

The Effectiveness of Multi-pronged Educational Intervention to the Registered  
Nurses in Influencing the Compliance with the Standard Precautions in Selected  
County Referral Hospitals in Kenya

**BY**

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## Declaration

I, Mukthar Vincent Kiprono, declare that this research thesis is my own original work and has never been presented for an academic award in any university or institution of higher learning.

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## **Dedication**

This work is dedicated to my wife, Dorcas Chepchirchir, our children, Eugene Rono, Damian Rono, Prince Rono and Natalie Rono, my parents Mr. and Mrs. Matthew Lang'at, for their love, support, sacrifices and encouragement.

## **Acknowledgement**

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## **Abbreviations and Acronyms**

AIDS	-	Acquired Immune Deficiency Syndrome
CDC	-	Center for Disease Control
HBM	-	Health Belief Model
HIV	-	Human Immunodeficiency Virus
HVB	-	Hepatitis B virus
HVC	-	Hepatitis C Virus
KAIS	-	Kenya AIDS Indicator Survey
NACC	-	National AIDS Control Council
NIOSH	-	The National Institute for Safety and Health
NSI	-	Needle Stick injuries
OSHA	-	Occupational Safety and Health Act
PEP	-	Post- Exposure Prophylaxis
PI	-	Percutaneous Injuries
RN	-	Registered Nurse
SD	-	Socio-demographics Characteristics
SCT	-	Social Cognitive Theory
SP	-	Standard Precautions
WHO	-	World Health Organization

## **Operational Definitions of Terms**

### **1. Percutaneous Injuries-**

These are sharp injuries that break the skin integrity and are captured in numbers/frequencies.

### **2. Percutaneous Injuries ‘Previous Year’ Prevalence-**

Is the proportion of nurses who reported having sustained at least one injury in the previous year as was established in the baseline data.

### **3. Percutaneous Injuries ‘Career’ Prevalence-**

Is the proportion of nurses who reported ever sustaining at least a percutaneous injury in their practice as was established in the baseline data.

### **4. Percutaneous Injuries Incidence rate per fulltime employees-**

Are the new cases of injuries that occur during the six (6) months follow up period per 100 fulltime nurses.

### **5. Knowledge in the Standard Precautions-**

These are knowledge items of the concept Standard Precautions identified as guided by Occupational Safety and Health Act (OSHA) guidelines on the Standard precautions and sharps injuries management and scored up to a maximum of thirteen (13) points.

#### **6. Self-reported Compliance with the Standard Precautions-**

These are eight (8) performance items of the concept Standard Precautions identified as guided by Occupational Safety and Health Act (OSHA) guidelines on the Standard precautions and sharps injuries management. They are scored up to a maximum of eight (8) points as declared by the respondents.

#### **7. Observed Compliance with the Standard Precautions-**

These are ten (10) performance items of the concept Standard Precautions identified as guided by Occupational Safety and Health Act (OSHA) guidelines on the Standard precautions and sharps injuries management. They are scored up to a maximum of twenty (20) points as observed by the research assistants as either performed always, performed sometimes or not performed at all.

#### **8. Multi-pronged Educational Intervention –**

An education package that entails five learning methods supported by organizational facilitation. The five learning methods are; first, a 30- minutes' face to face lesson, second, a 10- minutes' video-assisted simulation or illustration of concepts, third, 10- minutes' small group discussion, fourth, 10- minutes' demonstration and return demonstration and finally, the posting of posters/flyers in strategic places to act as cues/reminders to action.

## **Executive Summary**

*Background:* World Health Organization (2010) estimates that over 2.5% of all HIV and other infections in sub-Saharan Africa are transmitted through blood and body fluids exposures thus it recommended the use of Standard Precautions (SPs) to prevent these transmission. In spite of widespread adoption of Standard Precautions by organisations, gaps in their implementation by healthcare workers have been noted and blood and body fluids exposures continue to occur (Powers et al., 2016). Therefore, a variety of interventions including Multi-pronged Educational Intervention have been designed to promote implementation of Standard Precautions as the basis for infection prevention and control.

*Objective:* To analyze the effectiveness of Multi-pronged Educational Intervention to Registered Nurses in influencing compliance with the Standard Precautions in Selected County Referral Hospitals

*Methodology:* This was a prospective Quasi Experimental study. The respondents were registered nurses in the selected hospitals. The instruments were self-administered Questionnaires and Observational schedule. Data were analyzed using Statistical Package for Social Sciences version 20. The study has employed both descriptive and inferential statistics to analyze the data. Results have been presented in prose, tables and graphically.

*Results:* The study established that a previous year Percutaneous Injuries prevalence was still high at 32.1% with a mean frequency of 2.1(SD=1.3) injuries per respondent. The annual percutaneous incidence rate was 18.6 and 25.8 injuries per 100 fulltime employees respectively for the study group and the control group after the intervention. Around 70% of the Percutaneous Injuries are not reported. The self-reported knowledge scores on the Standard Precautions were 58.5%. The knowledge scores on the Standard Precautions increased from 57.7% to 66.2% in

the study group after the educational intervention. The self-reported compliance scores on the Standard Precautions were 48.8% for both groups combined after the interventions. The self-reported compliance scores on the Standard Precautions improved from 46.3% to 73.8% in the study group after the educational intervention. The observed compliance scores on the Standard Precautions were 62.7%. The observed compliance scores on the Standard Precautions increased from 61.3% to 67.6% in the study group after the educational intervention. Knowledge on the Standard precaution was a predictor to its compliance (AOR= 1.9, CI=1.1-3.6)

*Conclusion:* The new cases of Percutaneous Injuries to the study group upon being exposed to the Multi-pronged Educational Intervention was less by 7.2% ( 18.6% versus 25.8%) per annum per one hundred equivalent fulltime nurses compared to the control group. The prevalence percutaneous injuries in the previous year for both the study and control group was 32.1%(n=145) with a mean frequency of 2.1(SD=1.3).

The difference between self-reported knowledge gained upon being exposed to Multi-pronged Educational Intervention between study and control group was about 4% (8.5% versus 4.6%) and was statistically significant( $p<0.01$ ).

The difference between compliance reported upon being exposed to Multi-pronged Educational Intervention between study and control group was 17.7% (27.5% versus 10.0%) and was statistically significant( $p<0.01$ ).

The difference between compliance observed upon being exposed to Multi-pronged Educational Intervention between study and control group was 3.5% (6.0% versus 2.5%) and was statistically significant( $p<0.01$ ). The study concluded that Multi-pronged Educational Intervention strategy is effective in influencing compliance with the Standard Precautions.



*Recommendations:* This study recommends that the Multi-pronged Educational Intervention to replace the routine conservative approaches of continuous professional development programmes in health facilities. Second, this study recommends the Multi-pronged Educational Intervention strategy as an induction package to Interns and new nursing staff to pre-empt the occupational exposures to themselves and to their clients. Third, this study recommends the inculcation of the Multi-pronged Educational Intervention principles in drafting of educational policies in health. Finally, this study recommends the incorporation of Multi-pronged Educational Intervention strategy in curricula.

## **1. CHAPTER ONE: INTRODUCTION**

This chapter outlines the magnitude of the hospital-acquired infections to the healthcare workers and specifically to the nurses. It highlights the occupational hazards posed by the working environment of the health care workers. To mitigate this hazard to the health care workers, WHO has developed and recommends the implementation of Standard Precautions (SPs). However, the compliance with the use of Standard Precautions is not a common practice. This study came up with an educational intervention (Multi-pronged Educational Intervention) grounded on Social Cognitive Theory. This study aimed to evaluate the effectiveness of Multi-pronged Educational Interventional to the nurses in influencing compliance with Standard Precautions

### **Background of the study**

Hospital-acquired infections are infections that arise within the hospital environment. These infections affect the quality of medical care and increase medical care costs (Luo, He, Zhou, and Luo, 2010)

Occupational health and safety is a pertinent issue because of high rates of associated morbidity and mortality of health care workers who are exposed to blood and body fluids. An estimated 100,000 people die from occupational illnesses, while about 400,000 new cases of occupational diseases are diagnosed every year. Globally, healthcare facilities employ over 59 million workers and offer variety of services to clients and patients, and are classified as hazardous and high risk work place (Aluko, Adebayo, Adebisi, Ewegbemi, Abidoeye and Popoola, 2016). Healthcare-associated infections (HAIs) can be considered as the most frequent adverse event that occurs in providing healthcare worldwide (Donati, Biagioli, Cianfrocca, De Marinis, and Tartaglioni, 2019).

Infection transmission risks are present in all healthcare settings worldwide, with high prevalence in developing countries (30-50%) (Bassyouni, Wegdan, and El-Sherbiny, 2016).

Healthcare facilities like other high risk work places are characterized by a high level of exposure to hazardous agents, which significantly endangers the health and life of workers (Aluko et al., 2016).

Practising healthcare workers are exposed to occupational hazards that include blood-borne infections such as Hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). The risk of transmission of these diseases following blood and body fluids exposure among healthcare worker is high, with HBV at 37%, HCV at 39% and HIV at 4.4% (Adefolalu, 2014).

Practising health care workers are exposed to other hazards in line of duty such as percutaneous Injuries (PIs), musculoskeletal injuries, allergy to diagnostic/therapeutic instruments, physical assault, and stress. As much as these occupational hazards are manageable if not preventable, healthcare workers continue to experience injuries and illnesses in the workplace. The incidences of non-fatal occupational injuries and illness to healthcare workers are among the highest of any industry sector (Adefolalu, 2014; Mbaisi, Nganga, Wanzala, and Omolo, 2013).

Among blood borne diseases that can be transmitted via blood and body fluid exposures, HIV infection is the most common and significant one (Amuwo, Lipscomb, McPhaul, and Sokas, 2013). The risk of being infected with HIV from a single prick with a sharp gadget that has been used on an HIV-infected person is thought to be about 1 in 150. The World Health Organization and International Council of Nursing estimate that approximately 2.5% of all HIV infections in sub-Saharan Africa are transmitted through unsafe healthcare injections and other sharp objects. Because of this, the United Nations General Assembly has continuously encouraged the nations of the world to implement the Standard Precautions

to prevent HIV transmission by health workers either to themselves or to others (Phillips, Conaway, Parker, Perry, and Jagger, 2013).

The factors that contribute to occupational illnesses and injuries in healthcare settings include negligence and carelessness of health care workers, lack of adequate protective aids and equipment, inadequate number of staff, excessive workload, failure to observe basic safety and hygiene guidelines, and inadequate operational knowledge of modern healthcare equipment. This prompted the US Centre for Disease Control and Prevention (CDC) to develop Standard Precautions for preventing occupational exposures and handling of infectious materials in HCFs. Adherence to the SP guidelines has been shown to be effective in curtailing occupational illnesses and injuries among HCWs in healthcare settings (Aluko et al., 2016).

The Standard Precaution is a package of infection prevention and control practice applied in the clinical set up by the health providers to reduce the risk of transmission of blood borne infections. They include guidelines and principles in hand washing, use of gloves and other protective barriers eg aprons, gowns, goggles and masks, proper handling of sharps, disinfection of soiled instruments and linen and proper management of sharp injuries (Maheshwari and Muthamilselvi, 2014). Most studies document general lack of awareness and limited access to information about the appropriate precautions to prevent exposure which in some-way contribute to risky behaviours amongst nurses (Moore, Edward, King, and Giandinoto, 2015).

Despite of the publication of the Standard Precautions protocol and the consequences of non-compliance thereof, significant issues remain around compliance with SP by the health care workers. These flaws in satisfactory compliance with the Standard Precautions has exposed the health care workers especially the nurses to blood-borne infectious diseases (Powers, Armellino, Dolansky, and Fitzpatrick, 2016). In spite of widespread adoption of Standard

Precautions by organisations, gaps in their implementation by healthcare workers have been noted and blood and body fluids exposures continue to occur. Therefore, several interventions have been devised to promote implementation of Standard Precautions as the basis for infection prevention and control (Powers et al., 2016).

The Cochrane Effective Practice and Organisation of Care taxonomy consists of four categories by which health system interventions can be classified: delivery arrangements, financial arrangements, governance arrangements, and implementation strategies. The delivery arrangements and implementation strategies are most relevant to promoting adherence to Standard Precautions. Interventions related to delivery of care can include providing access to infection prevention and control expertise, or providing and placing materials required to implement Standard Precautions. Implementation strategies can be directed to healthcare organisations, such as strategies to change organisational culture, or they can be directed to healthcare workers. Examples of the latter are audit and feedback, use of reminders and checklists, and education. Educational approaches, such as campaigns, instruction and training, and use of pamphlets or posters, may be targeted to individuals or directed to groups (Moralejo, El Dib, Prata, Barretti, and Corrêa, 2018a)

Interventions in occupational health may be classified into three strategies; management of hazards in the place of work, modifying healthcare workers knowledge and behaviour; and prevention of disease and disability (Cheetham, Thompson, Liira, Afilaka, and Liira, 2016). The intervention in this study draws from the first two strategies. This study aimed to improve knowledge and compliance with standard precautions.

Evidence based strategies in helping healthcare workers learn and change practice are at the forefront of the design of continuing medical education (Sanci, 2000). Education interventions may consist of group-based instructions or other types of information delivery such as videos, leaflets, protocols and guidelines given to people to watch or read in their

own time (Cheetham et al., 2016). Several studies have investigated the effect of education intervention alone with varied delivery mode, content, settings and duration with a positive improvement of about 10% in observed scores of the Standard Precautions. Other studies have investigated education intervention with peer evaluation which have yielded better outcomes of observed compliance with the standard precaution ( $\approx 20\%$ ) (Luo et al., 2010). According to Cheetham et al. (2016), educational interventions may assume didactic form (such as face to face lecture presentation) or interactive form which entails innovative learning methods such as demonstration, case studies, role play, simulation etc. Cheetham further explains that repeated and active educational interventions promote interactivity have higher chances of altering and sustaining behaviour change in healthcare workers. Multi-pronged Educational Intervention uses of a combination of both didactic and interactive learning methods coupled with peer/organizational support as guided by Social Cognitive Theory.

### **Statement of the Problem**

Health care workers are exposed to blood and body fluids and are at increased risk of occupational illnesses. These illnesses may be serious and fatal such as hepatitis B virus, hepatitis C virus, or human immunodeficiency virus. Furthermore, over 40% of the healthcare workers in Kenya have experienced blood and body fluids exposures in the course of their duties (Mbaisi, et al., 2013).

Blood and Body Fluids exposures are frequent occurrences in health workers, and are not always adequately assessed and/or addressed because of massive under-reporting of the accidents within the hospital (Courtenay-Quirk et al., 2016).

The Standard Precautions were developed to reduce occupational exposures and for better handling of infectious materials by the healthcare worker. Adherence to the Standard

Precaution guidelines has been shown to be effective in curtailing occupational illnesses and injuries among healthcare workder in healthcare settings (Aluko et al., 2016). The Standard Precautions is a package of infection prevention and control practice applied in the clinical set up by the health providers to reduce the risk of transmission of blood borne infections. They include guidelines and principles in hand washing, use of gloves and other protective barriers (such as aprons, gowns, goggles and masks), proper handling of sharps, disinfection of soiled instruments and linen and proper management of sharp injuries (Maheshwari and Muthamilselvi, 2014).

Most studies document a general sub-optimal knowledge and limited access to information about the Standard Precautions. This knowledge discrepancy on the Standard Precautions contributed to increased exposure to blood and body fluids exposures thus may contribute to risky behaviours amongst nurses(Moore et al., 2015).

Though, it is a fact the compliance with the Standard Precautions greatly prevents hospital-acquired infections and protects healthcare workers during provision of care, the compliance is still not a common practice and this constitutes a public health concern. Some of the attributes to low compliance includes lack of time, lack of awareness, deficient lifelong learning process, sheer carelessness or guts to engage in risky behaviours, inadequate equipments and protective equipments (Koné and Mallé, 2015; Moore et al., 2015; Porto and Marziale, 2016).

A study to establish the prevalence of blood and body fluids exposures among the nurses/midwives at a Ugandan hospital determined that over 40% of the respondents had experienced blood and body fluids exposures (Odongkara et al., 2012). Health worker studies in Africa, specifically, Uganda, Ghana and Nigeria document that health workers often fail to practice Standard Precautions consistently and correctly (Amaran and Onwube, 2013).

Compliance with Standard Precautions in Ethiopia was about 12% (Haile, Engeda, and Abdo, 2017).

About twenty percent (20%) of healthcare workers are considered to have adequate knowledge on the Standard Precautions and while slightly above 60% are considered to be compliant with the Standard Precautions in Kenya (Gichuhi, 2015, 2015; Moyo, 2013; Ochieng, 2016).

Nurses comprise the backbone of the healthcare system and are principle caregivers to people living with HIV/AIDS (Phillips et al., 2013). According to Maniar, Tawari, Suk, Bowen, and Horwitz (2015) and Wang et al. (2015), nurses are at a greater risk of blood and body fluids exposure than other groups of health workers. Wang et al. (2015), underscores that the proportion of nurses at risk in the International Labor Organization database was around 40%. According to Koné and Mallé (2015), there is a correlation between non-compliance to the Standard Precautions and adverse occupational exposures.

Despite the overstated beneficial effect of the use of Standard Precautions on infection prevention and control, the knowledge on the Standard Precautions is suboptimal and compliance with Standard Precautions is not a common practice among the healthcare workers and particularly nurses.

The study area was selected based on a report by Ministry of Public Health and Sanitation & Ministry of Medical Service (2010), which conducted a survey on the extent of compliance of infection prevention and control in selected county facilities in five regions(former Provinces). This qualitative rapid assessment of infection prevention and control established that the compliance was lower in the former Rift Valley region at about 55% compared to other regions which had at least 60% compliance.



Available literature dwell more on cross-sectional studies on aspects of on the use Standard Precautions. Several studies have recommended that innovative educational interventions, ongoing quality improvement projects, and preventive programs play a major role in augmentation of knowledge and safe behaviour of healthcare workers (Porto and Marziale, 2016). Therefore, this study adopted a longitudinal approach to investigate the effectiveness of using an innovative educational intervention, namely Multi-pronged Educational Intervention, to influence compliance with the Standard Precautions.

### **Justification of the study**

Occupational exposures to blood and body fluids pose significant risk of transmission of blood-borne infections to healthcare workers (Swetharani, Vinod, Hamide, Dutta, and Harichandrakumar, 2016). Healthcare workers in every clinical environment often face many occupational hazards such as exposures to human blood and body fluids, involving serious consequences to their health. Occupational exposure to blood and body fluids among healthcare workers consist a major occupational hazard, globally. The World Health Organization estimates that 3 million blood and body fluids exposures occur annually among 35 million healthcare workers globally; over 90 % occurring in resource constrained countries including Africa. Nurses emerge as the staff group reporting the highest proportion of such exposures (Nouetchognou, Ateudjieu, Jemea, and Mbanya, 2016).

Hospital- associated infections is a major health problem in all societies. According to the WHO, 7.1 million cases of Hospital - associated infections occur every year. One out of every 20 people suffers from hospital infection (Sarani, Balouchi, Masinaeinezhad, and Ebrahimitabas, 2015). The risk of human immunodeficiency virus transmission from patient to health worker is 0.3% and 0.09% following percutaneous and muco-cutaneous exposure, respectively (Aynalem Tesfay and Dejenie Habtewold, 2014).

Worldwide occupational exposure accounts for 2.5 % of HIV cases and 40 % of Hepatitis B and C cases among healthcare workers. Each year as a consequence of occupational exposure, an estimated 66,000 Hepatitis B, 20 million hepatitis C and up-to 260,000 HIV infections occur. These infections are preventable through compliance with the Standard Precautions which significantly reduce the risk of HIV and Hepatitis transmission among health workers (Mbanya et al., 2010). Monitoring occupational exposure among healthcare workers over a two-year period showed that 47.65% of healthcare workers with exposure to blood/other body fluids had detectable levels of blood-borne pathogens, including HBV, HCV, or HIV. In addition, 25.6% of source patients were positive for hepatitis B virus surface antigen (HBsAg), 8.7% for HCV RNA, and 3.5% for HIV (Yi, Yuan, Li, Mo, and Zeng, 2018).

The transmission of common blood-borne pathogens, namely HBV, HCV and HIV, to healthcare workers have cumulatively caused about 1100 deaths as well as substantial disability globally. Other rare blood-borne pathogens still pose a risk: for example, in the 2013–2016 Ebola virus disease outbreak, over 890 health-care workers were infected, with a case fatality rate of 57% (Auta et al., 2017). Literature states that many nurses who sustain HIV exposures through Percutaneous Injuries choose not to report the incidences to the hospital authorities for further management; that is comprehensive psychological counselling, initiation of Post Exposure Prophylaxis with antiretroviral drugs and follow ups care (Courtenay-Quirk et al., 2016).

The opportunity cost of not adhering to the dictates of the Standard Precautions is dire. Non-compliance to the Standard Precautions presents a huge burden on society in terms of the costs of treatment and the absence from work, as well as of the distress and anxiety at work (Marković-Denić et al., 2013).

Auta et al. (2017), proposed that there is need to device innovative approaches to regular in-service training for health-care workers which could help promote Standard Precautions for preventing the transmission of blood-borne infection. Furthermore, Standard Precautions could be supplemented by educating health-care workers to take responsibility for their own health and safety and for that of others who may be affected by their actions at work.

This study has contributed to the body of knowledge on the effectiveness of an innovative educational intervention coupled with peer support on influencing the knowledge on Standard Precautions and compliance with Standard Precautions. Furthermore, this study will also inform policy decisions thus mitigating on morbidity and mortality of healthcare workers associated with blood and body fluids exposures.

## **Objectives**

### **1.1.1 Broad objective**

To evaluate the effectiveness of Multi-pronged Educational Intervention to the nurses in influencing compliance with Standard Precautions

### **1.1.2 Specific objectives**

- 1) To establish the incidence rate of Percutaneous Injuries for both the study and the control groups
- 2) To assess the knowledge on the Standard Precautions before and after e after exposure to Multi-pronged Educational Intervention for both the study and the control groups
- 3) To analyse the self-reported compliance with the Standard Precautions before and after e after exposure to Multi-pronged Educational Intervention for both the study and the control groups

- 4) To analyse the observed compliance with the Standard Precautions before and after e after exposure to Multi-pronged Educational Intervention for both the intervention and the control groups

**Hypotheses (Null)**

1. There is no significant difference in the incidence rate per fulltime employee of Percutaneous Injuries between the study and the control group
2. There is no significant difference in knowledge scores on the Standard Precautions before and after the exposure to Multi-pronged Educational Intervention
3. There is no significant difference in self-reported compliance scores on the Standard Precautions before and after the exposure to Multi-pronged Educational Intervention
4. There is no significant difference in observed compliance scores on the Standard Precautions before and after the exposure to Multi-pronged Educational Intervention

## **2. CHAPTER TWO: THEORETICAL FRAMEWORK**

This chapter presents and justifies my philosophical worldview from which the study was conceptualized. The theoretical framework of the study has been described in five sections that form the chapter. This study carefully subscribed to positivism paradigm perspectives, objective epistemological perspectives, critical realist ontological perspectives, functionalist theoretical underpinnings and quantitative methodological approaches.

### **The Paradigm of Inquiry**

The term paradigm is described by different researchers as a worldview or set of assumptions about how things work. It is shared understanding of reality. It guides the way researchers do things or formally sets of practices in knowledge development and interpretation (Rossman and Rallis, 2012). Paradigms can be categorized based on three concepts namely: ontology, epistemology and methodology (Creswell, 2009).

Rossman and Rallis (2012), identified four different paradigm perspectives namely Positivism, Post-positivism, Interpretivism and Constructivism. The choice of a paradigm perspective must conform to the researcher's beliefs about reality in order to attain a congruent research design.

For this study, I applied the Positivism paradigm of inquiry which is consistent with Quantitative research and involves hypothesis testing. This Paradigm and the rationale for the choice have been further elaborated in the subsequent sub-section.

### **The Positivism paradigm of inquiry**

The positive paradigm is based on the philosophical ideas of the French philosopher August Comte. He emphasized observation and reasons are means of understanding human behaviour. True knowledge is based on experience of senses and can be obtained by observation and experiment. Verified data received from the senses are known as empirical

evidence. Thus positivism is based on empiricism. Positive knowledge is based on natural phenomena and their properties and relations, interpreted through reasons and logical observation. Positivist thinkers adopt scientific method as a means of knowledge generation. Hence it has to be understood within the frame work of the principles and assumptions of science. Positivism holds that valid knowledge is found only in derived knowledge or exclusive authoritative knowledge (Grant and Osanloo, 2014).

According to Johnson (2018), Positivism boasts of a well-defined structure during studies and discussions. Positivists believe that since there are set laws and rules followed, there will be minimum room for error. This structure also gives little room for variance and drastic variable changes, thus making the study more accurate when it comes to experiments and applications as it tries to follow specific rules using objective mathematical and scientific tools. Positivism relies on quantitative data that positivists believe is more reliable than qualitative research. Quantitative research is more “scientific” in its methods than qualitative research and thus more trustworthy. In research, quantitative data provides objective information that researchers can use to make scientific assumptions. Amzat and Razum (2014) add that Positive Philosophy advocates for experimental, observational, and comparative methods in the understanding of its subject matter or phenomena.

