, multi-trait multimethod was used to test for convergence validity.

### **3.6.2 Objectivity**

In order to ensure that this paper is free from bias, critical review of different sources was conducted. This ensured that the views expressed in the paper are based on scientific facts and not the investigator's views.

### **3.7 Ethical Issues in Research**

Ethical approval was sought from the Strathmore Business School ethics committee before this research is carried out. Once authorized to conduct research, participants were informed of their rights in so far as the study was concerned. A consent form explaining details of the study was issued to the participants, and those willing to participate appended their signature as a sign of their willingness to participate in the study. No form of inducement, financial or otherwise, was provided to any of the participants.

Confidentiality of identity and participant's private details was considered during the entire process of handling of data. Finally, respect to the participants was maintained thorough out the study. Further, secondary sources of information such as journals,

books and articles were accompanied by references so as to give recognition to the source of information.



## CHAPTER FOUR: PRESENTATION OF RESEARCH FINDINGS

### 4.1 Introduction

This chapter presents the results of data collection. Firstly, it presents key demographic characteristics of the respondents who participated in the study. Secondly, it presents the results of descriptive analysis of the data obtained by the study. Finally, it presents the results of inferential analysis of the data.

### 4.2 Demographic Information

#### 4.2.1 Respondent's hospital

Data was collected from the two hospitals, Pumwani Maternity Hospital and Mbagathi County Hospital. In order to cater for non –response, seventy questionnaires were issued to each hospital, giving a total of one hundred and forty questionnaires. The response rate was as follows:

**Table 4.1: Respondents hospital**

<b>Hospital</b>	<b>Frequency</b>	<b>Percent</b>
Mbagathi	68	52.3
Pumwani maternity hospital	62	47.7
<b>Total</b>	<b>130</b>	<b>100.0</b>

Seventy questionnaires were issued to each of the two hospitals, Mbagathi and Pumwani. Mbagathi hospital returned 68 questionnaires while Pumwani returned 62, making the composition of the respondents to be 52.3% and 47.7% respectively. Ten questionnaires were not returned.

#### 4.2.2 Respondents working department

The study revealed that 71% of the respondents were from casualty, 49% from surgery and 10% from pediatrics department.

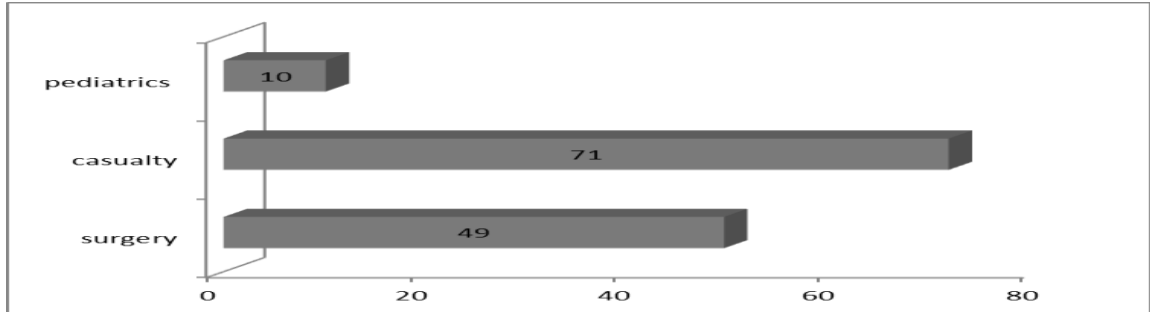


Figure 4.2: Respondents working department

#### 4.2.3 Respondents Duration in the Department

Concerning the duration of working in the department, 63% of the respondents indicated that they had worked in the department for more than 12 months while 37% of the respondent's s indicated that they had worked in the department for less than 12 months.

