THE MANAGEMENT OF BLOOD AND BODY FLUIDS IN A KENYAN UNIVERSITY HOSPITAL: A NURSING PERSPECTIVE

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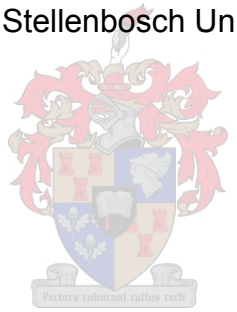
Assignment presented in partial fulfilment of the requirements for the degree of Master of Nursing Science in the Faculty of Health Sciences at Stellenbosch University



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DECLARATION

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ABSTRACT

The purpose of this study was to determine the knowledge of Universal Precautions Policy by Registered Nurses at Kenyatta National Hospital (Kenya) and their perception of occupational risk of exposure to blood-borne pathogens. The study also assessed management of blood and body fluids of patients and identified the types and frequency of occupational exposure common among these Registered Nurses. A structured 24-item, self-administered questionnaire was distributed to 185 randomly sampled Registered Nurses in selected departments at this hospital. Compliance with Universal Precautions practices was also observed using a checklist. Data analysis was done by use of computer software package, Statistical Package for Social Sciences (SPSS) version 11.0. The study findings suggest: 1) lack of continuous education demonstrated by a high level of non-response about knowledge of Universal Precautions Policy with only 19% of the respondents having attended an in-service course in Universal Precautions Policy, and 2) inaccurate understanding of transmission modes of blood-borne pathogens. The majority of nurses surveyed were using Universal Precautions; with indications that nurses were not as familiar with Universal Precautions as they think they were. Respondents admitted modifying personal protection habits based on subjective judgment regarding patient's perceived blood-borne infectious state. Non-compliant behaviours with barrier precautions were identified, which included failure to use gloves, gowns and protective eyewear, failure to wash hands, and recapping used needles. Compliance with barrier precautions was associated with patients' perceived blood-borne status. The study revealed a high level of occupational exposures, of which the majority went unreported. Although respondents were aware of the risk of occupationally acquired blood-borne infections, their irregular practice of Universal Precautions Policy is likely to perpetuate the risks. The findings suggest a need for more educational interventions, which may result into integration of concepts into practice. Educational programmes should focus on the epidemiology of occupationally acquired blood-borne pathogens and their modes of transmission, risk of occupationally acquired blood-borne infections at work place, and with emphasis

on the principle and practice of Universal Precautions Policy and current protocol of reporting mechanisms in Kenya.

OPSOMMING/ABSTRAK

Die doel van hierdie studie was om die kennis te bepaal van Universele Voorsorgmaatreels Beleid (Universal Precautions Policy) van die Geregistreerde Verpleegkundiges by Kenyatta Nasionale Hospitaal (Kenya) en hulle insig van arbeids risiko's aan blootstelling van bloed oordraagbare patogene. Die studie het ook die hantering van bloed en liggaamsvloeistowwe van pasiente ondersoek, en die tipes en die frekwensie van blootstelling aan bogenoemde, tussen hierdie Geregistreerde Verpleegkundiges geidentifiseer.

"n Opgestelde 24 item, self beskrywende vraelys was tussen 185 blindweg gekose Geregisteerde Verpleegkundiges versprei, in geselekteerde afdelings van die hospitaal. n Vraelys was gebruik om die toepassing van universele voorsorgmaatreels te bepaal. Data analise was met behulp van 'n rekenaar en sagteware gedoen SPSS (Statistieke Pakket vir Sosiale Studies) weergawe 11.0. Die studie bevindings het die volgende getoon:

Gebrek aan volgehoue opleiding by 'n groot groep van deelnemers ivm kennis van die Universele Voorsorgmaatreels Beleid, met slegs 19% van die respondente wat die interne kursus in Voorsorgmaatreels Beleid gevolg het.

Miskonsepsie van die maniere van oordrag van bloed oordraagbare patogene. Die meeste van die verpleegkundiges wat deelgeneem het, gebruik die Universele Voorsorgmaatreels Beleid, met die begrip dat hulle die kennis het van die Voorkomings Beleid, maar daar is egter baie leemtes.

Deelnemers het erken dat hulle hul persoonlike beskermings gewoontes aangepas het, met subjektiewe veroordelings betrekkende pasiente se bloedoordraagbare infeksie status.

Nie aanvaarbare gedrag met skans voorkomingsmaatreels was geidentifiseer, wat die gebrek om handskoene, oorjasse en beskermende brille te dra, nalating om hande te was en die onveilige gebruik van onbeskermde naalde insluit. Toegeeflikheid met die toepassing van skans voorkomingsmaatreels was geassosieer met die pasient se vooropgestelde bloed oordraagbare status.

Die studie het ‘n hoë voorkoms van arbeids blootstelling, waarvan die meeste nie gerapporteer is nie. Deelnemers was bewus van die risiko van arbeids verworwe bloedoordraagbare infeksies, deur onreëlmatige toepassing van die Universele Voorsorgmaatreels Beleid.

Na aanleiding van die bevindinge is daar n definitiewe behoefte vir meer opleidings geleenthede, wat kan lei tot integrasie van voorkomings beginsels in die praktyk. Opvoedkundige programme behoort te fokus op die epidemiologie van arbeidsverworwe bloed oordraagbare patogene en hulle maniere van oordrag, risiko vir infeksies by die werkplek, met die klem op die toepassing van die beginsels van die Universele Voorsorgmaatreels Beleid asook huidige protokol van aanmeldings prosedures in Kenya.

ACKNOWLEDGEMENTS

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Finally I would like to express my gratitude to our librarians at the Tygerberg Campus Library, of the Stellenbosch University for their assistance.

DEDICATION

This research assignment is dedicated to my husband, Dr. James L. Ngesa, who financed my course; friends and colleagues whose encouragement, support and guidance have made my study for Masters of Nursing possible.

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CHAPTER 1
INTRODUCTION

1.1 Background

Proper handling of blood and body fluids is mandatory in any healthcare institution. Occupational exposure to patients' blood and other body fluids represents a major risk to health-care workers worldwide (Ippolito *et al* 1999; Lymer *et al* 1997; CDC, 1995; Willy *et al* 1990; Gerberding, 1990a). Healthcare workers, nurses included, are constantly at risk of occupational exposure to blood and body fluids. Nurses worldwide have consistently reported higher incidences of occupational exposures particularly needle-stick injuries than other healthcare workers (Ayranci and Kosgeroglu, 2004; Lymer *et al* 1997; Gershon *et al* 1994; Ippolito *et al* 1993; Eisenstein and Smith, 1992) and account for almost 80% of healthcare workers infected occupationally (Ippolito *et al* 1999; Gerberding, 1990b). In some of those studies, nurses reported more than 60% of the total number of exposures of healthcare workers in those hospitals (Ayranci and Kosgeroglu, 2004; Lymer *et al* 1997; Ippolito *et al* 1993; Eisenstein and Smith, 1992).