The study entailed an educational intervention which is to be manipulated to evaluate its effectiveness in knowledge and compliance with the Standard Precautions. Cognizant of the advantages, suitability and relevance of Positivism paradigm of inquiry to my study, I chose it to test the hypothesis.

### **Ontological perspectives**

Ontology is the philosophical study of the nature of reality. Ontology seeks to establish the nature and origin of knowledge or reality. There are two perspectives in ontology namely:

the Relativist ontology and the Critical Realist ontology. The Relativist ontologist believes that reality is a finite subjective experience while Critical Realist ontologist assumes that reality objective and independence of the researcher's interest in it. Critical Realist ontologist believe that the purpose of science is to identify phenomena and develop agreement regarding the description of events to produce predictable causal and effect results (Adom, Hussein, and Joe, 2018).

In the context of nursing research, ontology can be termed as the philosophical study of the nature of nursing realities and extrapolation of causal effects relationships in nursing. From a Critical Realist ontological perspectives, the researcher uses objective epistemology and quantitative research methodology. Critical Realist ontological perspective shapes the methodological decision-making towards a quantitative approach to encompass objective, positivist study (Harré and Binghamton University State University of New York, 1997)

In the current study, my ontological perspective on nurses' knowledge and compliance with the Standard Precautions upon exposure to innovative educational intervention resonates with a critical realist ontological and objective epistemology stance through positivist paradigm.

### **Epistemological perspectives**

Epistemology is the study of the nature of knowledge, justification, and the rationality of belief. Epistemology is concerned with four areas: the philosophical analysis of the nature of knowledge and how it relates to such concepts as truth, belief, and justification; various problems of skepticism; the sources and scope of knowledge and justified belief, and finally is the criteria for knowledge and justification (Wenning, 2009).

There are two opposing epistemological standpoints known as objectivism and subjectivism. Objective epistemology is associated with critical realism and proposes that knowledge is often used to explain, predict, and control events (Grant and Giddings, 2002; Lever, 2013) as

quoted by Wagoro, Duma, Mayers, and Chitere (2017). However, subjective epistemology assumes that knowledge is always filtered through the lenses of language, gender, social class, race, and ethnicity (Denzin and Lincoln, 2005) as quoted by(Wagoro et al., 2017).

Objectivist epistemology holds that all of man's knowledge comes from the senses, and is developed in the following order- Percepts, which come from the automatic integration of certain sensations that lead to awareness of a specific existent, and Concepts, the mind's organization of percepts into groups based on their essential characteristics that differentiate them from other entities. According to Objectivism, the human mind apprehends reality through a process of deductive reasoning based upon sensory observation, in which perceptual information is built up into concepts and propositions(Rand and Mayhew, 2005). It is my belief that nurses form mental constructs of reality from what is observed, sensed and perceived in their environment of work. This study set out to manipulate a variable in order to evaluate the effect on phenomenon of Standard Precaution knowledge and applications. Based on this stated belief, I adopted the objective epistemology for this study. The objective epistemology subscribes to Positivist paradigm of inquiry.

### **Theoretical perspectives**

A theoretical perspective is a set of assumptions about reality that inform the questions we ask and the kinds of answers we arrive at as a result. In this sense, a theoretical perspective can be understood as a lens through which we look, serving to focus or distort what we see. It can also be thought of as a frame, which serves to both include and exclude certain things from our view. It can be summarized as philosophic stand point that guides and directs research methodology. Theoretical perspectives help researchers to organize their thoughts and ideas thus make them clear to others (Kulis, Marsiglia, Kopak, Olmsted, and Crossman, 2012).



There are three primary theoretical perspectives: the symbolic interactionist perspective, the functionalist perspective, and the conflict perspective. The symbolic interactionist perspective, also known as symbolic interactionism, directs researchers to consider the symbols and details of everyday life, what these symbols mean, and how people interact with each other. According to the symbolic interactionist perspective, people attach meanings to symbols, and then they act according to their subjective interpretation of these symbols (Rand and Mayhew, 2005).

The conflict perspective is derived from the writing of Karl Marx and assumes that conflicts arise when resources, status, and power are unevenly distributed between groups in society. According to this theory, conflicts that arise because of inequality are what foster social change. From the conflict perspective, power can take the form of control of material resources and wealth, of politics and the institutions that make up society, and can be measured as a function of one's social status relative to others (Creswell, 2009).

According to the functionalist perspective, each aspect of society is interdependent and contributes to society's functioning as a whole. Functionalists believe that society is held together by social consensus, or cohesion, in which members of the society agree upon, and work together to achieve, what is best for society as a whole (Amzat and Razum, 2014). Emile Durkheim suggested that social consensus takes one of two forms mechanical consensus and organic consensus. Mechanical solidarity is a form of social cohesion that arises when people in a society maintain similar values and beliefs and engages in similar types of work. On the other hand, Organic solidarity is a form of social cohesion that arises when the people in a society are interdependent, but hold to varying values and beliefs and engage in varying types of work (Chattoe, 2006).

Some functionalist sociologists categorize human functions into Manifest and Latent functions. Manifest functions are intentional and obvious, while latent functions are unintentional and not obvious. A sociological approach in functionalism is the consideration of the relationship between the functions of smaller parts and the functions of the whole (Amzat and Razum, 2014).

In the context of this study, I chose to use Functionalism theoretical perspective that is compatible with positivism paradigm of inquiry. In line with Functionalism theoretical perspective, the positivism paradigm approach adopts the position that human behaviour is a product some predictable stimulus (Grant and Osanloo, 2014).

Functionalism grew with the rise of empiricism, rationalism, and, in general, the scientific revolution. Functionalist believe in the reality of social existence and phenomena. To them, whatever exists is real and can be studied objectively and empirically. Health problems are a part of the realities of social existence. To study an event objectively implies that value detachment is possible. The researcher can always be objective and systematic in carrying out investigation. Realism promotes value-free science, which means that social research should be conducted in an objective manner based on empirical evidence without interference of moral and political values (Creswell, 2009).

Functionalists also hold that social processes are determined, grounded on the principle of cause-effect (or deterministic) assumption that whatever happens has a cause. Science in general and empirical works in particular flow from the deterministic assumption. The primary endeavour of science is to understand causality. It is only when the cause is understood that scientists can understand the effects. Functionalism, like other approaches in science, believes in multiple causalities. A particular phenomenon can be attributed to many causal and intervening factors. The implication of this deterministic assumption in understanding human behaviour is that there are external and coercive factors responsible for

human actions and behaviour. Particularly to the functionalists, the social norms, values and positions, and conditions greatly determine human behaviour. The social processes are fraught with expectations. Hence behaviour emerged in the process of meeting expectations and fulfilling social imperatives (Amzat and Razum, 2014). This study exposes the subjects to an educational intervention with the hope of accepting or rejecting hypotheses that it is effective in positively influencing the nurses knowledge on Standard Precautions and compliance with it.

### **Methodological Approaches**

Methodology is the philosophical framework within which the research is conducted or the foundation upon which the research is based. It can also be described as the principles, procedures and practices that govern research (Grant and Osanloo, 2014). Quantitative methodology is underpinned by positivist paradigm, objective epistemology and critical realist ontology. According to Creswell (2009), quantitative approach most often uses deductive logic, in which researchers start with hypotheses and then collect data which can be used to determine whether empirical evidence to support that hypothesis exists.

In this study where the objective is to evaluate the effectiveness of an innovative educational intervention in influencing compliance with the Standard Precautions among the nurses of selected county hospitals, quantitative method was the best-suited.

### **Research Implications**

From the arguments and discussions in this chapter, it is reasonable to conclude that, the ontological and epistemological position that I hold influenced the type of research methodology selected, subsequently the research design and data collection methods. In the context of this study my standpoint of the critical realist ontology and objective epistemology means that hypotheses formulated are to be tested empirically and deductive model applied to come up with conclusions on the research problem.

The positivism paradigm and Functionalists theoretic perspective that I opted to adopt based on my ontological and epistemological perspectives guided the choice of quantitative methodology.

The positivism paradigm and Functionalists theoretic perspective led to Quasi Experimental design where numerical data was collected prior (pre) and after (post) innovative educational intervention. Probability sampling procedure was used. It therefore follows logically that numerical data analysis was applied to test the hypothesis stated. As stated by Amzat and Razum (2014), the functionalism in the social sciences is the general thesis that phenomena can be explained strictly with reference to what they do rather than what they are. This study employed observation checklist to measure observed compliance and questionnaires to measure knowledge and self-reported compliance.

### **3. CHAPTER THREE: REVIEW OF RELATED LITERATURE**

This chapter discusses literature review that was relevant to this study. This chapter therefore is discussed guided on study objectives that is it begins with review of literature on the first objective that is Percutaneous Injuries or blood/body fluids exposures among the nurses. The second section of this chapter is the review of related literature concerning the second objective that is the knowledge of standard precaution among the nurses. The third section of this chapter is the review of related literature concerning the third objective that is the self-reported compliance with standard precaution among the nurses. The fourth section of this chapter is the review of related literature concerning the fourth objective that is on observed compliance with standard precaution among the nurses. The fifth section of this chapter gives insight of the social cognitive theory and justification for its choice. The sixth section is the elaboration of the conceptual framework and seventh section discusses the Multipronged Educational Intervention. Finally, the last part provides a summary of the literature review.

#### **Types and sources of literature review**

This study employed integrative literature review approach. The integrative review method is an approach that allows for the inclusion of diverse methodologies (i.e. experimental and non-experimental research (Whittemore and Knafl, 2005). Integrative literature review is considered a form of research that reviews, critiques, and synthesizes representative literature on a topic in an integrated way such that new frameworks and perspectives on the topic are generated. The body of literature includes all studies that address related or identical hypotheses. According to Whittemore and Knafl (2005), a well-done integrative review meets the same standards as primary research in regard to clarity, rigor, and replication.

It is a fact that primary sources of literature are more credible and authoritative than secondary sources of literature (Whittemore and Knafl, 2005). I used types and sources of literature that would provide quality information for my research. Some old sources were

used to obtain primary literature on the Social Cognitive Theory. Secondary sources of literature reviews was obtained from established databases namely PUBMED, CINAHL Plus, Cochrane Collection Plus, MEDLINE (Ovid) and Nursing and Allied Health Database

### **Percutaneous Injuries and blood/body fluids exposures**

A cross-section descriptive study done in Serbia on the 983 healthcare workers in a tertiary health facility, established a throughout career prevalence of 56.5% and a previous 12 months prevalence of 26.9% (Marković-Denić et al., 2013). The authors add that the prevalence of blood and body fluids exposures were highest among nurses/technicians compared with other professionals. The study records that nearly 80% of all percutaneous sharps injuries were caused by a needle stick. Most (75%) of these blood and body fluids exposures are not reported thus may delay proper medical evaluation and further management.

In a follow up study done among 287 China nurses, the previous 12 months, the incidence rate of needle and sharp injuries was 1.31 incidences per nurse in a year. The author further adds that nurses are at greater risk for HIV or hepatitis B and C through occupational exposures of blood and body fluids (He et al., 2016).

Ghanei Gheshlagh, Aslani, Shabani, Dalvand, and Parizad (2018), in a systematic review and meta-analysis study on prevalence on sharp injuries among healthcare workers in Iranian Hospitals documented a prevalence of 42.5% for all healthcare workers. It goes further to single out that the all career prevalence is higher (44%) among the nurses compared to other healthcare workers.

A systematic review of blood and body fluids exposures to healthcare workers in 21 African countries summarized that the previous 12-month prevalence ranged from 17.0% to 67.6% with an average of 48.0%. Regional pooled estimates ranged from 33.9% in southern Africa to 60.7% in northern Africa. It adds that Burundi is doing poorly with a previous 12 months

prevalence of 67.6% (Auta et al., 2017). The study posits that the estimated incidence rate of blood and body fluids exposures to an individual health-care worker in Africa was 2.10 per annum.

A cross-sectional descriptive study done in Ethiopia on needle stick injury among 313 nurses working in public hospitals established that the previous 12 months prevalence was 34.5% and throughout their career prevalence was 48.8% (Kebede and Gerensea, 2018). They add that Hollow bore needle (57.7%) and Suturing needle (28.5%) were the most common cause of the exposures. The same study documents that 86.4% report these exposures for further management.

Tanzania reports 35% previous 12 month's prevalence of Percutaneous Injuries in a study done on 291 healthcare workers in a tertiary hospital. The study also adds that the annual incidence rate is 0.2 Percutaneous Injuries per healthcare worker per year (Mponela, Oleribe, Abade, and Kwesigabo, 2015). Moreover, only, 46.1% of the exposures were reported to the authorities for further management.

A study to establish the previous 12 months prevalence of blood and body fluids exposures among the nurses/midwives at a Ugandan hospital determined that 46 % of the respondents had experienced blood and body fluids exposures (Odongkara et al., 2012).

Furthermore, about 40% of the healthcare workers in Kenya have experienced blood and body fluids exposures in the course of their duties (Mbaisi, et al., 2013). The study notes that about fifty percent reports the incidences for evaluation and further management.

Several studies appreciate that the most important factor that affects exposure to blood and body fluids among the healthcare workers is application of Standard Precautions. It is estimated that health care providers who practice the standard precaution are 99 times less likely to face blood and body fluids exposures as compared to those who do not practice

(Dilie, Amare, and Gualu, 2017). The Standard Precautions provide barriers from exposure to blood and body fluid.

Longitudinal studies done in Jordan and Bangladesh on the impact of an educational intervention on blood and body fluids exposure prevention among nurses demonstrated there was a very significant (about 30%) reduction of the exposures six months after the intervention (Khraisat, Juni, Anita, and Salmia, 2016).

### **Knowledge on the Standard Precaution**

In a cross-sectional survey on factors of compliance with the standard precaution among nurses in home healthcare settings in the Northern America, majority (over 90%) of nurses demonstrated adequate knowledge on Standard Precautions as appertaining to applicability to people without infections, on handling or contact with bodily fluids and on the underlying principles of standard precaution (Russell et al., 2018). The study also established less than adequate knowledge on use of masks/goggles for care that is unlikely to cause splashing of fluids (69.6%); using soap and water to wash hands before eating and drinking (57.1%). Elsewhere in Vietnam, a comparative cross-sectional survey on factors of compliance with the standard precaution among 339 healthcare workers in two hospitals (Urban and Rural) documented that the median knowledge scores were 65.3% and 73.4% in the rural and urban hospitals respectively. The study concluded that the majority of respondents showed adequate knowledge (Lien et al., 2018).

According to a study done in China by He et al.( 2016), 83.7% had adequate knowledge on Standard Precautions; and 65.4% were correct about HIV post-exposure prophylaxis. Knowledge about the importance of starting post-exposure prophylaxis early is very low (28.7%). Only 30.3% have previously received occupational safety special training. Several



similar studies have found post-exposure prophylaxis knowledge among healthcare workers is still inadequate

Akagbo, Nortey, and Ackumey (2017), established that knowledge of the basic concepts of standard precaution was low among healthcare workers in Ghana. The cross-sectional study reports that about 37.0% of healthcare workers knew that standard precaution includes hand washing before and after any direct contact with the patient, 39.0% knew about cough etiquettes and 40.0% knew about aseptic techniques which involve infection prevention strategies to minimize the risks of infection. Similarly in the same study, knowledge of hand washing practices and the use of personal protective equipments was generally poor.

According to a cross-sectional study done in Nigeria on knowledge and practice of infection prevention among the health care workers, the median overall percent knowledge was 70% (Iliyasu et al., 2016). The same study observes that nurses were more knowledgeable of the fact that hand hygiene is the most effective method to prevent healthcare acquired infection. Furthermore, majority of the respondents agreed that avoiding recapping needles, use of barrier precaution and hand hygiene effectively prevent hospital acquired infections. More details on knowledge of standard precaution among Nigerian health workers was recorded by Aluko et al. (2016), who record that 89 % were knowledgeable about hazards in health care settings, 70% identified recapping used needles as a risky practice and all(100%) recognized that effective hand washing prior to, and after every clinical procedure in preventing cross infection. Also, most respondents (96.2 %) believed they were at risk of occupational hazards while about two-thirds perceived the risk as high.

In across-sectional study on knowledge and practice of standard precaution among 251 healthcare workers of Jimma University Medical Center, Ethiopia, 82.2% had good overall knowledge about Standard Precautions. However, the level of knowledge in some

components of Standard Precautions was inadequate. For instance, less than 70% appreciated that Standard Precautions apply to blood, all body fluids, secretions, and excretions (except sweat), nonintact skin, or mucous membranes. Similarly, only less than half (44.8%) knew that Standard Precautions are intended not only for patients who have signs and symptoms of disease (s). Slightly more than half (58.3%) of the respondents knew that needles should not be disposed mixed with other wastes/rubbish (Hebo, Gameda, and Abdusemed, 2019).

In a cross-sectional study done in Uganda, most (51.1 %) healthcare workers are considered adequate knowledgeable on Standard Precautions (Wasswa et al., 2015). The study concludes that adequate knowledge was also strongly associated with compliance with the standard precaution.

In a quasi experimental study done in Pakistan that was testing the efficacy of an education program on knowledge on standard precaution among of health care worker, knowledge scores increased by over 20% from 58.6% (6.44 out of 11) to 80.2%(8.82 out of 11) (Ismail et al., 2018).

Kebede and Gerensea (2018), notes the nurses who had not attended any training on prevention and management of needle stick injuries in their workplace were at a significantly greater risk of sustaining such injury compared with those who had attended some kind of training. The study thus concludes that the role of any training or educational intervention cannot be underestimated.

About twenty percent (20%) of healthcare workers are considered to have adequate knowledge on the Standard Precautions and while slightly above 60% are considered to be compliant with the Standard Precautions(Moyo, 2013; Ochieng, 2016; Gichuhi, 2015).

### **Self-reported Compliance with the Standard Precautions**

Donati et al.(2019), carried out longitudinal study to confirm the relationship between an educational intervention and compliance with the standard precaution among nurses in an Italian University Hospital. The study established that compliance of nurses who participated in at least one training course on standard precaution was significantly higher than that reported by those who had never participated in such training.

In a Northern America cross-sectional study on factors of compliance with standard precaution among nurses in selected Home Healthcare Agencies concluded that there is high rate of self-reported compliance with standard precaution. The percentage of nurses in the study who reported compliance with standard precaution practices exceeded 90% for 5 of 8 measured behaviours (Russell et al., 2018).

A comparative cross-sectional survey on factors of compliance with the standard precaution among 339 healthcare workers in two hospitals (Urban and Rural) in Vietnam established a median practice scores were 73.3% and 82.6% in the rural and urban hospitals respectively. Similar to the knowledge score, most staff scored good to adequate practice scores range in both hospitals (Lien et al., 2018).

He et al. (2016), observes in a longitudinal study done in China that adequate knowledge on standard precaution may not be assure satisfactory compliance with the standard precaution. The same study further demonstrate this fact by establishing that 95.3% of investigated nurses their risk of occupational exposure to be high or very high yet they did fail to follow Standard Precautions. In this same study only 24.0% of the nurses used gloves regularly when contacting patient body fluids/blood. They also improperly disposed of medical waste which caused most of the occupational exposures. Therefore, improving knowledge of professional behaviours is essential to minimize occupational exposures to HIV.

He et al. (2016), posit that effective measures to prevent nurses from occupational exposure include practice of the Standard Precautions, eliminating unnecessary injections, education, use of sharp instrument containers for disposal, and elimination of needle recapping, and these measures have reduced blood and body fluids exposures by 80%. He et al., add that a case-control study documented that prompt initiation of zidovudine can decrease the risk of acquiring HIV by 81% after occupational exposure

Kebede and Gerensea (2018) established that Ethiopian Nurses who do not use personal protective equipment during procedure were more than four times at more risk to sustain needle stick injury than their counter parts. The same study associated compliance with standard precaution with adequate knowledge. In Kenya, the self-reported compliance with the standard precaution when considered wholesomely is estimated at about 67% (Gichuhi, 2015; Moyo, 2013; Ochieng, 2016).

### **Observed compliance with the Standard Precautions**

Russell et al. (2018), established poor observed compliance with standard precaution especially in hand hygiene among Northern America nurses. This contradicts high self-reported compliance with standard precaution among nurses in the same study.

Yusefzadeh, Didarloo, and Nabilou (2018), did a prospective cross-sectional study on observed compliance with standard precaution with focus on injection handling among anaesthetists in Iran. The study noted that 99% of injections were administered using the standard disposable syringe and 98% of the injections used the syringe and needle was taken from a sterile unopened packet. The study also observed that only 17% correctly reconstituted medicine using diluents from the same manufacturer and that only 19% of the injections were both preceded and concluded with hand hygiene. The study summarizes that safety

requirements were observed in 61.28% of injections with considerable variation in values of items measured.

Though it is a fact that compliance with the use of Standard Precautions prevents infections and protects health care workers during provision of care, compliance is still not a common practice and thus poses a challenge. Some of the contributing factors to low compliance includes lack of time, lack of awareness, deficient lifelong learning process, sheer carelessness or guts to engage in risky behaviours, inadequate equipments and protective equipments (Koné and Mallé, 2015; Moore et al., 2015; Porto and Marziale, 2016).

Akagbo, Nortey, and Ackumey (2017), established that compliance with the standard precaution among healthcare workers in Ghana was low. The study underscores that 50% of the health workers always protect themselves against blood and body fluids exposures. About a quarter of the health workers do not recap needles after use (25.0%). Twenty-eight (28.0%) percent of respondents sometimes promptly wipe all blood spills while 61.0% of respondents always wipe blood spills. Surprisingly, only 61.0% of respondents wear gloves, the basic protective equipment.

Amuwo et al. (2013), demonstrated that participatory educational intervention was effective in increasing some aspects of the Standard Precautions. The same quasi experimental pre/post test study noted that the use of sharp containers/ boxes increased significantly from 31.9% to 52.2%.

In Kenya, the observed compliance with the use of standard precaution items varied; for instance, 33% performed hand hygiene before administering medications, 66.7% performed hand hygiene before feeding of patients and all(100%) of them performed hand hygiene while handling contaminated objects (Moyo, 2013).

## **The Social Cognitive Theory**

This study is based on The Social Cognitive Theory. The above theory and principles are widely used in health and nursing studies in an attempt to predict and/or explain health behaviours. They inform complex human behaviours and unexpected way of doing things (Bandura, 2010).

Social Cognitive Theory is a theory developed by Albert Bandura initially in 1960s and he continually improved in late 1980s to 1990s. The gist of The Social cognitive Theory according to Bandura (2010), is that human beings learn by observing others(vicarious learning), within the context of social interactions in a setting herein referred to as the environment but subject to ones cognition which entails ones personality. The learned behaviours are central to ones personality.

