FACTORS INFLUENCING INJECTION SAFETY AMONG CLINICAL HEALTH CARE PERSONNEL IN GARISSA PROVINCIAL GENERAL HOSPITAL

BY: JUDITH MUTINDI MWEU

H56/64159/2010

DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE IN MASTER OF SCIENCE IN CRITICAL CARE NURSING, OF THE UNIVERSITY OF NAIROBI

JULY 2012

DECLARATION

I, Judith Mutindi Mweu declare that this dissertation is my original work and has never been presented in any other institution for the purpose of obtaining a degree or any other award.

Signed……..Date……

SUPERVISORS' APPROVAL

This research dissertation is submitted as partial fulfillment for the award of Master of Science degree in Critical Care Nursing of the University of Nairobi with our approval as internal Supervisors.

SUPERVISORS

1. Mrs. Theresa M.A Odero
   BSN, MSC, RN, RM, CCN, HEd
   Lecturer, University of Nairobi, School of Nursing Sciences

   Signature…… Date……..

2. Mrs. Angeline Kirui
   (MSC MED Microbiology)
   Lecturer, University of Nairobi, School of Nursing Sciences

   Signature ……..Date……

3. Dr. John Kinuthia
   Consultant Obstetrician/ Gynecologist.
   Honorary Lecturer, University of Nairobi

   Signature……..Date…….

DEDICATION

To my family, my beloved father, James Muiya who is my hero and my late dear mother Josephine Mulekye who taught me how to love sincerely. To my wonderful brothers, Alex and Peter, sisters Esther and Evelyne who believe in me, and all my many friends and relatives.

ACKNOWLEDGEMENT

I sincerely acknowledge my supervisors and lecturers for their continuous support and encouragement.

I express my special gratitude to Almeric Nzuki who cares for me very much and encouraged me during the whole study period.

I sincerely thank Mr. Philip Ayieko of KEMRI- Welcome Trust for statistical Support.

LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired immunodeficiency syndrome
BCC	Behavior Change and Communication
CDC	Centers for Disease Control and Prevention,
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIV	Human immunodeficiency virus
PEP	Post-exposure prophylaxis
SIGN	Safe Injection Global Network
SOP	Standard operating procedure
WHO	World Health Organization
KSPAS	Kenya Service Provision Assessment
KAIS	Kenya AIDS Indicator Survey
PATH	Program for Appropriate Technology in Health
USAID	United States Agency for International Development
GPGH	Garissa Provincial General Hospital

OPERATIONAL DEFINATIONS

Clinical Health Care Workers: All health care providers involved in administering injections and waste generation to final disposal

Safe Injection: An injection that does not cause any harm to the patient, the injection provider and is safe to the community

Hand Hygiene: Hand washing either with water and soap or using alcohol based gels or foams that do not require use of water to prevent avoidable contamination while administering injections.

Healthcare waste: The total waste stream from a healthcare or research facility that include both potential waste and non-risk materials and by products

Sharps: Any object that can penetrate and injure the skin including, but not limited to needles, scalpels, broken glass, broken capillary tubes and exposed ends of dental wires

Needlestick injuries: lacerations caused by needles that accidentally puncture the skin

Hazardous wastes: Any waste that has the potential to harm a person or animals in the environment due to chemical, physical and biological contaminants

Biomedical waste: Any waste that is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities in the production of testing of biological products. The universal color coding is black for non-infectious waste, yellow for infectious waste, red for highly infectious waste

Conceptual framework: Is an outline used in research to depict possible courses of action or to show a preferred approach to an idea or thought. It is an interrelationship between variables in the study

Independent variable: An attribute that does not change in the study

Dependent Variable: Is the variable representing the value being manipulated or changed.

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ABSTRACT

Introduction: The World Health Organization (WHO) estimates that approximately 16 billion injections are administered in developing and transitional countries each year. Injection safety is therefore critical in preventing occupational exposure and infection from blood borne pathogens which are issues of public health importance. Thus, such prevention is a vital part of any comprehensive plan for protecting health workers, patients and maintaining a safe environment. The main aim of this study was to determine the factors influencing injection safety among clinical personnel at the Garissa Provincial General Hospital. .

Methodology: This was a cross-sectional study which was conducted from September 2011 to July 2012. Data collection used questionnaires, observation checklists and key informant interviews. Purposive sampling was used to select 72 respondents who participated in the study. Data cleaning and analysis was done using Scientific Package for Social Scientists (SPSS) Version 18. Descriptive statistics including means, standard deviation and frequency distributions were used in univariate. Associations between variables were tested using Fisher's test for proportions and ANOVA and t-tests for continuous variables. Thematic analysis was used to analysis the qualitative data.

Results: A total of 72 health workers were recruited for the study and most (50%) were nurses. Injection safety knowledge was high and on average, the respondents had a knowledge score of 12.65 (SD ± 2.3) out of the total of 16. Appropriate injection safety practices like non-recapping of needles, hand washing and proper waste management were reported by most of the respondents. The level of knowledge was not significantly associated with respondents' demographic characteristics ($p > 0.05$) but was significantly associated with hand washing practice ($p=0.01$). Drug administration practice varied in the different departments ($p=0.043$) and recapping of needles was significantly associated with training (0.047), designation (0.02) and area of deployment (0.017). .

Conclusion and recommendation: Although the health workers were knowledgeable on injection safety, waste management and injection safety practices were poor. There was insufficient provision of injection safety equipment and supplies in all the areas studied, hence the need by the hospital management to put in place measures to promote good injection safety practices among the health workers.

CHAPTER ONE

1.1 BACKGROUND

An injection is a skin-piercing exercise done to introduce a substance into the body for prophylactic, curative or recreational intentions. Injections are among the most frequent medical procedures (Kermode, 2004). According to World Health Organization (WHO), each year, about 16 billion injections are dispensed in developing and in countries that are in transition. Unsafe injection practices are not uncommon globally and they convey substantive proportion of avoidable blood borne infections (MOH, 2006a). WHO defines safe injection as the one that does not cause harmful effects to the recipient, does not expose the injection provider to any avoidable health related risks or generate waste that will cause harm to the community (MOH Waste Management Plan, 2008-2012).

According to the WHO, unsafe injections can bring about transmission of an extensive variety of pathogens such as viruses, bacteria, fungi and parasites along with non-infectious adverse events like abscesses. Reuse of syringes or needles is still widely practiced in many clinical settings and it exposes patients to risks of infections. The burden of disease for the year 2000 from unsafe injection practices for these pathogens worldwide to include 21 million HBV, which is 32% of new HBV infections, 2 million HCV infections, 40% of new HCV infections and 260 000 HIV infections 5% of new HIV infections (WHO, 2010). In South East Asia up to 9% of new cases of blood borne diseases are likely to result from unsafe injections (Miller & Pisani, 2006). At present, injection service is a major method to administer drugs to patients (Yan *et al.,* 2006).

Health care delivery is frequently complicated by Nosocomial infections worldwide. Strict adherence to the provided infection control standards and guidelines along with constant vigilance are necessary to stamp out such infections. Reliable running water, hand disinfectant, the appropriate sharp boxes for proper disposal of sharp wastes, disinfectant solution and gloves are the items that are also considered crucial and essential (Friedman *et al.,* 2010). In developing countries, it is suspected that unsafe injections occur regularly (Simonsen *et a.,l* 1999).
African countries have the highest needle stick exposure than anywhere in the world and have a substantial public health issue due to the fear of occupational infections faced by poorly paid,

health care workers who are also over worked (Kermode, 2004). Studies show that about one-third of immunization injections are unsafe in several countries of the world including Africa. USAID found that only 12.3% of injection providers in Nigeria practiced hand washing prior or after giving injections (Akpan *et al*, 2009). Majority of Health Care workers still have poor understanding of safe immunization injection and are not familiar with any policy on injection safety in Nigeria (Ernest, 2002). Health-care workers still experience common accidental needle stick injuries in Ethiopia. That creates a constant occupational health hazard and a significant public health concern in health care settings (Yan *et al*., 2006).

Unsafe injection practices pose a significant risk of disease transmission because injections are so common. In prevention of blood borne diseases such as HIV/AIDS, Hepatitis B and Hepatitis C, adequate knowledge on how both infection prevention and control relates to injection safety is necessary (MOH, 2006b). Knowledge on safe injection practices is critical for evidence-based development of intervention initiatives (Chowdhury *et al.,* 2011). The importance of giving safe injections and the appropriate handling of medical waste is recognized by the Government of Kenya so as to protect the safety of the health care providers, patients, the environment and the community (MOH, 2006a).

1.2 PROBLEM STATEMENT

At least 50% of the injections that administered in the developing world each year are unsafe. In Kenya, each person has an average of 2-3 injections per year and 70% of injection providers reported that they had suffered needle stick injuries (MOH, 2005). Clinicians prescribe injections in considerable cases even when oral medications would be preferred and are similarly effective. Primary care givers administer injections to 9 out of 10 of their patients in certain cases, of which 70% are unnecessary or have available oral alternatives. All these injections carry a high risk of transmission of deadly blood borne pathogens **(**MOH, 2006b). As injections are so common, unsafe injection practices pose a significant risk of disease transmission. Adequate knowledge on the relationship between infection prevention and control with safe injection practices is therefore critical in the prevention of avoidable blood borne diseases (MOH, 2006a)

A nationally representative survey conducted showed that HIV prevalence among adults who reported medical injections in the previous year was 9.2% and was higher than among adults who did not, which was 6.0%. HIV prevalence increased significantly from 8.4% among individuals receiving a single injection to 13.9% among individuals receiving 11 or more injections in the previous year. (Kenya AIDS Indicator Survey [KAIS], 2007). Despite the formulation of policies and laws on healthcare waste management in Kenya, many health care facilities in Kenya still lack adequate enforcement and suitable legislation for waste handling and disposal (MOH Waste Management Plan, 2008-2012)

In Kenya, Only thirty six percent of facilities have adequate infection control items which include sharps boxes, color coded waste bins and liners, gloves, adequate running water and soap (KSPA, 2010). This study aimed at determining injection safety practices at GPGH as a baseline evaluation.

1.3 JUSTIFICATION

Injections are a common mode of drug administration in most health facilities in the country and can pose risk of transmission of blood borne diseases where safe injection practices are not implemented (MOH, 2006b). This risk is worsened by popularity of injections and in most cases needless use of injections in many low income countries (Kermode 2004). In response to dangers posed by unsafe injection practices, the Ministry of Health in Kenya has formulated injection safety guidelines to ensure that injections are safe to the recipient, the provider and to the community (MOH, 2006a). Currently, there is no data on injection safety practices in GPGH. This study aims to evaluate injection safety practices and the enforcement of the WHO/MOH guidelines on injection safety at GPGH, one of the largest and main referral Hospital in Northern Kenya.

1.4 STUDY QUESTIONS

1. What is the level of knowledge on injection safety among clinical health care personnel in Garissa Provincial Hospital?
2. What is the practice on injection safety by clinical health care personnel in Garissa Provincial Hospital?
3. How is the sharps waste generated, segregated, transported and disposed of at the Garissa Provincial Hospital?
4. What is the relationship between knowledge, practice with injection safety in Garissa Provincial Hospital?

1.5 BROAD OBJECTIVE

To determine the factors influencing injection safety among clinical workers at the Garissa Provincial General Hospital.

1.6 SPECIFIC OBJECTIVES

1. To determine level of knowledge on injection safety among clinical health care personnel working in Garissa Provincial Hospital.
2. To determine the practice of injection safety by the clinical health care personnel working in Garissa Provincial Hospital.
3. To describe how sharp waste is generated, segregated, transported and disposed Garissa Provincial Hospital.
4. To determine the relationship between knowledge, practice and injection safety among health care workers in Garissa Provincial Hospital.

1.7 HYPOTHESIS

There is no relationship between knowledge and Injection safety practice among clinical health care workers in Garissa Provincial Hospital.

1.8 STUDY BENEFITS

The findings will document injection safety status in GPGH which would guide planning, training, policy formulation and further research.

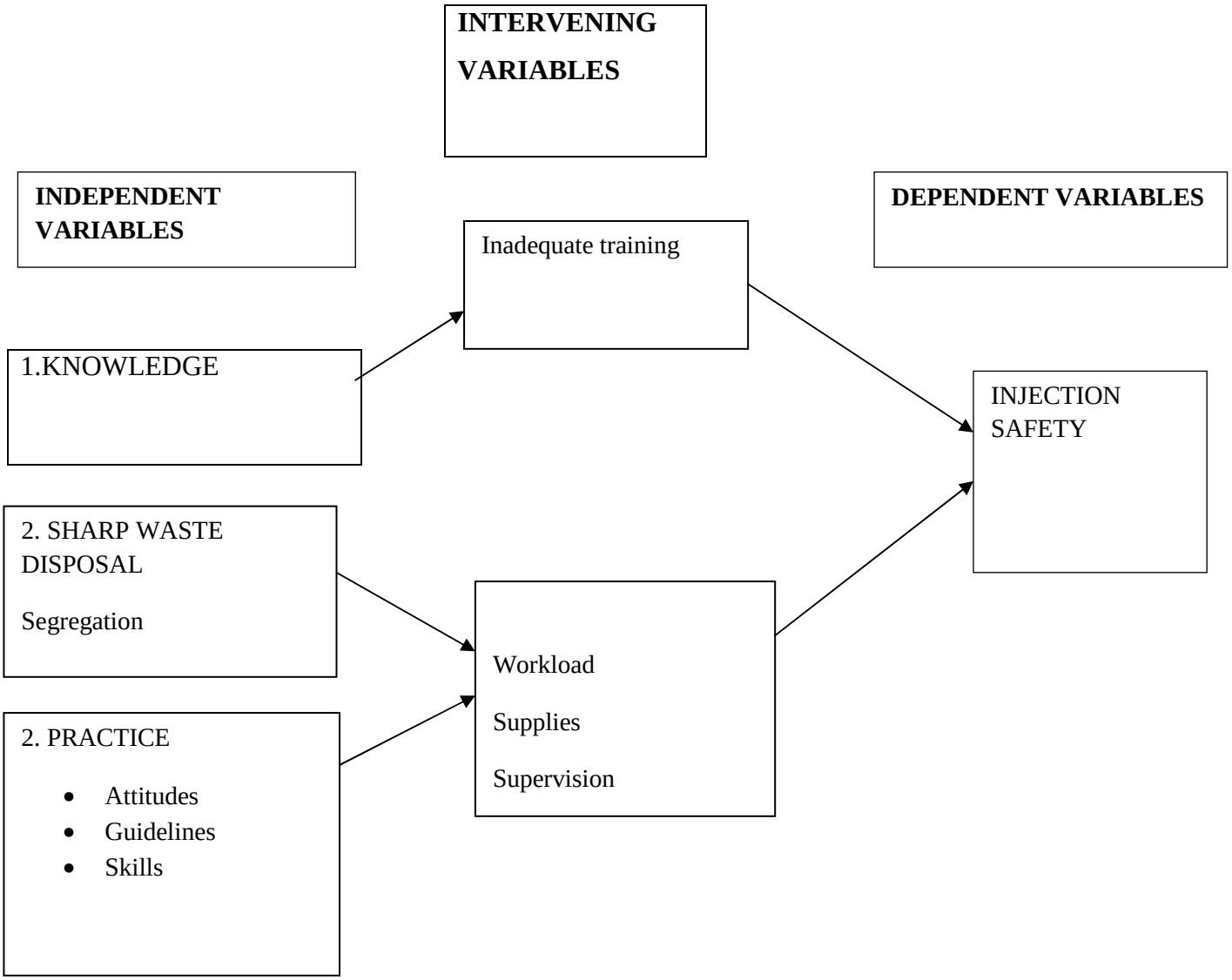
1.9 THEORETICAL FRAMEWORK

ENVIROMENTAL MODEL BY FLORENCE NIGHTINGALE

Florence Nightingale was a nurse who practiced in the 1850s. She utilized her vast knowledge base and understanding of disease incidence and prevalence to champion hospital and environmental reforms which greatly improved leading to a decline of death rate from 42% to 2% (http://en.wikipedia.org/wiki/Florence_Nightingale). She emphasized on the importance of a sanitized environment both for the healthy and the sick. Nightngale believed a decisive component of nursing care involved manipulation of the environment to make it safe for the patient. Nightngale advocated for personal hygiene and promoted frequent hand washing while providing patient care. With her broad base in epidemiology, she advocated the importance of hygienic environment and considered the environment as all external situations and effects influencing the life and growth of an organism which has ability to avert accidents or death (George, 2002).