Percutaneous (skin puncture) and mucocutaneous (splashes) exposure is particularly hazardous for transmission of blood-borne infections (Cutter and Jordan 2004; Beltrami *et al* 2000). Several studies have demonstrated occupational transmission of Human Immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C (HCV) following this kind of exposure (Ippolito *et al* 1999; Knight and Bodsworth, 1998; Ippolito *et al* 1993; Tokars *et al* 1993; CDC, 1992; Henderson *et al* 1990; Gerberding, 1990a). Occupational exposure that may result in transmission of these blood-borne infections include needle-stick and other sharps injuries; direct inoculation of virus into cutaneous scratches, skin lesions, abrasions, or burns and inoculation of virus onto mucosal surfaces of the eyes, nose or mouth through accidental splashes (Beltrami *et al* 2000). In an effort to prevent or minimize such transmissions several recommendations have been made (CDC, 1998a, 1996; OSHA, 1992; CDC, 1988) and adopted in various healthcare facilities worldwide (Ducel *et al* 2002; OSHA, 2001). These

recommendations form part of infection control measures that are continuously being reviewed and incorporated in local, national and international infection control policies (CDC, 2007; Ducel *et al* 2002). Because infection control problems are identified in the course of disease outbreak there is often a need for new recommendations or reinforcement of existing infection control recommendations to protect both the patients and healthcare workers (CDC, 2007). Recently Standard Precautions (CDC, 2007) have been recommended and include a group of infection control practices that apply to all patients, regardless of suspected or confirmed infection status, in any healthcare setting. Standard Precautions (CDC, 1998a, 1996, 1988) combine the major features of Universal Precautions (CDC, 1988) and body substance Isolation (CDC, 2007). It therefore becomes the latest set of infection control guidelines that replace Universal Precautions of 1988. However, the term “Universal Precautions” is used in this document because it reflects the goal of this research study and is the term most familiar to healthcare workers in developing countries (Kermode *et al* 2005). It is still being used by the World Health Organization (WHO) and International Council of Nurses (Kermode *et al* 2005).

Universal blood and body fluid Precautions Policy (Universal Precautions) had been previously recommended (CDC, 1988) and implemented in the United States of America (OSHA, 2001, 1992). Universal blood and body fluid precautions require that all body fluids including blood to be treated as infectious regardless of the source person’s diagnosis (CDC, 1988). Aside from including Universal Precautions (CDC, 1988), Occupational Safety and Health Ad ministrations (OSHA, 2001, 1992) made Universal precautions (CDC, 1998a, 1996, 1988) and other Occupational Safety and Health Administrations (OSHA) recommendations mandatory and fully enforceable in all healthcare settings. Other OSHA recommendations include hepatitis B vaccination, exposure control plan, engineering and work practice controls, sharps and waste disposal, barrier precautions (for example gloves, apron/gowns, masks and eyewear), proper housekeeping and laundry practices, post-exposure evaluation, communicating hazards, and training of staff. It is therefore mandatory to have barrier protection whenever there is potential contact between healthcare worker and non-intact skin, mucous membranes, blood, or other body fluids (Cutter and Jordan, 2004;

Leliopoulou *et al* 1999; Knight and Bodsworth, 1998; Willy *et al* 1990). Although, the use of Universal Precautions is now mandatory for healthcare workers in exposure-prone settings, nurses still need to exercise discretion and nursing judgement in the use of Universal Precautions since it does not apply to body fluids or body substances that do not contain visible blood. Therefore, the nurse must decide what methods of protection to use and when (Ronk and Girard, 1994).

In Kenyan hospitals, healthcare workers are also expected to treat all patients as potentially infectious (Mboloi, 1999; CDC, 1998a, 1996, 1988). Kenyatta National Hospital (KNH) is one of the two national referral, teaching and research hospitals in Kenya. It is an 1800-bed public hospital that has been in existence since 1901. KNH has developed its own guidelines for handling infectious diseases (Mboloi, 1999). Such measures to be taken include proper precautions (that is, correct and appropriate use of protective devices in handling blood, other bodily secretions, and patient care facilities contaminated by those fluids). Gloves must be worn during any procedure or activity in which there is possibility of coming into contact with blood or other potentially infectious body secretions and excrement. Gowns that are full size and made of waterproof material should be used when splashing blood, other body fluids or potentially infectious material is anticipated. Masks and eye shields should also be worn to protect against splashing and spattering (Mboloi, 1999). The KNH policy requires that all contact with blood and body fluids be reported to a supervisor and the infection control nurse, and an incident report filed (Mboloi, 1999). KNH infection control guidelines (Mboloi, 1999) also include hepatitis B vaccination, exposure control plan, engineering and work practice controls, sharps and waste disposal, barrier precautions (for example gloves, apron/gowns, masks and eyewear), proper housekeeping and laundry practices, post-exposure evaluation, communicating hazards, and training of staff. These KNH guidelines seem to be in conformity with the Centres for Disease Control and Prevention (CDC) Universal Precautions Policy guidelines (Ducel *et al* 2002; CDC, 1998a, 1996, 1988) and Occupational Safety and Health Administrations (OSHA, 1992) recommendations.

1.2 Rationale

The researcher observed (in her capacity as Registered Nurse) that despite the Universal Precautions Policy guidelines (CDC, 1998a, 1996, 1988) and KNH infection control guidelines (Mboloi, 1999) guidelines being in place, nurses continued to sustain inoculation injuries and splashes of body fluids such as blood and urine. The researcher has also, during six years experience as a Registered Nurse at KNH, observed inappropriate handling of blood and body fluids. Nurses seem to be aware of the fact that all body fluids including blood should be treated as infectious regardless of the source person's diagnosis, but they fail to put the Universal Precautions Policy (CDC, 1998a, 1996, 1988) and KNH infection control guidelines (Mboloi, 1999) into practice, for example, nurses recap needles before disposing them instead of disposing without recapping it. However, more compliance to KNH guidelines amongst nursing colleagues was noted, when they were attending to patients whose HIV/HBV status was already known. Since inoculation injuries continue to occur amongst nurses despite the presence of KNH guidelines in this hospital, a link between risk perception and compliance may be assumed. Furthermore, based on the literature review undertaken for the study, the types and frequency of occupational exposures in a Kenyan University hospital has not been well documented. Given that there is very little scientific evidence about these observations in this hospital, it became necessary to determine the knowledge of Registered Nurses regarding Universal Precautions Policy guidelines of this hospital, and to assess the management of blood and body fluids by the Registered Nurses of this hospital. It also became important to investigate risk perception among the Registered Nursing staff. Therefore, it was necessary to design a research study that describes the knowledge of, and compliance with, Universal Precautions Policy (CDC, 1998a, 1996, 1988) and KNH infection control guidelines (Mboloi, 1999). However, the questions in the questionnaire for research study did not differentiate between Universal Precautions Policy (CDC, 1998a, 1996, 1988) and KNH infection control guidelines (Mboloi, 1999). Since it was appreciated that infection control practices are continually being reviewed and standard practices changing (Ducel *et al* 2002), it was assumed that Kenyatta National Hospital (KNH) incorporated the latest CDC guidelines (CDC, 1998a, 1996, 1988) recommendations then, in the

development of its Infection control guidelines. It was evident that these KNH guidelines were in conformity with the Centres for Disease Control and Prevention (CDC) Universal Precautions Policy guidelines (CDC, 1998a, 1996, 1988).