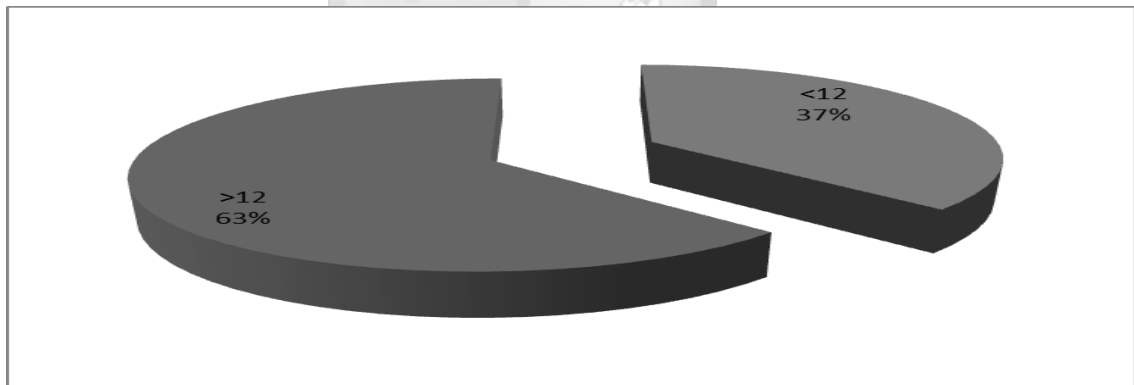
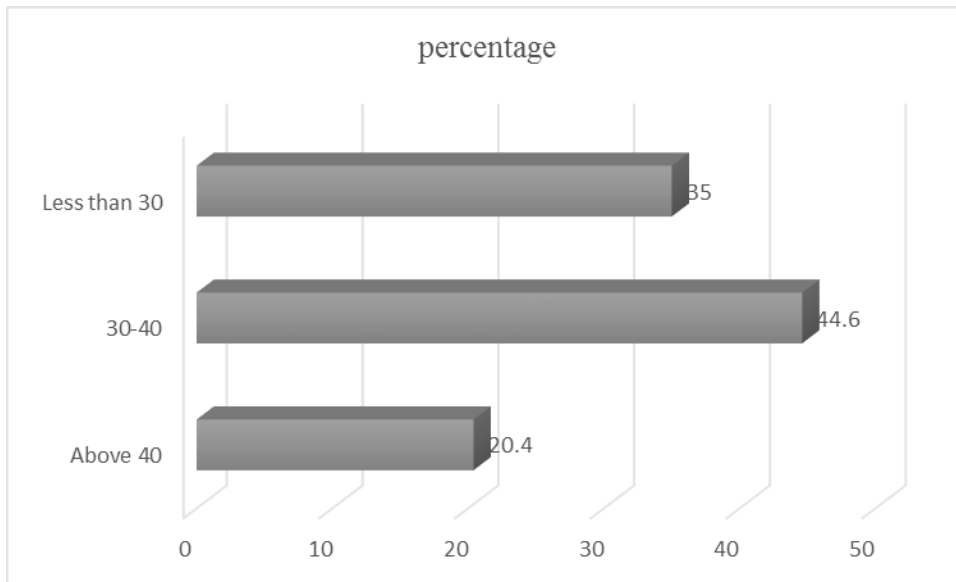


Figure 4.3: Duration in the department

#### 4.2.4 Respondents' age.

The study required the respondent to indicate their age. From the findings, the study established that most of the respondents were between the ages of 30 to 40 shown by