Maintaining a sanitized environment promotes the proper waste management including strategies to ensure all sharp wastes is duly collected and safely transported to its final disposal location. This will create a safe environment for the patient, the health care provider, visitors and the community (MOH Waste Management Plan, 2008-2012). Poor injection practices such as improper disposal of sharps waste creates an environment where patients and health care providers can suffer from needle stick injuries and contract nosocomial infections. (MOH, 2006a). Inadequate sharp waste disposal also poses a real danger to the community and hence emphasis on her environmental theory creates a safe environment for the patient, injection provider and the community. Florence advocacy for frequent hand washing also promotes safe injection practices as it promotes of washing hands before and after handling the patient. This therefore supports safe injection practices in our health facilities (George, 2002).

1.10 CONCEPTUAL FRAMEWORK



CHAPTER TWO

LITERATURE REVIEW

2.1 The science of injection safety

The science of safety requires recognition that everyone makes mistakes. In an effort to prevent mistakes, make them detectable and ease the detriment when they occur, well formulated structures needs to be enforced. Regularization decreases inconsistency, reduces errors and adds dependability and safety. All team members get motivated and comfortable to freely express their concerns without fear of reprisal irrespective of their position on the team once a culture of safety is created (Friedman *et al.*, 2010).

Enhanced injection safety practices are needed to ensure sensible and safe use of injections globally. The obligation for ensuring injection safety rests with national governments, prescribers, administrators, receivers of injections and the wider community. WHO recognizes this responsibility of its member states and the challenges they are facing. It demonstrates commitment to curb transmission of injection related pathogens for patients, health care providers and the community by appropriate use of injections through the Injection Safety Programme and the Safe injection Global Network (SIGN) (WHO, 2010).

WHO and SIGN recognize the significance of infection prevention and control in injection safety. The approach used by WHO to promote global appropriate and safe use of injections include plans and formulation of nationwide policies. This will enforce safe and proper use of injections safeguarding use of injection equipment that is of appropriate quality. It will also enable fair access to safe injection equipment and practices with achievement of rational, suitable and affordable use of injections (WHO, 2008).

Approximate cost of more than $535 million per year in direct medical expenditures is caused by unsafe injection practices. WHO member states agreed to promote total injection safety by communication of risks associated with unsafe injections to patients and health care providers and the appropriate use of barrier protection such as gloves and appropriate segregation and disposal of sharps waste (WHO, 2010). A hospital epidemiology program is required so as to achieve the main goal of preventing or reducing the risk of hospital-acquired infections. It will

safeguard the development of infection control policies and formulate procedures and the safe disposal of sharp instruments and needles in puncture proof containers (Friedman *et al*., 2010).

Infectious waste and sharps constitute hazardous waste and their disposal system is considered to meet purpose if the waste is collected and disposed of in the right manner (KSPAS, 2010). Closure of the gap between best evidence and existing clinical practice carries the potential to promote health outcomes. Use of Evidence-based standard clinical guidelines alone may not bring about the needed change in clinical practice. Formulation of evidence-based guidelines that are likely to be enforced, developing implementation plans that give direction on increasing their chances of acceptance, and analyzing the implementation plan to support improvement before extensive dissemination will encourage uptake of the guidelines (Carey & Sanson, 2008). The clinician is encouraged to adopt new clinical behaviors by research evidence (Sanson-Fisher, 2004).

The safety of the patient, health care personnel and the community is ensured by adequate infection control practices in the health care institutions. It is disheartening for unsuspecting patients to contract deadly blood borne diseases from health care providers with whom they trust their care (Muchina & Muchina, 2009).

2.2 Hand hygiene

Hand hygiene is part of safe injection practices. It refers to either hand washing with soap and water or rubbing hands with alcohol-based gels or foams that do not necessitate the use of water. It is the single most crucial measure to reduce transmittance of microorganisms among people or to different sites on the same patient (MOH, 2006a). WHO has formulated an annual initiative to save lives by promoting hand washing. It defines the key moments healthcare workers should perform hand hygiene. The WHO approach advocates that Health Care Workers clean their hands, before touching a patient, before clean/aseptic procedures, after body fluid exposure/risk and after touching a patient or their surroundings. This evidence-based, field-tested concept can be applied in a vast range of settings (Friedman *et al*., 2010). A study done in Nigeria indicated that only 12.3% of health care workers washed their hands before and after administering

injections but 84.3% prepared medications under hygienic conditions where blood contamination was unlikely (Akpan *et al.*, 2009).

2.3 The global trends

Worldwide, the approximate percentage of unsafe injections range from 15% in Eastern Europe to 50% throughout Asia. The global burden of blood borne diseases is contributed extensively by unsafe injection practices. Health care providers who practice inconsistently the standard precautions are constantly exposed to blood in the course of their work and are at risk of getting blood borne infections along with their patients. Each year, about 6% of the world population receives injections contaminated with hepatitis B virus and between 417 000 and 1.3 million deaths are caused by unsafe injection practices in medical practices (Kermode, 2004).

2.4 Injection practices in the Unites States, Europe and China

In the United States, the management of potential exposure to blood borne pathogens such as immunodeficiency virus (HIV-1), hepatitis B virus (HBV) and hepatitis C virus (HCV) are emphasized by the epidemiology of blood borne exposures in health care providers and United States Occupational Safety and Health Administration (OSHA) (Winters *et al*., 2011). A study in North Virginia USA displayed that dangerous injection hazards occur and that nearly 40% of health care providers had Post Exposure Prophylaxis administered (PEP) following occupational exposure HIV transmission through needle stick injuries (Reid, 2010).

Health care workers (HCWs) are exposed to blood borne pathogens, especially hepatitis B (HBV), hepatitis C (HCV), and human immunodeficiency virus (HIV) through job-related risk factors such as avoidable needle stick injuries that can be prevented by safer devices according a study done in Germany University. (Wicker *et al.*, 2008). A total of 98 (22.3%) of 440 Health Care providers from hospitals and Immunization Clinics reported 1 or more sharps injury during the previous 12 months in a study in the Dominican Republic.. Recapping a needle after use in a patient was reported by (90.7%) of 302 HCWs at public hospitals. 26.2% of Health Care Workers at public hospitals reported they disposed sharps into regular waste bins (Pedro *et al*., 2007)

The proportion of unsafe injections was 16% and that of unnecessary injections was 57% in a study conducted in China. Among 118 health care professionals interviewed, those who had knowledge that human immunodeficiency virus, hepatitis C virus and hepatitis B virus might be transmitted by the contaminated syringes and needles accounted for 95%, 59% and 89% correspondingly. The study also showed that 55% of the injection providers had suffered from needle stick injuries in the past year and the health professionals were experiencing a high risk for being exposed to unsafe injection. Violation of operational procedures in the injection practices could be an important cause for injury to health workers (Yan *et al*., 2006).

2.5 Injection practices in the developing countries

World Health Organization estimates that 15% to 50% of injections administered in developing countries are unsafe yet up to 56% of prescriptions have at least one injection prescribed. Unsafe injections practices therefore transmit blood borne pathogens on a large scale (WHO, 2002) African countries have the highest needle stick exposure than anywhere in the world and hence has a substantial public health issue due to the fear of occupational infections (Yan *et al.*,, 2006). These unsafe practices can result in local trauma and nerve injury (Kotwal *et al.*, 2004).

In the developing countries, unsafe injection practices exist substantially and are associated with the transmission of blood-borne pathogens. Almost 77 percent of Health service providers had unsafe injection practices, including the use of boiling pans for sterilization, recapping of used needles and exposure to body fluids in a study In Gujarat, India. Government health service providers had higher proportion of unsafe injection practices than private facilities. The prevalence of needle stick injuries among service providers was 52.2 percent (Pandit & Choudhary, 2008).

Needle stick injuries are not uncommon and pose a constant risk throughout the hospital setting. Transmission of blood-borne pathogens due to unsafe injection practices exist extensively, in the developing countries. Advances in education, needle disposal, changes such as needleless devices, safety needles and worker protection has reduced cases of needle stick injuries but institutions and healthcare professionals ought to continue to take responsibility lower the risk further (Yan *et al*., 2006).

In Cameroon the most common invasive health care procedures are medical injections and pose potential for transmission of blood-borne infections such as HIV, HBV and HCV via use of unsafe injection equipment while a total 44% of health workers reported involvement in some form of unsafe injection procedures and use of inappropriate equipment use (Okwen *et al.*, 2011). A study done in Cambodia indicated that injections are overused and are frequently administered in an unsafe manner. In many occasions, health care providers declined to follow infection control practices and hence exposed themselves and the communities to dangers of needle stick injuries due to the unsafe practices which included poor collection and disposal of dirty injection equipment. Sharp waste was seen in the hospital environment (Vong *et al.*, 2005).

Health-care workers still experience common accidental needle stick injuries in Ethiopia. That creates a constant occupational health hazard and a significant public health in health care settings. Thirty percent of health care workers had experienced at least one case of needle stick injury in the previous year according to an analytical cross-sectional study. Majority of Health Care workers had poor understanding of safe immunization injection and were not familiar with any policy on injection safety (Ernest, 2002).

Proper documentation of blood borne pathogens caused by occupational exposure in developing countries is scarce despite their high prevalence. While only 4 percent of worldwide cases of occupational HIV infection are reported from sub-Saharan Africa yet seventy percent of the world's HIV-infected populations come from this region. In dissimilarity, North America and Western Europe has only 4 percent of the world's HIV infected population yet 90 percent of documented occupational HIV infections are reported from these areas (Puro *et al.*, 2001).

2.6 The Kenyan situation

In Kenya a countrywide survey on Health care waste management indicated that rural or urban settings unavoidably generate wastes that may be dangerous to health or with potential to cause harmful and unwanted environmental effects. The study reported that only a few hospitals labeled the waste while 47% of the hospitals had storage rooms and transportation of the medical waste to final disposal. It was noted that some health care facilities used wheel barrows to

transport medical waste and hardly any had the recommended waste transportation trolleys (MOH Waste Management Plan, 2008-2012).

A National cross-sectional survey in Kenya on injection safety practices indicated that there is over prescription of injections, inadequate availability of injection safety guidelines, limited injection supplies leading to improper reuse of the available injection equipment and inefficient facilities of collection and disposal of injection wastes. Analysis showed that there is no existing consumption data on the number of rational injections required in the country hence lack of appropriate base for forecasting (MOH, 2005).

An evaluation of injection safety and waste management done in Nyanza and Western provinces established that injection overuse was still rampant and prescribers admitted they were pressed by patients to prescribe or administer injections and they mostly complied. Constraints in the work environment impeded implementation of injection safety measures by prescribers and providers even with adequate knowledge to safeguard them. Injection waste still remained a constant hazard and needle stick injury reports were made by the health care workers. The study also indicated less than 30% of health care providers in those districts had been trained on safe waste handling and most waste handlers were ignorant of Post Exposure Prophylaxis (PEP) (Achola *et al.*, 2009).

A study to identify determinants of poor and good injection practices in in Kiambu and Bondo Districts established patients constantly received unwarranted injections. This was because the patients demanded for the injections and the clinicians mostly complied to ensure patients did not seek for them from unqualified individuals if their demand were denied at the health care facility. There were poor waste management practices and reported cases of needle prick incidences among medical staffs and members of the community (Songa et al., 2008).

A study conducted in Kakamenga, Nyanza and Embu Provincial General Hospitals outpatient departments found that there was rampant prescription of unnecessary injections even when alternative oral formulations were available. Halve of the respondents reported that they

prescribed injections to all their patients. Only 37% of the respondents reported that the educated their clients on the effectiveness of oral medications. (Chirchir *et al.*, 2010).

A study conducted in maternity units in five hospitals which involved a National Referral Hospital, a specialized maternity Hospital, two district hospitals and one sub-district hospital all spread over two provinces of Kenya indicated that only 19.4% of health care workers had attended an update course on infection control in the three years prior to the study. The institutions admitted having an inactive infection control committee or team (Muchina & Muchina, 2009).

In a country wide assessment of on the management of health care waste, the survey showed that packaging and labeling of waste was observed in only a few hospitals. Most hospitals used wheelbarrows to transport waste but a few transported via waste trolleys. Only 47% of the hospitals had waste holding rooms as it awaited transportation. Two thirds of the incinerators were functional but only 24% had a good siting for the incinerator (MOH Waste Management Plan, 2008-2012).

Ministry of public health and sanitation advocates that proper disposal of waste involves segregation of medical waste into sharps such as needles, syringes and blades, infectious and general wastes. The areas of focus, the norms and limits of practice to ensure quality health care are outlined in the National Injection Safety and Medical Waste Management Standards and guidelines. The standards and guidelines will ensure that health workers, communities and the environment are protected from risks associated with unnecessary and unsafe injections, as well as improper disposal of medical waste (MOH, 2006).

CHAPTER THREE

METHODOLOGY

3.1 Study Design

This was a cross-sectional study that employed both qualitative and quantitative methods to determine the practice of injection safety in Garissa Provincial Hospital.

3.2 Study Area Description

Garissa Provincial General Hospital is in Garissa town which is the administrative office of North Eastern Province of Kenya. According to the 2009 Census report by the Ministry for Planning, National Development and Vision 2030, North Eastern Province has a total Population of 2,310,757.

Garissa Provincial General Hospital is the main referral hospital in North Eastern Province and neighboring districts of Isiolo and Mwingi in Eastern Province and Tana River district in Coast Province. It is also the main referral facility in the region. It borders Ethiopia to the North, Somalia to the East, Coast province to the south and Eastern province to the west. It comprises of three counties; Garissa, Wajir and Mandera.

Garissa is the capital of both Garissa District and the North Eastern province. Most of the town's inhabitants are ethnic Somali nomads. The climate is mostly arid and desert terrain. The town lies along the Tana River, and has a very warm/hot climate.

Garissa Provincial Hospital has an in-patient capacity of 248. The bed space was distributed according to departments as follows; 54 for pediatric, 67 for surgical, 42 for obstetrics and gynecology and 85 for medicine. The average bed occupancy is 90% throughout the year. The outpatient department was organized into Special clinics, Dental, Pharmacy, accident and emergency and pediatrics. It served an average of 243 Patients in a day. The hospital had six Medical Consultants, nine Medical Officers, eleven Medical Officers on internship training, four pharmacists, two dentists, 103 nurses of which 30 are diploma holders while the 73 have certificate qualification in Nursing.

Garissa provincial Hospital is a level 5 Hospital (a provincial Hospital) used by the Provincial Health Management Team to integrate health services into normal health care system. It is accorded support in capacity building and quality assurance by the provincial team. Level five hospitals are referral hospital to the district hospitals in the province. It is also at this level that feedback of projects and programs is transmitted to the national level. The provincial team provides supervisory support to district teams by developing capacity of the districts. This thus facilitates the implementation of level one service and ensures quality and people's rights in the health arena. It also provides technical and material support on planning, implementation, monitoring, evaluation and feedback of health projects and programs at the district level (MOH, 2006e).

3.3 Study population

It comprised of nurses, who were holders of diploma or certificate qualifications in Nursing profession, Consultants (Medical doctors that are specialists in different medical fields), Medical and Clinical officer interns who have qualified but are still on their internship training and certified Medical doctors, working in the selected units.