What makes the Social Cognitive Theory unique is that it proposes that learning considers how people maintain a learned behaviour, considers past experiences and is a collective function of Self-Efficacy, goals and Outcome expectancies. Social Learning Theory states that when people observe a model performing behaviour and the consequence of the behaviour, they remember the sequence of events and are likely to remember the information to guide subsequent behaviour and more so, it prompts them to try out an already learned behaviour. Organizational support meant the study facility provided adequate materials needed for implementation of the Standard Precautions such as personal protective equipments (such as gloves), colour-coded bins, sharp boxes and facilitation of the organized learning sessions. The Social Cognitive Theory emphasizes that the dynamic interaction (Triadic Reciprocal Determinism) between people (personal factors), their behaviours and their environment as demonstrated by the following Figure 1;

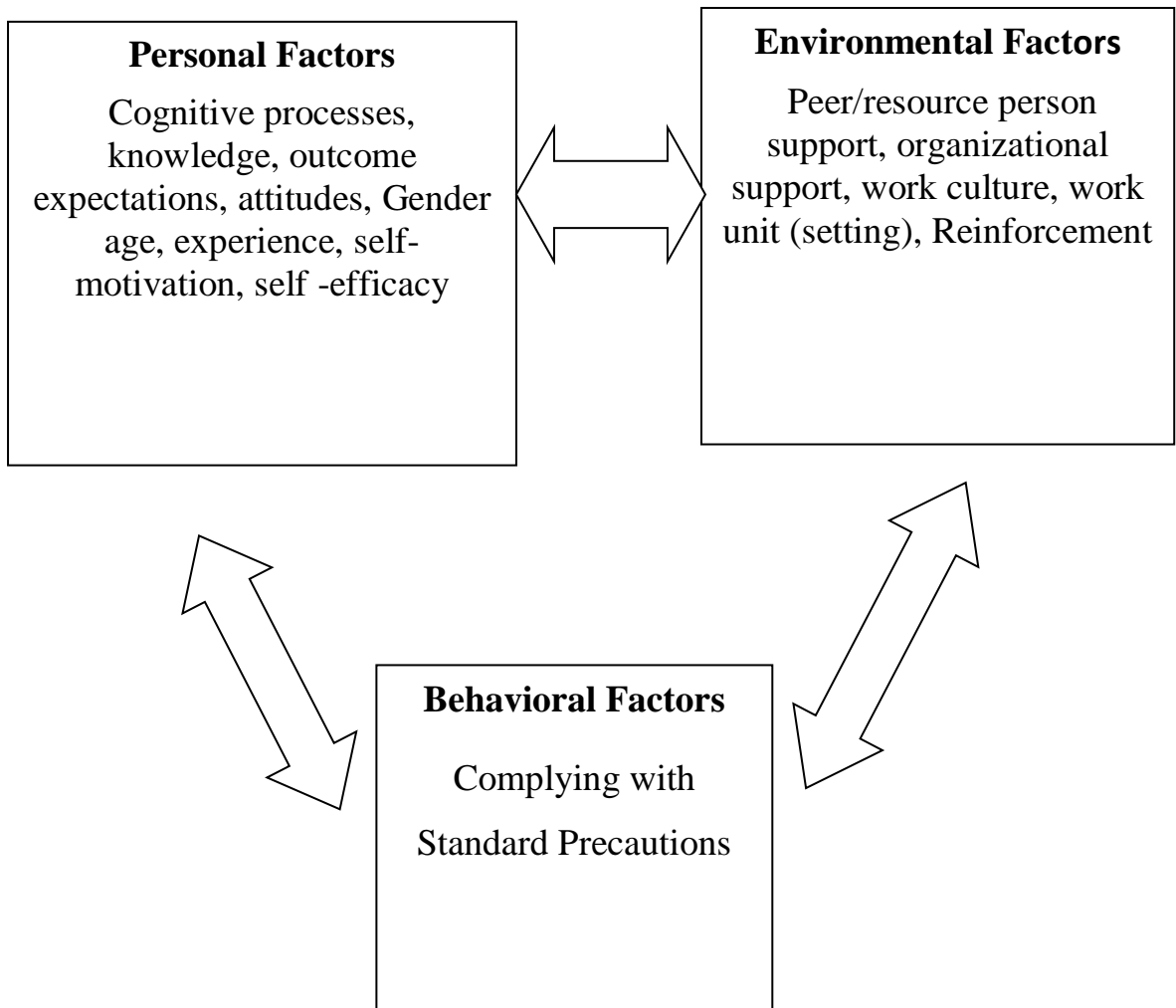


Figure 1: Social Cognitive Theory (Modified) adapted from Bandura(2011)

### **3.1.1. Personal factor**

According to Bandura (2010), personal factor has four constructs namely; Self efficacy, expectations, expectancies and self-control or self-regulation constructs. Self-efficacy construct refers to the level of one's confidence in their ability to successfully perform a behavior or specifically the confidence to comply with the Standard Precautions. Expectation construct is the consequences of behaviour change. Expectation construct can also be defined as the likelihood and value of the consequences of behavioural choices. Through the set intervention, the study aimed to make the nurses believe that complying with the Standard Precaution is noble and beneficial to them. Standard Precaution compliance eliminates or mitigates the occupation risks.

Expectancy construct is the value that an individual associates with the behavioural outcome. This study takes cognizance of the fact that the greatest impediment to any compliance is a negative attitude towards any idea or concept. The intervention in this study aimed to instil appropriate attitude towards the Standard Precaution and thus compliance. Self-control/regulation construct is how much control over behaviour change (Bandura, 2010). The study is intended to gradually inculcate the notion that personal safety and health is in the nurses' hands, thus they ought to be in a position of deciphering and complying with the Standard Precautions for their own good.

### **3.1.2. Environmental factors**

Environmental factor has four constructs namely; vicarious learning construct, situation construct, reinforcement construct and collective efficacy construct. Vicarious learning is learning by observing others' behaviours and the consequences following them. There are four conditions before a behaviour is modelled; attention (the learner has to listen/see or perceive a desired behaviour), retention (the desired behaviour has to be remembered), reproduction (the actual attempting or doing of the desired behaviour) and motivation (the



self-drive to perform the desired behaviour) (Bandura, 2010). Competent models, with power and prestige had been purposively selected to educate and demonstrate from time to time on the various aspects of the Standard Precautions. The authoritative experts and knowledgeable models who are also peers shall exhibit the desired attitude and attempt to address or recourse the attitudes that are unfavourable to the Standard Precaution through their day to day activities in their work environment. Situation construct is about the environment in which behaviour occurs and perception of it. The experts and the knowledgeable/resourceful peers continuously corrected misconceptions of infection prevention and Standard Precautions. The involvement of peers from their working set ups made the environment supportive, facilitative and friendly to comply with the Standard Precautions. Besides the knowledgeable peers, the environment was facilitated in liaison with the hospital administration to consistently provide protective gears, infection prevention bins, injections safety boxes as well as the educative fliers and brochures on the accessible and strategic notice boards

Reinforcement construct is about the use and misuse of rewards and punishment to modify behaviour. The experts and the knowledgeable peers acknowledged, appreciated and encouraged demonstration that was in line with principles of infection prevention and Standard Precautions and discourage what is contrary. Collective efficacy construct is the confidence or belief in a group's ability to perform actions to bring about desired change (Bandura, 2010). Collective efficacy is also the willingness of community members to intervene in order to help others. The ultimate goal of this study was to enhance the nurses' knowledge on the Standard Precaution and to help the majority develop positive attitudes and group confidence on performance of compliance with it. With consistent reminders and friendly educational packages especially from peers and experts instilled the attitude of 'Yes we can' comply with the Standard Precautions.

### **3.1.3. Behavioural factor**

According to Bandura (2010), behavioural factor or construct is about the level of knowledge and skill to execute a behaviour. This study had an intervention, Multi-pronged Educational Intervention, package encompassing knowledge contents, tools, resources and supportive environment to make compliance of the Standard Precaution easier to achieve. This study implemented an intervention that enhanced both self-efficacy and collective- efficacy in compliance of the Standard Precautions

Ghadyani, Tavafian, Kazemnejad, and Wagner (2017), vouched for the social cognitive theory, a health behaviour change theory that provides a comprehensive and well-supported conceptual framework for understanding the interaction of an individual's behaviour and environment that influences healthcare providers' behaviour. Moreover, according to Thompson and Thompson (2014), the Social Cognitive Theory provides a model that explores the factors that determine the longevity of behavioural changes resulting in successful outcomes that may be long-term. The subjects' realistic outcome expectations are likely to encourage the resilience, perseverance and long-term commitment. Bandura (2010) contends that both self-efficacy and collective efficacy beliefs people's judgment of their capabilities to organize and execute courses of action required to attain designated types of outcomes are central to well-being. It is only when people believe their actions can produce the desired outcome that they develop incentive to act accordingly. Based on the foregoing this study chose the social cognitive theory as the most appropriate theory to guide the interventions in improving both self and collective efficacy in compliance with the standard precaution.

## The Conceptual Framework

The ultimate objective of this study was to evaluate the effect of Multi-pronged Educational Intervention in influencing compliance of the Standard Precautions. Multi-pronged Educational Intervention was innovative to the extent that it was administered by experts initially and later on by knowledgeable and credible peers of repute in a conducive environment while the dependent variables were knowledge and compliance with the Standard precaution. The Multi-pronged Educational Intervention was premised on the principles of pedagogy, androgogy and vicarious learning. The educational intervention was founded on Social Cognitive Theory. The role of other extraneous variable identified together as socio-demographic characteristics which could be influencing the respondents' perception of the Standard Precautions was examined. The following diagram (Figure 2) is a conceptual framework of this study.

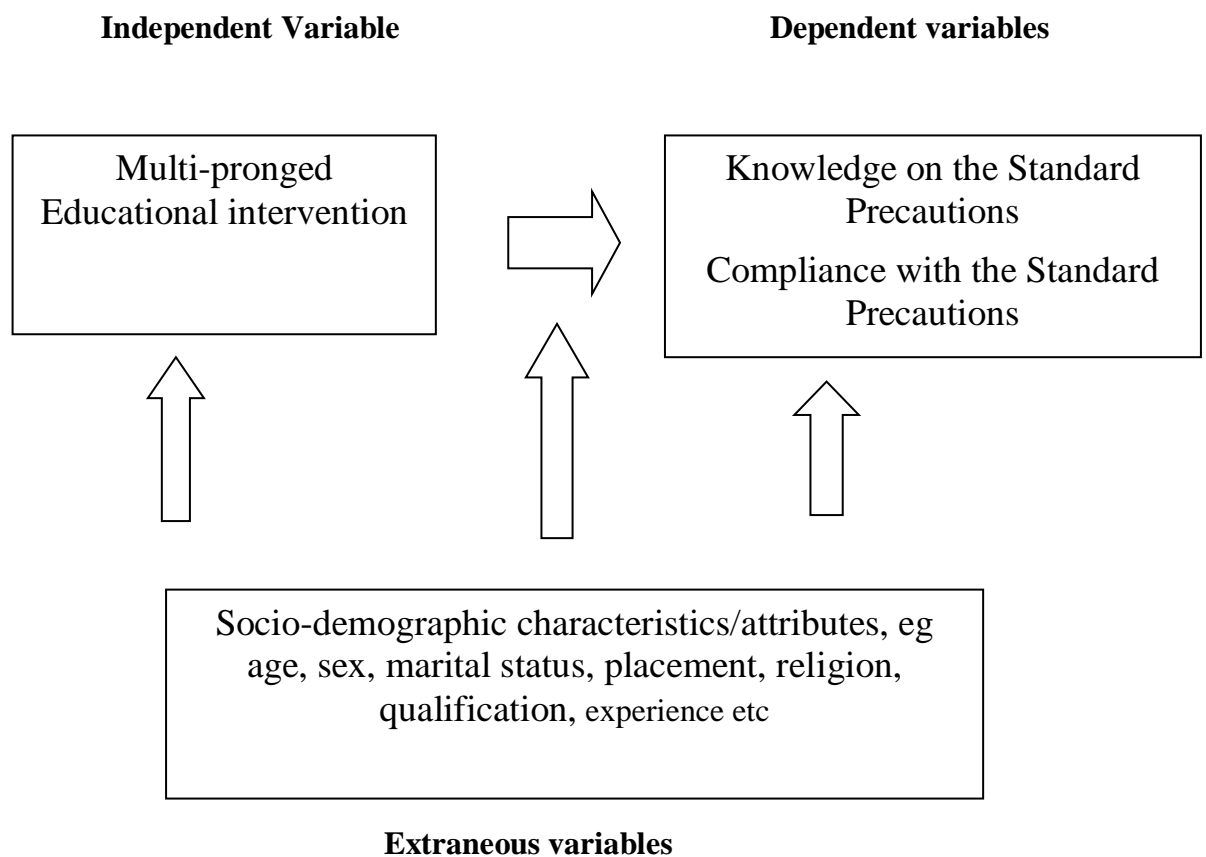


Figure 2: Conceptual Framework authored by Mukthar, V.K.(2020)

## **Educational Intervention Development**

According to Campbell, Murray, and Darbyshire (2017), behaviour change is a complex process involving psychological, social and environmental dimensions. Research has demonstrated that behaviour change interventions are effective in changing a variety of adverse health related behaviours. Among the interventions identified is the educational intervention. Educational intervention has been applied widely in health to initiate a positive behaviour change or to extinguish an adverse or undesirable behaviour in health with relative success (Moralejo et al., 2018a). The educational interventions packages are greatly diverse and dynamic based on the choice of inherent theory guiding it (Campbell et al., 2017). The intervention model was based on the Social Cognitive Theory which is commonly used in health education and promotion.

Auta et al. (2017), proposed that there is need to devise innovative approaches to regular in-service training for health-care workers could help promote Standard Precautions for preventing the transmission of blood-borne infection. Furthermore, Standard Precautions could be supplemented by educating health-care workers to take responsibility for their own health and safety and for that of others who may be affected by their actions at work.

There are several behaviour change theories that have been previously used to design intervention with Health Belief Model and Theory of Planned Action/Behaviour being popular. This study chose to use Social Cognitive Theory for its comparative advantage of maintenance of behaviour changed rather than just initiating a behaviour change. Furthermore, Social Cognitive Theory is considered more comprehensively than other theories. It attempts to embrace the subtle and complex relationships between people and their environment, and the social and environmental influences on their actions (Van Den Broucke, 2014). It builds on Bandura's work (2010) on self-efficacy and a greater awareness

of the ways in which the environment shapes behaviour by making it more or less rewarding to behave in certain ways. Social Cognitive Theory has three constructs namely Personal, environmental and Behavioural constructs that interact in what is referred to as Triadic Reciprocity to influence learning as a conscious and deliberate effort to improve the dependable variables namely occurrence of Percutaneous Injuries, knowledge and compliance of the Standard Precautions.

Many studies including Li, Liang, Lin, and Wu (2015), have recommended the use of longitudinal and randomized studies to measure the effect educational interventions on standard precaution. The educational intervention aimed to impart knowledge and create favourable attitudes on compliance of the Standard Precautions and sharps injuries management. Moralejo, El Dib, Prata, Barretti, and Corrêa (2018b), in a comprehensive systematic review of studies applying various educational interventions to influence knowledge and compliance with the Standard Precautions contends that continued research on understanding behaviour change issues would allow development of interventions with a clearer theoretical rationale. Moralejo et al.(2018b), posit that these education interventions improve both knowledge and compliance with standard precaution by at least 10%. These interventions are education alone, education with simulation, with reminders/cues or checklists, with audit and feedback, with financial support and with organization support. Moreover, the education intervention could be face to face lesson, small discussion group, large groups sessions, use of additional educational materials such as flyers/posters, computer assisted simulation.

Appreciating the Social Cognitive Theory and the guided by literature herein, this study came up with the innovative educational package identified as Multi-pronged Educational Intervention discussed in the subsequent section.

## **Multi-pronged Educational Intervention**

### **3.1.4. Content**

Multi-pronged Educational Intervention had both theory lessons and practical aspects. The topics covered under the Standard Precautions included basics of infection preventions, use of personal protective equipments (PPEs), sharps/needles management, decontamination/disinfection, blood and body fluids exposure management. The educational intervention was structured based on training program minimum standards by OSHA, WHO and CDC (CDC, 2014a, 2014b; WHO, 2014). The Multi-pronged Educational Intervention was guided by a training manual that with the overall objective of enhancing knowledge and compliance with Standard Precautions among the nurses in the study group.

### **3.1.5. Delivery Methods**

Multi-pronged Educational Intervention in a nutshell means an education package or strategy that entails five learning methods supported by organizational facilitation. The five learning methods are; face to face lessons (with Power-point presentations), video-assisted simulation, small group discussion, demonstration and finally, the posting of posters/flyers on the subject matter in strategic places to act as cues/reminders to action. Multi-pronged Educational Intervention sampled both didactic and interactive learning methods that ensured high level of the learners' interest and engagement.

### **3.1.6. Learning Phases**

Multi-pronged Educational Intervention was developed in three phases namely; Pre-active, Interactive and Post-active phases as outlined by Gongora-Ortega, Segovia-Bernal, Valdivia-Martinez, Galaviz-deAnda, and Prado-Aguilar (2012).

*Pre-active phase* the resource persons prepared for the lesson by being briefed on the lesson plans and design, seeking clarification on strategy and method adopted and preparing of the

teaching aids including posting of posters/flyers in strategic places to act as cues/reminders to action. Furthermore, in this phase aspects of organizational support were assessed and put in place. The resource person ensured that adequate materials needed for learning and implementation of the Standard Precautions are available. For instance provision of personal protective equipments (such as gloves), colour-coded bins and sharp waste boxes

*Interactive phase* is the execution phase where learning experiences were provided through the five suitable modes adopted by this strategy. The learning methods are; firstly, a 30-minute's face to face lesson aided with Power-point presentations, secondly, a 10-minute's video-assisted simulation, thirdly, 10-minute's small group discussion and finally a 10-minute's demonstration.

*Post-active phase* is also called the evaluation stage. This phase involved the activities that evaluated learning and identified challenges in the learning process. At the end of the intervention, the resource person asked the learners questions as well as requesting the participants to do return-demonstration on selected components of the Standard Precautions.

Each unit had a self assessment competitive process of identifying a leading and exemplary nurse on subject of standard precaution who doubled up as recognized resource person and peer support system. In essence, Multi-pronged innovative educational intervention offered in a supportive environment and aimed at improving the nurses' knowledge on the Standard Precautions and compliance with Standard Precautions.

### **3.1.7. Resource Persons**

A resource person that doubled up as the hospital Infection Prevention and Control Committee Head was appointed as the Lead Research Assistant(tutor) and was assisted by four other Research Assistants. All the Research Assistants had been sufficiently trained on the Multi-pronged Educational intervention strategy and on the subject matter(SP).

In order to implement the Multi-pronged Educational Intervention herein explained, the resource persons were guided by Training Manual and Lesson Schedules developed by the researcher and validated by experts/supervisors. Both the Training Manual and the Lesson Schedule were drawn founded on Occupational Safety and Health Act (OSHA) guidelines on the use of Standard Precautions and sharps injuries management.

### **Summary of Literature Review**

It is worth noting that previous year prevalence is more reported than entire career prevalence. This prevalence ranges from 25% to 70% with more exposures affecting nurses or health workers in the developing nations. There are very few longitudinal studies done in the developing nations. There are reported Percutaneous Injuries incidence rate of between 1.0 to 2.5 incidences per nurse per year. Most studies documented that comparatively, nurses are at a greater risk of blood and body fluids exposures. The literature notes that up to 30% of these blood and body fluids exposures are never reported for clinical evaluation and further management. It is noted that educational intervention has demonstrated that it can reduce blood and body fluids exposures by up to 30%.

Adequate Knowledge on the standard precaution was very varied ranging between 20% and 90%. Some studies explored on the entire concept of knowledge on the standard precaution while others were specific to some selected items of the standard precaution thus uniformity was not guaranteed. Many studies reported that three areas that scored poorly in knowledge of standard precaution practice were hand hygiene use of personal protective equipments and knowledge on management of blood and body fluids exposures. The three studies that have done some works in the topic in Kenya reported very low (20%) adequate knowledge on the standard precaution. It is noted that educational intervention has demonstrated that it can reduce blood and body fluids exposures by up to 20%.



The self-reported compliance with the standard precaution was higher (67-95%) than the observed compliance with the standard precaution (around 50%). The use of personal protective devices and the practice of hand hygiene are noted to be poorly scored both in self-reported and observed studies. Needle recapping and inconsistent decontamination of potential hazardous spills is a common underbelly in compliance with the Standard Precautions. It is worth noting that educational intervention has been documented to improve the compliance of both self-reported and observed compliance up to 20%. This study chose the social cognitive theory as the most appropriate theory to guide the interventions in improving both self and collective efficacy in compliance with the Standard Precautions.

## **4. CHAPTER FOUR: METHODS AND MATERIALS**

In this chapter, research methodology is described including justification for the Quantitative approach, Quasi-experimental design, the setting of the study, total population sampling techniques, training procedures in terms of method and content, quality control measures, descriptive and inferential methods of data analysis, presentation of results, dissemination of results and ethical considerations.

### **Study Approach and Design**

According to Creswell (2009), research approaches are plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis and interpretation. The positivism paradigm and Functionalists theoretic perspective that the study opted to adopt based on ontological and epistemological perspectives guided the choice of quantitative methodology or approach. Creswell expounds that quantitative research test theories or hypotheses deductively building in protecting against bias, controlling for alternative explanations and being able to generalize and replicate the findings.

Research design are types or strategy of inquiry within qualitative, quantitative or mixed approaches (Creswell, 2009). This study applies Quasi experimental design precisely Non-equivalent Control Group study whereby the units of observation (nurses) were not be randomly assigned to either study or control groups. According to Price and Chiang (2012), Quasi experimental design involves manipulation of an independent variable without random assignment of participants to conditions or orders of conditions. This design is recommended in the field setting involving human being where randomization is impossible or raises ethical concerns. Price and Chiang add that it is recommended in evaluating the effectiveness of treatments such as educational interventions. The other advantage of quasi experiment over

correlation methods is it eliminates the directionality problem by the virtue that it involves the manipulation of an independent variable.

The study group included the nurses from Baringo County Referral Hospital (BCRH) while the control group included all the nurses from Nandi County Referral Hospital (NCRH). The independent variable that was manipulated was the Multi-pronged Educational Intervention while the dependent variable was compliance with the Standard Precautions.

### **Study Setting**

The study area was selected based on a report by Ministry of Public Health and Sanitation & Ministry of Medical Service (2010), which conducted a survey on the extent of compliance of infection prevention and control in selected county facilities in five regions(former Provinces). This qualitative rapid assessment of infection prevention and control established that the compliance was lower in the former Rift Valley region at about 55% compared to other regions which had at least 60% compliance. The selection of study and control groups' hospital was done by cluster sampling and simple random sampling as elaborated in the sampling subsection. The study was undertaken in two county hospitals namely Baringo County Referral Hospital (BCRH) as study group and Nandi County Referral Hospital (NCRH) as control group. Baringo County Referral Hospital (BCRH), a 160 in-patient capacity referral health facility located in Kabarnet town, the headquarters of Baringo County in Kenya. It covers an area of 11,015 square Kilometres and lies between Latitudes 00 degrees 13'' South and 1 degree 40'' North and Longitudes 35 degrees 36'' East and 36'' degrees 30'' East (Omondi et al., 2017).

Nandi County Referral Hospital (NCRH), a 150 in-patient capacity referral health facility located in Kapsabet town, the headquarters of Nandi County in Kenya. It covers an area of 2,884 square Kilometers and lies between Latitudes 00 degrees 20'' North and 0.333 degree

40” North and Longitudes 35 degrees 10” East and 35” degrees 167” East (Omondi et al., 2017).

The county hospitals are major hospitals that provide specialized care, involving skills and competence not available at Sub-county hospitals, Health Centres and dispensaries. Their personnel include medical professionals, such as general surgeons, general physicians, paediatricians, general and specialized nurses, midwives, and public health staff (Wakaba et al., 2014).

### **Study population**

Population is a complete set of individuals, cases or objects with some common observable characteristics (Mugenda and Mugenda, 2003). The population in this study are all the Registered Nurses in Kenya. The Target or Theoretical population is the group to whom the conclusions can be generalized to and in this study are all the Registered Nurses from the fourteen counties of Rift Valley region (former Rift Valley province). According to MoH(K) and NCK (2012), the Registered Nurses constitute over ninety three per cents (93%) of the Kenyan nursing workforce and are recognized globally. Where the target population is large and scattered over vast geographical location, Mugenda and Mugenda (2003), advise the use of accessible population. Mugenda and Mugenda explained that the accessible population is narrowly defined, comparable and manageable population. In this study the Accessible population also called the study population are the nurses drawn from the two health facilities sampled for this study from the fourteen clusters, namely Baringo County Referral Hospital and Nandi County Referral Hospital. Baringo County Referral Hospital has Registered Nurses’ population of eighty six (86) unpublished BCRH Records (2015), while Nandi County Referral Hospital has Registered Nurses’ population of seventy four (74) unpublished NCRH Records (2015).

#### **4.1.1. Inclusion Criteria**

1. Must be Registered Nurses working in the sampled facilities
2. Must have freely consented to participate in the study

#### **4.1.2. Exclusion Criteria**

1. The Registered Nurses who did not consent to participate in the study

#### **Sample size determination**

A sample is a representative subgroup obtained from the accessible population. (Creswell, 2009; Mugenda and Mugenda, 2003), advocate for including the entire population in the study where it is practical for better population validity. Total population sampling (census) is a type of purposive sampling technique where you choose to examine the entire population that have particular set of characteristics(Creswell, 2009).but where it is possible to study the entire population. This study applied Total Population Sampling (census) owing to relatively small size of the population that is 86 for the study group (Registered Nurses from Baringo County Referral Hospital) and 74 for the control group (Registered Nurses from Nandi County Referral Hospital).

#### **Sampling method**

Sampling is the process of selecting a number of individuals for a study in such a way that the individuals selected represents the large group from which they are selected from (Mugenda and Mugenda, 2003). The accessible population is in the Rift Valley region(former rift valley province) has fourteen counties, thirteen county referral hospitals and one national teaching and referral hospital (Moi Teaching and Referral Hospital). The thirteen county referral hospitals are relatively comparable in resources and nurse to patient ratio thus they formed thirteen clusters. Two facilities considered for this study were identified by simple random sampling from the thirteen clusters. To be specific a sampling frame of thirteen formed,

assigned sequential number and two hospitals identified using computer-assisted random number generator. The two county facility randomly selected by the process above are Baringo County Referral Hospital (BCRH) and Nandi County Referral Hospital. The two facilities were further subjected to simple random sampling to identify the study and control group.

Upon identifying both the study group and control group, Total Population Sampling approach (census) was applied. This means all the Registered Nurses in the two health facilities sampled were the units of observation/study.

### **Recruitment and consenting procedures**

Upon receiving the ethical clearance by the KNH/UoN ERC and by the relevant hospitals authorities, the potential and eligible study respondents in each of the participating hospitals were accessed through internal advertisements/memoranda within the selected hospital notices and through the nursing leadership. The message that went out outlined the general study purposes, design, and eligibility to the study, the duration, benefits/compensation, general ethical consideration and consenting procedures. Then the researcher and other trained enumerator met the respondents in designated venue per unit (Surgical, Medical, Casualty/Outpatient, Other special units) on daily basis for one month where they were taken through the Consent form and those who assented to it formed the Study and Control groups. The following Figure 3 show the respondent recruitment and consenting process.