1.3 Research problem

Patients' blood and body fluids pose an occupational risk of exposure to blood-borne pathogens to all healthcare workers. Understanding how an exposure occurs and the risk of exposure is critical to both the nurse and other healthcare workers (Twitchell, 2003). Several institutional, national and international recommendations (Ducel *et al* 2002; 1998a, 1996, 1988) have been made on how to handle blood and body fluids in healthcare settings, however occupational exposures continue to occur among the nurse especially at the Kenyatta National Hospital.

In light of the above-mentioned observations and the personal experience of the researcher (see part 1.2), the following research questions arose:

1. What is the knowledge of the Registered Nurses with regard to Universal Precautions Policy (CDC, 1998a, 1996, 1988)?
2. How are blood and body fluids managed in the Kenyatta National Hospital?
3. What are the types and frequency of occupational exposures common amongst the nurses working in the hospital?
4. How do nurses perceive their risk of exposure to blood-borne pathogens?

1.4 Purpose for the research

The purpose of this research study was to explore and describe how the Registered Nurses at the Kenyatta National Hospital manage blood and body fluids; and to examine their perception of risk to occupational exposure. The study was also designed to identify types and frequency of occupational exposures in this category of nurses.

1.5 Objectives

The objectives of the research were to:

1. determine the knowledge of Registered Nurses working at Kenyatta National Hospital regarding the Universal Precautions Policy (CDC, 1998a, 1996, 1988).
2. assess the compliance of Registered Nurses with Universal Precautions (Mboloi, 1999; CDC, 1998a, 1996, 1988) when handling blood and body fluids at the Kenyatta National Hospital.
3. determine the types and frequency of occupational exposures to blood and body fluids among the Registered Nurses in this hospital.
4. determine the perception of the Registered Nurses towards their risk of exposure to blood-pathogens.
5. make recommendations towards the reduction of occupational exposures to blood and body fluids to Kenyan healthcare workers.

1.6 Methodology

An explorative and descriptive approach was used to assess and describe the management of blood and body fluids at Kenyatta National Hospital (Kenya) with regards to Universal Precautions Policy (CDC, 1998a, 1996, 1988) and Kenyatta National Hospital guidelines (Mboloi, 1999). A random sample of 185 Registered Nurses was selected to voluntarily participate in this study. Data was collected by means of self-administered questionnaires (Appendix I) and a checklist (Appendix II) whereby the nursing activities of the subjects was observed and recorded by the researcher. The checklist identified the occurrence and frequency of specified Universal Precaution practices (Appendix II).

1.7 Operational definitions

Universal Precautions Policy refers to a system in which the healthcare worker considers any direct contact with blood or body fluids potentially infectious. Adherence to Universal Precautions was investigated by analyzing individual components of the policy.

Blood and body fluids management is methods by which blood and body fluids are handled and disposed according to Universal Precautions Policy and was assessed by examining individual components of this policy.

Registered Nurses refer to holders of Diploma in nursing, Bachelor of Science in Nursing, and Masters in Nursing or PhD in nursing as recognized by Nursing Council of Kenya.

Inoculation injuries are injuries that involve contaminated sharps puncturing the skin, for example needle-stick and sharp instruments. Inoculation injuries was assessed by asking questions pertaining to frequency of needle-stick injuries sustained in their nursing practice and the circumstances in which the injury occurred.

Risk perception refers to awareness of the healthcare worker to the fact that blood-borne pathogens can be contracted if blood and body fluids of patients are not handled carefully. Risk perception was measured by asking Likert scale questions pertaining to individual susceptibility to blood-borne diseases when exposed to blood and body fluids of infected patients.

Reporting mechanism refers to the procedures of seeking advice or treatment from an emergency room physician, personal physician or any healthcare worker. Awareness of the reporting procedure was analyzed.

Compliance refers to the extent to which healthcare workers follow the rules, regulations, and recommendations of infection control. Compliance was analyzed by examining extent of adherence to Universal Precautions Policy.

Sharps injuries are broadly defined as puncture wounds obtained though contacts with needles, disposable syringes, intravenous catheters, winged steel needle infusion sets, lancets or scalpel blades.

Exposure-prone procedures refers to those procedures in which the worker's gloved hand may be in contact with sharp instruments, needle tips or sharp tissues (for example, spicules of bone or teeth) inside a patient's open body cavity, wound or confined anatomical space where the hands or finger tips may not be completely visible at all times.

1.8 Conceptual framework

Scientific knowledge and clinical practice is the cornerstone of any healthcare practice, particularly nursing practice where the nurse is almost the only professional which cares for a patient in a comprehensive and holistic way. It is also important that the nurse is knowledgeable, competent and adheres to appropriate policies in different clinical practices to both protect her and patients. Blood-borne infections such as HIV, HBV and HCV have become a serious problem worldwide to an extent that institutional, national and international policies and procedures have been promulgated to prevent occupational exposure of healthcare workers worldwide (Ducel *et al* 2002; OSHA, 1992). Therefore, it is essential that all trained nurses understand the principles of Universal Precautions (Ducel *et al* 2002; CDC, 1998a, 1996, 1988) and be able to apply them in everyday practice.

Knowledge of the appropriate policies is acquired through education. It is assumed that effective handling of blood and body fluids depends on the education and nurses' knowledge of Universal Precautions Policy (Ducel *et al* 2002; CDC, 1998a, 1996, 1988). But, knowledge of Universal Precautions Policy alone does not ensure compliance by the nurse. The impact of education in improving compliance with infection control is still unclear (Cutter and Jordan, 2004). Various degrees of success in improving the application of Universal Precautions have been achieved through education although Willy *et al* (1990) found that education was of little benefit unless perception of risk were altered. Healthcare workers have cited of lack of time and interferences with manual dexterity during emergency situations as obstacles to use of protective barriers (Cutter and Jordan, 2004; Le Pont *et al* 2003; Nelsing *et al* 1997; Williams *et al* 1994; McNabb and Keller, 1991).

Contextual factors have also hindered adherence to Universal Precautions guidelines more so in the developing countries. These factors include overcrowding in the wards, shortage of staff and inadequate or inaccessible supplies (Kermode *et al* 2005; Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Ansa *et al* 2002; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997; Adegboye *et al* 1994). Another reason for non-compliance in these regions is inadequate training of the healthcare workers (Nsubuga and Jaakkola, 2005; Gumodoka *et al* 1997).