3.4 Sample size determination

The following is the staff distribution in Garissa Provincial hospital in the selected units.

Table 1: Table showing staff distribution in maternity, paediatric and medical wards

CADRE	MATERNITY	PEDIATRIC UNIT	MEDICAL WARDS
CONSULTANTS	1	1	2
MEDICAL OFFICERS	2	2	2
MEDICAL OFFICER INTERNS	2	2	4
CLINICAL OFFICER INTERNS	8	6	12
NURSES	15	12	16
TOTAL	28	23	36

3.5 Sampling Method

Purposive sampling (Tongco, 2007) was used to select respondents for inclusion in the study. To ensure adequate representation of all the cadres of health care workers, recruitment of sample was done using probability proportional to size (PPS) and based on the percentage of different cadres within the population of health workers.

3.6 Sample size calculation

$$n = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

Where n= Sample size with finite Population

N =Population size; the total number of health care workers in the study areas = 87

Z =Z statistic for a level of confidence=1.96

P= Expected Proportion=0.5

d=Precision=0.05

$$\text{Thus, } n = \frac{87\times 1.96^2\times 0.5(1-0.5)}{0.05^2(87-1)+1.96^2 0.5(0.5)}$$

=72

The proportionate allocation scheme which ensures adequate representation of the target clinical health care workers is presented in table 2.

Table 2: Table showing the proportionate sample of target health care workers

CADRE	MATERNITY	PAEDS	MEDICAL	TOTAL	PROPORTION	NO. OF SAMPLE
Consultant (PHYSICIANS)	1	1	2	4	4÷87×100 = 4.6%	4.6%×72= 3.3
Medical officers	2	2	2	6	6÷87×100 = 6.9%	6.9%×72= 5.0
Medical Officer Interns	2	2	4	8	8÷87×100 = 9.2%	9.2%×72= 6.6
Clinical Officer Interns	8	6	12	26	26÷87×100 = 29.9%	29.9%×72 = 21.5
Nurses	15	12	16	43	43÷87×100 = 49.4%	49.9%×72 = 35.5
Total				87	100	72

The following is the proportion of cadres who were selected.

Consultants -3

Medical Officers -5

MO Interns -6

CO Interns -22

Nurses -36

3.7 Data collection procedure

The data was collected using three different methods namely; questionnaires, observation check list and key informant interviews. The main study instrument was the questionnaire (Appendix 2). The questionnaire contained closed ended questions assessing knowledge and practice of Health Care Workers regarding infection prevention and Control. The questionnaire was guided by WHO tool in rapid assessment of injection safety. There were four observation checklists which were used to collect data on safe injection practices. One was used on all the studied health care workers while they performed injection procedures except the consultants (Appendix 3), the second was used to collect data on safe injection practices in patient care areas (Appendix 4), the third collected data on waste transportation and disposal (Appendix 6), while the last check list was used to collect data on injection safety supplies management (Appendix 5).

The key informant interviews were conducted with nurse in charge of each of the selected wards, the supplies manager and the hospital medical superintended (Appendix 7). These interviews explored factors that influence safe injection practices. The interviews were guided by WHO injection safety toolkit which is designed to promote implementation of safe practices associated with, intradermal, subcutaneous and intramuscular needle injections, intravenous infusions and injections, dental injections, phlebotomy and lancet procedures.

3.8 Pre-testing of the data collection tools

Pretesting of all the study tools was done at Kenyatta National Hospital (KNH), which is similar to GPGH as it is also a referral hospital. The questionnaires were pretested in KNH Maternity, pediatric and medical wards. The observation check list pretesting was also done in the above selected units and the incinerator

3.9 Training of research assistants

One research assistant that was a nurse in the hospital and was off duty during the study period was trained on how to administer the questionnaires and the whole process of data collection.

3.10 Recruitment and consent

Potential study respondents were approached for consent before being recruited into the study. Participation in the study was voluntary and based on the informed consent. The researcher explained objectives of the study to respondents and informed them of their roles and benefits of taking part in the study.

3.11 Inclusion criteria

Those included were nurses, consultant physicians, Medical officers, Clinical and Medical officer interns who had been working in Maternity, Pediatric Units and Medical wards for three months or more prior to the study. In addition they were:

1. Willing to give a written consent
2. Available at the time of data collection

Medical, pediatric and maternity wards were selected due to the following reasons;

Maternity was chosen because it had significant risk of blood contamination due to the delivery procedures done there. Pediatric was chosen because it is usually a busy unit and the possibilities of children playing around who can get the needles and play with them posing risk of injury and transmission of blood borne infections. Most patients with medical conditions requiring admissions were managed using parenteral medications.

3.12 Exclusion Criteria

1. All students who were under supervision
2. Health Care personnel who had worked in the selected units for less than three months.
3. Those who did not give a written consent

3.13 Quality assurance procedures

At the end of each interview, the investigator read through the completed questionnaires and checked for completeness and validity of responses. When missing responses were noted, follow up was done with the respondent to obtain the omitted data or clarify inconsistencies. The research assistant was trained on appropriate approach for interviews, obtaining responses for the specific questions contained in the questionnaire and on how to obtain informed consent.

3.14 Data Management

Data collected was edited and entered in computer and analyzed using Statistical Package for Social Scientists (SPSS) version 18. Quantitative data was entered into customized MS Access databases and exported to SPSS version 18.0 statistical package for analysis. A univariate analysis of each variable in the data set was conducted to check variable distribution and document completeness of data. For categorical variables frequency distributions was produced using the analyze procedure in SPSS. These results were presented using tables, bar graphs and pie charts. Age and other continuous variables were summarized by calculating mean and Standard Deviation or median and interquartile range depending on the distribution of the specific variable.

The main outcome was calculated as percentage of health worker displaying knowledge and appropriate infection prevention practice. The appropriate non parametric tests were used to compare percentage of health workers with the main outcome by different socio-demographic variables and for analysis of Likert scale responses. Statistical significance was determined at the level $p < 0.05$. Data from field notes were transcribed and read before coding which was conducted using open coding approach. The data was analyzed using a thematic analysis approach to explore for emerging themes based on the codes attached to the data.

There were 72 respondents who completed the questionnaire on knowledge and practice. Observation check list was used to collect data on their practice of injection safety while doing the injection procedures except the consultants. The observation was done before the respondents completed the questionnaire to avoid Hawthorne effect influence (Bronches, 2008). There was also one check list per unit to obtain data on the generation, segregation, transport and final disposal of injection waste of the selected units and the incinerator. This was all carried out by the researcher. The key informant in-depth interviews were conducted individually with the nurse in charge of each of three selected units, the Head of supplies department and the hospital medical Superintendent**.**

3.15 ETHICAL CONSIDERATIONS

1. Ethical review of the study was done by Kenyatta National Hospital/University of Nairobi Ethics and Research Committee.
2. Permission from GPGH was also sought.
3. A written consent for all respondents was obtained after explanation and understanding of the research requirements.
4. Information collected was treated with confidentiality and stored under lock and key. The data was only accessed by the principal investigator.
5. Respondents did not indicate their names or any form of identification on the questionnaires.
6. Questionnaires were coded to conceal identity.
7. The three ethical principles; Beneficence, Autonomy and Justice were upheld.

3.16 STUDY LIMITATIONS

1. Passive resistance among the health care workers. The investigator took time to explain to them the significance of the informed consent and that details of their responses will be confidential. They were educated of the benefit of the study to the institution and the importance of honest responses and they complied and participated voluntarily.

2. In considerable number of times the investigator would find the health care workers very busy with clients. This was coupled by the fact that the hospital suffers staff shortage substantially and for them to find time to complete the questionnaire was a challenge. The investigator allowed them time to first attend to their clients and took time to go back several times until an ideal opportunity was found to collect the data.

3. Some staffs were on night shift duties for prolonged periods of times so the investigator had to visit the facility during the night to achieve the sample size.

CHAPTER FOUR: RESULTS

4.1 Introduction

There were a total of 72 respondents among the clinical staff working at Garissa Provincial General Hospital who were recruited. In addition, key informant interviews on infection prevention were conducted with five respondents including three departmental in charges, supplies manager and the hospital medical superintendent. The findings from the analysis of the data are presented in this chapter.

4.1.1 Demographic characteristics of respondents

Age

The mean age of the respondents was 33.4 years (SD ± 8.2) table3. The age range was 24 years to 55 years. Majority (40.28%) of respondents were aged between 20-29 years. There was only one respondent who was aged above 50 years.

Table 3: Age distribution

Characteristic	**(N)Frequency**	**Percent**
Age in years		
20-29	29	40.28
30-39	26	36.11
40-49	16	22.22
Above 50	1	1.39
Total	72	100

Gender

The ratio of male to female respondents was 1.3: 1. Majority 41(56.94%) of respondents were males while 31 (43.06%) were females as shown in Figure 1.

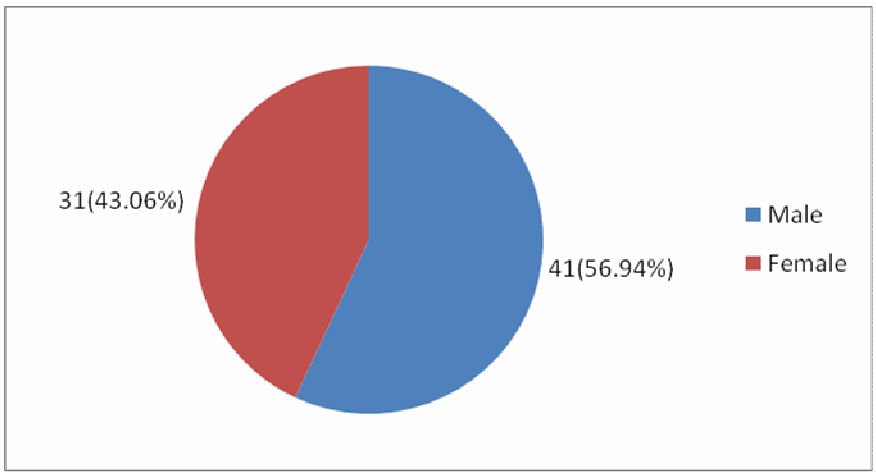


Figure 2: Gender distribution

4.1.2 Designation and level of training

The median duration of clinical experience among respondents was 3 years (IQR 7 months to 6 years). Most of those who participated 36 (50%) were nurses, and among the 36 nurses in the study eight (11.11%) were enrolled nurses and the remaining 28 (38.89%) were nurses with diploma qualifications. Consultant doctors constituted only 4.17% of the respondents (table 4).

Table 4: showing the job categories of the respondents

	Frequency	**Percent**
Designation		
Consultant physicians	3	4.17
Medical Officer	5	6.94
Medical officer intern	4	5.56
Clinical officer intern	24	33.33
Registered nurse	28	38.89
Enrolled nurse	8	11.11
Total	72	100

Table 5 represents the respondents' professional qualifications. Majority of the respondents (70%) were diploma holders (clinical officer and registered nurses). All the three (4.17%)

masters qualifications were held by consultant doctors and most of the doctors (9 out of 10) were holders of bachelor degrees.

Table 5: showing the respondents' professional qualifications

	Frequency	Percent
Level of education		
Masters	3	4.17
Bachelors	10	13.89
Diploma	51	70.83
Certificate	8	11.11
Total	72	100

4.1.3 Departmental distribution

The respondents were deployed within three departments in the hospital: pediatrics, maternity and medical wards. The distribution in the departments is shown in figure 2 below. The majority 29(40.28%) of the respondents were from medical wards.

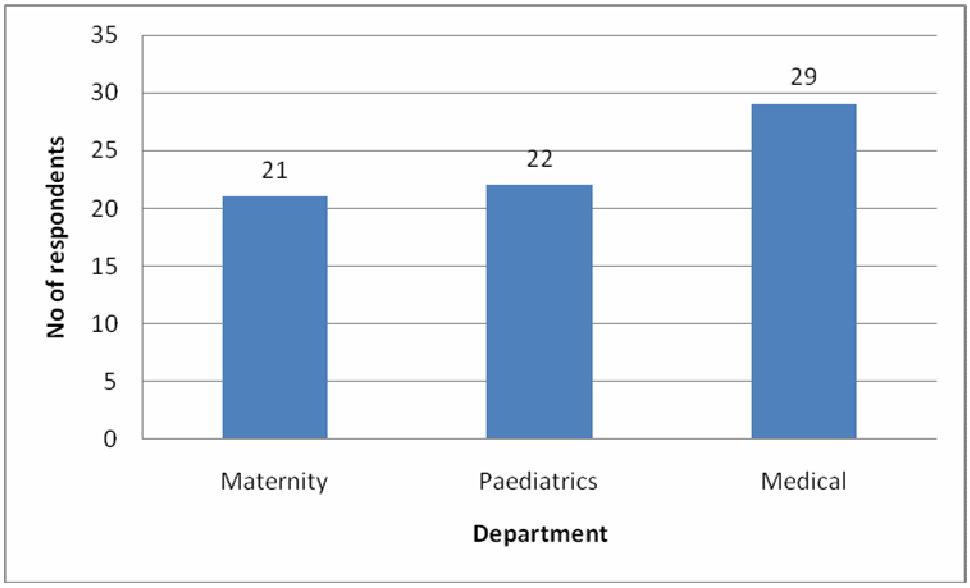


Figure 3: Distribution of respondents within the 3 departments included in the study

4.1.4 Injection safety training

Attendance of injection safety training as reported by respondents is shown in figure 3. Among the respondents, 31 (43.06%) reported to have participated in injection safety training.

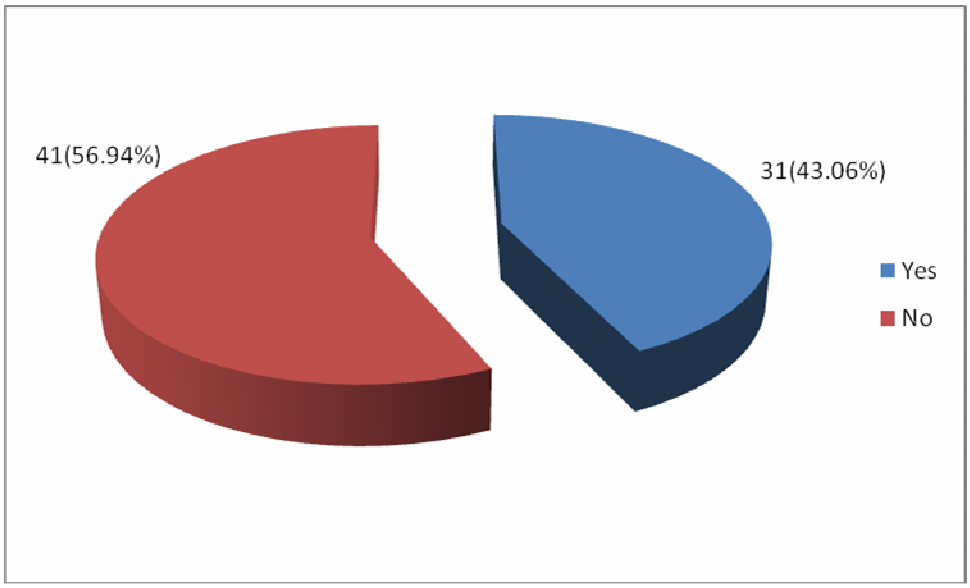


Figure 4: Number of staffs reporting attendance of injection safety training

The specific areas of injection safety training attended are shown in figure 4. Waste management training had been attended by 25 (34.7%) respondents. The next most common area of training was clinical practice (n = 15, 20.8% respondents) which entails hand hygiene, use of gloves, preparation of the skin prior to injection, maintenance of sterility and avoidance of needle stick injuries.