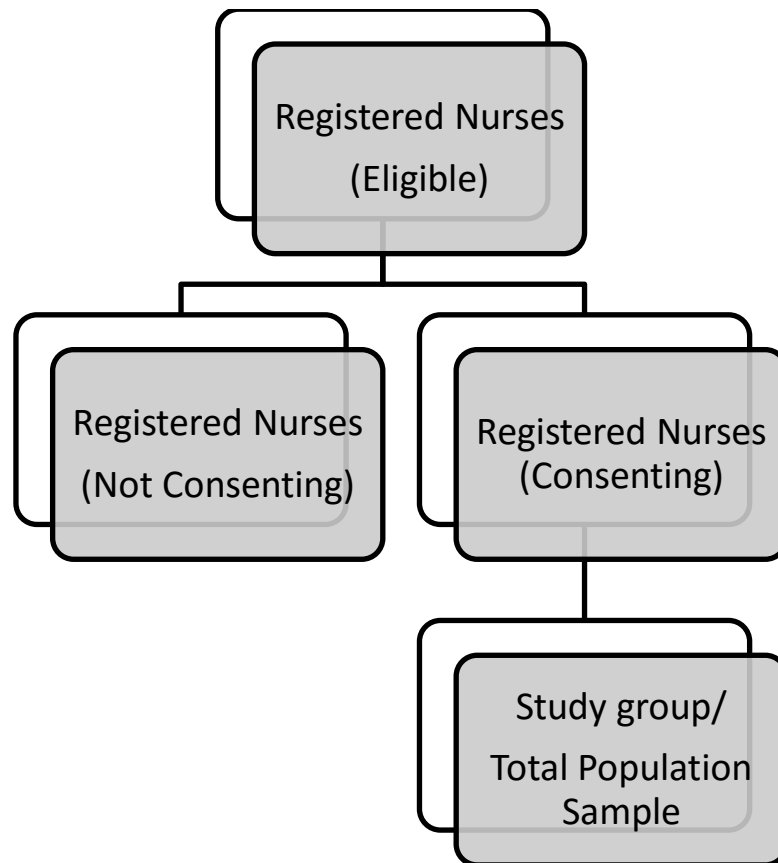


Figure 3: Flow Chart on Recruitment and Consenting

## Variables

### 4.1.3. Independent variable

The independent variable is the Multi-pronged Educational Intervention. This is of deliberate and planned pedagogical efforts that were presented in a group setting using interactive and innovative learning approaches tailored for adult learners based on Social Cognitive Theory. It is an education package that entails five learning methods supported by organizational facilitation. The five learning methods are; firstly, a 30- minute's face to face lesson, secondly, a 10- minute's video-assisted simulation/illustration, thirdly, 10- minute's small group discussion, fourthly, 10- minute's demonstration and return demonstration and finally, the posting of posters/flyers in strategic places to act as cues/reminders to action. The control group was not exposed to the educational intervention package

#### **4.1.4. Dependent variables**

##### **Percutananeous injuries**

Extensive Literature agree that Percutaneous Injuries can be assessed in three ways namely career life prevalence, Previous year prevalence/previous 12 months prevalence and as incidence rate (Amuwo et al., 2013; Butsashvili et al., 2012; Ghanei Gheshlagh, Aslani, Shabani, Dalvand, and Parizad, 2018; Gopar-Nieto, Juárez-Pérez, Cabello-López, Haro-García, and Aguilar-Madrid, 2015; Kebede and Gerensea, 2018; Khraisat et al., 2016). Career life prevalence means all the Percutaneous Injuries exposures/accidents ever encountered by the health workers/nurse since they qualified. The previous year or previous 12 months prevalence means the entire all the Percutaneous Injuries exposures or accidents experienced by the health workers in the last one year. Finally, Incidences rate of Percutaneous Injuries are all the new Percutaneous Injuries exposures/accidents experienced in the period of study per fulltime equivalent employee per 100 nurses (self-reported).

This study established the self- reported previous year prevalence and Percutaneous Injuries incidence rate. The incidence rate meaning the number of Percutaneous Injuries sustained within the six months period of study (after the educational intervention) per the number of Full-Time Equivalent (FTE) of Registered Nurses. It is appreciated that all the respondents were on full time employment basis

##### **Self-reported knowledge on standard precautions**

The concept of self-reported knowledge of the Standard Precautions was measured with scores, a set of thirteen (13) questionnaire items were presented to the respondents to indicate the best and correct response in a Likert scale as adapted from literature (Benboubker, El Marnissi, Nhili, and El Rhazi, 2017; Chee and Ong, 2016; Russell et al., 2018; Sarani et al., 2015; Xiong, Zhang, Wang, Wu, and Hall, 2017). Items included statements in which nurses



indicated their level of agreement by selecting 1 of the following response options: strongly agree, agree, neutral, or disagree or strongly disagree (eg, “We wash your hands before handling sharps”). The items were later recoded with the correct response getting one(1) point while the incorrect responses were getting zero(0) points. After the recoding we computed new variable that is knowledge scores summation. The maximum knowledge score was thirteen (13) points.

### **Self reported compliance with the standard precautions**

The concept of self-reported compliance with the Standard Precautions was assessed using a set of eight (8) questionnaire items as adapted from literature (Donati et al., 2019; Giard et al., 2016; Haile et al., 2017; Lam et al., 2012; Luo et al., 2010; Pereira, Lam, Chan, Malaguti-Toffano, and Gir, 2015; Powers et al., 2016; Russell et al., 2018; Xiong et al., 2017). The eight items were presented to the respondents to indicate the best and correct response. The items were later recoded with the correct response getting one(1) point while the incorrect responses were getting zero(0) points. This proportional score ranges from 0 to 1, where 1 reflects self-reported compliance with all practices and 0 indicates noncompliance with all practices. After the recoding we computed new variable that is a sum of all the self-reported compliance scores. The maximum score was eight (8) points and the minimum being zero (0) points. Scores were summed up later and compared between the groups and also before intervention and after intervention.

### **Observed Compliance with the Standard Precautions**

The concept of observed compliance with the Standard Precautions was assessed with a set of ten(10) checklist adapted from previously developed instruments (Lam et al., 2012; Moralejo et al., 2018a; Russell et al., 2018; Sadeghi, Hashemi, and Khanjani, 2018). The tools were presented to the research assistants to indicate whether ‘done always’, ‘done

sometimes' or 'not done'. The items were later recoded with the correct 'done always' being awarded two(2) points, 'done sometimes' being awarded one(1) point and 'not done' being awarded zero(0) points. After the recoding we computed new variable that is a sum of all the observed Compliance scores. The maximum score was twenty (20) points and the minimum being zero (0) points.

### **Implementation of the Multi-pronged Educational Intervention**

In order to implement the Multi-pronged Educational Intervention herein explained, the resource persons were guided by Training Manual and Lesson Schedules developed by the researcher and validated by experts/supervisors. Both the Training Manual and the Lesson Schedule (Table 1) were drawn founded on Occupational Safety and Health Act (OSHA) guidelines on the use of Standard Precautions and sharps injuries management.

The study was structured in three Steps/Phases as follows:

#### **Step/ Phase One**

This is the phase of getting baseline data upon getting the requisites permits. Phase one was executed in the second month of data collection stage. The eligible respondents were identified and sensitized from both study and the control groups. The two study instruments were used as appropriate. The researcher with the help of trained research assistants obtained self-reported previous year prevalence of Percutaneous Injuries, the self-reported Knowledge on Standard Precautions, the self-reported compliance with the Standard Precautions and the observed compliance with the Standard Precautions. The data obtained was well-stored and backed up in a computer. Furthermore, from this data an initial analysis comparing groups was done mainly using Independent t-test and valuable information was deciphered which yielded the first paper published in peer-reviewed journal.

### **Step/ Phase Two**

This was the phase of implementing the five learning methods of the Multi-pronged Educational Intervention to the study group only. Multi-pronged Educational Intervention is strictly executed as extensively described in the literature section of this thesis. The intervention was packaged in six lessons spread out to about six weeks. The two months were spread out between the third and fourth month of the data collection stage.

### **Step/ Phase Three**

This is the data collection step that comes six months after exposing the study group to the Multi-pronged Educational intervention. Data is collected from both study and control groups. The data collection done during the eleventh and twelfth months of data collection stage using the two data collection instruments. This was done by the principal investigator with the assistance of the research assistants. . The data obtained was well-stored and backed up in a computer. Furthermore, from this data a subsequent and comprehensive analysis was done. On analysis the pre-intervention and post-intervention figures were compared mainly using Paired t-test and valuable information was obtained which yielded another two papers published in peer-reviewed journals. The Lesson Schedule (Table 1) as follows gives the outline of the phases and other relevant details.

**Table 1: Lessons Schedule**

<b>Lecture</b>	<b>Month</b>	<b>Time</b>	<b>Topic</b>	<b>Phase of study</b>
	2 <sup>nd</sup> month			Pre-intervention
Lecture 1	3 <sup>rd</sup> month	Week 1	Gloving, Use of Gowns, Masks and Goggles	Intervention phase
Lecture 2	3 <sup>rd</sup> month	Week 2	Needles/sharps management	
Lecture 3	3 <sup>rd</sup> month	Week 3	Disinfection	
Lecture 4	3 <sup>rd</sup> month	Week 4	Exposure management	
	4 <sup>th</sup> month	Week 5-6	Reviews/ clarifications	
	5 <sup>th</sup> – 10 <sup>th</sup> month			Follow up (6/12)
	11 <sup>th</sup> -12 <sup>th</sup> month			Post-intervention (data collection)

### **Control Group**

This group was neither exposed to any educational intervention, nor any information or documentation relating to Standard Precautions or infection prevention and control.

However, they gave data before and after the intervention in the same manner as the study group.

### **Data collection instruments**

Quantitative methods of data collection were used. The study instruments (tools) were self-administered Structured Questionnaires and observation Checklist/Schedule. The self-administered Questionnaire had four dimensions as guided by Occupational Safety and Health Act (OSHA) guidelines(Li et al., 2015) namely socio-demographic characteristics of the respondents, knowledge of the standard precaution, self-reported compliance and Percutaneous Injuries section(see Appendix 2). The observation checklist has observable aspects of the Standard Precautions were borrowed from the Compliance with Standard Precaution Scale as advanced by (Lam et al., 2012). The checklist had three options namely “Never done”, “Done sometimes” and “Done Always” (see Appendix 3). The Questionnaires captured the *self-reported* knowledge of the Standard Precautions, *self-reported* compliance with the Standard compliance and *self-reported* incidences of Percutaneous Injuries post-intervention and their reporting status(if they did report or not the occupational exposures) while the Observation Checklist/Schedule captured the *observed* compliance with the Standard Precautions. This study conveniently chose two procedures to be observed namely administration of injectable medications and wound dressing for the reason that these procedures covers all aspects of the Standard Precautions from the hand hygiene, use of personal protective equipments, sharps/management management and decontamination. The research assistants were to observe at least four episodes of the stated procedures and make a judgment on compliance of various aspects of Standard Precautions. To avoid observed bias the following key was provided (if the parameter being observed is not observed at all-“never done”, if parameter is observed in 1-3 of the episodes - “done sometimes”, and if observed in all the four episodes - “done always”.

## **Quality Assurance**

### **4.1.5. Validity**

Validity is the accuracy and meaningfulness of inferences which are based on the research results (Mugenda and Mugenda, 2003). The data collection instruments were reviewed and approved by nursing education experts in the School of Nursing Sciences in the University of Nairobi for content validity. All the tools were in English language which is well understood by all the qualified nurses in Kenya. Pretesting was done in Nakuru Level Five Hospital, a similar county teaching and referral facility. Pre-test data was obtained from ten respondents which represented around 10% of the desired sample. Feedback obtained was used to modify the instruments to improve clarity and relevance. Obtaining of baseline data, administering of Multi-pronged Educational Intervention to the study group and obtaining of post - intervention data was done by trained enumerators who were nurses of the cadre of Bachelor of Science in Nursing (recently registered). The majority (8) enumerators had been recruited purposively upon finishing their internship from the same hospital but with four from other facilities in the region. The enumerators had been trained for a month in theory and practice of the standard precaution. They facilitated learning based on a researcher-established lesson plans that were verified by the supervisors. The trained enumerators were also charged to collect pre-test and post-test data.

### **4.1.6. Reliability**

Reliability refers to the measure of the degree to which an instrument yields consistent results or data after repeated trials (Mugenda and Mugenda, 2003). Two approaches were used to test internal consistency reliability of the questionnaire. SPSS version 20 was used to run the two tests of reliability. The questions applying Likert Scale were tested using Cronbach Alpha Method which when ran yielded Reliability Coefficient of 0.82. According

(Mugenda and Mugenda, 2003), a Reliability Coefficient of 0.8 implies high degree of reliability of data and thus this instrument was considered highly reliable. The other eighteen (18) choice questions of the questionnaire instrument were tested for reliability using Split-Half test which yielded a reliability Spearman-Brown coefficient of 0.86 and thus such tool was equally considered highly reliable. Inter-rater reliability is used to assess the degree to which different raters/observers give consistent estimates of the same phenomenon. Inter-rater reliability of the second instrument, the Observation Checklist, was also put to test. Since all the ten (10) items were presented in a Likert Scale, the most appropriate test was Cronbach Alpha Method which when ran yielded Reliability Coefficient of 0.90 and was considered highly reliable.

### **Data collection procedures**

The questionnaires were equally administered to the respondents in both the study and control groups. Baseline data was collected concurrently from both study and control group in the first month of study. Multi-pronged Educational Intervention was later administered to the study group. The intervention was a package of six lessons within two month. Each instrument was applied by the principal investigator two(2) months before and six(6) months after the intervention. Eventually data was collected concurrently from both study and control groups six months after the intervention(where intervention was applicable).

### **Data management and statistical analysis**

The data was cleaned, coded and entered into a computer for analysis using Statistical Package for Social Sciences (SPSS version 20). Both descriptive and inferential statistics was used in analysis. Means and standard deviations were computed for continuous variables and frequencies/proportions for categorical variables. This study adopted a Confidence interval of 95% and a significant level of  $\leq 0.05$ .

Independent t-test was employed to determine the difference between the treatment and the control groups as appertaining to the registered nurses self-reported knowledge scores, self-reported compliance and observed compliance scores. Paired t-test was employed to determine the differences in means before and after periods for each group (the study and the control groups) as appertaining to the registered nurses' self-reported knowledge scores, self-reported compliance and observed compliance scores.

Pearson Product Correlation Coefficient was used to determine relationship between continuous variables (some socio-demographic characteristics, knowledge level and the dependent variable being prevalence of Percutaneous Injuries incidence rate).

Linear regression analysis was used for further analysis of the continuous variables in order to identify the predictors to prevalence of Percutaneous Injuries incidence rate.

Chi square test of significance was used to determine the association between categorical variables between two groups. Binary Logistic regression was also employed to measure the actual effect of categorical variables on some selected outcome variables. The results are presented in text, tabular and graphical form

### **Ethical Considerations**

Truthfulness and confidentiality: this study full disclosure of all relevant information and the study before the respondent committed to being part of the study. The respondents will remain anonymous. Any personal information obtained from this study will not be shared with any other unauthorized person or entity and will remain within the confines of principles of privacy and confidentiality. The study generated vast data that was encrypted and stored in my personal laptop computer and backed up in external disk.

Autonomy and informed consent: Participation in this study is of one's own free will and volition. The participants will be at liberty to decline or withdraw from the study any time of their choice. Refusal to take part will not attract any penalty or consequence. Written



informed consent was obtained from all participants (Appendix 1). Ethical clearance was obtained from the University of Nairobi / Kenyatta National Hospital Ethics and Research Committee (Appendix 4).

**Beneficence:** Participation or non participation does not come with any financial cost. Equally, there is no compensation for participating in the study either to the study or control group. There are no direct benefits to those participating in this study. However, should the educational intervention be effective in the final analysis of this study, and then the participants in the intervention group will benefit from the Multi-pronged Educational Intervention in the short-term. The long-term benefit of this study will be to establish if Multi-pronged Educational Intervention is effective and dependable as an approach of reducing percutaneous injuries incidences and in promotion of compliance with the Standard Precautions

**Non-maleficence:** This study is non-invasive and therefore comes with no foreseeable actual or perceived risks for the potential participants. This study does not involve the extraction of any specimen from the study participants

**Justice:** Dignity, respect and participants rights were respected throughout the study. All the respondents were treated fairly without prejudices. Feedback from this study was disseminated through peer-reviewed journals which are accessible to the respondents and the general public.

## 5. CHAPTER FIVE: RESULTS

This chapter presents the results of this study in five sections for both the study and control groups. It starts with section one where the respondents response rate and the socio-demographic characteristics of the respondents is described. Sections two to five are guided by the study objectives. Section two presents the results of Percutaneous Injuries, incidence rate and their reporting. Section three presents results on the knowledge on the Standard Precautions. Section four presents results on the self-reported compliance with the Standard Precautions. Section five presents results on the observed compliance with the Standard Precautions.

### Socio-demographics

The study's data collection was conducted in between 2015 and 2017. The response rate for this study was around 91% (n=160). The results in the following Table 2 shows that majority of the respondents came from Baringo County Referral Hospital (n=145, 52%), and were most of female in gender (n=145, 73%), were married (n=145, 76%) and were Christians (n=145, 99%).

**Table 2: The sample of the respondents by Socio-demographic characteristics**

Variable	Categories	Frequency	% (n=145)
Hospital(Group)	Baringo County Referral Hospital (study group)	75	51.7
	Nandi County Referral Hospital (Control group)	70	48.3
Gender	Male	39	26.9
	Female	106	73.1
Marital status	Single	24	16.6
	Married	110	75.9
	Widowed/Divorced	11	7.5
Religion	Christianity	143	98.6
	Islam	2	1.4

The overall (for both study and control groups) mean age of the respondents is at 36.6 years (SD=7.1) while the specific mean age for the Study group, the Baringo County Referral Hospital(BCRH), lower (36.4 years, SD 5.8) than that of the control group, Nandi County Referral Hospital (NCRH), (36.8 years, SD=8.4).

The general mean number of practice years (experience) is 12.43(SD=7.06) but the specific for the respondents in Study group (BCRH) was lower (11.4 years, SD 5.8) than that of control group (NCRH) (13.5 years, SD=8.2).

### **Percutaneous Injuries Prevalence, Incidence Rate and their reporting**

The prevalence of Percutaneous Injuries in the previous year for both the study and control group was 32.1%(n=145) with a mean frequency of 2.1(SD=1.3).

#### **5.1.1. The post-intervention self-reported Percutaneous Injuries per group**

**Table 3: Comparison by group the self-reported Percutaneous Injuries incidence rate(Semi-Annual)**

<b>Variable</b>	<b>Stage</b>	<b>Frequency</b>	<b>Percentage</b>	<b>X<sup>2</sup></b>	<b>p-value</b>
<b>n=145</b>					
Group	Study Group	7	9.3%	0.458 <sup>a</sup>	.499
	Control Group	9	12.9%		

A Pearson Chi Square test of independence was calculated comparing the PI incidence rate by the study group and control group. A non-significant interaction was found ( $\chi^2(1) = 0.458$ ,  $p > 0.05$ ). The Percutaneous Injuries incidence rate per fulltime equivalent employee in the study group was lower( 9.3%, n=75) compared with 12.9%(n=70) in the control group. This

translates to 9.3 injuries for study group and 12.9 injuries per a hundred fulltime employee per half a year as shown in Table 3.

On a multiple responses analysis, the two commonest in circumstances associated with sustaining Percutaneous Injuries is needle recapping (25.1%) and by Procedure clearance (22.3%) as shown in the following figure 4.

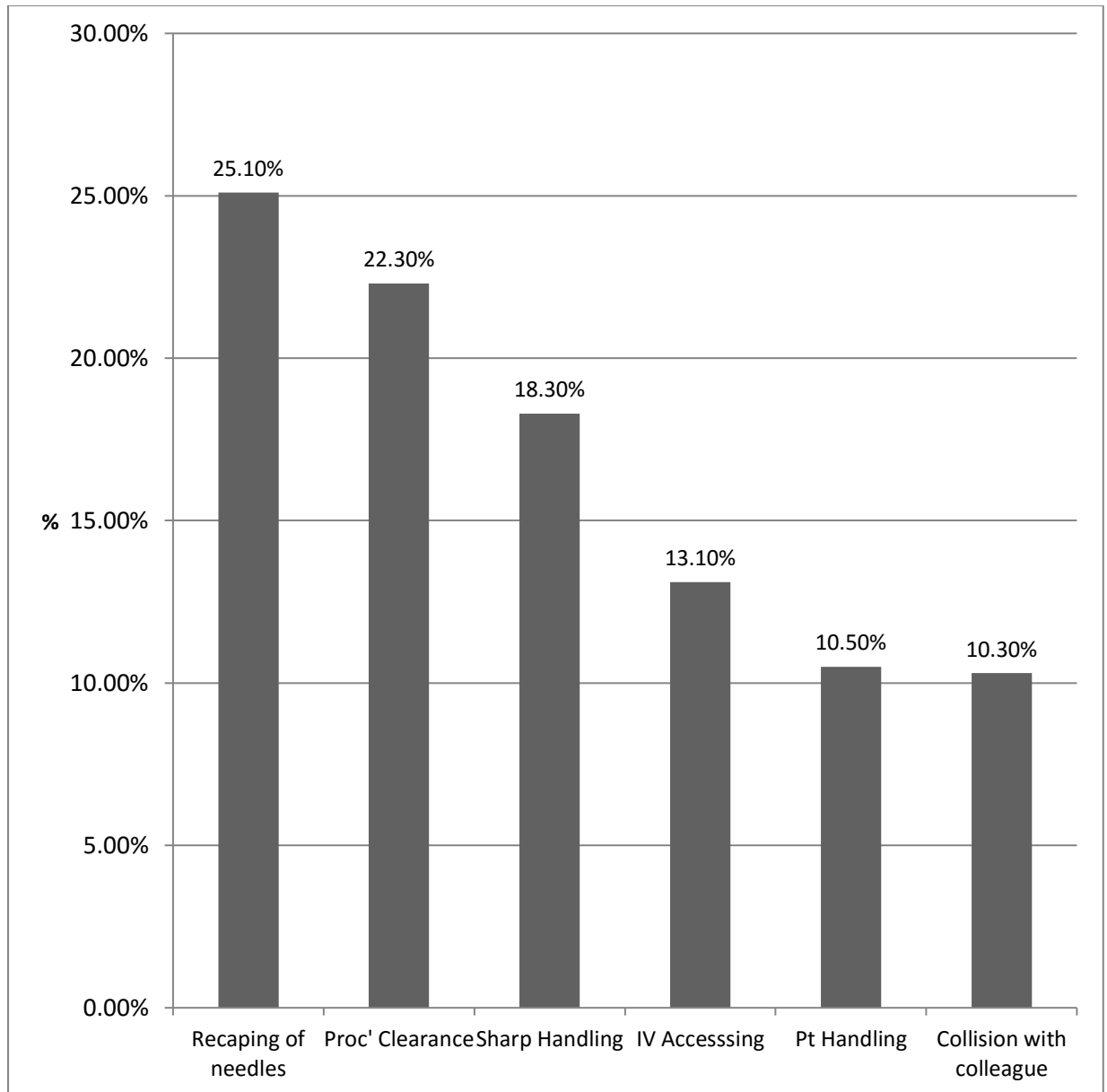


Figure 4: The Circumstances of sustaining Percutaneous Injuries

**5.1.2. Evaluation of post-intervention self-reported Percutaneous Injuries between the two groups**

**Table 4: Comparison by Groups the frequency in self-reported Percutaneous Injuries in post-study stage**

<b>Group</b>	<b>n</b>	<b>freq'</b>	<b>Mean score</b>	<b>SD</b>	<b>Df</b>	<b>t-value</b>	<b>p-value</b>
Study group	7		1.1	0.4	14	-1.746	0.103
Control group	9		1.6	0.5			

An independent t-test was conducted to compare frequency of Percutaneous Injuries in Study group and in control group during the post-study stage. There was a non-significant differences in the mean frequencies scores in Percutaneous Injuries for study group (M=1.1, SD=0.4) and control group (M=1.6, SD=0.5),  $t(14)=-1.746$ ,  $p>0.05$  as shown in Table 4

**Table 5: Relationship between the knowledge scores and the frequency of Percutaneous Injuries during the post-study stage**

<b>Scale</b>	<b>Frequency of Pis (no)</b>	
Knowledge scores on the SP	Pearson	-.808
	Correlation(r)	
	p-value	.000
	n	16

Based on the results of the study on applying Pearson Correlation test, the knowledge scores is strongly related to frequency of PI experiencing  $r=-0.808$ ,  $p<.01$  as shown in Table 5.

A simple linear Regression was calculated to predict frequency of Percutaneous Injuries based on knowledge scores. A significant Regression equation was found ( $F(1,14)=26.25$ ,  $p<.01$ ) with an  $R^2$  of 0.652 Participants predicted Frequency of Percutaneous Injuries =  $3.443 - 0.274(\text{Knowledge scores})$  number when knowledge score is measured in numbers.