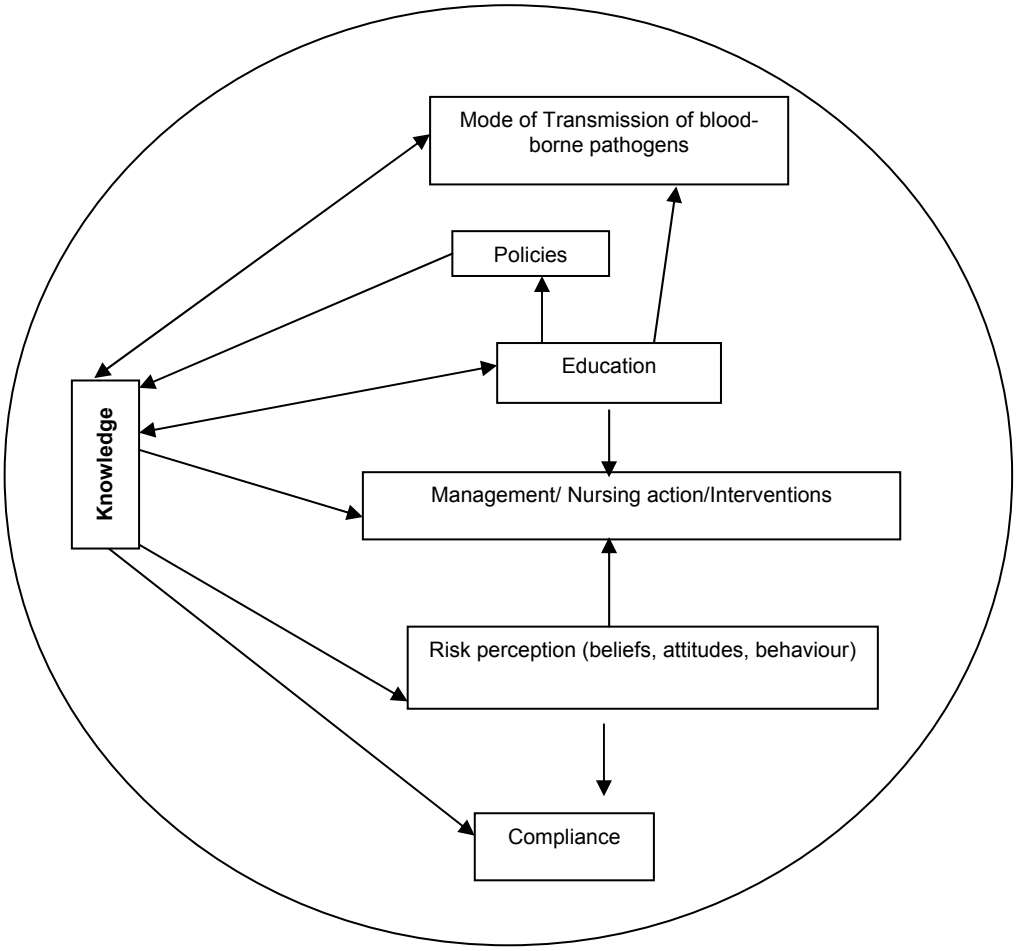

Figure 1-1 A diagrammatic framework showing the relationship between concepts included in this study

This study was based on concepts of Health Belief Model (HBM), which theorizes that one who believes that behaviour will lead to positive outcomes will hold a favourable attitude towards that behaviour (Kretzer and Larson, 1998; Grady *et al* 1993). This modified Health Belief Model (Figure 1-1) comprises the perceived susceptibility to blood-borne pathogens, fatal consequences to occupational exposures and perceived benefits of use of protective barriers. This framework (Figure 1-1) assumes that knowledge of transmission modes of blood-borne pathogens and of Universal Precautions Policy should be able to guide healthcare worker towards safe practices (Grady *et al* 1993). However, increase in knowledge does not always translate to improved practice (Cutter and Jordan, 2004, Roberts, 2000). According to this framework, belief in susceptibility of acquiring these blood-borne pathogens coupled with the belief that protective barriers will provide protection from these infections was expected to motivate healthcare workers to

comply with recommended Universal Precautions Policy practices. Furthermore, perception of the seriousness of the threat posed by these infections will motivate one to focus on effective preventive behaviour, for example effective use of protective barriers. The framework highlights the importance of a continuous process of education. Knowledge gained through education is expected to assist the nurse assess situations in which contact with patients' blood and body fluids is anticipated and to exercise accurate judgement whereby policies are not clear.

1.9 Ethical considerations

A written approval was obtained from Ethics and Research Committees of Stellenbosch University (Republic of South Africa) and Kenyatta National Hospital in Kenya (Appendix IV). Informed consent was sought and obtained from each participating subject (Appendix III).

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

Literature review is a process that involves finding, reading, understanding, and forming conclusions about the published research and theory on a particular topic (Polit and Hungler, 1999). This literature review was conducted using the MEDLINE database on research findings and information related to nursing management of blood and body fluids by Registered Nurses. The search was conducted using a combination of the following key words and phrases: management of blood and body fluids, Universal Precautions Policy, Registered Nurses, inoculation injuries, risk perception, reporting mechanism, compliance, exposure-prone procedures. The data search included articles published between 1983 and 2006, limited to articles written in English language. Literature reviewed also included studies to measure knowledge of Universal Precautions, compliance, types of occupational exposures, risk perception, reporting mechanisms of individual institutions and exposure-prone procedures. This chapter of literature review will be discussed under the following headings: estimated risk of occupational exposures, universal precautions, body fluids to which universal precautions apply, body fluids to which universal precautions do not apply, use of protective barriers, compliance to universal precautions, reporting of inoculation injuries, situation in Africa and other developing countries, Kenyan perspective and conclusion.

2.2 Estimated risk of occupational exposures

Exposure to blood borne pathogens through a contaminated needle-stick or cut with a sharp object is the most common mode of occupational transmission in healthcare settings (Twitchell, 2003; Ippolito *et al* 1999). Occupational exposure also may occur through splash to mucous membranes, such as the eyes, nose and mouth; or through exposure to non-intact skin, such as chapped, abraded, infected, or cut skin (Ippolito *et al* 1999). The risk of infection after such exposures depends on a variety of factors including the type of body substance, route of

exposure, volume of blood or body fluid, severity of exposure, pathogen involved and the degree of viraemia (Twitchell, 2003; Ippolito *et al* 1999; CDC, 1995). The immune status of the healthcare worker at the time of injury; and whether appropriate post-exposure prophylaxis (PEP) was used are also factors in determining the risk of infection (CDC, 1998b). Several studies have demonstrated occupational transmission of HIV, HBV and HCV following this kind of exposure (Ippolito *et al* 1999; Shapiro, 1995; Ippolito *et al* 1993; Tokars *et al* 1993; CDC, 1992; Henderson *et al* 1990; Gerberding, 1990a).

Prospective studies indicate that the estimated risk for HIV infection after percutaneous exposure to HIV-infected blood ranges between 0.3% to 0.4% (Twitchell, 2003; Beltrami *et al* 2000; Tokars *et al* 1993; Willy *et al* 1990; Henderson *et al* 1990) and between 0.03% and 0.09% for mucocutaneous exposure (Cutter and Jordan, 2004; Twitchell, 2003; Beltrami *et al* 2000). The estimated risk of acquiring hepatitis-B related illness following percutaneous exposure ranges between 3.5% and 37% (Twitchell, 2003; Watson *et al* 1997; Gerberding, 1990a; Willy *et al* 1990). Several studies have attempted to determine the probable risk of HCV transmission in healthcare workers and found variable rates of transmission ranging from 0% to 7% (CDC, 1998b; Neal *et al* 1997; Puro *et al* 1995; Petrosillo *et al* 1994; Jadoul, 1994).

Strategies to reduce risk of transmission of HIV, HBV and other blood-borne pathogens between healthcare workers and patients have been adopted and evaluated (Cutter and Jordan, 2003; Roberts, 2000; CDC, 1992) yet occupational exposure still continue to occur (Beltrami *et al* 2000). With the emergence of HIV pandemic the need to step up protection of healthcare worker has increased. Prevention programmes should include everything necessary and available to eliminate needle-stick injuries, including new equipment, training in use of this equipment and safe disposal system (Ducel *et al* 2002; Mboloi, 1999; CDC, 1998a, 1996; Gerberding, 1990a). Such programmes should also include time spent helping employees break bad habits, such as the very common and dangerous practice of recapping used needles (Ducel *et al* 2002; CDC, 1998a, 1996; Mboloi, 1999; Gerberding, 1990a). The World Health Organisation (WHO) has outlined the requirements for development and adoption of infection control

policies at institutional, national and international levels (Ducel *et al* 2002). Kenyatta National Hospital has developed its institutional infection control policy (Mboloi, 1999) that, according to the researcher, has met these WHO requirements (Ducel *et al* 2002). However, it is not clear whether the uptake of this KNH infection control guidelines has been evaluated in any research study.