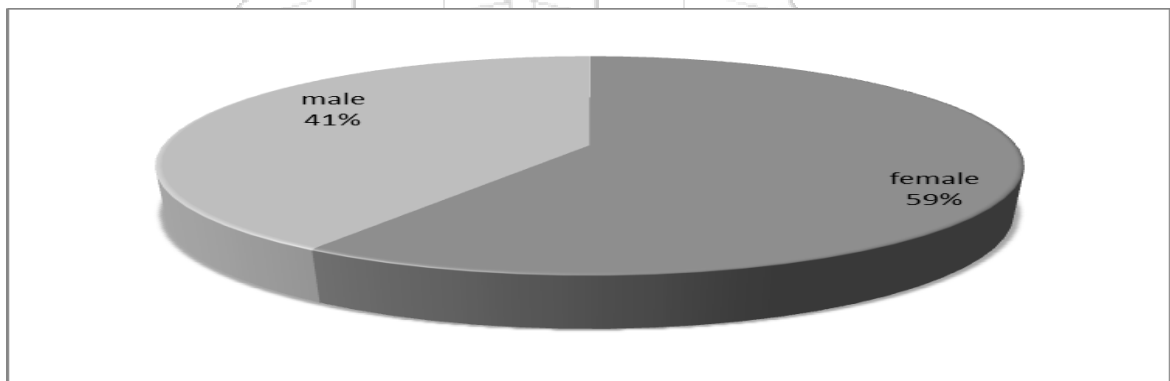
44.6%, 35% of the respondents were less than 30 years and 20.4% of the respondents were above 40 years.



**Figure 4.4: Respondents age**

#### 4.2.5 Respondents Gender

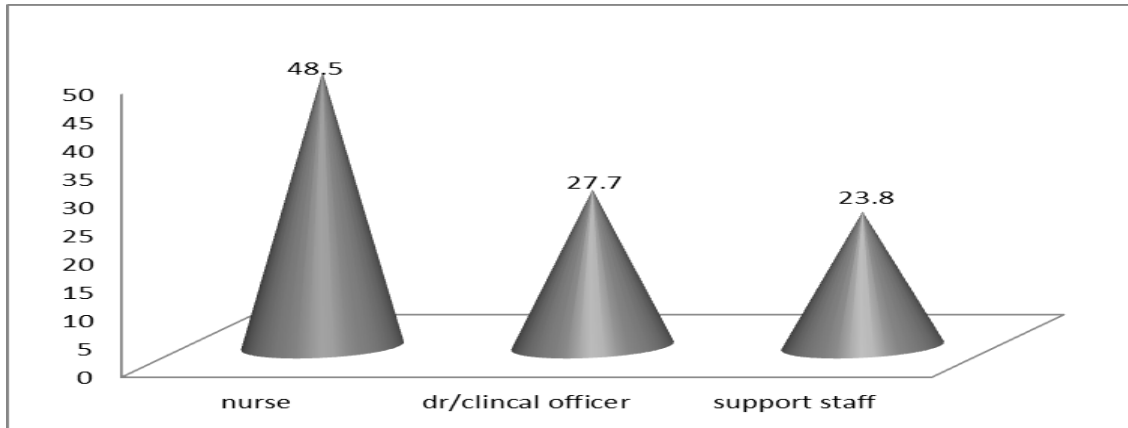
In terms of gender representation, a majority of the respondent were female, making up 59.3% while the male gender formed 40.7% of the respondents.



**Figure 4.5: Respondents gender**

#### 4.2.5 Cadre of the respondent

Analysis by cadre established that 48.5% of the respondents were nurses, 27.7% were doctors while 23.8% were support staff.



**Figure 4.6: Cadre of the department**

### 4.3. System Failures

#### 4.3.1. System failures Causing NSI among all the respondents

**Table 4.2: System Failures Causing NSI among all Respondents**

Statement	% of respondents					Total
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Lack of policy	38.5	28.5	10.0	13.1	10.0	100.0
Lack of training	38.5	33.8	2.3	20.8	4.6	100.0
Lack of standards	37.7	32.3	4.6	17.7	7.7	100.0
Lack of supervision	37.7	30.8	9.2	13.8	8.5	100.0
Lack of corrective measures	20.8	43.1	3.8	20.0	12.3	100.0

In so far as system failures are concerned, more than 50% of all the respondents either strongly disagreed or disagreed that lack of policy, lack of training, lack of standards, lack of supervision and lack of corrective measures could have led to the last needle stick injury that they had incurred

### 4.3.2. System Failures Causing NSI among the Nurses

**Table 4.3. System Failures Causing NSI among the Nurses**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Lack of clear policy	60.5	34.4	5	0.0	0.0
Lack of training	60.5	31.8	2.7	0.0	0.0
lack of standards on disposal used needles	43.7	32.3	4.6	11.7	7.7
Lack of supervision	43.7	26.8	9.2	11.8	8.5
Lack of corrective measures	20.8	43.1	3.8	20	12.3

The nursing staff strongly disagreed that system failures caused the last needle stick injury sustained by them. For all the listed options, more than 50% of the nurses either strongly disagreed or disagreed with the response provided.