**Table 6: Comparison by group the reporting PIs sustained in post-study stage**

Reporting of PI	Groups	n	Freq'	%	df	Chi Square ( $X^2$ )	p- value
	Study group	7	6	85.7%	1	2.861 <sup>a</sup>	.09
	Control Group	9	4	44.4%	1		

A Pearson Chi Square test of independence was calculated comparing the reporting of Percutaneous Injuries by groups. A non-significant interaction was found ( $\chi^2(1) = 6.268$ ,  $p>0.5$ ). Though a majority (85.7%,  $n=7$ ) of the Percutaneous Injuries were reported in the study group compared to about a half (44.4%,  $n=9$ ) in the control group as shown in Table 6.

By use of Chi Square Test of Significance to determine the categorical variables that are significantly related to reporting of Percutaneous Injuries to the authorities, the only two variables that were significant are age ( $p=0.002$ ) and the fear of contracting HIV infection and stigma ( $p= 0.03$ ). Other factors attributed to reporting but not significantly associated are experience, knowledge of Standard Precautions and unit placements

**Table 7: PI Reporting by age categories and its Univariate Odds Ratio**

<b>Variable</b>	<b>Category</b>	<b>Frequency (reported PIs)</b>	<b>%</b>	<b>Unadjusted Odds Ratio(95% CI)</b>	<b>p-value</b>
Age	35yrs and below	17	56.7%	4.3 (1.7-10.8)	0.002
	Above 35yrs	16	23.2%	1.000	
Fear of contracting HIV/ Stigma	yes	22	42.3%	2.1 (1.6-3.4)	0.003
	no	9	19.2%		

Binary Logistic regression was used to measure prediction of reporting by two variables earlier identified to be significant by Chi Square test of independence. It was established that the respondents of age 35years and below had higher odds of reporting injuries compared to those of over 35 years (AOR 4.3, CI1.7-10.8). Furthermore, it was also established that the respondents who expressed fear of contracting HIV/AIDs as their greatest occupational concern had higher odds of reporting their Percutaneous Injuries (AOR 2.1, CI 1.6-3.4) as shown in Table 7.

### Self-reported knowledge on the Standard Precautions

The general knowledge score on the Standard Precautions for both study and control groups was 7.6 (SD=1.4) out of the possible 13 or 58.5%.

#### 5.1.3. Pre-intervention versus post-intervention knowledge scores on Standard Precautions for each group

**Table 8: Knowledge on Standard Precautions before and after the intervention per Group**

Group	Stage	Knowledge Mean Score	SD	df	t-value	p-value
Study group (n=75)	Pre-intervention	7.5		74	-7.686	0.000
	Post-intervention	8.6	0.9			
Control group (n=70)	Pre-intervention	7.6		69	5.511	0.000
	Post-intervention	8.2	1.0			

A paired t-test was conducted to compare the mean knowledge scores in SP in pre-intervention stage and post-intervention stage for the both groups differently. There was a significant difference in the scores for pre-intervention (M=7.5, SD=1.1) and post-intervention (M=8.6, SD=0.9);  $t(74)=-7.686$ ,  $p < .01$  for study group. On the other hand, there was also a significant difference in the scores for pre-intervention (M=7.6, SD=1.7) and post-intervention (M=8.2, SD=1.0);  $t(74)=-5.511$ ,  $p < .01$  for the control group as demonstrated by Table 8.



**5.1.4. Evaluation of Pre-intervention versus post-intervention knowledge scores on SPs between the two groups**

**Table 9: Comparison by groups Knowledge of SPs in post-intervention stage**

<b>Group</b>	<b>n</b>	<b>Knowledge</b>	<b>SD</b>	<b>df</b>	<b>t-value</b>	<b>p- value</b>
		<b>Mean score</b>				
study group	75	8.6	0.9	143	13.932	.000
Control group	70	8.2	1.0			

Independent t-test was conducted to compare mean scores in knowledge of SP in study group and in control group during the post-study stage. There was a significant differences in the means scores in knowledge for study group (M=8.6, SD=0.9) and control group(M=8.2, SD=1.0),  $t(143)=13.932$ ,  $p < 0.01$  as shown in Table 9.

The correct knowledge of the Standard Precaution by items was for most items at-least 75% with exception of handling of sharp exceptions(55.9%), correct knowledge on Personal Protective Equipments(55.2%) and the correct procedure of donning of Personal Protective Equipments (28.30%) as shown by Figure 5.

### 5.1.5. Knowledge scores per specific SP items for both groups combined

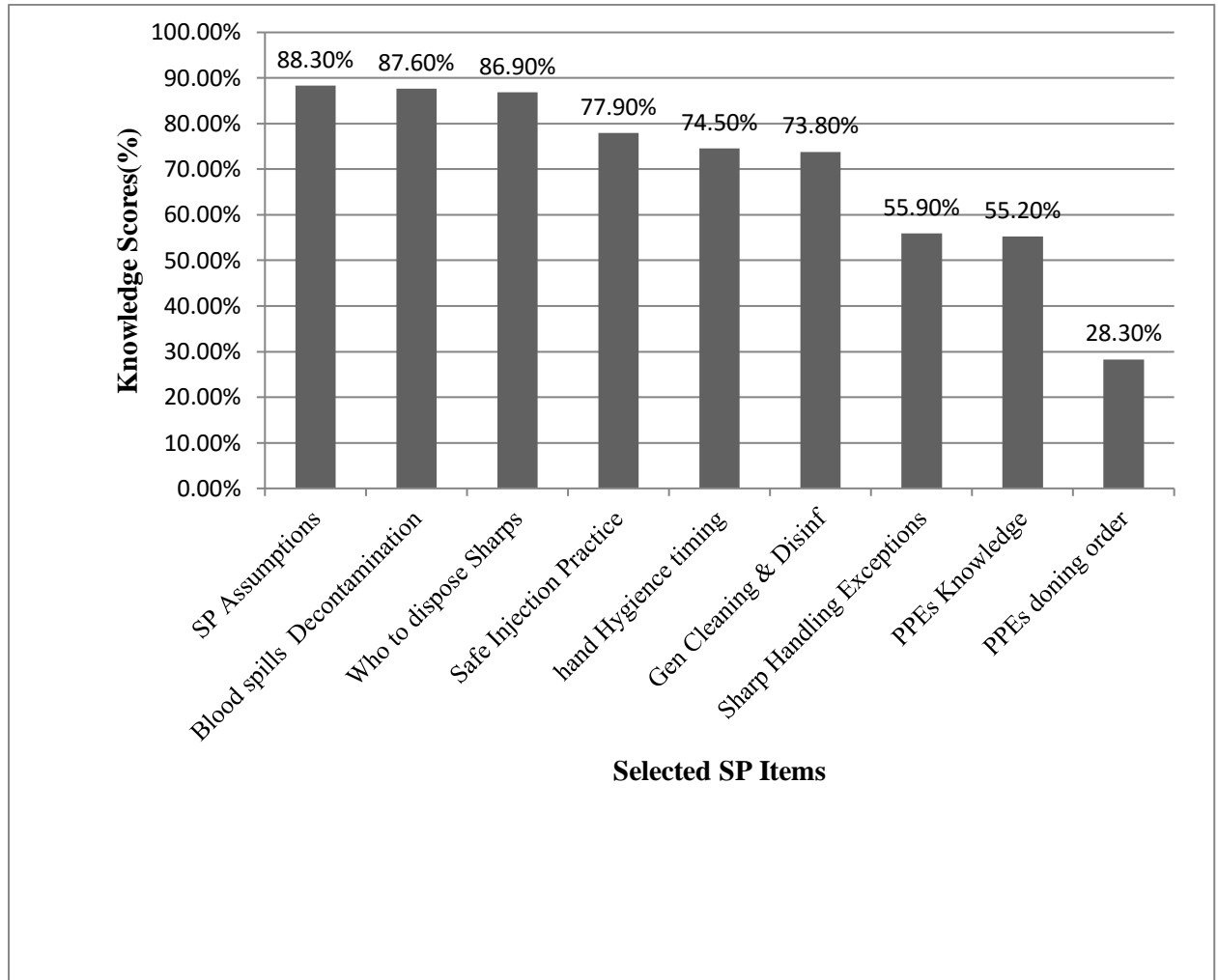


Figure 5: Knowledge Scores (%) of Selected Standard Precautions Items

### Self-reported compliance with the Standard Precautions

The general self-reported score on the Standard Precautions for both study and control groups was 3.9 (SD=0.9) out of the possible 8 or 48.8%.

#### 5.1.6. The pre-intervention versus post-intervention self-reported compliance scores on Standard Precautions for each group

**Table 10: Comparison by stage the self-reported Compliance mean Scores with the Standard Precautions**

Group	stage	Compliance Mean Score	SD	df	t-value	p-value
Study group (N=75)	Pre-intervention	3.7	0.6	74	-6.409	0.000
	Post-intervention	5.9	0.8			
Control group (N=70)	Pre-intervention	3.2	0.9	69	-5.104	0.000
	Post-intervention	4.0	0.9			

A paired t-test was conducted to compare the Mean scores in the self-reported compliance with the Standard Precautions in pre-intervention stage and post-intervention stage. There was a significant difference in the scores for pre-intervention (M=3.7, SD=0.6) and post-intervention (M=5.9, SD=0.8);  $t(74)=-6.409$ ,  $p < .01$  in the study group. Comparatively, there was a significant difference in the self-reported compliance scores for pre-intervention (M=3.2, SD=0.9) and post-intervention (M=4.0, SD=0.9);  $t(69)=-5.104$ ,  $p < .01$  in the control group as shown in Table 10.

**5.1.7. Evaluation of pre-intervention versus post-intervention self-reported compliance scores on Standard Precautions between the two groups**

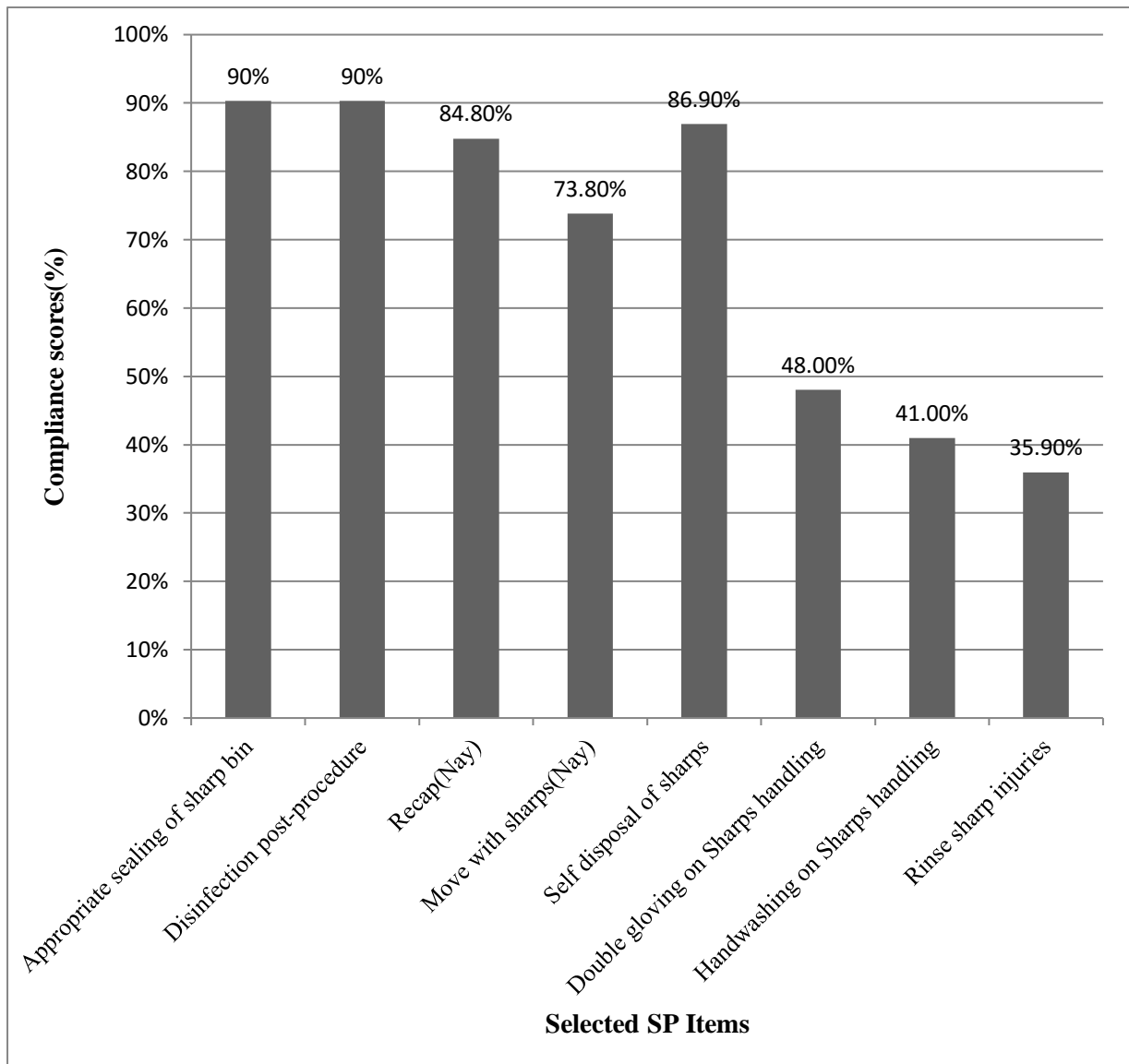
**Table 11: Comparison by groups the self reported compliance with the Standard Precautions in post-intervention stage**

<b>Group</b>	<b>n</b>	<b>Compliance Mean score</b>	<b>SD</b>	<b>df</b>	<b>t-value</b>	<b>p- value</b>
study group	75	5.9	0.8	143	3.466	.001
Control group	70	4.0	0.8			

An independent t-test was conducted to compare mean scores in self-reported compliance with the Standard compliance by groups during the post-study stage. There was a significant difference in the mean scores of self-reported compliance for study group (M=5.9, SD=0.8) and control group (M=4.0, SD=0.8),  $t(143)=3.466$ ,  $p < 0.01$  as shown in Table 11

The self-reported compliance with the Standard Precaution by items was less than 50% in rinsing of sharp injuries with water and soap, hand-washing and gloving when handling sharps as demonstrated by Figure 6.

**5.1.8. Self-reported compliance scores per SP items for both groups combined**



**Figure 6: Self-Reported Compliance Scores (%) of Selected Standard Precautions Items**

**Table 12: Relationship of selected variables and the self reported compliance with the Standard Precautions the post-study stage**

Variable		Self-reported Compliance
Knowledge scores on the SP	Pearson Correlation(r)	-.293
	p-value	.271
	n	16
Frequency no Pis	Pearson Correlation(r)	-.101
	p-value	.086
	n	16

Based on the results of the study on applying Pearson Correlation test, the self-reported compliance mean scores is neither related to mean frequency of PI experience  $r=-0.101$ ,  $p>.05$  nor to mean scores of knowledge on SP  $r=-0.293$ ,  $p>.05$  as shown in Table 12.

**Table 13: Self-reported Compliance with the Standard Precautions by Self-reported Knowledge and its Univariate Odds Ratio**

Variable	Category	Freq (n=89)	%	Unadjusted Odds Ratio(95% CI)	p-value
Knowledge	Not Knowledgeable	21	23.6%%	1.0	0.034
	Knowledgeable	68	76.4%	1.9 (1.1-3.6)	

Binary Logistic regression was used to determine if knowledge and other socio-demographics predict compliance with Standard Precautions. This study established that the respondents

considered to be knowledgeable in the Standard Precautions had higher odds of being compliant with the Standard Precautions compared to those considered not knowledgeable (AOR 1.9, CI1.1-3.6) as shown in Table 13. Other Socio-demographics (such as age, gender, experience, marital status etc) were not significantly associated with compliance with the Standard Precautions ( $p>0.05$ ).

### **Observed compliance with the Standard Precautions**

The general observed compliance score on the Standard Precautions for both study and control groups was 12.5 (SD=1.3) out of the possible 20 or 62.5%.

#### **5.1.9. Pre- versus post-intervention observed compliance scores on Standard Precautions per group**

**Table 14: Comparison by stage the observed Compliance with the Standard Precaution**

<b>Group</b>	<b>Stage</b>	<b>Observed Compliance Mean Score</b>	<b>SD</b>	<b>Df</b>	<b>t-value</b>	<b>p-value</b>
Study group (N=75)	Pre- intervention	12.3	1.4	29	-5.286	0.000
	Post- intervention	13.5	0.73			
Control group (N=70)	Pre- intervention	11.8	1.1	29	-4.267	0.000
	Post- intervention	12.3	1.0			

A paired t-test was conducted to compare the Mean scores in observed compliance in SP in pre-intervention stage and post-intervention stage for both groups. There was a significant difference in the scores for pre-intervention (M=12.3, SD=1.4) and post-intervention (M=13.5, SD=0.73);  $t(29)=-5.286$ ,  $p < .01$  for the study group. Comparatively, there was a significant difference in the scores for pre-intervention (M=11.8, SD=1.1) and post-intervention (M=12.3, SD=1.0);  $t(29)=-4.267$ ,  $p < .01$  for the control group as demonstrated by Table 14.

**5.1.10. Evaluation of pre-intervention versus post-intervention observed compliance scores on Standard Precautions between the two groups**

**Table 15: Comparison by groups the observed compliance with the Standard Precautions in post-intervention stage**

<b>Group</b>	<b>n</b>	<b>Observed compliance</b>	<b>SD</b>	<b>df</b>	<b>t-value</b>	<b>p-value</b>
		<b>Mean score</b>				
Study group	30	13.4	0.7	58	7.350	.000
Control group	30	12.3	0.9			

An independent t-test was conducted to compare mean scores in observed compliance with the Standard Compliance in study group and in control group during the post-study stage. There was a significant differences in means scores in self-reported compliance for study group (M=13.4, SD=0.7) and control group (M=12.3, SD=0.9),  $t(58)= 7.350$ ,  $p < 0.01$  as shown in Table 15.



#### **5.1.11. Observed compliance scores per specific SP items for both groups combined**

The observed compliance with Standard Precautions scores was highly scored in clearing after procedures (68%, n=30), self –disposal of sharps (63%, n=30) and appropriately sealing of sharp bins/boxes (59.2%, n=30). The observed compliance with Standard Precautions scores was poor hand washing before handling sharps (44%, n=30) and double gloving before handling sharps (38%, n=30). The numbers of were not adequate to run Logistic regression.

## **6. CHAPTER SIX: DISCUSSION**

This chapter is guided by the study objectives thus it starts by discussing the Percutaneous Injuries and their reporting patterns, then the knowledge on the Standard Precautions, followed by the self-reported compliance with the Standard Precautions and concludes with the discussion on observed compliance with the Standard Precautions. Finally, this section will evaluate the study hypotheses based on the study findings.

### **Percutaneous Injuries and their reporting**

The prevalence of Percutaneous Injuries in the previous year for both the study and control group was 32.1% (n=145) with a mean frequency of 2.1 (SD=1.3). This is within the Percutaneous Injuries prevalence range as reported by a couple of studies (Kaweti and Abegaz, 2016; Lori, McCullagh, Krueger, and Oteng, 2016; Mbaisi, et al., 2013).

This prevalence of Percutaneous Injuries ranged from a high of 46.6% documented in a cross-sectional study done in 2014 among healthcare workers in Hawasa Referral Hospital in Ethiopia (Kaweti and Abegaz, 2016) to a low of 19% in a study done in a county referral hospital in Kenya (Mbaisi, et al., 2013).

After the the Multi-pronged Educational Intervention, the Percutaneous Injuries incidence rate per fulltime equivalent employee was better in the study group(18.6%) compared with control group(25.8%). This incidence rate of 18.6 to 25.8 were lower than that between 30 to 35 injuries per 100 fulltime equivalent employees that is recorded by Lu, Senthilselvan, Joffe, and Beach (2015).

The average frequency of sustaining Percutaneous Injuries for a nurse was higher in the control group(1.6) compared to the study group(1.1). The study suggest that Multi-pronged Educational Intervention might have reduced the Percutaneous Injuries incidence rate though not statistically finding were not significant( $p>0.05$ ). therefore, this study failed to reject the hypothesis that stated, “there is no significant difference in the incidence rate per fulltime

employee of Percutaneous Injuries between the study and the control group”. Though we failed to reject the hypothesis based on a p value higher than 0.05, there is a positive impact attributable to the Multi-pronged Educational Intervention of reducing the blood and body fluids exposure burden to the extent of lowering the Percutaneous Injuries Prevalence and incidences. Thus I posit that any intervention including Multi-pronged Educational Intervention that has any positive impact on the wellbeing of practising nurses ought to be considered and even adopted.

A cross-sectional study done in 2014 that investigated Percutaneous Injuries and their reporting among healthcare workers established that only 24% reported their Percutaneous Injuries for further management (Kaweti and Abegaz, 2016). Despite the relatively unsatisfactory reporting of Percutaneous Injuries, a couple of educational study studies on nurses showed at least 10% improvement on reporting of Percutaneous Injuries (Mehrdad, Meshki, and Pouryagub, 2013; Rajkumari et al., 2014; Zawilla and Ahmed, 2013).

On applying Logistic regression, this study established that reporting of Percutaneous Injuries is significantly predicted by age; with the younger age group (35 years and below) having higher likelihood of reporting (AOR 4.3, CI 1.7-10.8) compared to older age group (>35 years). This finding corresponds with a study done in Nigeria which stated that though the younger health workers have greater exposures of Percutaneous Injuries, they also had higher propensity to report out of fear and anxiety compared with the older health workers (Amira and Awobusuyi, 2014).

It is certainly obvious that Percutaneous injuries still pose a serious occupational hazard to the nurses. This occupational hazard may in future cause qualified nurses to change their profession and even worse, it may dissuade potential candidates from joining the profession.

### **Self-reported knowledge on the Standard Precautions**

The general knowledge scores on the Standard Precautions was 58.5% (7.6 out of possible 13) in this study is generally lower than that of the region (about 65%) and even globally (about 85%) as documented by several cross-sectional studies on the Standard Precautions (AL-Rawajfah and Tubaishat, 2015; Aluko et al., 2016; Benboubker et al., 2017; Chee and Ong, 2016; Quan et al., 2015). It is particularly worrying that the self-reported knowledge on Standard Precautions is lower than that of the region and even global.

This study demonstrated a significant positive change of 8.5% in knowledge score after exposure to Multi-pronged Educational Intervention. This finding corresponds with a similar study done among both nursing and medical students in Italy that posted a positive variance of about 12% (D'Alessandro et al., 2014). Moreover, about 9% improvement of knowledge scores on Standard Precautions was noted upon exposure to an educational intervention to healthcare workers in Zambia (Msisuka, Nozaki, Kakimoto, Seko, and Ulaya, 2011).

Thus based on the fore-going, this study hereby rejects the hypothesis that “There is no significant difference in knowledge scores on the Standard Precautions before and after exposure of Multi-pronged Educational Intervention”. It may be robustly argued that Multi-Pronged Educational Intervention to the nurses significantly improved self-reported knowledge on Standard Precautions. Multi-Pronged Educational Intervention increases the attention, retention and recall of the concepts taught. I aver knowledge precedes practice and thus Multi-Pronged Educational Intervention is key to practice or adherence of concepts such as the use of Standard Precautions.

### **Self-reported compliance with the Standard Precautions**

The general nurses self-reported compliance with the Standard precaution of 48.8% is comparable to that of Nigeria ( around 50%), but grossly lower than of Brazil (around 69%), Asia ( around 80%), Jordan (around 84%) and the United States of America ( around 95%),

as documented by several cross-sectional studies on the Standard Precautions (Aluko et al., 2016; Chee and Ong, 2016; Hessels, Genovese-Schek, Agarwal, Wurmser, and Larson, 2016; Pereira et al., 2015; Powers et al., 2016; Quan et al., 2015).

This study demonstrated a significant positive change of +27.5% in self-reported compliance scores after an educational intervention to the study group. This finding corresponds with a randomized study done on the subject of the self-reported Standard precaution compliance by the nursing students in China (Xiong et al., 2017). It may be assumed that knowledge re-enforced by the Multi-pronged Educational Intervention enhances self-reported compliance by reviewing the basic tenets of Standard Precautions and mediating on attitudes.

On the other hand control group also demonstrated a significant positive change of +10.0% in the Standard Precautions self-reported compliance scores after exposure to the baseline questionnaire items only. This positive finding that is not related to any intervention is a function of a pre-test sensitization or exposure to the study instrument.

Due to impressive positive change of self-reported compliance with Standard Precautions (+27.5%) in the study group, the hypothesis that states, “There is no significant difference in self-reported compliance scores on the Standard Precautions before and after the Multi-pronged Educational Intervention” is hereby rejected.