2.3 Universal precautions

In 1983, the Centre for Disease Control (CDC) made recommendations that included precautions to be taken when handling patients who were known or suspected to be infected with blood-borne pathogens (CDC, 1983). In 1987, the CDC made it mandatory that precautions be consistently used for all patients regardless of their blood-borne infection status. The extension of blood and body fluid precautions to all patients was previously referred to as “Universal Blood and Body Fluid Precautions” or “Universal Precautions” (CDC, 1988) but has since been replaced with the term “Standard Precautions” (CDC 2007). Under Universal Precautions, blood and certain body fluids of all patients are considered potentially infectious for HIV, HBV, and other blood-borne pathogens (CDC, 1988). In 1988 the CDC updated and clarified the guidelines for Universal Precautions for prevention of transmission of HIV, HBV and other blood-borne pathogens in healthcare settings (CDC, 1988). The Occupational Safety and Health Administrations (OSHA) implemented the Universal Precautions in the United States of America (OSHA, 1992) and were reviewed to be enforceable in all the states (OSHA, 2001). The purpose of the Universal Precautions is to decrease the risk of transmission of blood-borne pathogens, specifically HIV, HBV and HCV infections (Ducel *et al* 2002; CDC, 1998a, 1996; Ramsey *et al* 1996). Universal Precautions are intended to prevent parenteral, mucous membrane, and non-intact skin exposures of healthcare workers to blood-borne pathogens (CDC, 1988). Immunization with HBV vaccine is also recommended as an important adjunct to Universal Precautions for healthcare workers who have exposures to blood (Ducel *et al* 2002; CDC, 1998a, 1996). It is worth noting that the term “Universal Precautions” has since been replaced with the term “Standard Precautions” (CDC, 2007). However, for the purposes of this assignment the researcher shall consistently use the term “Universal Precautions” in order to

reflect the objectives of this research study and be able to compare the findings with previous literature. But for any future research reports and publications from this research work the term “Standard Precautions” would be adopted.

Most recent studies have reported that the number of people infected with HIV/HBV viruses has increased, especially in developing countries (Le Pont *et al* 2003; Memish *et al* 2002; Ansa *et al* 2002; Sagoe-Moses *et al* 2001; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997). In most cases serological status of the individuals is unknown because they are asymptomatic. This implies that healthcare professionals are increasingly caring for people who may be infected but remain undiagnosed. Therefore, professionals have an obligation to themselves as well as to their patients to practise safely, which can only be achieved if all patients are regarded as potentially infected with HIV and/or other blood-borne pathogens.

According to Universal blood and body fluid precautions (CDC, 1998a, 1996, OSHA, 1992; CDC, 1988) it is mandatory to have barrier protection whenever there is potential contact between healthcare worker and non-intact skin, mucous membranes, blood, or other body fluids. Universal Precautions include the use of appropriate barrier protection, such as gloves, waterproof gown/apron, eye protection and mask, for all patients whenever contact with blood or other body fluids is anticipated (Cutter and Jordan, 2004; Henry *et al* 1994). Although, the use of Universal Precautions is now mandatory for healthcare workers in exposure-prone settings, nurses still need to exercise discretion and nursing judgement in the use of Universal Precautions (CDC, 1998a, 1996; OSHA, 1992; CDC, 1988). Therefore, the nurse must decide what methods of protection to use and when (Ronk and Girard, 1994). Registered Nurses must have knowledge of Universal Precautions Policy and measures to be taken when accidental exposure to blood and other body fluids occur.

Educational programmes should be provided by the employer and repeated annually for every employee who might be exposed (Ducel *et al* 2002; OSHA, 2001, 1992; Mboloi, 1999; CDC, 1998a, 1996). Training must include an explanation of the epidemiology of blood-borne diseases and their modes of transmission, the employer’s exposure control plan, the actions to be taken in

emergency situations and the procedures for post evaluation and follow-up. The programme also has to cover methods to reduce exposure, types of protective equipment and the basis for selecting them. Employees have to be informed about the benefits of vaccination. These policies are also applicable in the African healthcare institutions, more so because these blood-borne infections (HIV, HBV, and HCV) are more prevalent in the developing countries as compared to the developed world (Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Memish *et al* 2002; Ansa *et al* 2002; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997; Adegboye *et al* 1994). Literature search indicated that most African healthcare institutions have policies concerning precautions to prevent transmission of these blood-borne infections (Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Ansa *et al* 2002; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997; Adegboye *et al* 1994). However, contextual factors have hindered adherence to Universal Precautions guidelines in these developing countries. These factors include overcrowding in the wards, shortage of staff and inadequate or inaccessible supplies (Kermode *et al* 2005; Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Ansa *et al* 2002; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997; Adegboye *et al* 1994). Inadequate training was cited as a reason for non-compliance in two of those studies (Nsubuga and Jaakkola, 2005; Gumodoka *et al* 1997), while only one study cited lack of time during emergency situations as obstacle to use of barrier protection (Le Pont *et al* 2003).

2.4 Body fluids to which Universal Precautions apply

Universal Precautions apply to blood and other body fluids whether they contain visible blood (CDC, 1988), or not (CDC, 1998a, 1996). Universal Precautions apply to semen and vaginal secretions (CDC, 1988). Semen and vaginal secretions have been implicated in the sexual transmission of HIV and HBV but not in occupational transmission from patient to healthcare worker (CDC, 1988). However, this observation is not unexpected, since exposure to semen in the usual healthcare setting is limited, and the routine practice of wearing gloves for performing vaginal examinations protects the healthcare workers from exposure to potentially infectious vaginal secretions (CDC, 1988). Universal Precautions also apply to tissues and to the following fluids: cerebro-spinal fluid (CSF), synovial

fluid, pleural fluid, peritoneal fluid, pericardial fluid and amniotic fluid. Studies are yet to be done to prove the risk of transmission from these fluids. Epidemiological studies in the healthcare and community settings are currently inadequate to assess the potential risk of these fluids to healthcare worker from occupational exposure to them (CDC, 1988). However, HIV has been isolated from cerebro-spinal, synovial, and amniotic fluids. Hepatitis B Antigens (HbsAg) has been detected in synovial, amniotic, and peritoneal fluids (CDC, 1988). Whereas aseptic procedure used to obtain these fluids for diagnostic or therapeutic purposes protect healthcare workers from skin exposures, they cannot prevent penetrating injuries from occurring (CDC, 1988). Penetrating injuries from contaminated needles or other sharp instruments are the greatest risk of occupational transmission of blood-borne pathogens (Beltrami *et al* 2000). Therefore, changes are required in techniques and/or use of safety devices (Beltrami *et al* 2000).