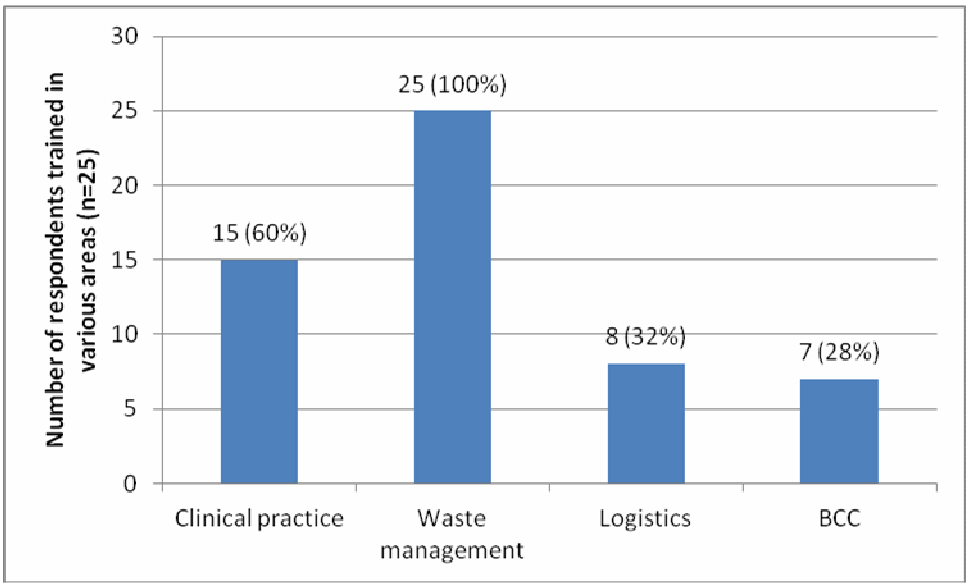


Figure 5: Reported area of injection safety training among staff

Majority (n = 25) of respondents who had been trained, reported to have been trained on waste management and the least (n = 7, 28%) had been trained on Behavior Change and Communication (BCC).

4.2 INJECTION SAFETY KNOWLEDGE

A knowledge questionnaire containing 16 items was administered to all respondents. The responses to each knowledge item are presented in table 6. Except for the item regarding safety of recapping needles after administering injection for which the correct response was "false", the correct response for all the remaining items was "true".

Most respondents had knowledge about transmission of Hepatitis B infection 57(79.2%) and its prevention through vaccination 64(88.9%) but a lower percentage possessed knowledge on hepatitis C transmission 37(51.4%). The areas in which health workers showed the highest knowledge were hand washing 69(95.8%), HIV infection (91.7%), PEP 65(90.3%) choice of correct injection devices (95.8%) and implementing measures to prevent sudden patient movement during injection (94.4%).

On average, the respondents had a knowledge score of 12.65 (SD ± 2.3) out of the total of 16 obtained by scoring each correct response as 1 and each incorrect response as 0.

In contrast, findings obtained from Key Informant Interview responses showed inadequate knowledge on the contents of Injection safety guide lines among all those interviewed and one pointed out "*to a large extent the hospital is still lagging behind in issues of injection safety"* It was also reported regarding the hospital health workers that "*more of them are not trained and we are seeking forums to have them trained*". It was also reported that health workers do not segregate waste because "*people do not have the knowledge about how those bins are supposed to be used*" Key Informants responses to questions on what MOH injection safety guidelines entail were not entirely accurate, possibly reflecting the lack of safe injection training and unavailability of the guidelines within the units.

Table 6: Responses to injection safety items during the study

	TRUE	FALSE	SOMETIMES	DON'T KNOW
	n(%)	n(%)	n(%)	n(%)
A safe injection poses no danger to the patient	59(81.9)	9(12.5)	1(1.4)	3(4.2)
is not dangerous to injection provider	56(77.8)	9(12.5)	7(9.7)	0
Safe injection practices do not pose harm to the community	62(86.1)	4(5.6)	5(6.9)	1(1.4)
Unsafe injection is associated with risk of				
HIV infections	66(91.7)	2(2.8)	4(5.6)	0
Hepatitis B	57(79.2)	9(12.5)	5(6.9)	1(1.4)
Hepatitis C infections	37(51.4)	21(29.2)	7(9.7)	5(6.9)
Recapping the needle after injecting a patient is a safe injection practice	17(23.6)	55(76.4)	0(0.0)	0
Hepatitis B vaccine is important to injection providers	64(88.9)	3(4.2)	1(1.4)	2(2.8)
Maintaining the reorder levels in stocks of injection supplies is important in injection safety.	61(84.7)	5(6.9)	1(1.4)	4(5.6)
I anticipate and take measures to prevent sudden patient movement:				
during injection procedure	69(95.8)	1(1.4)	2(2.8)	0
after the injection procedure	43(59.7)	17(23.6)	7(9.7)	0
Hand washing :				
prior to administering an injection is a safe injection practice	57(79.2)	8(11.1)	5(6.9)	2(2.8)
after administering an injection is a safe injection practice	69(95.8)	0(0.0)	3(4.2)	0
Observation of proper storage conditions, such as temperature as per manufactures instructions is safe injection practice	61(84.7)	7(9.7)	1(1.4)	1(1.4)
Post exposure Prophylaxis is recommended in the event of needle stick injuries	65(90.3)	2(2.8)	4(5.6)	0
I choose the correct injection device for the patient	68(94.4)	1(1.4)	2(2.8)	0

Apart from the relatively high knowledge levels among health workers there was a positive perception on the utility of injection safety guidelines in the Key Informant Interviews. One hospital leader reported that his training on the guidelines "*changed my knowledge, attitude and practices as far as injection safety is concerned*" to ensure that the staff get the support they require to maintain safe injection practices. The benefits of guideline use identified in Key Informant interviews encompassed usefulness "*to us as health workers and the patient even including the subordinate staff*" and included prevention of needle stick injuries, and protecting patients from transmission of infections.

4.2.1 Respondents age versus injection safety knowledge

The findings of the t-test presented in table 7, showed that on average male respondents score 12.85 (SD ± 2.38) on the knowledge items compared to female respondents score of 12.42 (SD ± 2.20). The difference in mean scores by gender was, however not statistically significant (p = 0.457).

Table 7: T test Comparison of average injection safety knowledge score among male and female respondents

Group	Number	Mean	SD	95% confidence interval		P VALUE
Male	41	12.83	2.38	12.08	13.58	o.457
Female	31	12.42	2.20	11.61	13.23	
Combined	72	12.65	2.30	12.11	13.19	
Difference		0.41		-0.68	1.50	

4.2.3 Area of service versus injection safety knowledge

The area of practice or deployment did not show significant association with knowledge on injection safety (p = 0.121). The mean score for staff in the various departments were: 13.1 in maternity, 12.97 in medical wards and 11.8 in pediatrics.

Table 8: Comparison of injection safety knowledge across departments

Source	Sum of squares	Degree of freedom	Mean Square	F	P value
Department	22.27	2	11.14	2.18	0.121
Residual	352.05	69	5.10		
Total	374.32	71	5.27		

4.2.4 Designation versus injection safety knowledge

The designation of respondents did not show significant association with knowledge on injection safety (p = 0.394). Enrolled nurses had the lowest mean knowledge score at 11.4 followed by CO interns (12.58) and medical officers (12.6) (table 9).

Table 9: Comparison of injection safety knowledge by respondents' designation

Source	Sum of squares	Degree of freedom	Mean Square	F	P value
Designation	27.70	5	5.54	1.05	0.394
Residual	346.62	66	5.25		
Total	374.32	71	5.27		

4.2.5 Injection safety training versus knowledge

Analysis of respondent knowledge scores showed that attendance of injection safety training did not significantly influence scores obtained from the knowledge items (p = 0.238). However, the average score of respondents increased according to level of education from 11.4 among certificate holders, 12.6 for diploma to 13.6 and 13 among Bachelor and Master degree holders, respectively (table 10).

Table 10. Comparison of injection safety knowledge by respondents' designation

Source	Sum of squares	Degree of freedom	Mean Square	F	P value
Training	22.40	3	7.47	1.44	0.238
Residual	351.92	68	5.18		
Total	374.32	71	5.27		

4.3 INJECTION SAFETY PRACTICES

The findings of practice are presented under the following three areas:

a) Recapping of used needles
b) Needle stick injuries
c) Hand washing
d) Clinical practice
e) Preference of injections
f) Supplies management

a) Recapping of used needles

Most respondents 48(58.3%) reported that they never recapped needles after administering injections, 19(26.4%) recapped used needles sometimes and 11(15.3%) always recapped used needles.

Table 11 shows findings of Fishers exact tests examining associations between reported recapping of needles and characteristics of study respondents. There were statistically significant associations between the practice of needle recapping and designation ($p = 0.02$), level of training ($p = 0.047$) and department ($p = 0.017$) respondents were working in.

Needle recapping and department

The practice showed significant association with area or departmental deployment ($p = 0.017$). All staffs working in pediatrics department reported that they did not practice recapping while 28.6% of respondents working in the maternity department recapped needles.

Needle recapping and designation

Recapping was significantly influenced by designation based on results in table 11 ($p = 0.02$). The medical officer interns had the highest (75%) rate of recapping used needles while the enrolled nurses had no reports of recapping.

Needle recapping and level of training

Level of training also had significant influence on recapping ($p = 0.047$). Highest rates of recapping were reported among respondents with Bachelor degree (40%) while none of the enrolled nurses reported needle recapping.

Table 11: Recapping of used needles and the factors associated with the practice

Characteristics	Yes	No	p value
Experience in years	**n (%)**	**n (%)**	
Less than 1 year	7(26.9)	19(73.1)	0.213
1 to 4 years	3(13.0)	20(87.0)	
5 to 9 years	1(5.9)	16(94.1)	
10 years and above	0(0.0)	6(100.0)	
Age of provider			
20-29 years	7(24.1)	22(75.9)	0.366
30-39 years	2(7.7)	24(92.3)	
40-49 years	2(12.5)	14(87.5)	
50 years and above	0(0.0)	1(100.)	
Department			
Maternity	6(28.6)	15(71.4)	0.017
Paediatrics	0(0.0)	22(100.)	
Medical ward	5(17.2)	24(82.8)	
Designation			
Consultant	1(33.3)	2(66.7)	0.020
Medical officer	1(20.0)	4(80.0)	
Medical officer intern	3(75.0)	1(25.0)	
Clinical officer intern	4(16.7)	20(83.3)	
Registered nurse	2(7.1)	26(92.9)	
Enrolled nurse	0(0.0)	8(100.)	
Level of training			
Masters	1(33.3)	2(66.7)	0.047
Bachelors	4(40.0)	6(60.0)	
Diploma	6(11.8)	45(88.2)	
Certificate	0(0.0)	8(100.)	
Attended injection safety seminar			
Yes	4(12.9)	27(87.1)	0.747
No	7(17.1)	34(82.9)	

The Key Informants consistently identified the practice of recapping "*most people do recap the needles*".

b) Needlestick injuries

Figure 5 shows that 15(20.8%) of respondents had suffered a needle stick injury during the past 12 month period. Out of respondents suffering an injury, 3 (20%) reported to their respective in-charge and 5 (33.3%) received the WHO recommended PEP treatment.

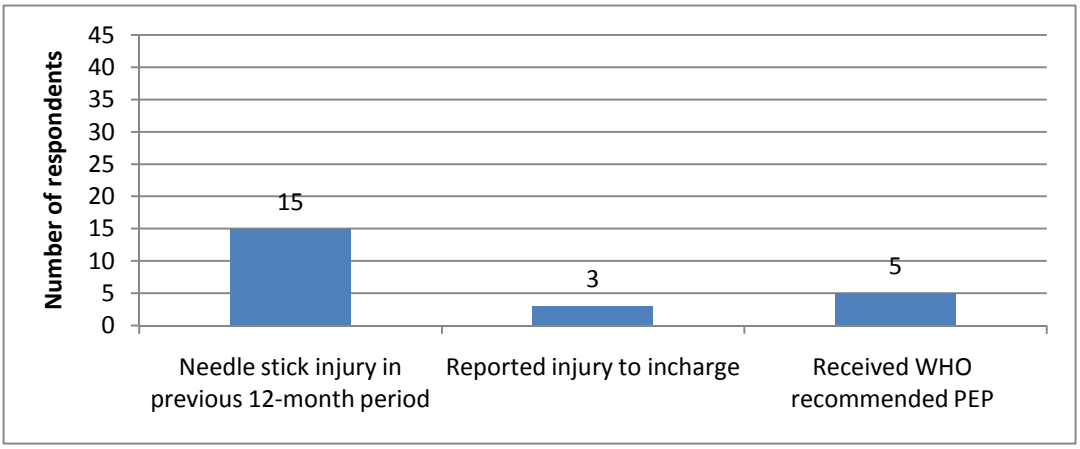


Figure 6: Reported frequency of needle stick injury and action taken

This finding was comparable to Key Informant interview responses in relation to needle stick injuries and PEP treatment. They reported that risk of needle stick injuries at GPGH was low. The informants consistently reported that they were aware of the standard management and reporting practices in the event of a needle stick injury and regarding PEP but investigator observation found that only one unit had the PEP guidelines displayed.

There was evidence at the Comprehensive Care Clinic (CCC) that PEP was handled as per MOH recommendation for those who reported the needle stick injuries. Key Informant responses on the guideline recommended PEP regimens and the specific PEP regimens available at the hospital were all varied and incorrect. One leader said " I *am not so sure about it*" while another reported "*the perception of the risk if there is a wide bore needle that has injured the patiet… Low risk is just may be a small gauge needle that has pricked you and maybe there is no bleeding so we don't take it as being risk"* This reflects a risky perception and of needle stick

injuries and has significant potential to promote HIV transmissions related to occupational hazards.

c) Hand washing

Investigator‘s observation established that each ward had taps with running water in all patient care areas. However none of the areas had hand washing soap or alcohol based hand rubs available. Based on respondent comments shown in table 12, health workers were more likely to wash their hands after contact with clients (69.4%) or after removing gloves (66.7%) compared to between procedures (30.6%) or before putting on gloves (33.3%) to administer injections.

Table 12: Hand washing practices among respondents

	Always	Sometimes	Never	Don’t know
Characteristics	n(%)	n(%)	n(%)	n(%)
Injection safety standards and guidelines are available in your unit	41(56.9)	23(31.9)	4(5.6)	3(4.2)
I wash hands with running water;				
Immediately on arrival to work	18(25.0)	40(55.6)	12(16.7)	0(0.0)
before putting on to give an injection	24(33.3)	38(52.8)	8(11.1)	0(0.0)
After removing the gloves	48(66.7)	22(30.6)	0(0.0)	0(0.0)
After contact with any form of contamination even when gloves are worn	50(69.4)	16(22.2)	5(6.9)	0(0.0)
Between procedures on same patient	22(30.6)	37(51.4)	12(16.7)	0(0.0)
With increased workloads, hand washing is compromised	16(22.2)	42(58.3)	13(18.1)	0(0.0)

d) Clinical practice

i) Preparation for invasive drug administration procedures

Approximately two-thirds of respondents reported observing each of the measures presented during the clinical procedures related to administration of drugs using invasive procedures. Respondents indicated that they always avoided contamination of medication 65(90.3%) and injection equipment 67(93.1%) during the injection process (table 13).