### 4.3.3. System Failures Causing NSI among doctors/clinical officers

**Table 4.4. System Failures Causing NSI among Doctors/Clinical Officers**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Lack of clear policy	67.0	23.1	10.0	0.0	0.0
Lack of training	65.5	33.8	1.7	0.0	0.0
Lack of standards	59.9	41.9	0.0	0.0	0.0
Lack of supervision	59.9	30.8	9.3	0.0	0.0
Lack of corrective measures	40.8	53.1	3.8	2.3	0.0

There was a strong dissent from the doctors/clinical officers to the options provided for system failures as the causes of the last needle stick injury among them. More than 90% of the doctors/clinical officers either strongly disagreed or disagreed that the listed system failure factors led to the last needle stick injury incurred.

#### 4.3.4. System Failure Causing NSI among support staff

**Table 4.5. System Failures Causing NSI among the Support Staff**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Lack of clear policy	38.5	28.5	10.0	13.1	10.0
Lack of training	38.5	33.8	2.3	20.8	4.6
Lack of standards	37.7	32.3	4.6	17.7	7.7
Lack of supervision	37.7	30.8	9.2	13.8	8.5
Lack of corrective measures	20.8	43.1	3.8	20.0	12.3

Majority of the support staff (more than 50%) either strongly disagreed or disagreed that system failure led to occurrence of the last needle stick injury incurred by them.

#### 4.4. Human Errors

##### 4.4.1. Human Errors Causing NSI among all respondents

**Table 4.6. Human Errors Causing NSI among all Respondents**

Statement	% of respondents					Total
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Pressure (busy shift)	16.2	23.1	6.9	34.6	19.2	100.0
Faulty instrument	34.6	26.2	16.2	13.1	10.0	100.0
Fatigue(long work hours)	10.8	30.8	6.9	32.3	19.2	100.0
Physical environment	29.2	37.7	10.0	16.9	6.2	100.0

As far as human errors were concerned, 54% of the health care workers agreed or strongly agreed that pressure of work could have led to the last needle stick injury that they had incurred. A further 51% agreed or strongly agreed that fatigue could have been the cause of the last needle stick injury incurred. As to whether a faulty needle holder or physical environment could have been the cause of accident, more than 50% of the respondents disagreed or strongly disagreed with these factors.

##### 4.4.2. Human Errors Causing NSI among the Nurses

**Table4.7. Human Errors Causing NSI among Nurses**

Statements	% of respondents				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Pressure (busy shift)	10.2	13.1	6.9	50.4	19.2
Faulty instruments	54.6	26.2	6.2	3.1	10.0
Fatigue (Long working hours)	8.8	18.8	6.9	36.3	29.2
Physical environment	26.2	51.7	10.0	6.9	6.2

The nursing staff in both hospitals agreed that pressure of work and fatigue were the main causes of needle stick injuries among them. As concerns pressure of work as a cause for NSI, 60% of the nurses either agreed or strongly agreed, while 65.5% of all the nurses either agreed or strongly agreed that fatigue was the cause of the last NSI that they incurred.