2.5 Body fluids to which Universal Precautions do not apply

According to Centres for Disease Control (CDC, 1988) Universal Precautions do not apply to faeces, nasal secretions, sputum, sweat, tears, urine, and vomitus unless they contain visible blood. The risk of transmission of HIV and HBV from these fluids and materials is extremely low or nonexistent. HIV has been isolated and HbsAg has been demonstrated in some of these fluids; however, epidemiological studies in the healthcare and community settings have not implicated these fluids or materials in the transmission of HIV and HBV infections (CDC, 1988). Human breast milk has been implicated in peri-natal transmission of HIV and HBV infections but not occupational exposure to healthcare workers, since the healthcare worker will not have the same intensive exposure as the nursing neonate (CDC, 1988). However, even if Universal Precautions do not apply to human breast milk, gloves may be worn by healthcare worker in situations where exposure to breast milk might be frequent, for example, in milk banking (CDC, 1988). Universal Precautions do not apply to saliva. General infection control practices, which include use of gloves for digital examination of mucous membranes and endo-tracheal suctioning and hand washing after exposure to saliva should further minimize the minute risk for salivary transmission of HIV and

HBV infections. Gloves need not be worn when feeding patients and when wiping saliva (CDC, 1988).

2.6 Use of protective barriers

Protective barriers recommended in Universal Precautions Policy include gloves, waterproof gown/apron, eye protection and mask (Ducel *et al* 2002; CDC, 1998a, 1996; CDC, 1987). Protective barriers reduce the risk of exposure of the healthcare worker's skin or mucous membranes to potentially infective materials (Ducel *et al* 2002; CDC, 1998a, 1996; Marcus *et al* 1993; Fahey *et al* 1991; CDC, 1988). Gloves reduce the incidence of contamination of hand but cannot prevent penetrating injuries caused by needles or other sharp instruments; whereas masks and protective eyewear or face shield reduce the incidence of contamination of mucous membrane of the mouth, nose and eyes (CDC, 1988). Universal Precautions are meant to supplement rather than replace recommendations on the general infection control measures, such as hand washing and using gloves to prevent microbial contaminations of hands (Ducel *et al* 2002; CDC, 1998a, 1996, 1988).

Other recommended measures (Ducel *et al* 2002; CDC, 1998a, 1996, 1988) to reduce the risk of occupational transmission of HIV, HBV, and other blood-borne pathogens to healthcare workers include:

a) Taking care to prevent sharps injuries when:

   i. using needles, scalpels, and other sharp instruments or devices;
   ii. handling sharp instruments after procedures;
   iii. cleaning used instruments; and
   iv. disposing used needles.

b) Not recapping needles by hand; avoiding removing needles from disposable syringes by hand; avoiding bending, breaking, or manipulating used needles by hand.
c) Placing used disposable syringes and needles, scalpels blades, and other sharp items in puncture-resistant containers for disposal.
d) Placing the puncture-resistant containers close to working area as possible.

2.7 Compliance to Universal Precautions

Compliance is the degree to which a person adheres to advice, guidelines or policies (Lymer *et al* 2004; Kretzer and Larson, 1998). Despite efforts of healthcare agencies in educating and supporting healthcare workers in the use of Universal Precautions, studies have consistently demonstrated evidence of substandard compliance among all healthcare professionals including nurses (Cutter and Jordan, 2004; Ramsey *et al* 1996; Larson and Kretzer, 1995; Henry *et al* 1994; Williams *et al* 1994; Hersey and Martin, 1994). These studies have looked at the way professionals protect themselves from contamination risk and inoculation injuries, and their results highlighted the problem of non-compliance. However, some studies have reported significant compliance among healthcare workers offering care to Acquired Immunodeficiency Syndrome (AIDS) patients or patients suspected to be infected with HIV or HBV infections (Ronk and Girard, 1994; Henry *et al* 1994). Healthcare workers acknowledge the rationale behind the Universal Precautions Policy (Ducel *et al* 2002; CDC, 1998a, 1996, 1988), but fail to put them into practice suggesting a link between risk perception and compliance (Cutter and Jordan, 2004; Leliopoulou *et al* 1999; Gershon *et al* 1994; Ronk and Girard, 1994). Furthermore, accidental exposures continue to occur and the number of occupationally acquired HIV infection is increasing despite use of CDC guidelines especially in the developing countries (Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Ansa *et al* 2002; Ippolito *et al* 1999; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997; Adegboye *et al* 1994). Healthcare workers have cited various reasons for non-compliance with hand washing and use of barrier precautions which include the following: inaccessible hand washing supplies, irritating hand washing agents, lack of knowledge of protocols, forgetting the protocol, or insufficient time to implement the protocol, inadequate or inaccessible supplies, contact with few high risk patients, interference with provider-patient relationships, altered tactile sensation and restriction of movement (Lymer *et al* 2004; Kretzer and Larson, 1998; Larson and Kretzer, 1995; Williams *et al* 1994; Henry *et al* 1994). Compliance was also found to be associated with certain socio-demographic and attitudinal factors, such as profession, type of clinical setting, and geographic location (Kretzer and Larson, 1998; Gershon *et al* 1994). However, it has not been established whether these factors also apply in Kenyatta

National Hospital (KNH), since no research study has been undertaken to evaluate compliance with KNH infection control guidelines.

The impact of education in improving compliance with infection control is unclear (Cutter and Jordan 2004). Various degrees of success in improving the uptake of Universal Precautions have been achieved through education although Willy *et al* (1990) found that education was of little benefit unless perception of risk was altered. Perception of risk has been found to have an effect on compliance with Universal Precaution guidelines. For example, in two studies done by Gershon *et al* (1994), and Willy *et al* (1990), healthcare workers who perceived their risk as low were less likely to practise Universal Precautions.

Contextual factors have also hindered practice of Universal Precautions more so in developing countries. These factors include overcrowding in the wards, shortage of staff and inadequate or inaccessible supplies (Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Ansa *et al* 2002; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997; Adegboye *et al* 1994). Inadequate training was cited as a reason for non-compliance in two of those studies (Nsubuga and Jaakkola, 2005; Gumodoka *et al* 1997), while only one study cited lack of time during emergency situations as obstacle to use of barrier protection (Le Pont *et al* 2003).

2.8 Reporting of inoculation injuries

Most studies have found that the frequency of inoculation injuries amongst healthcare workers is higher than the actual number that is reported (Nsubuga and Jaakkola, 2005; Ayranci and Kosgeroglu, 2004; Cutter and Jordan, 2004; Cutter and Jordan, 2003; Memish *et al* 2002; Beltrami *et al* 2000; Haiduven *et al* 1999; Knight and Bodsworth, 1998; Burke and Madan, 1997; Mangione *et al* 1991; Hamory, 1983). The results of these studies suggest that underreporting of accidental exposures is very common. The number of healthcare workers with occupationally acquired infections is probably greater than the totals presented because not all healthcare workers are evaluated for these infections following exposures (Ayranci and Kosgeroglu, 2004; CDC, 1995; 1992; Harmony, 1983). Moreover, not all healthcare workers with occupationally acquired infections are reported (Ayranci and Kosgeroglu, 2004). Reasons for underreporting include a

belief that the exposure does not constitute a risk or that nothing much could be done about the exposure, ignorance of the reporting procedure or time constraints involved in the reporting procedure and concern for confidentiality (Ayranci and Kosgeroglu, 2004; Memish *et al* 2002; Haiduven *et al* 1999; Knight and Bodsworth, 1998; Burke and Madan, 1997; Mangione *et al* 1991).