The study contends that Multi-Pronged Educational Intervention increases the nurses’ self and collective efficacy in compliance of the Standard Precautions. Multi-Pronged Educational Intervention employs vicarious learning whereby what is seen (demonstrated) is easily remembered and reproduced in nursing and other health professionals

Logistic regression was used to determine if knowledge and other socio-demographics predicts self-reported compliance with Standard Precautions. This study established that the respondents considered to ‘being knowledgeable’ on the Standard Precautions had higher odds of being compliant with the Standard Precautions compared to those considered ‘not

knowledgeable' (AOR 1.9, CI1.1-3.6). From the foregoing, it is plausible to build strong and vast knowledge base/cognitive aspects of the practising nurses for them to higher chances or likelihood of practicing the same.

This findings are in conformity with the results posted by He et al. (2016) which essentially means the educational program addressed some knowledge gaps identified in the Standard Precautions. However, another study (Kagan, Ovadia, and Kaneti, 2009), suggest that that there could be other factors other than knowledge that determines of compliance to the Standard Precautions such as attitudes and environment that may warrant future research to comprehend.

### **Observed compliance with the Standard Precautions**

The general registered nurses observed compliance score on the Standard Precautions for both study and the control group was 12.5 (62.5%) out of the possible 20. This finding is slightly lower than that of a study on observed compliance with the Standard Precautions among nurses done in Italy (65.2%) while higher than in a similar study done in United States of America (62%) (Accardi et al., 2017; Hessels et al., 2016). This study demonstrated a significant positive change of 6.0% in compliance scores after an educational intervention to the study group. On the other hand control group demonstrated a significant positive change of only 2.5% in the Standard Precautions compliance scores after exposure to the baseline questionnaire items. It is probable that exposure to Multi-pronged Educational Intervention significantly improves Observed compliance with Standard Precautions. Thus based on the fore-going, the hypothesis that "There is no significant difference in observed compliance scores on the Standard Precautions before and after the Multi-pronged Educational Intervention" is hereby rejected.

The study confirms that the Multi-Pronged Educational Intervention was accepted and practised as appertaining to the compliance with SP and therefore, handy in behaviour change initiatives in health care settings.

## **7. CHAPTER SEVEN: CONCLUSION, LIMITATIONS, RECOMMENDATIONS AND FURTHER WORK**

This chapter is in four parts namely the Conclusions, Limitations, Recommendations and Further Work sections. The study's conclusions are objective- guided. The study limitations and mitigating factors are also highlighted. The study came up with four recommendations on nursing education, research, practice and policy. Finally, this study came up with three suggestions for further work.

### **Conclusions**

The first specific objective of the study was to establish the incidence rate of Percutaneous Injuries for both the study and the control groups. The new cases of Percutaneous Injuries to the study group upon being exposed to the Multi-pronged Educational Intervention was less by 7.2% (18.6% versus 25.8%) per annum per one hundred equivalent fulltime nurses compared to the control group. The prevalence percutaneous injuries in the previous year for both the study and control group was 32.1% (n=145) with a mean frequency of 2.1 (SD=1.3). It could be argued that this finding gave credit to the Multi-pronged Educational Intervention applied in mitigating the incidences of Percutaneous Injuries though the difference was not statistically significant ( $p>0.05$ ).

The second specific objective of the study was assess the knowledge on the Standard Precautions for both the study and the control groups. The difference between self-reported knowledge gained upon being exposed to Multi-pronged Educational Intervention between study and control group was about 4% (8.5% versus 4.6%) and was statistically significant ( $p<0.01$ ). The two items of the standard precautions lowly scored are on knowledge and donning of Personal Protective Equipments and sharps handling. It is evident from this finding that Multi-pronged Educational Intervention grossly improves knowledge on Standard Precautions.



The third specific objective of the study was to analyze the self-reported compliance with the Standard Precautions for both the study and the control groups after the exposure to the Multi-pronged Educational Intervention (where it applied). The difference between compliance reported upon being exposed to Multi-pronged Educational Intervention between study and control group was 17.5% (27.5% versus 10.0%) and was statistically significant ( $p < 0.01$ ). Self-reported compliance with the standard precautions was not optimal in gloving, hand-washing and management of occupational exposures such as percutaneous injuries. This study finding boldly avers that Multi-pronged Educational Intervention greatly improves self-reported compliance with Standard Precautions.

The fourth and final specific objective of the study was to analyze the observed compliance with the Standard Precautions for both the study and the control groups after the exposure to the Multi-pronged Educational Intervention (where it applied). The difference between compliance observed upon being exposed to Multi-pronged Educational Intervention between study and control group was 3.5% (6.0% versus 2.5%) and was statistically significant ( $p < 0.01$ ). The observed compliance with Standard Precautions scores was poor hand washing before handling sharps and double gloving before handling sharps. It is posited by this finding that Multi-pronged Educational Intervention improves observed compliance with Standard Precautions, albeit in a small proportion.

The study's aim was to evaluate the effectiveness of Multi-pronged Educational Intervention to the nurses in influencing compliance with Standard Precautions. The study underscores that the incidence rate of Percutaneous Injuries, knowledge, self-reported and Observed compliance with Standard Precautions improved when the nurses were exposed to the Multi-pronged Educational Intervention. In conclusion, it is this study ultimate position that Multi-

pronged Educational Intervention strategy to the nurses is effective in positively and significantly influencing the compliance with the Standard Precautions.

### **Research Limitations**

The study obtained considerable data from the respondents as self-reported accounts, thus there is a challenge of Recall bias as a limitation to the quality outcome measure but to counter this limitation the follow up period was limited to six months period.

This study applied the Quasi experimental design (Non-randomized controlled study) meaning it lacks in one significant quality of an experiment that is real randomization. Despite appreciating that True experiments are the gold standards in measuring efficacy of any intervention, the quasi experiment was chosen in consideration of the ethical issue likely to be raised should the intervention have borne actual or perceived beneficial/detrimental effects.

This study being a prospective and academic engagement, it is limited by time and better results would be yielded if it was to take a longer follow up period of time and greater geographical scope. The small sample size is a limitation to the study; however, this has been mitigated by using the Total Population Sampling in the selected facilities. There was a possibility of losing some respondents who had been initially recruited in the study due to different reasons like transfers, study leaves, illness or even worse death.

The danger of contamination of study and control group has been mitigated by selecting a non-equivalent control separated by a distance of over 100km. Though distance between the two study sites is not short, the relatively good transport and communication network in Kenya may pose a threat to study integrity. Lately, social media has greatly liberalized communication channels and therefore, may influence such an educational intervention study.

## **Recommendations**

- 1 I hereby recommend the Multi-pronged Educational Intervention strategy to the health facilities' leadership as an innovative educational intervention to replace the routine conservative approaches of continuous medical/professional development. This strategy will be beneficial in tackling critical concepts that have both knowledge and compliance domains in the nursing disciplines and generally in health care settings.
- 2 A further recommendation is that Multi-pronged Educational Intervention strategy as an induction package to the health facilities' administration to be delivered periodically to BScN interns and new nursing staff (novices) to pre-empt the occupational exposures/hazards to themselves and to their clients.
- 3 I also recommend that the Multi-pronged Educational Intervention strategy be incorporated in curricula and especially in clinical teaching. This will ensure that the students are well-grounded and demonstrate competence in such critical concepts such as the Standard Precautions
- 4 In addition, I recommend that the Multi-pronged Educational Intervention principles be inculcated in drafting of educational policies in health. This may enhance comprehension and uptake new concepts being introduced in the practice of nursing and allied disciplines

## **Further Work**

- 1 This study involved the nurses in two county referral hospitals thus may limit generalization of its findings. It is hereby suggested that future studies on Multi-pronged Educational Intervention should include wider scope in terms of health personnel and greater spectrum of health facilities.
- 2 One of this study's objective was on Incidence Rate which for calls for a prolonged period of time to accurately measure. Therefore, this study recommends that similar

longitudinal and interventional study should involve a considerable longer period of time; for instance five year follow up period.

- 3 The study recommends that similar studies should employ computer-aided/ IT software in collection of data to minimize bias and for efficiency.

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## 9. APPENDICES

### Appendix 1: Research Participation Consent Form

**Title of study:** The effectiveness of Multi-pronged Educational Interventional intervention to the Registered Nurses in influencing knowledge and compliance with the Standard Precautions in selected county referral hospitals in Kenya

**Introduction:** This study entitled, “The effectiveness of Multi-pronged Educational Interventional intervention to the Registered Nurses in influencing the Knowledge and compliance with Standard Precautions in selected county referral hospitals in Kenya” is an academic pursuit and precisely a partial requirement towards the attainment of Doctor of Philosophy in Nursing.

**Objective:** To assess the effectiveness of Multi-pronged Educational Interventional intervention to the Registered Nurses in influencing the Knowledge and compliance with Standard Precautions in selected county referral hospitals in Kenya

**Confidentiality:** The respondents will remain anonymous. Any personal information obtained from this study will not be shared with any other unauthorized person or entity and will remain within the confines of principles of privacy and confidentiality.

**Benefits:** There are no direct benefits to those participating in this study. However, should the educational intervention be effective in the final analysis of this study, and then the participants in the intervention group will benefit from the Multi-pronged Educational Intervention in the short-term. The long-term benefit of this study will be to establish if Multi-pronged Educational Intervention is effective and dependable as an approach of reducing percutaneous injuries incidences and in promotion of compliance with the Standard Precautions

**Compensation:** Participation or non participation does not come with any financial cost. Equally, there is no compensation for participating in the study either to the study or control group

**Risks:** This study is non-invasive and therefore comes with no foreseeable actual or perceived risks for the potential participants.

**Voluntary:** Participation in this study is of one's own free will and volition. The participants will be at liberty to decline or withdraw from the study any time of their choice. Refusal to take part will not attract any penalty or consequence.

**Specimen:** This study does not involve the extraction of any specimen from the study participants

**Duration of this study:** This study is projected to take 12 months upon been granted the ethical clearance by the KNH/UoN Ethics and Research Committee as outlined in the Work-plan

I do hereby consent to participate in this study as read and clearly explained to me by Principal investigator/Research assistants.

	<i>Sign</i>	<i>Date</i>
Participant's Signature	.....	.....

I confirm that I have clearly explained to the participant the nature of the study and the contents of this consent form in detail and the participant has decided to participate voluntarily without any coercion or undue pressure.

	<i>Sign</i>	<i>Date</i>
Investigator's Signature	.....	.....

Witness's signature .....

For Any Enquiries, please contact:

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3. The Chairman,

Kenyatta National Hospital/UoN Ethics and Research Committee

Email:- uonknh\_erc@uonbi.ac.ke

Tel: 020-2726300 Ext 44355

## Appendix 2: Questionnaire

Questionnaire No: \_\_\_\_\_

Date: \_\_\_\_\_

### INSTRUCTIONS

- 1) *This questionnaire has four sections. Please answer all questions.*
- 2) *Do not write your name in this questionnaire.*
- 3) *Please tick (✓) the most appropriate answer or score appropriately*

### Section 1: Socio-demographics characteristics

1. Indicate your gender.

Male                       female

2. Indicate your age in years.

.....

3. Indicate marital status.

Single     Married     Divorced                       Widowed

4. Indicate your religion.

Christianity                       African Traditional Religion

Islam                                       Atheist

Others (Specify) \_\_\_\_\_

5. Indicate the number of years of you have practiced upon licensure.

.....

6. Indicate the section of the hospital where you work

.....

7. Indicate your highest nursing education level.

Diploma Level

Bachelor's Level

Master's level

Doctorate Level

8. Prior to this study had you ever had any continuous professional training on sharps and sharp injury management or the Standard precautions?

Yes

No

**Section 2: Knowledge on the Standard Precautions**

*(Tick one correct response)*

9. The Standard Precautions assumes that certain patients may be colonized or infected with an infectious organism

True

False

10. Hand hygiene should be performed(Tick one appropriate response)

Before beginning any patient care activity, unless gloves will be worn

Immediately after removing personal protective equipment (PPE)

Between caring for different patients

All of the above

11. Who should disposes off your sharp after use. (Tick one appropriate response)

Myself	Cleaner/ Patient Assistants	My colleagues	I don't know

12. The following can be said about Personal Protective Equipment: (Tick one appropriate response)

- Wear gloves any time you touch intact skin
- Wear gown, mask and eye protection during all patient care activities that are likely to generate splashes or sprays of blood or body fluids
- Wear a respirator during lumbar puncture procedures such as myelograms
- All of the above

13. When donning Personal Protective Equipment, the following order is recommended:

- Gloves, gown, eye protection, mask
- Gown, mask, eye protection, gloves
- Eye protection, gown, mask, gloves
- Mask, eye protection, gown, gloves

14. Safe injection practices include all except :

Using fluid infusion and administrative sets for one person only and disposing after use

- Using single dose rather than multi-dose vials
- Leaving needles in vial caps
- Decontaminating ports and vial tops with 70% alcohol

15. Cleaning and disinfection should be performed:

- On equipment, instruments and devices used on or near patients
- On furniture and inanimate objects in patient rooms
- On toys in pediatric areas
- All of the above

16. The following can be said about handling sharps except:

- Never bend, break or recap contaminated needles unless using a hinged device
- If you must recap a needle, use a two-handed scoop method
- Dispose of sharps in puncture-proof containers
- Use tongs or a brush and a dust pan to collect broken glass.

17. If a surface or equipment comes into contact with blood, you should:

- Be sure it receives prompt, proper cleaning and decontamination
- Cover it with a heavy blanket or tarp
- Alert other people to steer clear of it

18. What time frame would you consider safe to administer Post-exposure Prophylaxis after occurrence of a percutaneous injury

- Up to 12 hours
- Up to 24 hours
- Up to 48 hours
- Up to 72 hours

19. The purple bin is a container for which kind of wastes?

- Non- infectious waste
- Infectious waste
- Sharps
- Highly infectious wastes

### Section 3: Self –reported compliance with the Standard precautions

For questions 20 to 26 you are asked to tick(√) the most appropriate response that indicates your level of agreement or disagreement with the statement

		<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
20	‘We use double gloves when handling sharps’					
21	‘We wash your hands before handling sharps’					
22	‘We close the sharp container once its three quarters full’					
23	‘We occasionally walk with sharps within the ward/my area of placement’					
24	‘we recap or re-sheath needles or lancets once					



	we are done with our procedures’					
25	‘We disinfect diagnostic/ therapeutic used equipments/packs after each procedure’					
26	‘we usually report splashes of body fluids to hospital authorities’					
27	We usually manage sharps injuries by irrigating with soapy water					

**Section 4: self-reported incidences of Percutaneous Injuries**

*(Only applicable for post-test- 6 months after the intervention)*

28. Have you ever had any sharp injury in the last six months of your practice?

Yes

No

29. If ‘Yes’ to question 28, how many incidences/times?

.....

30. If 'Yes' to question 28 under what circumstance did it happen?(can tick more than one)

- Manipulation of needle in patient
- Collision with co-workers with sharps
- During clearance/clean up after procedures
- While recapping of needles
- While accessing IV lines
- While handling a patient
- Not applicable
- Other(specify)

.....

31. If 'Yes' to question 28 , did you report the accident to the hospital authorities?

- Yes
- No

.....END.....

### Appendix 3: Observation Schedule/ Check List




Observed Compliance with the Standard Precautions(*tick as observed*)

Check list No: _____		section/unit/dept: _____	Date: _____	
		<b>Not Done</b>	<b>Done Sometimes</b>	<b>Done Always</b>
1.	Hand-washing done before and after handling of patients			
2.	Hands and other skin surfaces washed immediately and thoroughly if contaminated with blood and other body fluids			
3.	Gloving when handling blood and body fluids or items or surfaces soiled with blood and body fluids			
4.	Gloves changed after contact with each patient			
5.	Recapping			

6.	Used Sharps appropriately disposed in a Yellow sharps box			
7.	Sharps waste bin emptied at $\frac{3}{4}$ full			
8.	Highly infectious wastes disposed into a red bin			
9.	Used instruments appropriately decontaminated with dilute jik			
10.	Soiled linen appropriately decontaminated with dilute jik			

..... **END**.....

## Appendix 4: KNH/UoN Ethical Clearance



**UNIVERSITY OF NAIROBI**  
COLLEGE OF HEALTH SCIENCES  
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**KNH/UON-ERC**  
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Website: <http://www.erc.uonbi.ac.ke>  
Facebook: <https://www.facebook.com/uonknh.erc>  
Twitter: @UONKNH\_ERC [https://twitter.com/UONKNH\\_ERC](https://twitter.com/UONKNH_ERC)

**KENYATTA NATIONAL HOSPITAL**  
P O BOX 20723 Code 00202  
Tel: 726300-9  
Fax: 725272  
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/357

Vincent K. Mukthar  
School of Nursing Sciences  
College of Health Sciences  
University of Nairobi

Dear Vincent

**RESEARCH PROPOSAL – THE EFFECTIVENESS OF STRUCTURED EDUCATION TO THE REGISTERED NURSES IN INFLUENCING THE INCIDENCES RATE OF PERCUTANEOUS INJURIES AND COMPLIANCE TO THE UNIVERSAL PRECAUTIONS IN SELECTED COUNTY REFERRAL HOSPITALS (P173/03/2015)**

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 25<sup>th</sup> August 2015 – 24<sup>th</sup> August 2016.

This approval is subject to compliance with the following requirements:

- Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website <http://www.erc.uonbi.ac.ke>

Protect to discover

Yours sincerely,



**PROF. M. L. CHINDIA**  
**SECRETARY, KNH/UON-ERC**

- c.c. The Principal, College of Health Sciences, UoN  
The Deputy Director CS, KNH  
The Chairperson, KNH/UoN-ERC  
The Dean, School of Medicine, UoN  
The Director, School of Nursing Sciences, UoN  
Supervisors: Prof. Karani K. Anna, Dr. Waithira Mirie

Protect to discover

## Appendix 5: Educational materials -Scheme of Works

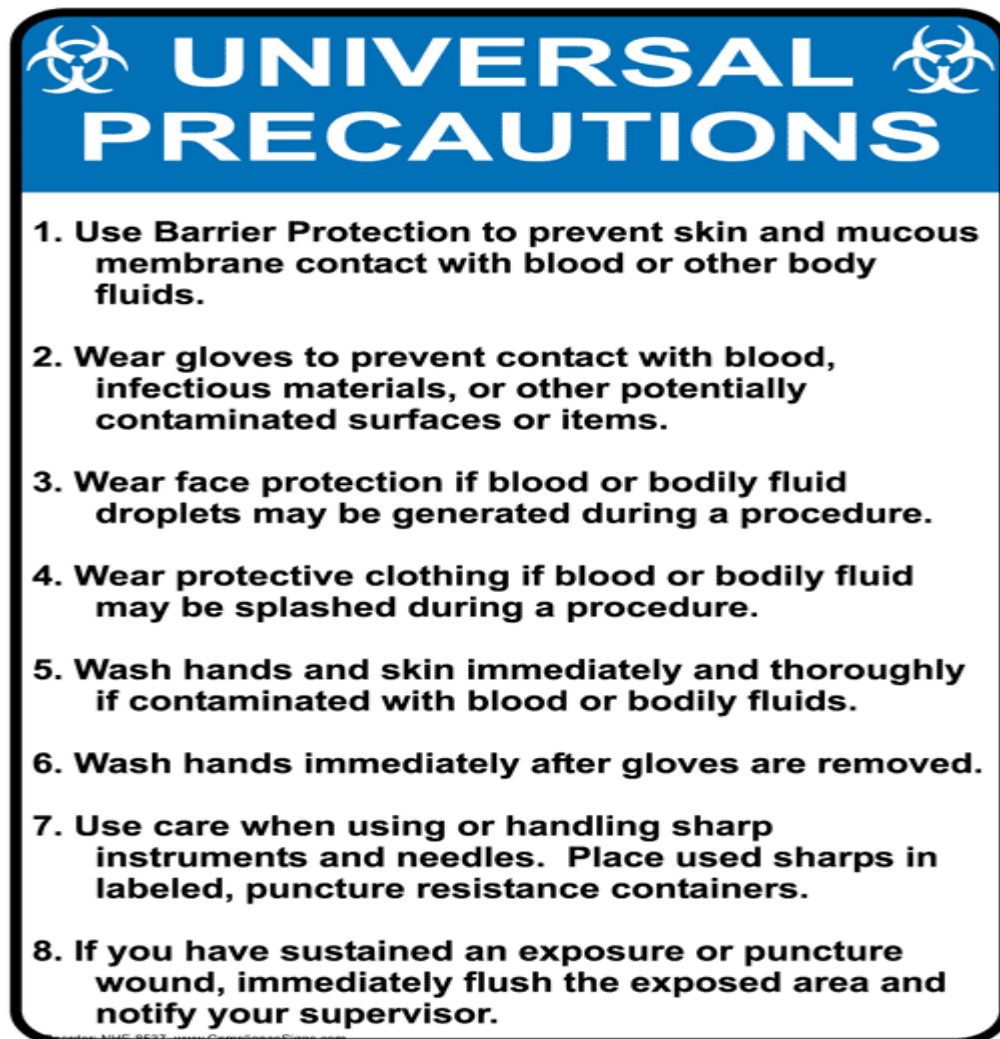
**Broad objective-** by the end of the series of lessons, the learners should be able to describe and apply appropriately the principles of Standard Precautions in their practice

Lesson	Time	Topic	Specific objective	Duration	Learning activity	Resource
Lesson 1	Week 1	Gloving Use of Gowns, Masks and Goggles	To correctly describe the use protective barrier methods in clinical set up	1 hour	Lecture, Discussion, Demonstration, Return-demonstration	LCD projector, Gloves, Aprons, goggles, masks, Flyer,
Lesson 2	Week 2	sharps management	To correctly describe the proper handling of sharps in clinical set up	1 hour	Lecture, Discussion, Demonstration, Return-demonstration	LCD projector, Yellow sharps box, Needles, Scalpels, Flyer,
Lesson 3	Week 3	Disinfection	To correctly describe the	1 hour	Lecture, Discussion,	LCD projector,

			indications and the procedure of disinfection in clinical set up		Demonstration, Return-demonstration ,	Sampled instruments, Bucket, Jik, Flyer,
Lesson 4	Week 4	Post-exposure management	To correctly describe the management of percutaneous accidents in clinical set up	1 hour	Lecture, Discussion, Demonstration, Return-demonstration ,	LCD projector, Flyer,



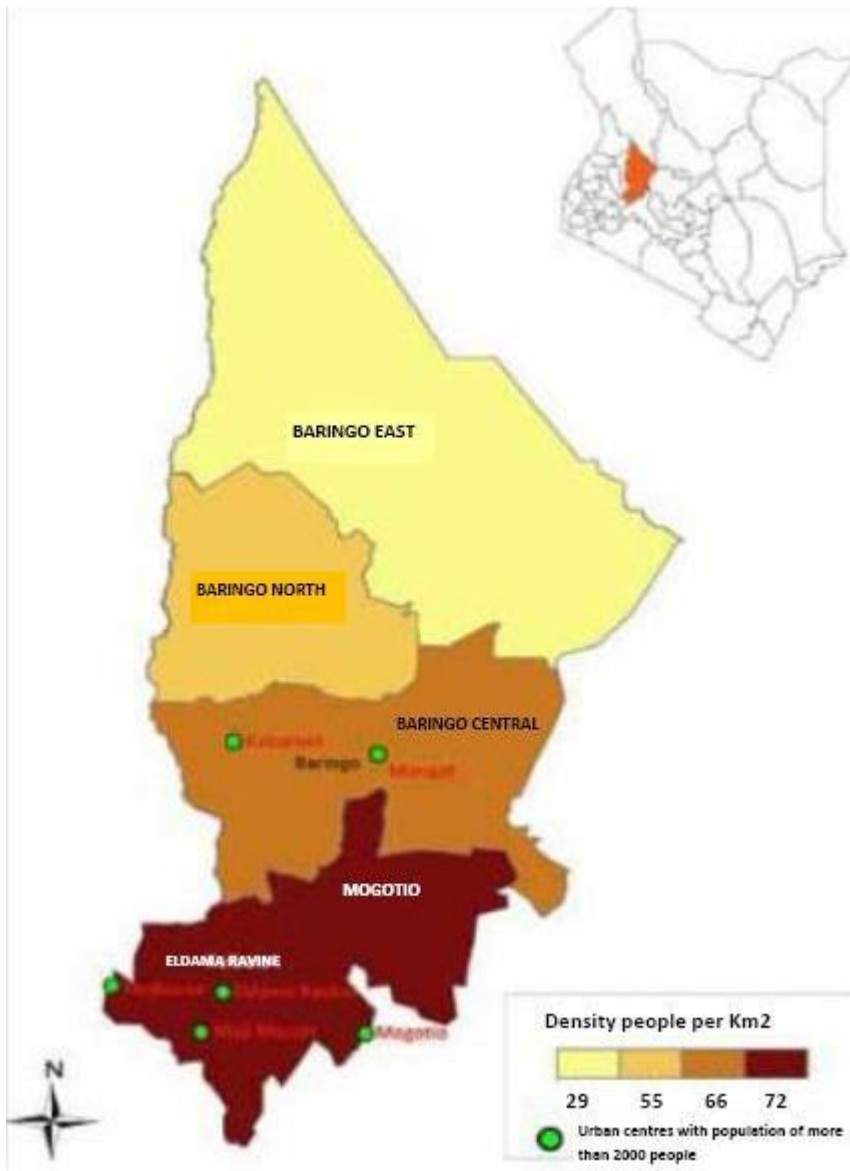
Appendix 6: Educational materials -A Flyer on the Standard Precaution

A flyer with a blue header containing the text "UNIVERSAL PRECAUTIONS" and two biohazard symbols. Below the header is a white box with a black border containing eight numbered steps for standard precautions.