#### 4.4.3. Human Errors Causing Injury among clinical officers/doctors

**Table 4.8. Human Errors Causing NSI among clinical officers/doctors**

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Pressure (busy shift)	6.2	13.1	6.9	54.6	19.2
Faulty Instrument	64.6	26.2	6.2	1.1	0.0
Fatigue (long working hours)	10.8	10.8	6.9	52.3	19.2
Physical environment	29.2	57.7	4.3	6.6	2.2

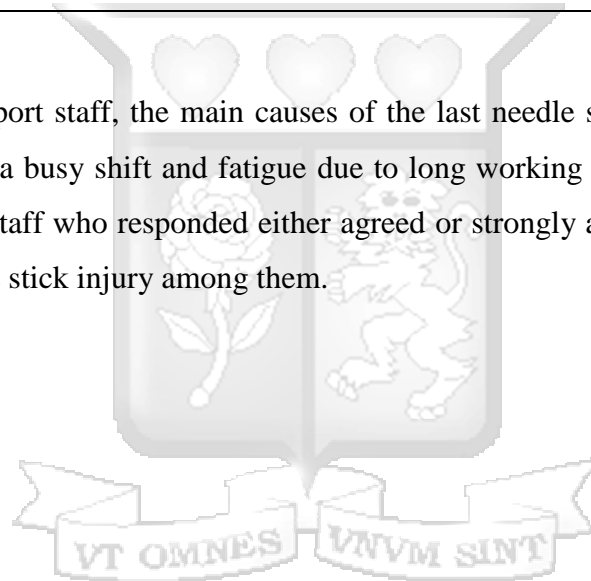
According to the doctors/clinical officers, the main causes of the last needle stick injury among them was pressure as 73.8% of them either agreed or strongly agreed with the option and fatigue due to long working hours to which 71.5% of them either agreed or strongly agreed.

#### 4.4.4. Human Errors causing NSI among the Support Staff

**Table 4.9. Human Errors Causing NSI among the Support Staff**

Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Pressure (Busy shift)	16.2	23.1	6.9	34.6	19.2
Faulty instrument	34.6	26.2	16.2	13.1	10.0
Fatigue (Long working hours)	10.8	30.8	6.9	32.3	19.2
Physical environment	29.2	37.7	10.0	16.9	6.2

Among the support staff, the main causes of the last needle stick injury incurred were pressure due to a busy shift and fatigue due to long working hours. More than half of all the support staff who responded either agreed or strongly agreed that these were the causes of needle stick injury among them.



## CHAPTER FIVE: DISCUSSION

### 5.1 Introduction

This chapter examined the results obtained from the study and their relevance to the objectives of the study. It further examined the results in relation to existing theory and previous research findings. Limitations of the results and moderating factors were also considered. Finally, recommendations for future studies were also discussed in this chapter.

### 5.2 Discussion of the Results

The study aimed to investigate causes of needle stick accidents and consequent injuries in two county hospitals in Nairobi. Basing the study on the Petersen accident/incident theory, the causal factors were categorized into system failures and human errors. A cross sectional survey was then carried out in the two county hospitals, study participants being those who had incurred a needle stick injury.

Generally, the participants agreed that factors related to human errors, that is, pressure of work and fatigue due to long working hours, was the cause of the last needle stick injury that they incurred. This pattern was consistent among all the represented cadres, that is, doctors/clinical officers, nurses and support staff. The participants also largely disagreed with other human error related factors, that is, faulty instruments and unsuitable physical environment, as the causes of the last needle stick injury incurred.

In so far as factors related with system failure, that is, lack of policy, lack of training, lack of standards, lack of supervision and lack of training are concerned, the participants largely disagreed that these were the causes of the last needle stick injury that they incurred. The dissent was consistent among all the cadres represented in the study.

The accident/incident theory, on which the study was based, states that industrial accidents occur as a result of system failures and human errors (Goetsch, 2013). By showing that needle stick accidents are largely associated with work pressure and fatigue due to long working hours, this study has demonstrated that, indeed, human

errors are a causal factor of accidents in the health care work environment, thus reaffirming the position of this theory.