It is important to detect underreporting because it leads to an underestimation of the overall occupational risk of acquiring HIV and other blood-borne pathogens. Failure to report inoculation injuries according to local and national protocols indicates a disregard for personal safety, management policy and national guidelines (Cutter and Jordan, 2003). Furthermore, appropriate post-exposure medical care cannot be provided unless exposures are reported in a timely manner (Cutter and Jordan, 2004; Moran, 2000; Mangione *et al* 1991). Prompt administration of immunoglobulin and vaccine reduces HBV transmission; and antiretroviral drugs reduce the risk of acquiring HIV (Cutter and Jordan, 2003). Reporting may increase if it is perceived that there is more benefit than harm to be derived from reporting potential exposures to HIV infection. Education on risks of injuries may improve the problem of staff not perceiving the exposure as a risk or feeling too busy to report injuries (Ayranci and Kosgeroglu, 2004; Mangione *et al* 1991). For frequency of reporting to increase, hospitals must design reporting procedures that ensure confidentiality and efficiency (Ducel *et al* 2002; Burke and Madan, 1997; Mangione *et al* 1991). All health workers handling blood products should attend annual infection control seminars that review Universal Precautions and the current mechanisms for reporting percutaneous exposures (Ayranci and Kosgeroglu, 2004; Lymer *et al* 2004; Moran, 2000; Mangione *et al* 1991). Accurate reporting of occupational exposures will lead to good management of these exposures (Moran, 2000). For example, PEP is likely to more effective when started early.

2.9 Situation in Africa and other developing countries

The healthcare workers in developing countries are at more risk of occupational exposure to blood-borne pathogens (HIV, HBV and HCV) compared to their colleagues in developed countries due to the high prevalence of these blood-borne pathogens in these developing countries (Kermode *et al* 2005; Le Pont *et al*

2003; Memish *et al* 2002; Ansa *et al* 2002; Sagoe-Moses *et al* 2001; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997). It is estimated that more than 23 million people are HIV infected in Africa (Newsom and Kiwanuka, 2002) and that the number is increasing considerably (Ansa *et al* 2002). Sub-Saharan Africa is the worst affected region by the HIV/AIDS pandemic with an estimate of 70% of the world's population of HIV-positive persons (UNAIDS, 2002) meaning that provision of medical care to sero-positive patients is a major activity to many healthcare workers in this region (Ansa *et al* 2002; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997). Therefore, the large numbers of HIV-infected individuals have increased anxiety surrounding needle-stick injuries in Africa (Newsom and Kiwanuka, 2002; Gilks and Wilkinson, 1998). Furthermore, protective equipments are often lacking, so occurrence of exposure-prone incidences is much more likely to be common. Insufficiency of protective equipment, inadequate use of hygienic measures as well inadequate training are thus likely to increase the risk of HIV and hepatitis B infection to the healthcare worker (Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Ansa *et al* 2002; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997; Adegboye *et al* 1994).

Although the prevalence of blood-borne pathogens in many developing countries is high, documentation of infections caused by occupational exposure in these countries is scarce (Ansa *et al* 2002; Sagoe-Moses *et al* 2001; Khuri-Bulos *et al* 1997). Since reporting of such exposures is not taken seriously (Le Pont *et al* 2003; Memish *et al* 2002; Ansa *et al* 2002), availability of data on these occupational exposures is also scarce. For example, in Burundi, a country with very high rate of HIV and HCV sero-prevalence, Le Pont *et al* (2003) established that reporting of occupational exposure is not mandatory and exposed workers are not followed up.

2.10 Kenyan perspective

Kenya occupies part of the sub-Saharan Africa where HIV/AIDS is most prevalent. Recent statistics on HIV estimate that 1.3 million Kenyans (UNAIDS, 2007) are infected. In Kenyan Hospitals, healthcare workers are also expected to treat all patients as potentially infectious. Kenyatta National Hospital (KNH) is one of the two national referral, teaching and research hospitals in Kenya. KNH has

developed its own guidelines for handling infectious diseases (Mboloi, 1999). The measures to be taken include proper precautions such as correct and appropriate use of protective devices in handling blood; other bodily secretions and patient care facilities contaminated by those fluids. Gloves must be worn during any procedure or activity in which there is possibility of coming into contact with blood or other potentially infectious body secretions and excrement. Gowns that are full size and made of waterproof material should be used when splashing blood, other body fluids or potentially infectious material is anticipated. Masks and eye-shields should also be worn to protect against splashing and spattering (Mboloi, 1999). These KNH guidelines seem to be in conformity with the Centres for Disease Control and Prevention (CDC) Universal Precautions Policy guidelines (Ducel *et al* 2002; CDC 1998a, 1996, 1988) and Occupational Safety and Health Administrations (OSHA, 2001, 1992) recommendations.

The hospital has an infection control department headed by a medical doctor. The department has nurse co-ordinators in the different units to oversee that infection control guidelines are observed. The department has been conducting continuous medical education seminars for its staff to enhance uptake of Universal Precaution Policy. The department conducts a two-day awareness seminar every month for all its healthcare workers, and certificates are awarded for attendance of the seminars. During the seminars the healthcare workers are grouped together according to occupational groups during the teaching sessions. For example doctors, nurses, laboratory personnel and so on are respectively grouped together so that explanation of terminology is simplified for easier understanding depending on the group being educated. The training includes prevention and management of needles-stick injuries in the work place. The infection control department also organize lectures to students who are in attendance of post basic diploma courses such as Intensive care, neonatal nursing and renal nursing courses. Measures that have been taken to protect the healthcare worker include immunization against Hepatitis B. A procedure of reporting accidental exposure is in place, including post exposure prophylaxis. Post exposure prophylaxis awareness is emphasized. The infection control department puts emphasis on prompt reporting and treatment with post exposure prophylactic medication following inoculation injuries.

2.11 Conclusion

This literature review revealed very few published studies on occupational exposure to blood-borne pathogens, especially on needle-stick injuries from Africa and other developing countries (Sadoh *et al* 2006; Nsubuga and Jaakkola, 2005; Ansa *et al* 2002; Memish *et al* 2002; Gumodoka *et al* 1997; Adegboye *et al* 1994). Most of the research in this area has been conducted in the United States, Europe and other developed countries. Furthermore, the body of research on nurses' protective behaviours with respect to transmission of blood-borne pathogens is limited because studies have only focused on needle-stick injuries and included other healthcare providers. Based on the literature review undertaken for this study, only one study specifically addressed needle-stick injuries among nurses in sub-Saharan Africa (Nsubuga and Jaakkola, 2005). No such study has been reported in Kenya and this provided a justification for this study. Many studies have demonstrated evidence of substandard compliance among all healthcare workers including nurses (Cutter and Jordan, 2004; Ramsey *et al* 1996; Larson and Kretzer, 1995; Williams *et al* 1994; Hersey and Martin, 1994). For instance, the practice of needle recapping is still common. The impact of education in improving compliance is not clear. Occupational exposures continue to occur despite adoption of Universal Precautions Policy. Most studies have also revealed evidence of underreporting both in the developed and developing countries. There is wide spread underreporting especially in the developing countries since reporting of exposures is not taken seriously. Therefore, documentation of infections caused by occupational exposure in these countries is also scarce.