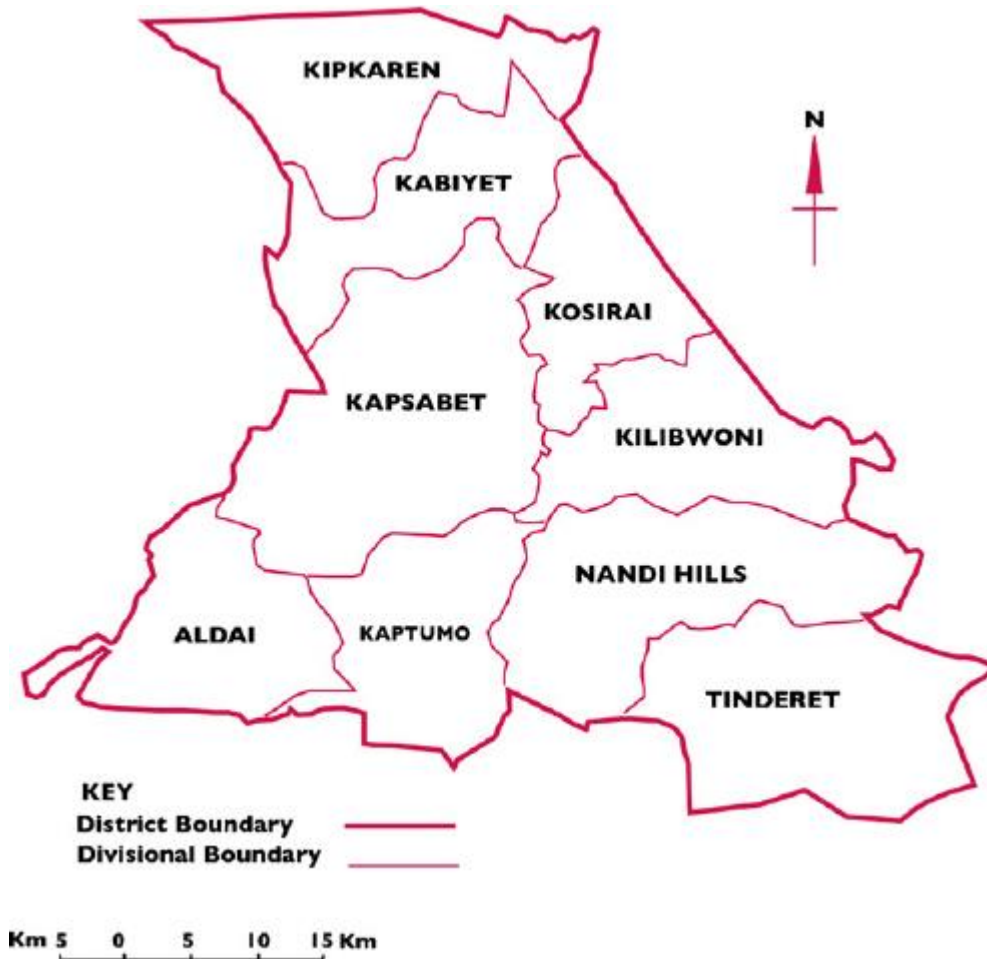
**UNIVERSAL PRECAUTIONS**

- 1. Use Barrier Protection to prevent skin and mucous membrane contact with blood or other body fluids.**
- 2. Wear gloves to prevent contact with blood, infectious materials, or other potentially contaminated surfaces or items.**
- 3. Wear face protection if blood or bodily fluid droplets may be generated during a procedure.**
- 4. Wear protective clothing if blood or bodily fluid may be splashed during a procedure.**
- 5. Wash hands and skin immediately and thoroughly if contaminated with blood or bodily fluids.**
- 6. Wash hands immediately after gloves are removed.**
- 7. Use care when using or handling sharp instruments and needles. Place used sharps in labeled, puncture resistance containers.**
- 8. If you have sustained an exposure or puncture wound, immediately flush the exposed area and notify your supervisor.**

## Appendix 7: Map of Study Area-Baringo County



**Appendix 8: Map of Study Area-Nandi County**



## Appendix 9: First Publication from the Study

East African Medical Journal Vol. 93 No. 6 June 2016

THE KNOWLEDGE AND COMPLIANCE WITH THE UNIVERSAL PRECAUTIONS AND THE PREVALENCE OF PERCUTANEOUS INJURIES AMONG THE REGISTERED NURSES IN SELECTED COUNTY HOSPITALS IN KENYA  
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Request for reprints to: V. K. Mukthar, Department of Nursing, Egerton University, P. O. Box 536-20115, Egerton, Kenya

### THE KNOWLEDGE AND COMPLIANCE WITH THE UNIVERSAL PRECAUTIONS AND THE PREVALENCE OF PERCUTANEOUS INJURIES AMONG THE REGISTERED NURSES IN SELECTED COUNTY HOSPITALS IN KENYA

V. K. MUKTHAR, A. K. KARANI and W. MIRIE

#### ABSTRACT

**Objective:** To establish the level of knowledge and compliance with the Universal Precautions and the prevalence of Percutaneous injuries among Registered nurses in Selected County Referral Hospitals in Kenya

**Design:** This was a cross-sectional hospital-based quantitative.

**Setting:** Two County Referral Hospitals purposively selected for this study were Baringo County Referral Hospital and Nandi County Referral Hospital both of which are situated in the Rift Valley Region of Kenya.

**Subjects:** The respondents were all the Registered Nurses in the selected County Referral Hospitals.

**Results:** The study established that the majority (87.6%, n=145) of the Registered Nurses are considered knowledgeable on the Universal Precaution. The difference between the means in knowledge scores of the two groups is significant at the 0.01 level,  $t(143)=3.820$ ,  $p<0.01$ . Those who were Compliant with the Universal Precautions was a minority (42.1%, n=145). Compliance with the Universal Precautions and was predicted by knowledge on the Universal Precautions ( $R^2=0.25$ ,  $p<0.01$ ).

A majority (57.2%, n=145) of the respondents had experienced at least one percutaneous injuries with those afflicted recording an average of 2.2 (SD=1.3) injuries per person in the last five years. Using Logistic Regression, it was established that Odds ratio of getting afflicted with Percutaneous Injuries comparing by gender is 0.47, 95% CI= (0.22-0.99). Simple linear regression established that the number of percutaneous injuries are predicted by age ( $R^2=0.48$ ,  $p<0.01$ ) and experience in years ( $R^2=0.59$ ,  $p<0.01$ ).

**Conclusion:** The study concluded that the level of knowledge of the Universal Precautions among the Registered Nurses is very good but is not corresponding to the relatively average compliance of the same Universal Precautions. Knowledge of the Universal Precautions was identified as a predictor to compliance with the Universal Precautions. Percutaneous Injuries occurrences are common to the Registered Nurses and most of those affected are reluctant to report to the authorities for further management.

#### INTRODUCTION

Health care workers are exposed to a couple of hazards on the duty, including percutaneous injuries, musculoskeletal injuries, allergy to diagnostic/therapeutic apparatus, physical assault, and stress. As much as these occupational hazards are manageable if not preventable, healthcare workers continue to experience injuries and preventable illnesses in the workplace. The incidences of nonfatal occupational injuries and illness among healthcare workers are among the highest of any industry sector (1).

Healthcare workers have a high risk of occupational exposure to Percutaneous injuries and

blood splashes on the skin which is a major concern (2-3), particularly in developing countries, with high incidence of blood borne diseases and prevalence of unsafe sharps handling practices. Such injuries can lead to serious and fatal infections with bloodborne pathogens such as hepatitis B virus, hepatitis C virus, or human immunodeficiency virus (4).

Health care workers have in the past become infected with blood-borne illnesses the line of their duties either via percutaneous injuries or exposures to contaminated blood / fluids to mucosal membranes. They further assert that the fear of contracting blood-borne illnesses / infections on duty is a considerable concern for many health care workers (5).

Nurses comprise the backbone of the healthcare system and are principle caregivers to people living with HIV/AIDS (6). Nurses are at a greater risk of percutaneous injuries than any other group of health care workers and that the proportion of nurses among all health-care workers at risk in the International Labor Organization database was generally between 35% and 50% (7). Percutaneous injuries to the nurses prevalence in Rift Valley Provincial Hospital is estimated around fifty three percent (53%) (8).

To mitigate this Center for Disease Control introduced the Universal Precautions which were intended to prevent parenteral, mucous membrane and non-intact skin exposures of health workers to blood-borne pathogens. The Universal Precautions assumes that blood and body fluids of all patients are considered potentially infectious and a such highly recommends use of protective barriers and prudent management of hospital wastes (1). The Universal Precautions is a package of infection prevention and control practice applied in the clinical set up by the health providers to reduce the risk of transmission of blood borne infections. They include guidelines and principles in hand washing, use of gloves and other protective barriers eg aprons, gowns, goggles and masks, proper handling of sharps, disinfection of soiled instruments and linen and proper management of sharp injuries (9).

It is therefore imperative that the nurses are well equipped with adequate knowledge on the Universal Precaution but more importantly that they practice its provisions and tenets.

#### METHODS AND MATERIALS

*Study Area:* The study was carried in both Baringo County Referral Hospital and Nandi county Referral Hospital. The two hospital were purposively selected for both teaching and referral facilities. They are both situated in the Rift Valley region of Kenya. This study aimed at establishing the prevalence of percutaneous injuries, the level of knowledge and the extent of compliance with the Universal Precautions.

*Study Design:* This was a descriptive cross-sectional institutional-based study carried out for a period of one month simultaneously in the two sites.

*Study Population and Sampling:* The study population was the Registered Nurses in the two selected hospitals. Total Population Sampling approach was employed owing to relatively small size of the population. The entire population stood at 160. The study assumed 95% Confidence Interval. The response rate was around 91%.

*Data collection tools:* A pretested structured self-administered questionnaires was administered to the Registered Nurses to collect quantitative data such as demographic characteristics, knowledge and compliance with Universal Precautions and Percutaneous injuries.

*Methods of Data analysis and presentation:* All information was entered into computer software for analysis, using statistical package for social sciences (SPSS) version 22 computer package and analyzed using descriptive and inferential statistics. The inferential statistics methods employed include independent t-test to compare means of continuous variables between groups, Chi Square to check for level of association between categorical variables, Simple Linear Regression to measure the of prediction of continuous outcome variables and finally Logistic Regression to measure the of prediction of dichotomous outcome variables. Descriptive data was presented using graphically and in text.

*Ethical considerations:* Ethical clearance was obtained from the University of Nairobi / Kenyatta National Hospital Ethics and research Committee. Informed and written consent was sought, obtained from all participants after explaining the nature and aim of the study and before administering the questionnaire. The study was purely voluntary.

#### RESULTS

*Socio-demographics:* This study was conducted in 2015 and the response rate for this study was around 91% (n=160). At the respondents were Registered Nurses. The results in the following Table 1 shows that majority of the respondents came from Baringo County Referral Hospital (52%), were of Female gender (73%), were married (76%) and professed Christian faith (99%).

**Table 1**  
The sample of the respondents by some Socio-demographic characteristics

	Frequency	Percentage
Hospital n=145		
Baringo County Referral Hospital	75	51.7
Nandi County Referral Hospital	70	48.3
Gender n=145		
Male	39	26.9
Female	106	73.1
Marital status n=145		
Single	24	16.6
Married	110	75.9
Widowed/Divorced	11	7.5
Religion n=145		
Christianity	143	98.6
Islam	2	1.4

The general mean age of the respondents is at 36.6 years(SD=7.1) while the specific mean age for the respondents in Baringo County Referral Hospital(BCRH) was lower (36.4 years, SD 5.8) than that of Nandi County Referral Hospital (NCRH) (36.8 years, SD=8.4).

The general mean number of practice years(experience) is 12.43(SD=7.06) but the specific for the respondents in BCRH was lower (11.4 years, SD 5.8) was lower than that of NCRH (13.5 years, SD=8.2).

*Self-reported Knowledge on the Universal Precautions:* On the concept of knowledge of the Universal Precautions, a set of twelve (12) questionnaire items were presented to the respondents to indicate the best and correct response. The items were later recoded with the correct response getting one(1) point while the incorrect responses were getting zero(0) points. After the recoding we computed new variable that is a sum of all the knowledge scores. The maximum score being twelve (12) points and the minimum being zero (0) points. The study assumes that for one to be considered knowledgeable to the Universal Precaution, the respondent must score above 50% which translates to at least seven(7) points. This study established that an overwhelming majority(87.6%. n=145) were knowledgeable on the Universal Precautions as elaborated in the following Table 2.

**Table 2**  
The Self-reported Knowledge on UP

	Frequency	Percentage
Not knowledgeable (Score 0-5)	18	12.4
Somewhat knowledgeable (Score 6-8)	84	57.9
Highly knowledgeable (Score 9-12)	43	29.7

The general mean knowledge score was 8.5(SD=1.7) out of the possible 12 points which translates to 71% . The results in the following Table 3 shows that the difference between the mean knowledge scores (M=8.0, SD=1.7) of Nandi County Referral Hospital was slightly lower than that(M=9.0, SD=1.6) of Baringo County Referral Hospital. The difference between the means in knowledge scores of the two groups is significant at the 0.01 level,  $t(143)=3.820$ ,  $p<0.01$ .

**Table 3**  
Comparison by Hospital of the mean knowledge Scores

Hospital	n	Mean knowledge scores	SD	df	t-value	p-value
Baringo	75	9.0 (75%)	1.6	143	3.820	0.000
Nandi	70	8.0 (66.7%)	1.7			

*Self-reported Compliance with the Universal Precautions:* On the concept of compliance with the Universal Precaution, a set of eight (8) statements were put on five (5) point Likert Scale in which the respondents were to indicate their level of agreement or otherwise. The items were recoded with the correct response getting one(1) point while the incorrect responses were getting zero(0) points. After the recoding we computed new variable that is a sum of all the scores. The maximum score being eight (8) points and the minimum being zero (0) points. The study assumes that for one to be considered compliant with the Universal Precaution, the respondent must score above 50% which translates to at least five(5) points. This study established that a minority (42.1%, n=145) of the respondents were compliant to the Universal Precautions as elaborated in the following Table 4.

**Table 4**  
The Self-reported Compliance with the Universal Precautions

	Frequency	Percentage
Not compliant (Score 0-4)	84	57.9
Somewhat compliant (Score 5-6)	59	40.7
Highly compliant (Score 7-8)	2	1.4

The general mean compliance score was 4.2(SD=1.3) out of the possible 8 points which translates to 52.5%. The results in the following Table 5 reveals that the difference between the mean compliance scores (M=3.7, SD=1.3) of Nandi County Referral Hospital was slightly lower than that(M=4.71, SD=1.2) of Baringo County Referral Hospital. The difference between the means of the mean compliance scores of the two groups was significant at the 0.01 level,  $t(143)=4.972$ ,  $p<0.01$ .

**Table 5**  
Comparison by Hospital of the mean Compliance Scores

Hospital	n	Mean compliance scores	SD	df	t-value	p-value
Baringo	75	4.7	1.2	143	4.972	0.000
Nandi	70	3.7	1.3			

A simple linear regression was calculated to predict compliance with the Universal Precautions(UP) based on knowledge of the Universal Precautions. A significant regression equation was found ( $F(4,78)=6.41$ ,  $p<0.01$ ), with an  $R^2=0.25$ . Participants predicted knowledge scores of UP is equal to  $3.01+0.33(\text{age})$  scores when age is measured in years.

*Prevalence of Percutaneous Injuries:* Slightly more than half (57.2%, n=145) of all the respondents have had ever had at least one percutaneous injuries but the specific prevalence per hospital favoured Baringo County Referral Hospital respondents(53.3%, n=75) compared to Nandi County Referral Hospital respondents had more injuries(61.4%, n=70). The prevalence of percutaneous injuries was higher in

the female (62.3%, n=106) than that of the males respondents(43.6%, n=39).

The level of association between prevalence of percutaneous injuries and gender is significant,  $\chi^2(1, N=145)=4.062$ ,  $p<0.05$ . On further subjecting the same association to Logistic Regression, it was established that Odds ratio of getting afflicted with Percutaneous Injuries comparing by gender is 0.47, 95%CI= (0.22-0.99). On average the odds of getting afflicted with Percutaneous injuries is 0.47 times higher in females than male respondents.

Other categorical variables found not significantly associated with proportion of Percutaneous injuries are the hospital, department of work and attendance of Continuous Professional Development on the subject matter as illustrated in following Table 6.

**Table 6**  
Comparison by some Categorical variables the proportion of Percutaneous Injuries

Variable	Scale	value	df	p-value
Hospital	Pearson Chi-Square	0.969	1	0.325
	N	83		
Work placement (Dept)	Pearson Chi-Square	9.994	5	0.075
	N	83		
Attendance of CPD	Pearson Chi-Square	0.035	1	0.851
	N	83		

The general mean number of percutaneous injuries to those who had been afflicted in the last five years was 2.2 (SD=1.3). The results in the following Table 7 reveals that the difference between the mean percutaneous injuries (M=2.44, SD=1.45) of Nandi County Referral Hospital was slightly higher than that (M=1.98, SD=1.19) of Baringo County Referral Hospital. The difference between the means of percutaneous injuries of the two groups was not significant at the 0.05 level,  $t(81)=-1.596$ ,  $p>0.05$ .

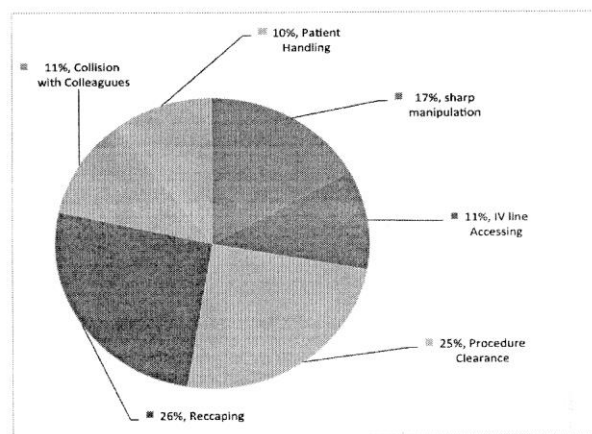
**Table 7**  
Comparison by Hospital of the mean Percutaneous injuries

Hospital	n	Mean PI	SD	df	t-value	p-value
Baringo	40	1.98	1.19	81	-1.596	0.114
Nandi	43	2.44	1.45			

A simple linear regression was calculated to predict the number of percutaneous injuries to the affected based on age of the respondents. A significant regression equation was found ( $F(1,81)=75.56$ ,  $p<0.01$ ), with an  $R^2=0.48$ . The respondents predicted number of percutaneous injuries is equal to  $-3.09 + 0.14(\text{age})$  percutaneous injuries when age is measured in years. Secondly, simple linear regression was calculated to predict the number of percutaneous injuries to the affected based on experience of the respondents in years. A significant regression equation was established ( $F(1,81)=116.6$ ,  $p<0.01$ ), with an  $R^2=0.59$ . The respondents predicted number of percutaneous injuries is equal to  $-0.135 + 0.154(\text{experience})$  percutaneous injuries when experience is measured in years.

The two leading circumstances associated with the Percutaneous injuries using the Multiple Response questionnaire items are needle recapping (26%,  $n=154$ ) and Clearance after procedures. The Multiple Response summary of the circumstances associated with Percutaneous Injuries are presented in following figure 1.

**Figure 1**  
Circumstances of Sustaining Percutaneous Injuries



About a third (27.7%,  $n=83$ ) of those afflicted by percutaneous injuries report to the hospital authorities for further management.



## DISCUSSION

The majority of the respondents were of female gender (73%, n=145) and was youthful in age (36.6 years, SD=7.1) which is a reflection of the nursing profession composition in Kenya. This corroborates findings that the largest numbers of nursing workforce in Kenya are between 30 to 40 years<sup>10</sup>.

This study established that an overwhelming majority (87.6%, n=145) were knowledgeable on the Universal Precautions with mean knowledge score of 71%. Most studies on this subject<sup>11-13</sup>, have previously reported that majority (over 75%) of health workers in general are knowledgeable in the subject of the Universal Precautions with mean scores of at least 65%. This implies that the Universal Precautions concept and the general infection prevention and control principles are highly valued, appreciated and emphasized in the nursing training institutions in Kenya as alluded by<sup>12</sup>. The variance in knowledge mean scores of the two selected hospital is probably due to the individual hospital authorities effort in continuous professional education on the subject and the setting difference; Baringo County Referral Hospital had a better mean score (75%) is situated adjacent to a nursing training college thus it is in an academic environment compared to Nandi County Referral Hospital mean score (66.7%). Also in a study done in a University teaching Hospital in United Arab Emirates, the knowledge nurses was strikingly high at 97.0%<sup>13</sup> giving the credence to the idea that respondents in academic settings tend to do well in knowledge scores. This study established that a minority (42.1%, n=145) of the respondents were compliant to the Universal Precautions based on the set criteria. The general mean compliance score was 4.2 (SD=1.3) out of the possible 8 points which translates to 52.5%. This compares slightly poorly than the Australian compliance with the Universal Precaution of 55.6%<sup>14</sup> 69.4% of Brazil and 57.4% of Hong Kong<sup>15</sup>. Among our peers in the region we are slightly better as evidenced by a study done in Ethiopia which established a compliance rate of 42.9%<sup>16</sup>.

There was a significant linear relationship between to compliance with the Universal Precautions (UP) based on knowledge of the Universal Precautions on applying Linear Regression ( $p < 0.01$ ) which tend to agree with many studies<sup>11,13,15</sup> and disagree that the two are not related<sup>17</sup> and my supposition is because the respondents were nursing students who often do well theoretical concepts and principles and exhibit minimal knowledge decay.

Participants predicted knowledge scores of UP is equal to  $3.01 + 0.33(\text{age})$  scores when age is measured in years meaning the knowledge score of the Universal Precautions improves with increasing age. This contradict the finding that young health

workers had good practice compared to the older ones. This insinuates that people learn over time and precisely experiential learning<sup>16</sup>.

Slightly more than half (57.2%, n=145) of all the respondents have had ever had at least one percutaneous injuries but the specific prevalence per hospital favoured Baringo County Referral Hospital respondents (53.3%, n=75) compared to Nandi County Referral Hospital respondents had more injuries (61.4%, n=70). The prevalence of percutaneous injuries in East African is between 40-60%<sup>18-19</sup>, the local prevalence varies by hospital for instance in Kenyatta National Hospital recorded 44%<sup>20</sup>, Moi Teaching and Referral Hospital recorded 43%<sup>18</sup> and Nakuru County Referral Hospital recorded 44%<sup>21</sup>. The prevalence of percutaneous injuries in the two selected county hospitals was higher than previous recorded locally and this could be attributed to their locality that is these selected hospitals are by and large in rural setting compared to the other hospitals previously studied.

On employing Logistic Regression, it was established that the odds of getting afflicted with Percutaneous injuries is 47% higher in females than male respondents (OR=0.47, 95% CI= (0.22-0.99) is in concurrence with a similar<sup>22</sup>. I note that there is no difference in exposures to risks of percutaneous injuries by gender, however, this could be because male nurses are more calm in executing their clinical duties and the minority are likely to be allocated administrative duties.

Linear Regression established that a significant relationship exist between age and experience in service with the number of percutaneous injuries ( $p < 0.01$ ), with the number of predicted percutaneous injuries increasing with both age and experience corresponding other studies<sup>20</sup>. As one advances in age and increases the clinical experience (years of service), the period of time of exposure also increases thus the elderly and most experienced nurses are likely to have been afflicted than the young nurses.

About a third (27.7%, n=83) of those afflicted by percutaneous injuries report to the hospital authorities for further management. This is comparable with what is documented that 30-60% of percutaneous injuries are unreported<sup>23</sup>. This reluctance to report percutaneous injuries cases despite the overstated advantages points to some degree of stigma and apathy associated.

In conclusion, the study concluded that the level of knowledge of the Universal Precautions among the Registered Nurses is very good but is not corresponding to the relatively average compliance of the same Universal Precautions. It is worth noting that the level of knowledge of the Universal Precautions was very significant with the compliance With the same Universal Precautions. Most of the Registered

Nurses have ever encountered Percutaneous Injuries and most of the affected are reluctant to report to hospital authorities for further management. This study recommends that the health fraternity and policy-makers needs to consider other innovative approaches of encouraging compliance with the Universal Precautions and reporting of percutaneous injuries. Taking cognisance that usual conservative continuous professional education was not significant to either compliance with the Universal Precautions, percutaneous injuries incidences and the reporting of percutaneous injuries. These approaches could include but not limited to individual or small group approaches and geared towards changing the perceptions of the Registered Nurses towards the Percutaneous Injuries and mitigating stigma associated with reporting of percutaneous injuries.