Table 13: Reported adherence to recommended injection safety measures

	Always	Sometimes	Never	Don't know
	n(%)	n(%)	n(%)	n(%)
I use a new sterile syringe from a sealed pack for each injection	54(75.0)	4(5.6)	4(5.6)	1(1.4)
I reuse disposable syringes	14(19.4)	1(1.4)	55(76.4)	0
I verify the integrity of the packet of the disposable syringe before use	45(62.5)	12(16.7)	12(16.7)	0
I prepare each injection in a clean designated area.	48(66.7)	15(20.8)	7(9.7)	0
With multi dose vials, I piece the septum with a sterile needle.	53(73.6)	11(15.3)	6(8.3)	0
I use a clean protective barrier (e.g small gauze pad) to protect fingers when opening a glass ampoule.	47(65.3)	14(19.4)	9(12.5)	1(1.4)
I discard medications with visible contamination	56(77.8)	5(6.9)	10(13.9)	0
I discard needles with visible contamination	60(83.3)	4(5.6)	7(9.7)	0
I use clean freshly-prepared single use swab to wipe the injection site when administering injections	58(80.6)	9(12.5)	4(5.6)	0
I discard syringes with visible contamination	59(81.9)	6(8.3)	6(8.3)	0
Avoiding contamination of injection equipment during injection process	67(93.1)	1(1.4)	3(4.2)	0
Avoiding contamination of medication during injection process	65(90.3)	2(2.8)	2(2.8)	0

As shown in Table 14, 15(20.8%) of respondents reported that they always adhered to recommended infection prevention practices during preparation of injections. The steps included items listed in Table 14 above. Findings of the Fisher's exact test showed that clinical practice was not significantly associated with respondents' characteristics examined in Table 14 ($p>0.05$).

Table 14: Appropriate injection preparation and respondents characteristics

	Yes	No	p value
Experience			
Less than 1 year	4(15.4)	22(84.6)	0.304
1 to 4 years	5(21.7)	18(78.3)	
5 to 9 years	6(35.3)	11(64.7)	
10 years and above	0(0.0)	6(100.0)	
Age in years			
20-29 years	8(27.6)	21(72.4)	0.661
30-39 years	4(15.4)	22(84.6)	
40-49 years	3(18.8)	13(81.3)	
50 years and above	0(0.0)	1(100.0)	
Department			
Maternity	6(28.6)	15(71.4)	0.220
Paediatrics	2(9.1)	20(90.9)	
Medical ward	7(24.1)	22(75.9)	
Designation			
Consultant	0(0.0)	3(100.0)	0.594
Medical officer	2(40.0)	3(60.0)	
Medical officer intern	1(25.0)	3(75.0)	
Clinical officer intern	4(16.7)	20(83.3)	
Registered nurse	5(17.9)	23(82.1)	
Enrolled nurse	3(37.5)	5(62.5)	
Level of training			
Masters	0(0.0)	3(100.0)	0.393
Bachelors	3(30.0)	7(70.0)	
Diploma	9(17.6)	42(82.4)	
Certificate	3(37.5)	5(62.5)	
Attended seminar			
Yes	8(25.8)	23(74.2)	0.394
No	7(17.1)	34(82.9)	

i) Drug administration practice

Garissa is an arid area with mostly very high temperatures yet most of the drugs were stored cabinets without regulated temperatures except insulin and some cancer drugs. Table 15 shows that pre-drawn medications were rarely labeled 26(36.1%) with the name of the person who had reconstituted the preparation. On the other hand, at least 59% of pre-drawn drugs were labeled to indicate medication name, time of preparation, strength of medication and expiry date.

Table 15: Reported drug administration practice among respondents

Characteristics	Always	Sometimes	Never	Don't know
Legible labeling of pre-drawn medication:	n(%)	n(%)	n(%)	n(%)
Medication name	48(66.7)	18(25.0)	4(5.6)	1(1.4)
Time it was done	44(61.1)	21(29.2)	4(5.6)	0(0.0)
Name of the person who did it	26(36.1)	31(43.1)	10(13.9)	1(1.4)
Strength of the medication	44(61.1)	16(22.2)	8(11.1)	0
Expiry date	41(56.9)	20(27.8)	8(11.1)	1(1.4)
Injection site selection criteria:				
Age of patient	50(69.4)	5(6.9)	13(18.1)	0
Dosage	49(68.1)	2(2.8)	15(20.8)	0
Type of injection	66(91.7)	1(1.4)	2(2.8)	0

Out of the 72 respondent only 19 (26.4%) indicated that they always conducted the five recommended steps presented under legible labeling in Table 15 while reconstituting pre-drawn medication: legibly labeled medication name, time of reconstitution, strength of education, expiry date and person preparing the medication.

Table 16: Appropriate drug preparation among health workers and factors associated with the practice

	Appropriate drug preparation		
	Yes	No	p value
Experience in years			
Less than 1 year	4(15.4)	22(84.6)	0.064
1 to 4 years	10(43.5)	13(56.5)	
5 to 9 years	5(29.4)	12(70.6)	
10 years and above	0(0.0)	6(100.0)	
Age of provider			
20-29 years	8(27.6)	21(72.4)	0.479
30-39 years	9(34.6)	17(65.4)	
40-49 years	2(12.5)	14(87.5)	
50 years and above	0(0.0)	1(100.0)	
Department			
Maternity	10(47.6)	11(52.4)	0.043
Pediatrics	4(18.2)	18(81.8)	
Medical ward	5(17.2)	24(82.8)	
Designation			
Consultant	1(33.3)	2(66.7)	0.4
Medical officer	0(0.0)	5(100.0)	
Medical officer intern	0(0.0)	4(100.0)	
Clinical officer intern	5(20.8)	19(79.2)	
Registered nurse	10(35.7)	18(64.3)	
Enrolled nurse	3(37.5)	5(62.5)	
Level of training			
Masters	1(33.3)	2(66.7)	0.136
Bachelors	0(0.0)	10(100.0)	
Diploma	15(29.4)	36(70.6)	
Certificate	3(37.5)	5(62.5)	
Attended injection safety seminar			
Yes	9(29.0)	22(71.0)	0.788
No	10(24.4)	31(75.6)	

There was a significant association between drug preparation practices and department (p = 0.043). Significantly higher proportion of respondent in maternity department 10(47.6%) reported appropriate practice compared to pediatrics 4(18.2%) or medical 5(17.2%) departments.

e) High injectable drugs preference

Key informant interviews revealed that most patients prefer injections rather than oral medications *"and they belief that injections will work faster that oral medications and they rather prefer them rather than getting oral medications*" It was also reported that "*there is a perception even the patients have towards health care workers that when they go to a health facility they have to get injections to feel better and of course the health care workers follow what the perceptions of the patients are"* He also reported that when the clinicians prescribe oral treatment and the patients ask for injections and the clinicians accept the patients request because *" you know the staffs may want to please patients so some staffs actually if they are not firm they give in to the pressure of the patients so I mean it happens"* he said the " *perception about injection safety and use are low among the staffs so we need to raise their knowledge about the use of injections"* he also added *" so we need to impart in them that it's not a must that the patients get injections, they can also get oral medications for them to recover as opposed to getting injections*" he said

f) Supplies management

In the store where injection commodities were kept, the environment was clean, dry, had adequate lighting, well ventilated and free from pest's infestation. The store was well secured and records were kept daily using the MOH recommended bin cards. There was one staff working who had documentary evidence that he had training on operating firefighting equipment. However, there was no firefighting equipment available and Ministry of Health (MOH) storage guidelines were not displayed in the store. Key informant reports indicated that the supply of the injection safety commodities was less than hospital the demand. Other major challenges reported included delay in delivery of supplies by KEMSA and limited storage facility *"you see now syringes are being kept in one place with Jik because of the room"* The officer added that to improve the supplies department, "*more staffs, properly trained people and again getting a vehicle to go and pick something from the dispensing in a quicker manner than taking a whole day….and again management to assist me*" were crucial.

4.4 SHARP WASTE MANAGEMENT GENERATION, SEGREGATION, TRANSPORT AND DISPOSAL.

Forty seven, (65.3%) of respondents reported that they always disposed generated waste into recommended color coded bins, while 44(61.1) % practiced waste segregation at point of waste generation, and 52(72.2%) segregated waste according to type.

Table 17. Waste generation and segregation practices among respondents

	Always	Sometimes	Never	Don't know
	n(%)	n(%)	n(%)	n(%)
I dispose injection waste into the recommended colour coded waste bins	47(65.3)	14(19.4)	8(11.1)	0(0.0)
I practice waste segregation; at the point of generation	44(61.1)	16(22.2)	6(8.3)	0(0.0)
I practice waste segregation; according to type	52(72.2)	12(16.7)	4(5.6)	0(0.0)

Thirty two (44.4%) out of the 72 participant in this study reported that they practiced all three recommended waste management practices examined namely: disposal in recommended bins, and waste segregation by type at point of waste generation.

The Key Informant responses identified several challenges in implementation of injection safety practices related both to waste management practice and inadequate supplies or resource unavailability. The informants consistently highlighted poor waste segregation practices and injection safety equipment shortages. One leader said "*segregation of waste is a major challenge whereby you may find some people are throwing sharps in dust bins instead of throwing them in sharp containers"* However another leader reported poor waste segregation is caused by inadequate supplies of the appropriate waste bins because the hospital is "*resource constraint*" although the officer also added "*even when the bins are bought the staffs may not use them as they are supposed to be used like you find that people have put food in to where infectious waste is supposed to be"* Lack of familiarity with guideline recommendations or difficulties in achieving health worker behavior change were also identified by Key Informants as hindrances to implementation of injection safety guideline recommendations. This was suggested as an explanation for the poor practices including filling safety boxes beyond the recommended level.

In addition, the key informant responses indicated that adequate and timely procurement of injection supplies was impeded by scarce financial resources, limited human resource and lack of transportation means which lead to delays in deliveries.

Inventories completed in the selected units through observation done by the investigator on the day of the survey established color coded bins were available for injection wastes but none had bin liners within the units. There was no waste segregation at the point of generation and there was mixing of waste in various waste bins

Based on the findings of the Fishers exact test presented in Table 18, none of the examined characteristics of respondents was significantly associated with good waste management practice ($p > 0.05$).

Table 18: Good waste segregation and respondent characteristics

	Yes	No	P value
Experience in years	**n(%)**	**n(%)**	
Less than 1 year	10(38.5)	16(61.5)	0.780
1 to 4 years	12(52.2)	11(47.8)	
5 to 9 years	7(41.2)	10(58.8)	
10 years and above	3(50.0)	3(50.0)	
Age in years			
20-29 years	12(41.4)	17(58.6)	0.099
30-39 years	9(34.6)	17(65.4)	
40-49 years	11(68.8)	5(31.3)	
50 years and above	0(0.0)	1(100.0)	
Department			
Maternity	10(47.6)	11(52.4)	0.364
Pediatrics	7(31.8)	15(68.2)	
Medical ward	15(51.7)	14(48.3)	
Designation			
Consultant	2(66.7)	1(33.3)	0.676
Medical officer	3(60.0)	2(40.0)	
Medical officer intern	2(50.0)	2(50.0)	
Clinical officer intern	10(41.7)	14(58.3)	
Registered nurse	10(35.7)	18(64.3)	
Enrolled nurse	5(62.5)	3(37.5)	
Level of training			
Masters	2(66.7)	1(33.3)	0.494
Bachelors	5(50.0)	5(50.0)	
Diploma	20(39.2)	31(60.8)	
Certificate	5(62.5)	3(37.5)	
Attended seminar			
Yes	15(48.4)	16(51.6)	0.635
No	17(41.5)	24(58.5)	

4.4.1 Observation checklist report for the three wards

Investigator observation done in the three selected units established this overall report. All the taps had running water in all the patient care areas. However none of them had hand washing soap or alcohol based hand rubs. Colour coded bins were available for the injection wastes but none had the bin liners. There was no waste segregation at the point of generation and there was mixing of wastes in various waste bins. The Ministry of Health (MOH) injection safety guidelines were not available. There was no documentation confirming that injection safety training was provided to all staff categories in the last one year. Medications were not stored as per the manufactures instructions. There was no documented evidence that supportive supervision is conducted every three months by MOH.

However, one ward had the Post Exposure Prophylaxis (PEP) guidelines displayed in the ward and there was evidence at the Comprehensive Care Clinic (CCC) that PEP was implemented as per MOH recommendation for those who sought the service.

4.4.2 Sharp waste management observation checklist report

Investigator observation noted that all the waste generated in the clinical areas remained in the ward and was not transferred to secure holding rooms. The staffs collecting injection wastes did not have personal protective equipment such as aprons, overalls, helmets or heavy duty boots or gloves. There was no documented evidence that all waste handlers were trained on safe handling of medical wastes and the potential risks involved. Full safety boxes were collected from the wards without any documentation. The waste was also not quantified by weight or volume and the source was not indicated before transportation. Investigator also noted that sharp waste was transported to the incinerator via a wheelbarrow which at some points had the wastes spill over and recollected. The explanation given was that sharp waste transportation trolleys could not be used because the route from the wards to the incinerator is rugged and hence the trolley wheels could not move smoothly.

The incinerator was not properly cited; it was situated next to a school and a TB care facility mostly referred to a *TB Manyata.* Some of the hospital wards were also located next to the incinerator. The environment around the incinerator was littered with sharp wastes which

included syringes, gloves, and needles. Data collected during Key Informants interviews reported that "*in the hospital we don't have an effective incinerator which could burn the waste we collect in the hospital..mm.. because ..heh what I can describe it, as what we have is just a burning chamber basically but not an incinerator per se.. like needles cannot be burnt with this kind of what we have at the moment*"

The incinerator therefore had no capacity to burn waste completely and so not appropriate for the work load. There was no available evidence that a qualified infection prevention official has inspected the incinerator during the previous six months or the MOH required service schedule. However, the incinerator was well secured and the entire walls were intact and the staffs who were working there had all the required personal protective gear for handling medical waste.

4.2 RELATIONSHIP BETWEEN KNOWLEDGE AND PRACTICE

Data collected from reported knowledge and practice on injection safety did not show statistically significant associations. The findings of t-tests comparing knowledge scores and appropriate practice are presented in Table 19. Among the four practices assessed only hand washing practice showed significant association with injection safety knowledge. Respondents who reported good hand washing practice had higher average knowledge score (mean = 14.27) compared to those who had poor hand washing practice (mean = 12.36).

Table 19: Association between safety knowledge and recommended practice

	Appropriate practice	Inappropriate practice	Difference	P value
Hand washing	14.27	12.36	1.91	0.01
Drug administration	12.28	12.57	0.33	0.596
Clinical practice	13.67	12.39	1.28	0.054
Waste management	12.84	12.5	0.34	0.53

Table 20: Association between observed verses actual practice

variable	Yes	No	Not applicable
	n(%)	n(%)	n(%)
Staff perform hand hygiene;			
Before putting on gloves to administer injections	6(8.3)	66(91.7)	0
After removing gloves once the injection is administered	40(55.6)	32(44.4)	0
After direct patient contact	35(48.6)	37(51.4)	0
After contact with any form of contamination even when gloves are worn	43(59.7)	29(40.3)	0
Needles are recapped after injecting a patient	37(51.4)	35(48.6)	0
Sharps are manipulated in anyway			
before they are used to inject the patient	51(70.8)	21(29.2)	0
after injecting the patient	44(61.1)	28(38.9)	0
Sharps are immediately removed from patients environment after they are used on a patient	29(40.3)	43(59.7)	0
Each needle is used;			
for only one patient	64(88.9)	8(11.1)	0
for only one drug	51(70.8)	21(29.2)	0
Each syringe is used;			
for only one patient	61(84.7)	8(11.1)	3(4.2)
for only one drug	54(75.0)	15(20.8)	3(4.2)
A new needle is used;			
for each medication vial	63(87.5)	8(11.1)	1(1.4)
for each medication ampule	65(90.3)	6(8.3)	1(1.4)

Table 20 compares self-reported practice and observed practice in hand washing and injection safety. While most health care workers reported washing hands before putting on gloves to administer injections, 66(91.7%) were observed not to wash before gloving.