In so far as specific accident causal factors are concerned, the findings of this study differs with several previous findings. For instance, the study by Motavaf et al (2014) demonstrated that unsatisfactory levels of knowledge and prevention practices were the main cause of needles stick injuries among health care workers. This contradicts the findings of this study, where the main causes of needle stick injuries among all the three cadres of health care workers represented was factors resulting in human errors, that is, pressure of work and fatigue related to long working hours. The difference in these results could have been modulated by the fact that the respondents in the two studies were drawn from different cadres of health care workers. While the respondents in the study by Motavaf et al were mainly anesthetists, the majority of respondents in this study were nurses. The difference in training of nurses, which involves extensive training in management practices alongside acquisition of technical skills, compared to the training and practice of anesthesia, which is largely technical, could have resulted in the differences observed between these two studies.

Another previous study, conducted by Yule and Flin (2007), asserted that management commitment, supervisor involvement and knowledge and training were key in achieving workplace safety. In this study, however, more than 50% of the respondents disagreed that lack of policy, lack of training, lack of standards, lack of supervision and lack of corrective measures were the cause the last needle stick injuries that they incurred. It is not clear whether the system factors are well established in these hospitals, or whether provision of more information to the participants on system factors and human errors, could have changed the findings of this study.

Subsequently, the findings of this study echoes those of Folkard and Lombardi (2006), who observed that a number of industrial accidents were attributable to fatigue and/ or human error. They are also consisted with the findings of Trinkoff et al (2007), who demonstrated that physical demands of the job were among the key factors associated with increased rate on needle stick injuries among nursing staff. Notably, in the study

by Trinkoff et al (2007) and this study, the key respondents were nurses, a factor that could have mediated the consistency.

The findings of this study have several implications for practice and for research. Based on these findings, the management of these hospitals need to consider pressure of work and fatigue due to long working hours as significant causes of needle stick accidents. This implies that strategies that reduce pressure of work and fatigue may, consequently, reduce occurrence of needle stick accidents and injuries.

The study has also revealed several gaps. For instance, it is not clear whether the findings of this study imply that system related factors are established in these hospitals, or, whether, given more information, the findings would be different. The state of system factors and human errors in these hospitals need to be established, before a causal relationship between these factors and occurrence of needle stick injuries is determined. Secondly, the prevalence of needle stick injuries in the two hospitals need to be established, in order to determine the magnitude of needle stick accidents as an occupational risk in this work environment, and the need for institution of intervention strategies.

### **5.3 Limitations**

The results of this study were adversely influenced by the following limitations:

#### **5.3.1. Convenience sampling**

The respondents for the study were selected conveniently rather than randomly. The researcher conveniently sampled participants from the departments of casualty, surgery and pediatrics, having inside information on the high rates of exposure to NSI in these department. This kind of sampling may not apply in other contexts, and a more purposeful sampling may need to be applied. Further, the results of this study may not be generalizable to the entire hospital population.

### **5.3.2. Response bias**

The fact that a majority of the respondents were nurses could have influenced the responses. Future research should include other cadres as well in order for the results to be more generalizable.

### **5.3.3. Use of structured questionnaires**

The study used self-administered structured questionnaires as the instrument of data collection. The respondent were required to choose from among listed factors. This could have been limiting to the respondents, considering that not all causative factors could have been listed. Moreover, the factor that the questionnaires were self-administered could lead to misunderstanding of the statements by the respondents. In some cases, since the researcher was more knowledgeable in the field, a determined effort was made to tweak the questions to adapt to the medical practioner's level of knowledge. These selective ways of reframing the questions was not captured in the questionnaire given in the appendices section.

The choice of structured questionnaires was made owing to time constraints and lack of adequate financial resources. In order to achieve more accurate results, however, unstructured questionnaires and interviews could have been used. Interviewer administered questionnaires improve the understandability of the questionnaire and, therefore, more accurate responses.

### **5.3.4. Short duration of research period**

The entire period for learning research concepts and conducting the research was two years. This period was rather short, leading to several mistakes and misconceptions by the researcher. This was however, necessary as it is a requirement by the program. If the same researcher were to perform the same study a second time, the results would be more accurate, since she would take more time and work at specific details.