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## Appendix 10: Second Publication from the Study

### PREVALENCE AND REPORTING OF PERCUTANEOUS INJURIES AMONG NURSES IN SELECTED COUNTY HOSPITALS IN KENYA

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#### Abstract:

**Introduction:** Berry and Noble (2008) states that health care workers have in the past become infected with blood-borne illnesses the line of their duties either via percutaneous injuries or exposures to contaminated blood/fluids to mucosal membranes. Wilburn (2004) asserted that 30-60% of percutaneous injuries are unreported. The aim of the study was to establish the prevalence and reporting of percutaneous injuries among Registered Nurses in Selected County Hospitals in Kenya

**Methods:** This was a cross-sectional hospital-based quantitative study. Two County Referral Hospitals purposively selected for this study were Baringo and Nandi County Referral Hospitals both of which are situated in the Rift Valley Region of Kenya. These were all the Registered Nurses in the selected County Referral Hospitals.

**Results:** A majority (57.2%, n=145) of the respondents had experienced at least one percutaneous injuries with those afflicted recording an average of 2.2 (SD=1.3) injuries per person in the last five years. Using Logistic Regression, it was established that Odds ratio of getting afflicted with Percutaneous Injuries comparing by gender is 0.47, 95%CI= (0.22-0.99). Simple linear regression established that the number of percutaneous injuries is predicted by age (R<sup>2</sup>=0.48, p<0.01) and experience in years (R<sup>2</sup>=0.59, p<0.01). Slightly less than a third (27.7%, n=83) of those afflicted by percutaneous injuries report to the hospital authorities for further management. All the respondents indicated that they have encountered at least one body fluids/ secretions splash on them but only around a third (35.9%, n=145) indicated having reported to the hospital authorities for further management.

**Conclusion:** The study concluded that percutaneous injuries and blood/body fluids splashes are still a major cause of concern and an occupational hazard to the nurses that needs to be addressed in totality. Most of those exposed to these occupational hazards are reluctant to report to the authorities for further management.

**Keywords:** Nurses, Percutaneous Injuries, Needlestick Injuries, Reporting, Blood, body Fluids

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## Appendix 11: Third Publication from the Study

Mukthar, VK., Karani, AK and Mirie, W., 2018

### The Effect of Social Cognitive Theory-based Educational Intervention on the Percutaneous Injuries Rate and their Reporting among the Registered Nurses in Selected County Hospitals in Kenya

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#### Abstract

**Introduction:** World Health Organization (2010) estimates that over 2.5% of all HIV and other infections in sub-Saharan Africa are transmitted through blood and body fluids exposures. Percutaneous injuries are frequent occurrences to nurses and are not always adequately assessed and/or addressed because of massive under-reporting of the accidents. The objective of the study was to analyse the effectiveness of structured education to Registered Nurses in influencing the compliance with the Standard Precautions and incidence rate of percutaneous injuries in Selected County Referral Hospitals

**Methods:** This was a prospective Quasi Experimental study. The respondents were registered nurses in the selected hospitals. These nurses were exposed to structured education as the intervention where self-administered Questionnaires and an Observational schedule were used before and after the intervention. The study has employed both descriptive and inferential statistics to analyse the data. Results have been presented in text, tables and graphically.

**Findings:** The prevalence of percutaneous injuries for the previous year was still high at 32.1% with a mean frequency of 2.1(SD=1.3) injuries per respondent. The annual percutaneous incidence rate was 18.6 and 25.8 injuries per 100 fulltime employees respectively for the study group and the control group after the intervention. Around 70% of the percutaneous injuries are not reported. The self-reported knowledge scores on the Standard Precautions was 58.5%.

**Conclusion:** Both self-efficacy and collective efficacy of healthcare workers on sharp management is a product of vicarious learning by friendly and conducive environment, motivation and robust cognitive understanding. Educational interventions should be rooted in the Social Cognitive Theory, Thorndike's Principles of Learning for greater impacts and desirable outcomes on nurses.

*Key Words: Percutaneous Injuries, Reporting, Needle Stick Injuries*

#### Introduction

The World Health Organization estimates that over three million percutaneous injuries afflict the health workers annually among forty million health workers globally (World Health Organization, 2010). Health workers in Africa experience between up to five percutaneous injuries per year with Nigeria, Tanzania and South Africa reporting an average of 2.4 injuries per health worker

(Mbaisi, Nganga, Wanzala, & Omolo, 2013).

A study to establish the prevalence of percutaneous injuries among the nurses/midwives at a Ugandan hospital determined that 46% of the respondents had experienced percutaneous injuries in the previous year (Odongkara et al., 2012) while

in similar study Rift Valley General Hospital(Kenya), it is estimated around 53% of the nurses had experienced percutaneous injuries in the previous year (Mukthar, Karani, & Kangethe, 2009).

Among blood borne diseases that can be transmitted via percutaneous injuries, HIV infection is the most common and significant one (Amuwo, Lipscomb, McPhaul, & Sokas, 2013). The risk of being infected with HIV from a single prick with a sharp gadget that has been used on an HIV-infected person is thought to be about 1 in 150. The World Health Organization and International Council of Nursing estimate that approximately 2.5% of all HIV infections in sub-Saharan Africa are transmitted through unsafe healthcare injections and other sharp objects. Because of this, the United Nations General Assembly has continuously encouraged the nations of the world to implement precautions to prevent HIV transmission by health workers either to themselves or to others (Phillips, Conaway, Parker, Perry, & Jagger, 2013). While less than 10% of the HIV among health workers is the result of an exposure at work to percutaneous injuries, 95% of the HIV occupational sero-conversions are preventable with practical, low-cost measures and have the co-benefit of preventing exposure to other blood borne viruses and bacteria (Boden, Petrofsky, Hoptia, Wagner, & Hashimoto, 2014).

Antiretroviral treatment reduces both the mortality and the morbidity of HIV infection, but these drugs are expensive and routine access to antiretroviral medication is not available in some countries. Due to the difficulty in treating HIV infection, preventing infection is a key aim in controlling the AIDS (Chughlay, Njuguna, Cohen, & Maartens, 2015). Post-exposure prophylaxis (PEP) is a short term preventive antiretroviral therapy that greatly reduces

the chances of HIV infection after potential infection either through sexual engagement or in the line of duty for health workers. PEP is provided as part of Comprehensive precautions package that reduces the health workers exposures to infectious hazards at works (World Health Organization, 2010). Percutaneous injuries are frequent occurrences in health workers, and are not always adequately assessed and/or addressed because of massive under-reporting of the accidents within the hospital. This has resulted in underestimation of current occupational exposure of health care workers to HIV (Courtenay-Quirk et al., 2016). Therefore this study set out to determine the Effect of Social Cognitive Theory-based Educational Intervention on the Percutaneous Injuries Rate and their Reporting among the Registered Nurses in Selected County Hospitals in Kenya. The study's null hypothesis was there is no significant difference in the incidence rate per fulltime employee of percutaneous injuries between the interventional and the control group.

The Theoretical Framework: Social Cognitive Theory is a theory developed by Albert Bandura in 1960s and improved in late 1980s. The gist of The Social cognitive Theory according to (Bandura (2010), is that human beings learn by observing others (vicarious learning), within the context of social interactions in a setting herein referred to as the environment but subject to ones cognition which entails ones personality. The learned behaviors are central to ones personality. What makes the Social Cognitive Theory unique is that it proposes that learning considers how people maintain a learned behavior, considers past experiences and is a collective function of Self-Efficacy, goals and Outcome expectancies. The Social Cognitive Theory emphasizes that the dynamic interaction

(Triadic Reciprocal Determinism) between people (personal factors), their behaviors and their environment.

### Methods

This was a prospective Quasi- Experimental study precisely Nonequivalent Control Group study whereby the units of observation (nurses) were not be randomly assigned to either study or control groups. The study was undertaken in two county hospitals in Kenya namely Baringo County Referral Hospital as study group and Nandi County Referral Hospital as control group. The study population consisted of Registered Nurses from the two health facilities purposively selected for this study, namely Baringo County Referral Hospital and Nandi County Referral Hospital. This study applied Total Population Sampling (census) owing to relatively small size of the population. The study instrument (tools) was a self- administered semi-Structured Questionnaires. Baseline data was collected initially before the intervention (baseline information), then the intervention (structured education) were administered to the study group as a package of six lessons within two months then followed up for a period of a six months and then the final data was captured. The data collection instruments were reviewed by nursing education experts in the School of Nursing Sciences in the University of Nairobi. All the tools were in English language which is well understood by all the qualified nurses in Kenya. Pretesting was done in a similar facility. Obtaining of Pretest data, administering of structured education to the study group and obtaining of post-intervention data was done by trained enumerators. They delivered their teaching based on an established lesson plans. The instrument was tested for reliability using Split-Half test which yielded a reliability Spearman-Brown coefficient of 0.86 and

thus such tool was considered reliable. The data collection instruments were self - administered structured questionnaires. The same instrument was used for both pretest and post test to both the study and control groups. Written informed consent was obtained from all participants. Ethical clearance was obtained from the University of Nairobi / Kenyatta National Hospital Ethics and Research Committee. Confidentiality, dignity, respect and participants rights were respected. Participation was voluntary with participants reserving their right to withdraw participation at any stage of the study. The data was entered into a computer for analysis using Statistical Package for Social Sciences (SPSS version 20). Both descriptive and inferential statistics was used in analysis. This study adopted a Confidence interval of 95% and a significant level of 0.05.

### Findings

This study was conducted in 2016 to 2017 and the response rate for this study was around 91% (n=160). At the respondents were Registered Nurses. The results in the following Table 2 shows that majority of the respondents came from Baringo County Referral Hospital (52%), were of Female gender (73%), were married (76%) and professed Christian faith (99%).

**Table 1: The sample of the respondents by some Socio-demographic characteristics**

Variable	Categories	Frequency	% (n=145)
Group	Study group	75	51.7
	Control group	70	48.3
Gender	Male	39	26.9
	Female	106	73.1
Marital status	Single	24	16.6
	Married	110	75.9
	Widowed/Divorced	11	7.5
Religion	Christianity	143	98.6
	Islam	2	1.4

The general (for both interventional and control groups) mean age of the respondents is at 36.6 years (SD=7.1) while the specific mean age for the Interventional group, the Baringo County Referral Hospital (BCRH), lower (36.4 years, SD 5.8) than that of the control group, Nandi County Referral Hospital (NCRH), (36.8 years, SD=8.4) as shown in Table 1. The general mean number of practice years (experience) is 12.43 (SD=7.06) but the specific for the respondents in Interventional group (BCRH) was lower (11.4 years, SD 5.8) than that of control group (NCRH) (13.5 years, SD=8.2)

The prevalence percutaneous injuries in the previous year for both the study and control group was 32.1% (n=145) with a mean frequency of 2.1 (SD=1.3).

**Table 2: Comparison by group the self-reported PIs incidence rate (Semi-Annual)**

Variable	Stage	Frequency N=145	%	X <sup>2</sup>	p-value
Group	Study Group	7	9.3%	0.458*	.499
	Control Group	9	12.9%		

A Pearson Chi Square test of independence was calculated comparing the PI incidence rate by the study group and control group. A non-significant interaction was found ( $\chi^2(1)$

=0.458,  $p>0.05$ ). The Percutaneous Injuries incidence rate of percutaneous injuries per fulltime equivalent employee in the study group was lower (9.3%, n=75) compared with 12.9% (n=70) in the control group. This translates to 9.3 injuries for study group and 12.9 injuries per a hundred fulltime employee per half a year as shown in Table 2. On a multiple responses analysis, the two commonest in circumstances associated with sustaining PIs is needle recapping (25.1%) and by Procedure clearance (22.3%) as shown in the following figure 1.

An independent t-test was conducted to compare frequency of PIs in Study group and in control group during the post-interventional stage. There was a non-significant differences in the mean frequencies scores in PIs for interventional group (M=1.1, SD=0.4) and control group (M=1.6, SD=0.5),  $t(14) = -1.746$ ,  $p>0.05$  as shown in Table 3

**Table 3: Comparison of frequency in Reported PIs by Groups**

Group	n	freq' Mean score	SD	df	t-value	p-value
Study group	7	1.1	0.4	14	-1.746	0.103
Control group	9	1.6	0.5			

Based on the results of the study on applying Pearson Correlation test, the knowledge scores is strongly related to frequency of PI experiencing  $r=-0.808$ ,  $p<.01$  as shown in Table 4.

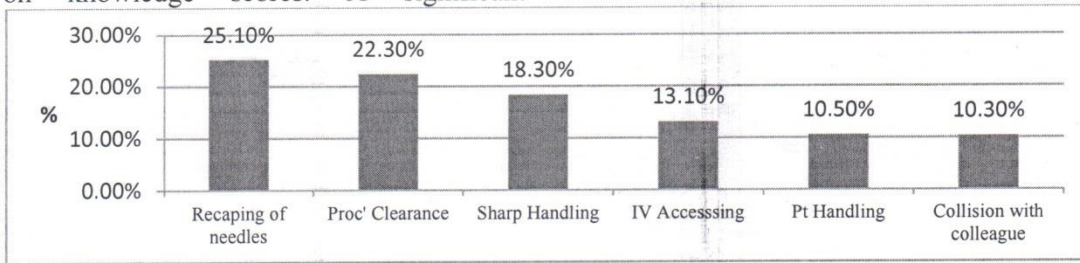
**Table 4: The relationship between the knowledge on Standard Precautions and the frequency of Percutaneous Injuries**

Scale	Frequency of Pis (no)
Knowledge scores on the Standard Precautions	Pearson Correlation(r) - .808
	p-value .000
	N 16



Based on the results of the study on applying Pearson Correlation test, the knowledge scores is strongly related to frequency of PI experiencing  $r=-0.808$ ,  $p<.01$  as shown in Table 4. A simple linear Regression was calculated to predict frequency of PIs based on knowledge scores. A significant

Regression equation was found ( $F(1, 14) = 26.25$ ,  $p < .01$ ) with an  $R^2$  of 0.652. Participants predicted Frequency of PIs =  $3.443 - 0.274(\text{Knowledge scores})$  number when knowledge score is measured in numbers.



**Figure 1: The Circumstances of sustaining Percutaneous Injuries**

A Pearson Chi Square test of independence was calculated comparing the reporting of PIs by groups. A non-significant interaction was found ( $\chi^2(1) = 6.268$ ,  $p > 0.5$ ). Though a

majority (85.7%,  $n=7$ ) of the PIs were reported in the study group compared to about a half (44.4%,  $n=9$ ) in the control group as shown in Table 5.

**Table 5: Comparison by group of Reporting Percutaneous Injuries**

Groups	N	Freq'	%	df	Chi Square ( $\chi^2$ )	p-value
Study group	7	6	85.7%	1	2.861 <sup>a</sup>	.09
Control Group	9	4	44.4%	1		

By use of Chi Square Test of Significance to determine the categorical variables that are significantly related to reporting of percutaneous injuries to the authorities, the only two variables that were significant are age ( $p=0.002$ ) and the fear of contracting HIV infection and stigma ( $p= 0.03$ ). Other factors attributed to reporting but not significantly associated are experience, knowledge of Standard Precautions and unit placements. Binary Logistic regression was used to measure prediction of Reporting by two variables earlier identified to be significant by Chi Square test of independence. It was established that the respondents of age 35years and below had higher odds of reporting injuries compared

to those of over 35 years (AOR 4.3, CI 1.7-10.8). Furthermore, it was also established that the respondents who expressed fear of contracting HIV/AIDs as their greatest occupational concern had higher odds of reporting their percutaneous injuries (AOR 2.1, CI 1.6-3.4) as shown in Table 6.

**Table 6: The PI Reporting by age categories and its univariate Odds Ratio**

Variable	Category	Frequency	%	Unadjusted Odds Ratio(95% CI)	p-value
Age	≤35yrs	17	56.7%	4.3(1.7-10.8)	0.002
	>35yrs	16	23.2%	1.000	
Fear of contracting HIV/AIDs	Yes	22	42.3%	2.1(1.6-3.4)	0.003
	No	9	19.2%	1.000	

## Discussion

The prevalence percutaneous injuries in the previous year for both the study and control group was 32.1%(n=145) with a mean frequency of 2.1(SD=1.3). This is within the percutaneous injuries prevalence range between twenty(20%) to forty(40%) percent both locally and regionally in the previous year as reported by a couple of studies (Kaweti & Abegaz, 2016; Lori, McCullagh, Krueger, & Oteng, 2016; Mbaisi, et al., 2013).

This prevalence was higher than the regional as documented In a cross-sectional study done in 2014 among healthcare workers in an Ethiopian referral hospital establishes that 46% of the healthcare workers had sustained atleast one pi in their professional life and around a quarter(28%) in the previous year(Kaweti & Abegaz, 2016). In similar another descriptive cross-sectional study done in Ghana, it was established that the prevalence of percutaneous injuries in a previous year to the nurses was 28.9%(Lori et al., 2016) locally a study done for all health workers in a county referral hospital in Kenya noted that around 19% of the health workers had been afflicted by percutaneous injuries but about half had afflicted the nurses only(Mbaisi, et al., 2013).

The Percutaneous Injuries incidence rate of percutaneous injuries per fulltime equivalent employee in the study group was lower(9.3%,) compared with 12.9% in the control group. This translates to 18.6 injuries for study group and 25.8 injuries per a hundred fulltime employee annually. This incidence rate of 18.6 to 25.8 were lower than that between 30 to 35 injuries per 100 fulltime equivalent employees that is recorded by Lu, Senthilselvan, Joffe, & Beach (2015). The average frequency of sustaining percutaneous injuries for a nurse was higher

in the control group(1.6) compared to the study group(1.1). Though the findings give credit to the educational intervention applied, the difference was not significant ( $p>0.05$ ) and thus the hypothesis that stated, "there is no significant difference in the incidence rate per fulltime employee of percutaneous injuries between the interventional and the control group", is hereby accepted. A cross-sectional study done in 2014 that investigated percutaneous injuries and their reporting among healthcare workers established that 24% reported their percutaneous injuries for further management (Kaweti & Abegaz, 2016). Despite the relatively unsatisfactory reporting of percutaneous injuries, a couple of educational interventional studies on nurses showed at least 10% improvement on reporting of percutaneous injuries (Mehrddad, Meshki, & Pouryagub, 2013; Rajkumari et al., 2014; Zawilla & Ahmed, 2013) thus I submit that the differences in reporting pattern between the study group and control group is partially a function of this study's impact. This study established via Logistic regression that is significantly predictive of reporting with the younger age group(35years and below) having higher likelihood of reporting (AOR 4.3, CI1.7-10.8), the corresponds with as study in Nigeria which stated that the younger health workers with less than ten years experience have high rate of PIs and have as well as higher propensity to report out of fear and anxiety compared with the older health workers(Amira & Awobusuyi, 2014).

## Conclusion and Recommendations

A previous year percutaneous injuries prevalence was still high at 32.1% with a mean frequency of 2.1(SD=1.3) injuries per respondent. The percutaneous incidence rate determined was 18.6 injuries per 100 fulltime employees for the study group and 25.8 injuries per 100 fulltime employees for

the control group after the intervention applied. Most (around 70%) of the percutaneous injuries are underreported. Reporting of percutaneous injuries improved from 35.6% to 85.5% in the study group after the educational intervention.

The study submits that both self-efficacy and collective efficacy of healthcare workers on any practical concept including sharp management are a function of vicarious learning supported with friendly and conducive environment, motivation and robust cognitive understanding. It is the proposal of this study that any educational intervention should not be one-off but rather should recur over a considerable period of time as envisaged by Thorndike Principle of Recency. The healthcare settings should adopt a system whereby in every clinical unit there are credible models (consultants) that are charged with the noble duty of re-enforcing standard operating procedures as well as clarifying misconceptions.

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## Appendix 12: Publication and Journal Analysis

Vincent K. Mukthar :VERIFICATION OF PUBLICATIONS AND JOURNALS				
CRITERIA		COMMENTS		
		Journal 1	Journal 2	Journal 3
<b>Publishers</b>		East African Medical Journal	Kenya Journal of Nursing and Midwifery	Kenya Journal of Nursing and Midwifery
1	Duration of the review process from submission to acceptance for publication	Submitted 10 <sup>Th</sup> January 2016 Accepted 6 <sup>Th</sup> June 2016	Submitted 9 <sup>Th</sup> December 2016 Accepted 13 <sup>Th</sup> March 2017	Submitted 24 <sup>Th</sup> October 2016 Accepted 4 <sup>Th</sup> December 2018
2	Members of Editorial board	Medical experts from East African Region with diverse specializations and experience	Nursing and Midwifery Authorities from Kenya	Nursing and Midwifery Authorities from Kenya
3	The scope of a journal in particular field	Covers health issues extensively	Covers wide breadth and depth of Nursing And Midwifery disciplines	Covers wide breadth and depth of Nursing And Midwifery disciplines
4	Website	<a href="https://www.ajol.info/index.php/eamj">https://www.ajol.info/index.php/eamj</a>	<a href="https://www.kjnm.co.ke">https://www.kjnm.co.ke</a>	<a href="http://www.kjnm.co.ke">www.kjnm.co.ke</a>
5	Regular issues	Published Monthly basis	Published Tri-annually	Published Tri-annually
6	Indexing with renown bodies	Indexed with Medicus(Med-line), SCISEARCH and EMBASE	Indexed with Med-line	Indexed with Med-line
7	Publication fee paid after acceptance of the article	Paid US\$ 130	Paid US\$ 160	Paid US\$ 160
8	The publisher's email address is professional	<a href="mailto:eamj@kma.co.ke">eamj@kma.co.ke</a>	administrator@kjnm.co.ke	administrator@kjnm.co.ke
9	The author (s) retains the copy right of the	Yes	Yes	Yes

	article and right of use			
10	The published article and journal are accessible	In the website above and <a href="https://scholar.google.com/citations">scholar.google.com &gt; citations</a>	In the website above and <a href="https://scholar.google.com/citations">scholar.google.com &gt; citations</a>	In the website above and <a href="https://scholar.google.com/citations">scholar.google.com &gt; citations</a>
11	Has an International Standard Serial Number (ISSN )	ISSN no. 0012-835X	ISSN: 2518-8631	ISSN: 2518-8631

## 9.13 Appendix 13: Declaration of Originality Form

### UNIVERSITY OF NAIROBI

#### Declaration of Originality Form

This form must be completed and signed for all works submitted to the University for examination.

Name of Student MUKTHAR, VINCENT KIPRONO

Registration Number H80/52081/2017

College HEALTH SCIENCES

Faculty/School/Institute SCHOOL OF NURSING SCIENCES

Department NURSING EDUCATION, LEADERSHIP, ADMINISTRATION AND RESEARCH

Course Name DOCTOR OF PHILOSOPHY IN NURSING EDUCATION

Title of the work

THE EFFECTIVENESS OF MULTI-PRONGED EDUCATIONAL INTERVENTION TO THE REGISTERED NURSES IN INFLUENCING COMPLIANCE WITH STANDARD PRECAUTION IN SELECTED COUNTY REFERRAL HOSPITALS IN KENYA

DECLARATION

1. I understand what Plagiarism is and I am aware of the University's policy in this regard
2. I declare that this THESIS (Thesis, project, essay, assignment, paper, report, etc) is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work, or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work
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5. I understand that any false claim in respect of this work shall result in disciplinary action, in accordance with University Plagiarism Policy.

Signature *Mukthar*

Date 18.06.2020

## 9.14 Appendix 14: Turnitin Report

Prof. Anne k. Karani



20/7/2020

### Turnitin Originality Report

The Effectiveness of Multi-pronged Educational Intervention to the Registered Nurses in Influencing the Compliance with the Standard Precautions in Selected County Referral Hospitals in Kenya by Vincent Kiprono Mukthar

From Nursing Education (PHD)

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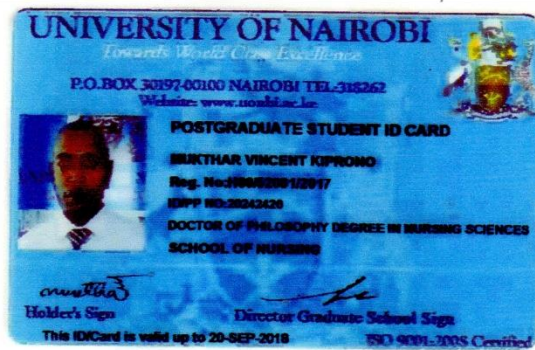
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## 9.15 Appendix 15: Student Identity Card



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Portal Home | Student Fees | Timetables | Course Registration | Results | Enquiries | Book Room | Logout

My profile | Change Password | Student ID | Inter Faculty | Clearance Status | Caution Refund | Academic Tracking

H80/52081/2017 VINCENT KIPRONO MUKTHAR (Nairobi Evening)

ID/PP No.	Type: New (First Time)	Make Request			
<b>Previous Requests</b>					
Request No.	Request Date	Status	Receipt No.	Validity	Remarks
1.	06-SEP-2017	PRINTED 20-SEP-2017 05:22		20-SEP-2017 - 20-SEP-2018	ID Already Printed
2.	07-JUN-2020	PENDING			ID Card Available for Printing

**Procedure for getting the new generation Student ID Card**

Printing of ID for students has been suspended until the University resumes

*Mukthar*  
20/07/2020