Table 21: Reported verses observed practice

		Observation		P value
		Yes	No	
Self report		N (%)	N (%)	
Reuse of syringe	Always	12(85.71)	2(14.29)	0.72
	Never/ Sometimes	42(76.36)	13(23.64)	
Hand washing	Always	1(4.17)	23(95.83)	0.65
	Never/ Sometimes	5(10.42)	43(89.58)	
Recapping used needles	Always	5(45.45)	6(54.55)	0.67
	Never/ Sometimes	32(52.46)	29(47.54)	
Drug administration	Always	48(72.73)	18(27.27)	0.15
	Never/ Sometimes	2(40)	3(60)	

a) Reuse of syringe

Fourteen percent of those who said they always reused disposable syringes were observed to use a syringe for more than one drug and 13(24%) of those who reported that they never reused syringes were observed reusing them. It was however observed that the syringes were reused for drug preparation and not for the actual injection (p=0.72).

b) Hand washing

Hand washing was rarely practiced before putting on gloves. Only 6(8.3) % were observed to wash their hands before putting on gloves. This observation contradicted reported practice by 23(96) % of respondents who reported that they always washed their hands and 43(90%) of those respondents reporting washing hands sometimes or never actually never washed (p=0.65).

c) Recapping of used needles

There was no association between reported and observed practice for recapping of needles. Six (55%) of respondents reporting that they always recapped were observed not to recap while 29(48) % of those who reported they never recapped needles were observed recapping them (p= 0.67).

d) Drug administration

While most 48(72%) of the respondents reported that they always avoided contamination of injections prior administration, 18 (28%) were observed to touch the sharps before injecting the patient increasing the risk of contamination.

Therefore using data collected from reported knowledge and practice, reported practice and observed actual practice, there is no association between knowledge and practice. (P=O.15)

CHAPTER FIVE: DISCUSSION

5.1 DISCUSSION

5.2 Introduction

Most of the respondents were males with an average age of 33.4 years and with diploma qualifications. Despite the absence of injection safety guidelines, knowledge on injection safety was high among staff and this could be attributed to training attended by one half of the respondents. The key training area was waste management while behaviour change was rarely covered during training. The study established that health workers knowledge was not associated with practice. (Tables 19, 20 and 21)

5.3 Factors influencing injection safety among clinical health care personnel

5.4 Level of Knowledge on Injection Safety

The overall results indicated that there was high level of knowledge among workers on injection safety in GPGH. This is in contrast to the results of a study done in Ethiopia which showed that majority of the health care workers still had poor understanding of safe injection procedures (Ernest, 2002). However there was no association between knowledge and gender, designation or the department where one worked (Tables 7, 8, 9). The high level of knowledge could also be associated with vigorous campaigns by MOH to promote safe injection practices via mass media and its move to publish and disseminate several job aids to health facilities that constantly sensitize health care workers on safe injection practices.

In this study in Garissa Provincial General Hospital (GPGH), over ninety percent of the respondents knew that unsafe injections are associated with HIV transmission, and 79.2% knew Hepatitis B transmission is associated with unsafe injections. Conversely, only half of the respondents were aware of Hepatitis C transmissions (Table 6). Using data presented in a study done in China, among 118 health care professionals had knowledge that HIV, Hepatitis C virus and Hepatitis B virus might be transmitted by the contaminated syringes and needles was 95%, 59% and 89% respectively (Yan *et al*., 2006). Compared to other infections knowledge on Hepatitis C transmission is low and hence should be the focus of attention in future organized training sessions (Table 6).

A study conducted in maternity units in five hospitals which involved a National Referral Hospital, a specialized maternity Hospital, two district hospitals and one sub-district hospital across two provinces of Kenya indicated that only 19.4% of health care workers had attended an update course on infection control in the three years prior to the study. (Muchina & Muchina, 2009).This however shows a higher coverage of training among the health care personnel from 19.4% in 2009 to the current 43.06% reported in Garissa (Figure 3) and this supports my findings of high level of knowledge among health care workers.

The medical waste handlers at GPGH were not trained on waste management guide lines and the potential risks involved. During the investigators' observation, they were observed collecting all the sharp waste together and without personal protective gear unaware of the dangers they were exposed into. This situation could also have been made worse by the fact that the MOH storage guidelines were also not available in all the units studied and this was supported by a national cross-sectional survey on injection safety practices that reported problems with availability of injection safety guidelines (MOH, 2005).

The staff working in the injection supplies store had documented evidence that he was trained in the use of firefighting equipment as stipulated in the MOH guidelines. It was observed that the firefighting equipment was however not available in the store. This could have been attributed to the fact that the hospital managers reported during the interviews that they were not fully conversant with the MOH injection safety guidelines. This was unsafe and risky because in the event of fire, injection supplies could easily be destroyed. The managers would have appreciated disaster preparedness where injection commodities are concerned and facilitate installation of firefighting equipment if they were aware of the MOH injection safety guidelines. This fact was supported by guidelines issued during the Global Challenges Survey and Injection Safety Meeting held in NOV 2010 which proposed that knowledge on risks associated with unsafe practices among patients and health care providers as a reliable measure to achieve safe injection practices (www.Global2015.net).

5.5 Injection safety practices

Reported practice varied for the different aspects of injection safety. Problematic areas of practice included hand washing, recapping, and drug administration at the individual level (Table

12, 13, 14 and 15). Investigator observation (Appendix 3) observed poor practice at ward level which was reflected by the unavailability of soap in all the taps in patient care areas. Inadequate resources cited during the key informant interviews could have been the cause which is also supported by the observed insufficient provision of injection safety equipment and supplies (Appendix3).

Health workers were more likely to wash their hands after contact with contamination but only 24(33%) reported that they washed their hands before putting on gloves and a similar number washed hands to administer injections. A similar study done in West Africa indicated that only 12.3% of injection providers washed their hands before and after administering injections. (Akpan, 2009). While this is an improvement in hand washing practice and depicts better performance from 12.3% in 2009 to the current 33%, it is still relatively low and presents an opportunity for spread of avoidable infections. All the taps in the patient care areas had running water but none had soap or alcohol hand rubs available. Findings of this study are supported by those of Friedman *et al.,* (2010) and Kermode (2004).

In GPGH, majority of the respondents reported that they prepared each injection in a clean designated area and fourteen respondents reported that they reused disposable syringes (Table 13). Only 45(62.5%) of the respondents verify the integrity of the packet of the disposable syringe before use and fourteen participants reported that they reused syringes (Table 13). Interviewed healthcare managers cited inadequate injection supplies as one of the major challenges in maintaining safe injection practices and could be the cause of that poor practice. These findings are supported by those of Akpan (2009).

In GPGH, only 13(18.1%) of the respondents never compromise hand washing due to increased work load (Table 12) This practice appears to account for the existing estimates that each year, about 6% of the world population receives injections contaminated with hepatitis B virus and between 417,000 and 1.3 million deaths are caused by unsafe injection practices in medical practices (Kermode, 2004).

In GPGH, 20.8% of the respondents had suffered a needle stick injury during the past 12 month period (Figure 5) and almost a similar situation was found in a study done in Dominican. These

cases of needle stick injuries could be associated with recapping of needles which exposes the injection provider to a higher risk of needle stick injury since almost the same number of respondents reported that they recapped used needles. It was not clear why despite the high knowledge some health care workers still mishandled potentially contaminated and infectious sharps.

Key informant interview reported that there was widespread use of injections in the hospital and that patients demanded for unwarranted injections and the clinicians mostly complied. Similarly, an injection safety survey done in Kiambu and Bondo districts established that injection overuse was still rampant and prescribers admitted they were pressed by patients to prescribe or administer injections and they often complied (Chirchir *et al.*, 2009) This was also similar to a National cross-sectional survey in Kenya on injection safety practices indicated that there is over prescription of injections (MOH, 2005). This high prevalence of injection use shows that the wrong perception that injections work better than oral medications continue to be intense and efforts need to be made to influence change of that attitude. This emphasizes the fact that this country still needs robust campaigns to empower patients and clinicians with the appropriate safe injection knowledge so as to promote Behavior Change and Communication.

The Kenya government guidelines (MOH, 2006c)stipulates that a supportive supervision schedule is also obligatory and should be schedules every three months for a provincial hospital facility such as GPGH. These visits would ensure supervision and facilitate identification of gaps between the set guidelines and actual practice. Investigator observation indicated that such there was no documentary evidence to confirm that useful supervision visits were made by the MOH managers. These visits should be enforced so that deviations from the required standards are corrected before it deteriorates further. Such supervision visits would recognize hospital problems such as the inadequate storage capacity which led to storage of jik detergent together with syringes as it was pointed out during the key informant interviews.

Among MOH requirements for the logistics is to have storage of injection commodities in a secured, clean, well lit, well-ventilated area free from infestation of pests and that was the case in GPGH. However, MOH storage guide lines, accessible and functional fire safety equipment was

not available. The injection safety supplies inventory management standards met the MOH requirements and all the needed records and reporting and tools updated as required.

5.6 Sharp waste generation, segregation, transport and final disposal

While infectious waste and sharps constitute hazardous waste and their disposal system is considered appropriate if the collected and disposed of in the right manner (KSPA, 2010), In GPGH, Only thirty two (44.4%) out of the 72 respondents in this study reported that they followed all three recommended waste management steps examined namely: waste segregation by type at point of waste generation, segregation according to type and disposal in recommended bins (Table 17) However, that was in disagreement with what was observed by the investigator while collecting data on ward waste management. It was observed that none of the wards practiced immediate waste segregation at the point of generation. The recommended color coded bins were available but none had the appropriate bin liners. All the wards studied had puncture proof sharp disposal boxes were available. Almost similar report was obtained in a study conducted in Nyanza and Western province revealed that 69% practiced waste segregation and 3% of injection providers and 5% of those involved in waste handling were fully protected from Hepatitis B (Chirchir *et al*,2009*).* A probable reason is what was reported during the key informant interviews that some staffs do not know the significance of waste segregation and that sometimes they overfilled the sharp waste boxes.

Participants reported recapping of used needles and the practice showed a significant association with area or departmental deployment. All the staffs working in pediatrics department reported that they did not practice recapping while the 28.6% of respondents working in the maternity department recapped needles (Table 11).

In GPGH, sharp waste remained within the patient care environment and was not kept away in safe holding rooms. This practice was in contrast to a countrywide survey done in Kenya which showed that 47% of the hospitals had waste holding rooms as it awaited transportation (MOH, 2008-2012). Lack of injection safety guidelines within the hospital and the fact that most health

care workers were not trained on safe injection practices could have contributed to that state of affairs.

In GPGH, waste handlers had not been trained in safe waste handling and the potential risks associated with medical waste handling. The staffs that collected sharp waste did not have personal Protective gear except the one who worked at the incinerator. Injection waste was collected without any documentation of its weight, volume or source being done. This was unlike previous waste management studies in Kiambu and Bondo Districts which established that only 20% of waste handlers were trained and 55% of the personnel who handle waste had the minimum required personal equipment (Songa *et al,*.2009). The Ministry of health should provide these workers with the required protective gear and empower them with knowledge on safe waste handling.

In GPGH, sharp waste was transported via a wheelbarrow from the wards to the incinerator. It was observed that waste transportation trolleys were available but could not be used because the route to the incinerator is rugged and so the trolleys have been stored waiting the pavement to be created. Investigator observation also in GPGH indicated that the incinerator was sited at very close proximity to some of the wards although there was a secured gate. The environment around the incinerator was littered with sharp waste materials. This is similar to a study done in Cambodia where by sharp waste was observed in the environment of three district hospitals (Vong *et al,*. 2005). The required MOH supervision visit can easily identify this vice and facilitate correction so they need to be started and maintained to save the patient, injection provider and the environment from avoidable contamination.

5.7 The relationship between Injection safety knowledge and practice

Knowledge did not show significant association with reported and observed practice. Among the clinical practices assessed only hand washing was significantly associated with injection safety knowledge. Respondents who reported good hand washing had a higher knowledge score compared to those who reported poor hand washing practice (Table 19).

Ninety six percent of the respondents who reported the washed their hands before administering medications actually never washed before they gave the injections on observation. Twenty nine (48%) of those who reported they never recapped needles were observed recapping used needles

(Table 21) While most respondents reported that they always avoided contamination of the injection process, 18(28%) of them were observed manipulating the needles before injecting the patient hence increasing the risk of contamination. This would probably mean that most health care workers do not appreciate the significance of maintaining a safe injection process even when they are aware of what it entails.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

CONCLUSION

- There was high level of knowledge in injection safety among workers in GPGH.
- There was no association between knowledge, designation, level of training or the department where one works.
- There was over prescription of injectable mode of treatment
- Although most of the respondents knew that unsafe injections are associated with transmission of infections such as HIV and Hepatitis B, almost more than half of all the respondents were unaware of the danger of transmitting hepatitis C via unsafe practices
- There was poor handling of waste in the areas studied, like lack of personal protective wear and improper waste segregation, transportation and final disposal
- The practice on injection safety was poor in most of the areas, like re-use of disposable syringes, recapping of needles and overfilling of safety boxes
- There was insufficient provision of injection safety equipment and supplies all of the areas studied
- Poor transportation of wastes to the incinerator, like use of wheel barrows was observed
- There was no significant association between the reported and observed practice
- Injection safety knowledge was significantly associated with hand washing practice.
- These findings can be used in designing intervention to improve injection safety which should address resource constraints, target new staff with shorter duration of practice and staff deployed in poor performing departments.

RECOMMENDATIONS

- All the health workers in GPGH should be trained on safe injection practices.
- Injection safety MOH guidelines should be availed within the relevant the areas in the hospital
- All health care workers should be educated on the importance of research and the need to participate voluntarily
- MOH should address the issue of staff shortage to improve on health care delivery
- There is need to educate the community around the GPGH to understand that oral medications are also effective
- Personal protective wears should be availed to all waste handlers in the hospital
- There should be adequate supplies of such resources like syringes and needles among others
- There should be supportive supervision schedules in the hospital in order to identify the gaps between the set guidelines and actual practice.
- The hospital injection supplies store needs to be fitted with a firefighting equipment
- There should be appropriate and well-designed pavements for transportation of wastes to the incinerator to enable the use of waste transportation trolleys instead of the wheel barrows

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APPENDIX 1: INFORMED CONSENT FORM

Informed Consent Form for Health care workers at the Garissa Provisional General Hospital.

Research Title: Factors influencing injection safety among clinical health care personnel at Garissa Provincial General Hospital

Principal Investigator: Judith Mutindi Mweu

Mobile number : 0789926941

P.O Box 20720 00202 Nairobi

Name of Sponsor: Partnership in Innovative Medical Education in Kenya (PRIME K), Linked Award- strengthening Maternal, New born, and Child Research Training in Kenya PRIME-K

Introduction

I am Judith Mutindi Mweu, a Masters student at The University of Nairobi School of Nursing Sciences. I am carrying out research on **Factors Influencing injection safety among clinical health care personnel at Garissa Provincial General Hospital**. I am inviting you to be part of this research and it is entirely voluntary. If there are terminologies that need clarification, please seek help from the investigator.

Confidentiality: The information that I collect from this research will be kept confidential. Any information you have given will have a number on it instead of your name. Only the researchers will know what your number is.

Sharing the Results

The information/findings that we get from this research will be shared with you through feedback to the administration before it is made widely available to the public. Confidential information will not be shared.

Certificate of Consent

I have read the foregoing information. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to be a participant in this research.

Signature of Participant _____

Date _____

Signature of the interviewer _____

Date _____

APPENDIX 2: RESPONDENTS' QUESTIONNAIRE

FACTORS INFLUENCING INJECTION SAFETY AMONG CLINICAL HEALTH PERSONNEL AT THE GARISSA PROVINCIAL HOSPITAL

Participant ID no…… Date……. Interviewer number……

SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Age in years a) 20-29 b) 30-39

   c) 40-49 d) 0ver 50 years

2. Gender a) Male [ ] b) Female [ ]

3. Department: a) Maternity b) Pediatric c) Medical Wards

4. Duration of experience in Garissa Provincial hospital (give in months or years)…….

5. Current designation

   a) Consultant b) Medical Officer c) Medical Officer Intern

   d) Clinical Officer Intern e) Nurse i) Registered ii) Enrolled

6. Your highest level of training

a) Doctorate b) Masters c) Bachelors d) Diploma c) Certificate

7. Have you attended any seminar/training on Injection Safety?

a) Yes b) No

If Yes i) What was the duration of the training……

ii) Which injection safety areas were covered?

a) Clinical practice,
b) Waste management,
c) Logistics
d) Behavior Change Communication (BCC).