### **5.3.5. Response rate**

Initially this study was intended to be carried out in three hospitals; Mama Lucy, Pumwani and Mbagathi. However, the researcher experienced difficulty collecting data from Mama Lucy hospital, where the hospital ethics committee declined to accept the ethical approval from Strathmore Business School as valid. This led to loss of time as well as an important proportion of the respondents. This also limits the generalizability of the results as it reduced the scope of study.

### **5.3.6. Lack of correlational analysis**

A correlational test was not carried out. This would have provided further insight to the responses. Future research should be conducted to test the association and relations of human errors and system failures as causes of needle stick injuries.

## **5.4. Conclusions**

Despite the limitations above, this study has provided some useful information concerning the causes of needle stick accidents in the county hospitals in Nairobi.

Most respondents agreed that human error, especially those associated with pressure of work and fatigue, could have resulted in the last needle stick injury that they incurred. Most respondents also disagreed that system failures could have resulted in the last needle stick injury that they incurred. Correlational studies were not conducted on the results, hence these results cannot be generalized.

## **5.6 Recommendations**

This study has demonstrated that health care workers in Mbagathi and Pumwani hospitals associate needle stick injuries with pressure of work and fatigue, factors related to human errors. The management teams of these hospitals need to implore strategies of addressing these two factors in order to reduce needle-stick injuries among the health care workers.

Further, as the findings of this study had several limitations, ranging from the use of convenience sampling to the use of a structured questionnaire which could have been

limiting to the respondents, further research needs to be carried using more purposeful sampling method and open questionnaires.

During the research, it was also realized that the prevalence of needle stick injuries in the two hospitals studied is not known. A study should be carried out to establish the prevalence of needle stick injuries in the two hospitals.



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## APPENDICES

### Appendix I: Consent Form

#### Introduction

Hello, my name is Dr Florence Achungo. I am currently conducting a study to establish the prevalence and causes of needle-stick injuries in the County referral hospitals, in Nairobi. Consequently, I would like to engage you as a participant in the study.

#### Objectives of the study

The purpose of this study is to establish the causes of needle stick injuries. Based on these factors, the study will recommend preventive strategies that can be implemented to reduce the occurrence of needle stick injuries.

#### Voluntarism

Your participation in this study is entirely voluntary. You are free to change your mind any time in the course of the study.

#### Contacts

For any question related to this study, you may contact me on the following address:

Dr. Florence Akinyi Achungo, P.O. Box 7837, 00100, Nairobi.

Phone: 0722386688: [fachungo@yahoo.co.uk](mailto:fachungo@yahoo.co.uk)

For questions related to your rights as a participant, you may contact the chair of Strathmore Business School Ethics research committee on the following address:

SU-IRB; Tel: +254-703034366; Email: [ethicsreview@strathmore.edu](mailto:ethicsreview@strathmore.edu)

#### Participant's declaration:

I have read and understood the information above as presented. I consent voluntarily to participate in the study.

Participants signature:.....

Witness signature:.....

## Appendix II: Questionnaire

<b>Demographic Data</b>						
1	Hospital	Mbagathi		PMH	MLKH	
2	Department	Surgery		Casualty	Pediatrics	
3	Duration in department	<12months		>12months		
4	Age	<30		30-40	>40	
5	Gender	M		F		
6	Cadre	Nurse		Dr/Clinical officer	Support staff/other	
	<b>Please tick the response you feel is most appropriate</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neither agree/disagree</b>	<b>Agree</b>	<b>Strongly agree</b>
	<b>System failures</b>					
1	Did lack of written down guidelines contributed to the needle stick injury?					
2	Was the injury a result of lack of training on how to handle used needles?					
3	Do you think the injury occurred as a result of lack of standards on disposal of used needles?					
4	Do you believe the main reason for the injury was lack of supervision of how needles are disposed?					
5	Do you think lack of corrective measures on poor disposal practices contributed to your injury?					
	<b>Human Errors</b>					
1	Do you think this injury was as a result of work pressure?					
2	Do you think faulty needle/holder could have contributed to your injury?					
3	Do you believe this injury was a result of fatigue due to long working hours?					
4	Do you think the unsuitability of your work environment could have contributed to the injury?					