QUESTIONARRE ON KNOWLEDGE

KNOWLEDGE	TRUE	FALSE	SOMETIMES	I DON'T KNOW
1. A safe injection poses no danger to the patient				
2. A safe injection is not dangerous to injection provider				
3. Safe injection practices do not pose harm to the community				
4. HIV infections is a risk associated with unsafe injections				
5. Hepatitis B infections are associated with unsafe injections				
6. Hepatitis C infections are associated with unsafe injections				
7. Recapping the needle after injecting a patient is a safe injection practice				
8. Hepatitis B vaccine is important to injection providers				
9. Maintaining the reorder levels in stocks of injection supplies is important in injection safety.				
10. I anticipate and take measures to prevent sudden patient movement a) during injection procedure				
b) after the injection procedure				
11. Hand washing prior to administering an injection is a safe injection practice				
12. Hand washing after administering an injection is a safe injection practice				

	TRUE	FALSE	SOMETIMES	I DON'T KNOW
13. Observation of proper storage conditions, such as temperature as per manufactures instructions is safe injection practice.				
14. Post exposure Prophylaxis is recommended in the event of needle stick injuries				
15. I choose the correct injection device for the patient				

QUESTIONNAIRE ON PRACTICE

PRACTICE	ALWAYS	SOMETIMES	NEVER	I DON'T KNOW
1. Injection safety standards and guidelines are available in your unit				
2. I recap needles after injecting the patient				
3. I wash hands with running water; a) Immediately on arrival to work				
b) Before putting on to give an injection				
c) After removing the gloves				
d) After contact with any form of contamination even when gloves are worn				
e) Between procedures on same patient				
f) With increased workloads, hand washing is compromised				
4. Pre-drawn medications are labeled with the legible identification;				
a) Medication name				
b) time it was done				
c) name of the person who did it				
d) strength of the medication				
e) expiration date				

	ALWAYS	SOMETIMES	NEVER	I DONT KNOW
5. I choose injection site according to; a) age of patient				
b)the dosage				
b) the type of injection				
6. I dispose injection waste into the recommended color coded waste bins				
7. I practice waste segregation;				
a) at the point of generation				
b) according to type				
8. I use a new sterile syringe from a sealed pack for the injections				
9. I reuse disposable syringes				
10. I verify the integrity of the packet of the disposable syringe before use				
11. I prepare each injection in a clean designated area.				
12. With multi dose vials, I piece the septum with a sterile needle.				
13. I use a clean protective barrier (e.g small gauze pad) to protect fingers when opening a glass ampoule.				
14. I discard medications with visible contamination				
15. I discard needles with visible contamination				
16. I use clean freshly-prepared single use swab to wipe the injection site when administering injections				

	ALWAYS	SOMETIMES	NEVER	I DON'T KNOW
17. I discard syringes with visible contamination				
18. During the injection process, i avoid contamination of; a) Injection equipment.				
c) The medication.				
19. Have you ever suffered from a needle stick injury in the last 12 months?				
(a) If yes, did you report to your in charge?				
(b) Did you receive the WHO recommended dose of Post Exposure Prophylaxis?				

APPENDIX 3

OBSERVATION CHECKLIST

Individual Level

	YES	NO	NOT APPLICABLE
1. Staff perform hand hygiene; a) Before putting on gloves to administer injections			
b) After removing gloves once the injection is administered			
c) After direct patient contact			
d) After contact with any form of contamination even when gloves are worn.			
2. Needles are recapped after injecting a patient			
3. Sharps are manipulated in anyway a) before they are used to inject the patient			
c) after injecting the patient			
4. Sharps are immediately removed from patients environment after they are used on a patient			
5. Each needle is used; a) for only one patient			
a) for only one drug			
6. Each syringe is used; a) for only one patient			
b) for only one drug			
7. A new needle is used; a) for each medication vial			
b) for each medication ampule			

APPENDIX 4: OBSERVATION CHECK LIST -Ward Level

	YES	NO
1. Hand washing points in patient care areas have; a) soap available;		
If YES, i) how many have ii) how many do not		
a) running water available If YES; i) how many have ii) how many do not		
b) Alcohol- based hand rubs available If Yes; i) how many have ii) how many do not		
2. Regarding injection wastes; a) Recommended color coded bins are available		
b) appropriate bin liners available		
c) Immediate waste segregation at the point it is generated		
d) It is deposited at into the right bins		
e) Available puncture proof sharp disposal box		
3. Injection safety guidelines are available in the unit		
4. There is documentation confirming that injection safety training is provided to all staff categories in the last one year		
5. Medications are stored as per manufactures instructions		
6. Documented reports on needle-stick injuries are available		
7. Displayed guidelines on post-exposure prophylaxis (PEP)		
8. Documented evidence that the PEP is done as per MOH recommendation		
9. Documented evidence of supportive supervision Schedule every 3 months		

APPENDIX 5

SUPPLIES OBSERVATION CHECK LIST

1. Injection commodities are stored in an environment that is; a) Clean	YES	NO
b) dry		
c) well lit		
d) well ventilated		
e) free from infestation by pests		
2. There is fire safety equipment available. If yes; is it a) accessible		
b) functional		
3. Documented evidence that all staffs are trained on firefighting equipment		
4. Storage guidelines are clearly displayed		
5. The store is well secured		
6. Records are kept daily using bin cards		

APPENDIX 6

WASTE MANAGEMENT OBSERVATION CHECKLIST

WASTE MANAGEMENT-CHECKLIST	TRUE	FALSE
1. Provide secure waste transfer stations or holding rooms		
2. Injection waste is collected from service point to storage area promptly		
3. The staff collecting the injection wastes have Personal Protective Equipment/gear (PPE) when handling waste which includes; a) Apron		
b) overall		
c) heavy duty boots		
d) heavy duty gloves		
e) helmet		
f)respiratory		
g) eye goggles		
4. documented evidence that all waste handlers are trained on safe handling of medical waste and risks involved		
5. documented evidence that all waste handlers are trained on safe handling of medical waste and the risks involved		
6. Full safety boxes are recorded		
7. Waste is quantified by volume or weight		
8. The waste source is legibly labeled		
9. Waste is place in a secure place until it is disposed		
10. The storage area is designated " for waste only" and secured for only authorized persons		
11. The waste remains segregated during transportation to		

final disposal		
12. Waste is moved from one point to the other in a designated trolley		
13. The incinerator a) properly sited		
b) secured		
14. Incineration area is a) free of clutter		
b) well ventilated		
15. Incinerator is in good working condition		
16. Available evidence on the incinerator service schedule		
17. The incinerator is appropriate for the work load		
18. The incineration area has adequate staff working there		
19. The environment around the incinerator is free from waste		
20. Documented evidence that a qualified Infection prevention official inspects the incinerator every 6 months		
21. The incinerator does not have broken walls		
22. The incinerator doors are in proper working conditions.		
23. Incinerator operators use the following personal protective equipment • Apron		
• Overall		
• Heavy duty boots		
• Heavy duty gloves		
• Helmet		
• Respirator mask		
• Eye goggles		

APPENDIX 7: KEY INFORMANTS INTERVIEW SCHEDULE

A. WARD INCHARGES

1. Have you ever been trained on any injection safety aspect?
   If Yes, when was it, on which aspect and was it of any benefit to you?
   If No, proceed to next question.
2. What is a safe injection?
3. Are you aware of WHO/MOH injection safety standards and guidelines?
   a. If Yes, what do they entail, how useful are they?
   b. If No, which guide lines are u currently using?
4. Do you have cases of needle injuries
   a. If Yes, how do you manage them in your unit?
   b. If no do u a standard management and reporting system for the same?
   c. What does Post Exposure Prophylaxis (PEP) involve?
5. How do you motivate health workers in your unit to maintain safe injection practices?
6. What are the main challenges you face as you implement safe injection practices
7. What are your suggestions that could help improve injection safety practices in this hospital?

A. SUPPLIES INCHARGE

1. What factors do you consider before procuring injection supplies
2. What measures have you put in place to ensure continuous adequate injection supplies
3. What are some of the tools you use for records and reporting in inventory management?
4. Which are the major challenges of maintaining the recommended stock levels
5. What are your suggestions that could health improve the supplies department?

A. THE MEDICAL SUPRITENDED

1. Have you been trained on any aspect of injection safety?
   If Yes, which one and was it of any benefit to you as an individual and as the medical superintended?
   If No, continue to the next question.
2. What is the status of behavior change and communication in regards to injection safety in this hospital?
3. Are there incidences of occupational sharp injuries in this hospital?
   If Yes, how do you handle them?
   If No, are there reporting and management systems in place to manage them of they occur?
4. What does PEP entail?
5. What is the preference of injections other than oral treatment by patients?
   Do patients ask for injections from clinicians?
   If Yes, do the clinicians accept to prescribe the unwarranted injections?
6. What challenges in sharp waste management do you experience in the hospital?
7. What are your suggestions in dealing with those challenges
8. Is there availability of oral alternatives?
   If Yes, is it reliable?
   If No, what measures are you taking to make it available to reduce injections usage?

APPENDIX 8: MOH INJECTION SAFETY GUIDELINES

OBJECTIVES OF THE STANDARDS AND GUIDELINES

- Promote quality assurance in service delivery
- Establish uniformity in practice on injection safety.
- Promote the rational use of injections and reduce demand and over prescription.
- Strengthen procurement procedures

COMPONENTS OF STANDARDS AND GUIDELINES:

- Clinical practice,
- Waste management,
- Logistics
- Behavior Change Communication (BCC).

1.CLINICAL PRACTICE

Core areas of injection Safety practices:

Hand hygiene for Infection prevention

- Wash hands with running water prior and after every injection procedure
- Cover small cuts before performing the procedure

Preparation of drugs

- Reconstitute and withdraw at point of use
- Do not withdraw more than one drug in one syringe

Use of gloves for providing injections

- Use single-use gloves if excessive bleeding is anticipated, infected, damaged or soiled skin
- Gloves are not needed for injections in the absence of the above conditions

Preparation of the skin prior to injection:

- Wash skin that is visibly soiled or dirty
- Use clean freshly-prepared single use swab on a clean skin
- Avoid giving injections if skin integrity is compromised

Injection sites

Give injections at the right site according to age of patient, dosage and type of injection

Observe and maintain sterility

• Use new and sterile needle and syringe for each injection and reconstitute each unit of medication at all times.

• Discard a needle and syringe if the package has been punctured, torn or damaged by exposure to moisture

Prevent contamination of equipment and medication

• prepare each injection in a clean designated area where blood or body fluid contamination is unlikely

• Use single-dose vials rather than multi-dose vials

• Always pierce the septum of multi-dose vials with a sterile needle.

• Avoid leaving a needle in place in the stopper

• Discard a needle that has touched any non-sterile surface

Prevent injuries during injection procedure:

• Select 'marked' ampoules rather than ampoules that require use of a metal file to open

• Protect fingers with a clean barrier (e.g., small gauze pad) when opening ampoules.

• Anticipate and take measures to prevent sudden patient movement during the procedure.

• Avoid recapping

• Discard used syringes and needles at the point of use in a sharps container that is sealed when 3/4 full

Prevent access to used syringes and needles

• Seal sharps containers for transport to a secure area.

• After closing and sealing, do not open, empty, reuse or sell them.

• Manage sharps waste in an efficient, safe and environmentally friendly way

Reuse prevention injection devices

• Use injection devices that have:

– Reuse prevention features (Auto-disable syringe)

– needle-stick prevention features (Retractable syringe)

2.MEDICAL WASTE MANAGEMENT

Core areas of medical waste management

Segregation

Segregate waste immediately at the point of generation according to type

Containment

• Use sharps containers for syringes and needles

– Safety box should be puncture-resistant and leak-proof

• Use color coded waste bins and bin liners for infectious and non-infectious waste

Handling - storage, collection and transportation

• Provide secure waste transfer stations or holding rooms

• Filled sharps containers should be sealed and stored in a secure place to prevent access by unauthorized persons

• Collect waste according to prescribed schedule

• Use designated trolleys for on-site transportation of waste

• Use the prescribed vehicle according to existing legislation for off-site transportation of waste

• All waste handlers must be trained on safe handling of medical waste and the risks involved

• Use Personal Protective Equipment/gear (PPE) when handling waste

Treatment

• Alternative waste treatment technologies that are environmentally friendly and cost effective should be encouraged

Final disposal

• Every health facility should have a functioning incinerator or other environmentally friendly waste disposal unit.

• The incinerator or disposal site should be properly sited and secured

• Injection waste generated by the community shall be disposed off in a secured Pits

3. LOGISTICS

Injection Commodities

• Shelf-life should be 2/3 of the expiry date

• Should meet the national standard as set out by Kenya Bureau of standards

• Should be approved by WHO

Storage of commodities

• Store commodities in a Clean dry, well-lit, well-ventilated room from infestation by pests

• Fire safety equipment available, accessible and functional

• All employees should be trained on the use of firefighting equipment

• Storage guidelines should be displayed clearly and followed.

• The stores should be well secured

Issuing and distribution

• Records should be kept using bin cards daily

• Maintain minimum stock at all levels

• National level 3 months,

• Regional level 3 months

• District level 2 months and

• Health facility level 1 month.

• Maximum stock at any given time should not exceed the following

• National level 6 months

• Regional level 6 months

• District level 3 months

• Health facility level 2 months

• Always use the ‘FIRST EXPIRE, FIRST OUT’ and ‘LAST IN LAST OUT’ principles

Inventory Management

• Records and reporting tools should be made available and utilized

• The following tools should be used

• Bin card

• S11/12 request forms

• Issue/receipt voucher
• Tally sheets for syringes
• Daily activity register (DAR) for injection safety commodities
• Consumption and request form for injection safety commodities

4.BEHAVIOR CHANGE COMMUNICATION (BCC)

Rational use of injections

• The essential drugs list should have more alternative oral medication
• Adequate alternative oral medication should be available
• Standard treatment guidelines should be made available for prescribers
• IEC material should be available to support both the health provider and the community on rational use of injections

Communication

• Use of interpersonal communication skills to enhance client/provider interaction
• Use the counseling process to assist clients make informed decision on rational use of injections
• Utilize mass media campaign to promote preference for oral medication
• Display IEC Materials (Posters, Leaflets, SOP charts) within health facilities
• BCC materials should meet set quality standards and criteria

Training

• Each health facility has enough trained personnel on injection safety and medical waste management
• A program for continuing education in every health facility
• Injection safety and health care waste management component included into training institutions curricula
• Sensitization schedule for health care providers on injection safety at the health facility

Supportive supervision

• Schedule for support supervision at all levels:

• National to Provincial every 6 months
• Provincial to District every 3 months
• District to facilities every month
• Facilities to community every month
• Use of checklist to supervise activities
• Report for each visit
• Feedback should be given
• Document on-job-training (OJT) sessions conducted

Monitoring and Evaluation

• Use indicators in monitoring and evaluating activities
• Checklist of indicators should be available
• Schedule of activities to be performed
• Activities should be carried out according to schedule
• Records correctly maintained and reports submitted in a timely manner
• Availability of injection safety and waste management supplies
• Performance of injection safety and waste management practices

Health provider safety

• Report needle-stick injuries immediately to the supervisor
• Display guidelines on post-exposure prophylaxis
• Personal Protective Equipment (PPE) should be made available for health care providers

Health workers

• Use of disposable gloves is essential to protect health workers from exposure to blood and body fluids
• Protective eye wear: eye shields, goggles and visors should b used by health providers at any time they work with blood that has a potential to spill or to spatter
• Surgical/disposable face mask are necessary to protect health workers' oral and nasal mucus membranes
• Surgical caps and hoods should be worn in instances when gross contamination is anticipated

• Overshoes protectors should be available to be worn in cases of biohazard spill or blood/body fluid in laboratories and labor wards

• Laboratory coats, gowns and plastic aprons should be worn by staff whenever working with blood that has a potential to spill or to spatter

Waste handlers

Waste handlers and incinerator operators should use the following personal Protective equipment

- Helmet
- Eye goggles
- Respirator mask
- Heavy duty gloves
- Heavy duty boots
- Overall
- Apron

APPENDIX 9: WHO PEP GUIDELINES

Management of exposure to HIV WHO TOOL KIT, 2010

Risk of transmission of HIV

The risk of acquiring HIV infection following an exposure through the skin (i.e. percutaneous) to blood known to be infected with HIV is approximately 0.3% (*14*). This figure is derived from studies carried out in well-resourced countries with a low background prevalence of HIV. The risk may be greater in countries with higher prevalence or in settings that have limited resources, where the reuse of medical supplies and equipment is higher and overall safety standards are lower. **Management of exposure to HIV**

Refer the person exposed to the risk of transmission to a trained person for medical evaluation, risk assessment and prescription of PEP. The decision on whether or not to take PEP should be based on the recommendations shown in Tables 4.3

Table 4.4 Evaluation of risk of HIV infection

	HIV status of source		
Exposure type	**Positive**	**Unknown**	**Negative**
Percutaneous: more severe[a]	Recommend two-drug regimen[b]	Consider HIV prevalence in population or subgroup	DO NOT recommend PEP provided there is NO risk that the source person might be in window period
Percutaneous: less severe[c]	Recommend two-drug regimen[b]	DO NOT recommend PEP	DO NOT recommend PEP
Splash[d]: more severe[e]	Recommend two-drug regimen[b]	Consider HIV prevalence in population or subgroup	DO NOT recommend PEP provided there is no risk that the source person might be in window period
Splash: less severe[f]	DO NOT recommend PEP. Two-drug regimen optional	DO NOT recommend PEP	DO NOT recommend PEP

HIV, human immunodeficiency virus; PEP, post-exposure prophylaxis.

[a] Injury with large hollow-bore needle, deep puncture, visible blood on device, needle used in artery or vein.

[b] In cases where the source person is known to be HIV positive with drug resistance or in settings where the drug resistant HIV prevalence is above 15%, a three-drug regimen with the addition of a protease inhibitor is recommended.

[c] Injury with small bore or solid needle, superficial injury.

[d] Exposure to nongenital mucous membrane, or nonintact skin exposures.

[e] Exposure to large volume of blood or semen.

[f] Exposure to smaller volume, or to less infectious fluid (e. g. cerebrospinal fluid) (*74, 75*).

and 4.4, appropriate information, and counselling on adherence and on the possible adverse reactions to the antiretroviral

Table 4.5 WHO recommended two-drug regimens for HIV post-exposure prophylaxis

Preferred regimens	Alternative regimen
1. ZDV + 3TC	1. TDF + 3TC[a]
2. d4T + 3TC	

3TC, lamivudine; d4T, stavudine; TDF, tenofovir; WHO, World Health Organization; ZDV, zidovudine.

[a] Prescribed in fixed dose combination tablets where possible.

Table 4.6 WHO recommended three-drug regimens for HIV post-exposure prophylaxis

Preferred regimens	Alternative regimens
1. ZDV + 3TC plus LPV/r	1. ZDV + 3TC plus SQV/r or ATV/r or FPV/r 2. TDF + 3TC plus SQV/r or ATV/r or FPV/r 3. TDF + FTC plus SQV/r or ATV/r or FPV/r 4. (d4T) + 3TC plus SQV/r or ATV/r or FPV/r

3TC, lamivudine; ATV/r, atazanavir/ritonavir; d4T, stavudine; FPV/r, fosamprenavir/ritonavir; FTC, emtricitabine; LPV/r, lopinavir/ritonavir; SQV/r, saquinavir/ritonavir; TDF, tenofovir; WHO, World Health Organization; ZDV, zidovudine.

When giving PEP:

• DO NOT prescribe certain combinations of medication (e.g. didanosine + stavudine) for women of childbearing age unless a pregnancy test is negative;

• DO NOT prescribe non-nucleoside reverse transcriptase inhibitors for PEP;

• ensure that lactating women are aware that antiretroviral drugs are present in breast milk and that the virus itself could be transmitted through breastfeeding;

• when and where alternatives to breastfeeding are feasible, discuss this with the mother.

Testing and counselling

For people potentially exposed to HIV, testing is highly recommended but should never be mandatory (*76*).

- If testing is available, offer a test, but ensure that the person receives appropriate counseling, with the option to opt out of testing.
- Where possible, also test the source patient, with that person's informed consent.
- DO NOT delay the administration of antiretroviral drugs for PEP while waiting for test results.
- If the test results of the source person are negative, consider stopping PEP.

Issues to raise in PEP counselling include:

- the importance of treatment adherence;
- the importance of HIV prevention in general and at the workplace;
- recommendations on the use of condoms and the avoidance of donating blood, sperm or organs until a test at 6 months after exposure is negative;
- information on contraception for women of childbearing age;
- information on alternatives to breastfeeding for lactating mothers.

Administration of PEP

Do not administer PEP to a person who is HIV positive, because PEP generally includes only two drugs to be taken for only 28 days, and is thus not a treatment for HIV infection. HIV treatment is based on a combination of three antiretroviral drugs taken continuously. If desired, it is acceptable to administer antiretroviral drugs for PEP, and to stop the treatment if the exposed person is found to be HIV positive.

In situations where PEP is required:

- administer the antiretroviral drugs for PEP as soon as possible after the exposure (ideally within 4 hours);
- continue the PEP regimen continuously for 28 days;
- use the two-drug regimen (recommended by WHO) unless there is suspicion or evidence of drug resistance, or unless there are national guidelines on choice of PEP regimen (in which case, follow these in preference);
- evaluate the person taking PEP within 72 hours, to monitor for possible adverse drug reactions and adherence, and follow-up (as described below) for at least two weeks.

HIV PEP standard drug regimen

Table 4.5 shows the WHO recommended two-drug combination therapies for PEP for HIV exposure.

As explained above, in cases where the source person is known to be HIV positive with drug resistance, or in settings where the drug resistant HIV prevalence is above 15%, a three-drug regimen with the addition of a protease inhibitor is recommended. Possible regimens are given in Table 4.6.

4.6.3 Follow-up of HIV exposure

An exposed health worker should seek or be referred for medical follow-up (7

- The aim of follow-up visits is to:
  - support adherence to PEP;
  - prevent or treat side effects of PEP;
  - identify a possible seroconversion.
- Test for HIV antibodies at baseline, 6 weeks and 6 months after exposure
- Test for HIV antibodies if illness compatible with an acute retroviral syn
- Repeat the test for HIV antibodies at 6 weeks and 6 months after exposu seroconversion occurs, refer the exposed person for treatment, care and
- Advise anyone who has been exposed to use precautions to prevent secor during the follow-up period; such precautions include:
  - avoiding pregnancy;
  - seeking safe alternatives to breastfeeding;
  - avoiding blood, tissue or sperm donation, and using condoms for sexu until a test at 6 months shows that the exposed person remains seron
- Evaluate individuals taking PEP within 72 hours, to monitor for possible reactions and treatment adherence. Follow up for at least two weeks.

Reporting of HIV exposure

Reporting of the incident should lead to the evaluation of the safety of working conditions and appropriate measures when relevant. All reports should be strictly confidential.

Prompt reporting of exposures is important to:

- ensure timely and appropriate PEP and follow-up;
- provide information useful for future prevention; for example, information about the circumstances of the exposure can be used to evaluate the occupational health programme and make recommendations for changes in products, practices and policies;
- document the injury in the case of seroconversion;
- monitor the frequency of needle-stick injuries and exposure events by person, place and time, as part of occupational exposure surveillance.

The data collected are of two kinds:

- data for risk assessment and post-exposure management;
- data that describe the circumstances of the exposure; these are used for making recommendations for future prevention.

APPENDIX 10: KNH/UON ETHICS AND RESEARCH COMMITTEE APPROVAL

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355

KNH/UON-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: www.uonbi.ac.ke
Link:www.uonbi.ac.ke/activities/KNHUoN

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

Ref: KNH-ERC/A/79

17th April 2012

Judith Mutindi Mweu
School of Nursing Sciences
College of Health Sciences
University of Nairobi

Dear Judith

RESEARCH PROPOSAL: "FACTORS INFLUENCING INJECTION SAFETY AMONG CLINICAL HEALTH PERSONNEL IN GARISSA PROVINCIAL HOSPITAL" (P108/02/2012)

This is to inform you that the KNH/UoN-Ethics & Research Committee (ERC) has reviewed and **approved** your above revised research proposal. The approval periods are 17th April 2012 to 16th April 2013.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
c) Death and life threatening problems and severe 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.
d) 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.
e) 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*).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) 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.

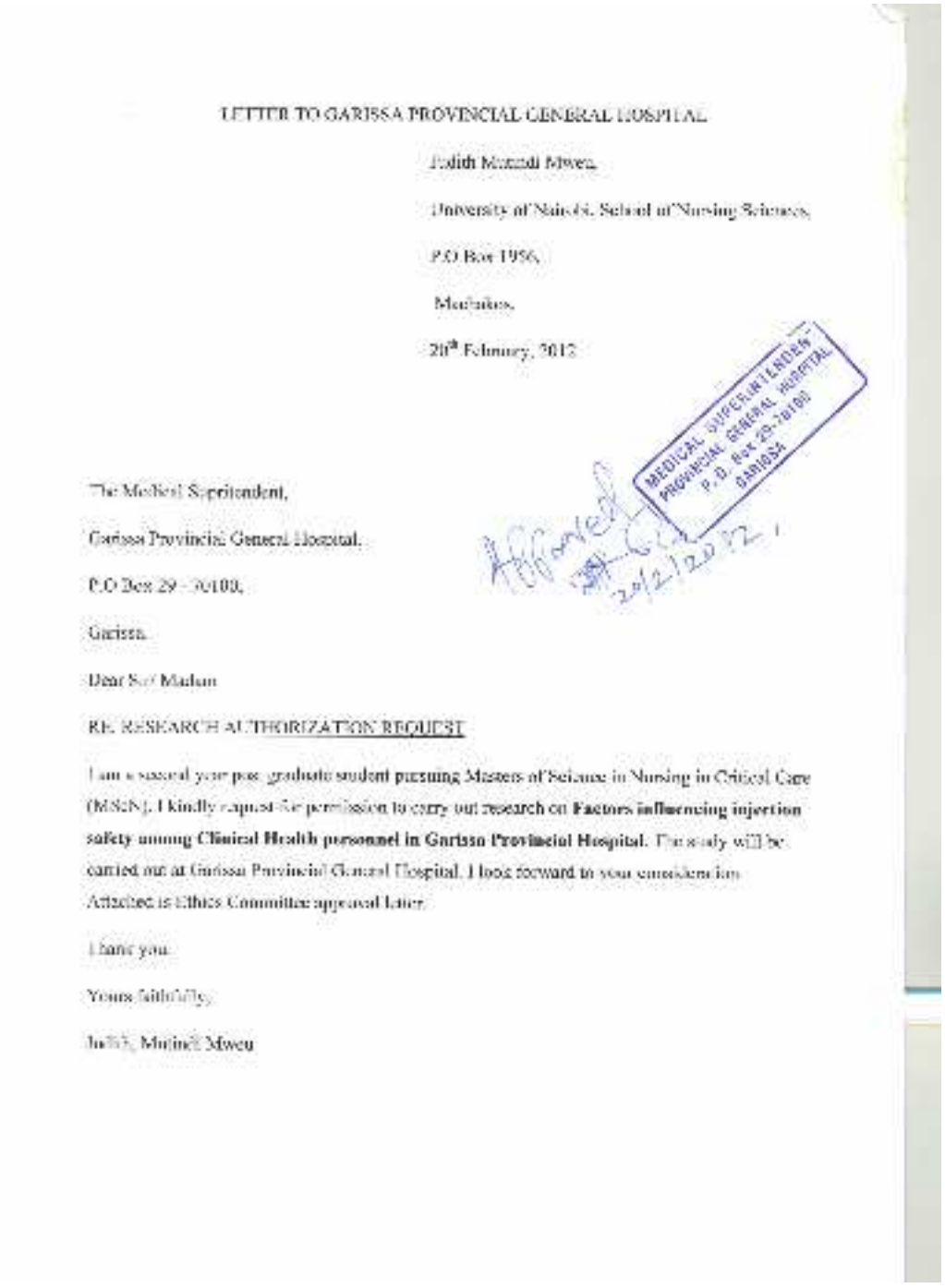
For more details consult the KNH/UoN -ERC website **www.uonbi.ac.ke/activities/KNHUoN**

Yours sincerely

PROF A.N. GUANTAI
SECRETARY, KNH/UON-ERC

c.c. The Deputy Director CS, KNH
The Principal, College of Health Sciences, UON
The Director, School of Nursing Sciences, UON
The HOD, Records, KNH
Supervisors: Mrs. Angeline Kirui, Mrs. Theresa Odero, Dr. John Kinuthia

APPENDIX 11: AUTHORIZATION LETTER BY GARISSA PROVINCIAL GENERAL HOSPITAL



LETTER TO GARISSA PROVINCIAL GENERAL HOSPITAL

Judith Mutindi Mweu,

University of Nairobi, School of Nursing Sciences,

P.O Box 1956,

Machakos.

28th February, 2012

MEDICAL SUPERINTENDENT
PROVINCIAL GENERAL HOSPITAL
P.O. BOX 29-70100
GARISSA

20/2/2012

The Medical Superintendent,

Garissa Provincial General Hospital,

P.O Box 29 – 70100,

Garissa.

Dear Sir/ Madam

RE: RESEARCH AUTHORIZATION REQUEST

I am a second year post graduate student pursuing Masters of Science in Nursing in Critical Care (MSCN). I kindly request for permission to carry out research on **Factors influencing injection safety among Clinical Health personnel in Garissa Provincial Hospital.** The study will be carried out at Garissa Provincial General Hospital. I look forward to your consideration.

Attached is Ethics Committee approval Letter.

Thank you.

Yours faithfully,

Judith Mutindi Mweu

APPENDIX 12: THE BUDGET

ITEM	UNIT	RATE	DAYS/ FREQUENCY	**TOTAL**
Document for input by faculty	1	500	4	2500
Submission of proposal to ethic committee	1	2000	1	2000
Preparation of research tools	1	2500	1	2500
SUB TOTAL				**7000**
Accommodation in Garissa	1	4000	3	12000
Research assistants – Lunch	4	500	1	2000
Fuel from Nairobi to Garissa	70	130	2	18200
Photocopy questionnaires	500	5	5	2500
Air Time	1	1000	1	1000
SUB TOTAL				**35700**
Data collection : 5 days				
Accommodation in Garissa	1	4000	5	20000
Fuel for transport from Nairobi to Garissa	70	130	2	18200
Fuel for transport from the hotel to the GPGH	10	130	5	6500
Research Assistants- Lunch	2	200	5	4000

GRAND TOTAL				**91,400**

APPENDIX 13: GNATT CHART

Activity	Sept 2011	Oct 2011	Nov 2011	Dec 2011	Jan 2012	Feb 2012	Mar 2012	Apr 2012	May 2012	June 2012	July 2012
Concept Paper development											
Proposal Development											
Proposal defense											
Submission to Ethics Board											
Preparation of research tool, Pretesting of tools, Data collection											
Data Analysis and Report writing											
Submission of final report and Oral defense.											
Feed back to Garissa Provincial General Hospital											