The literature review findings identified research studies that have been reported on occupational exposure to blood-borne pathogens. These findings guided the researcher to focus on, and refine the planned research study; to highlight the concepts that were addressed in this study; and to develop the appropriate conceptual framework of this study. This literature review enabled the researcher identify the appropriate study design; devise data collection instruments; and methods to execute the data analysis. It guided the researcher in interpreting the findings of this present research study; to compare them with findings of previous research studies; and to draw conclusions about the meanings and implications of the present study.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction of methodology

The description of the research methodology forms the core of any research project (De Vos, 1998). The research methodology of this present study is discussed under the following headings:

- Research design
- Population and sampling
- Data collection
- Limitations
- Conclusion

3.2 Research design

For the purpose of this research, a non-experimental, explorative and descriptive design was used by means of self administered questionnaire and direct observation to assess and describe the management of blood and body fluids at Kenyatta (KNH) National Hospital, with regards to Universal Precautions Policy (CDC, 1998a, 1996, 1988) and KNH infection control guidelines (Mboloi, 1999). The study was primarily quantitative, based on the data obtained from questionnaires and observations. According to Burns and Grove (2001) descriptive studies are designed to gain more information about characteristics within a particular field of study. In this study, the researcher sought to determine the knowledge of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) and perception towards risk of occupational exposures among the Registered Nurses at the Kenyatta National Hospital. The researcher also sought to assess the management of blood and body fluids, and determine the types and frequency of occupational exposures to blood and body fluids at this hospital over a period of 15th May and 15th July 2006. Preferably, the study should have been conducted over a longer period but time and financial constraints limited the researcher to a period of 2 months.

3.3 Population and sampling

A description of the population and sampling techniques is essential for any research study and reflects the scientific nature of the research study (De Vos 1998).

3.3.1 Population

The population implies all elements (individuals, objects, events, or substance) that met the criteria of the sample for inclusion in a study (Burns and Grove, 2001). The population in this research study consisted of all the Registered Nurses working in Kenyatta National Hospital except those working in the outpatient departments. The Registered Nurses working in outpatient departments were excluded because these departments rarely have procedures that predispose healthcare worker to contact with blood or other body fluids of patients. However, those Registered Nurses working in accident and emergency department were included in the study.

3.3.2 Sampling

The population of Registered Nurses working at the Kenyatta National Hospital is 700. According to Stoker in De Vos (1998) the sample size must be 25% of the total population (that is, 175 Registered Nurses). Since the researcher was not sure of getting 100% response rate, sample size was increased to 185 Registered Nurses (De Vos 1998). A modified random sampling technique was used to select individuals to participate in the study. A list of all the Registered Nurses working in each unit or ward with exposure-prone nursing procedures of Kenyatta National Hospital was obtained. Nursing staff who were in general administrative positions, outpatient departments as well as those who were on leave (annual, sick or study leave) during the study period were excluded from the list. Those who declined to participate in the study were also excluded. All nurses who were working between 15th May and 15th July 2006 and agreed to participate in the study were recruited after giving informed consent. From the list of names obtained, if an individual was not available or declined to participate in the study, the next nurse on the list was chosen till the desired number was obtained in each of the units.

3.4 Data collection

3.4.1 Instrumentation

Instrumentation is the application of specific rules to develop a measurement device or instrument (Burns and Grove, 2001). The instrument was designed based on the research questions and objectives set in chapter one and also based on extensive literature study carried out relating to knowledge of Universal Precautions Policy, perception towards risk of occupational exposures amongst the Registered Nurses, management of blood and body fluids, and types and frequency of occupational exposures to blood and body fluids.

The following instruments were developed and used:

1. A self-administered questionnaire (Appendix I) to determine Registered Nurses' knowledge of the Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) and their perception regarding their risk of exposure to blood-borne pathogens. The questionnaire also sought to determine types and frequency of occupational exposures to blood and body fluids. The questionnaire included both closed-and open-ended questions.

The self-administered questionnaire (Appendix I) is divided into three sections:

- Question 1-4: demographic information (gender, nursing education/qualifications, years of experience and working area). The demographic information was essential for describing the sample and determining the population for generalization of the findings.
- Question 5-18: sought Knowledge of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988). Respondents were asked to briefly describe what Universal Precautions Policy entailed. The respondents were required to indicate the transmission routes of HIV, HBV and HCV infections and how often they had contact with patients having the above infections. The questionnaire sought information on adherence to Universal Precautions (Mboloi, 1999; CDC, 1998a, 1996, 1988) practices (that is, use of gloves, protective eyewear, hand-washing behaviour and needle recapping practice). Respondents were asked if they change personal protection habits when aware of patients' blood-borne viral status. The

questionnaire sought information on the frequency of percutaneous and mucocutaneous exposures experienced and the circumstances surrounding the exposures. Those respondents who had experienced percutaneous and mucocutaneous exposures were asked whether they had reported. If respondents had not reported they were requested to give reasons for not reporting. Respondents were required to describe their institution's post-exposure reporting procedure.

- Question 19-24: sought information about perception of risk of occupational exposure to blood-borne pathogens. The questionnaire sought to establish respondents' knowledge of the likelihood of contracting HIV, HBV and HCV infections following needle-stick injury contaminated with these infections. The questionnaire sought to establish respondents' perception about; (1) risk of contracting HIV, HBV and HCV infections through exposure to blood and body fluids of patients and (2) personal risk of contracting HIV, HBV and HCV infections in their place of work. Respondents were asked whether they perceived Universal Precautions as necessary.

2. A checklist (Appendix II) to assess the management of blood and body fluid by the Registered Nurses. This checklist was formatted with a list of Universal Precaution Practices that were observed and recorded by the researcher. When a procedure was observed a mark was placed beside the appropriate practice in the Yes/No column to designate whether the practice was performed or not. The checklist identified the occurrence and frequency of specified Universal Precaution Practices.

3.4.2 Pilot study

The pilot study is a smaller version of a proposed study conducted to develop or refine the methodology, such as treatment, instrument or data collection process (Burns and Grove, 2001). A pilot study was carried out before the actual research study was done to determine possible problems or shortcomings in the methodological approach and instruments. Ten questionnaires were piloted with 10 randomly selected Registered Nurses. The results of the pilot study were used to modify the final draft of the questionnaire. For example, one question was restructured, while the word "motivate" was replaced with the word "justify" to give

clarity. The results of the pilot study were also used to test the proposed data analysis methods. Nurses included in the pilot study were excluded from the main study sample.

3.4.3 Validity and reliability

Validity refers to the degree to which an instrument (for example, a questionnaire) actually measures the theoretical construct it purports to measure (Burns and Grove, 2001; Polit and Hungler, 1999). Reliability of an instrument (for example, checklist) refers to the degree of consistency or accuracy with which it measures the attribute under investigation (Burns and Grove, 2001; Polit and Hungler, 1999). For this research study, content validity was enhanced by reviewing previous research articles with similar conceptual framework; and including as many questions that contain relevant aspects of Universal Precautions (CDC, 1998a, 1996, 1988) and Kenyatta National Hospital infection control guidelines (Mboloi, 1999). The researcher consulted an expert with knowledge of instrument development. The researcher also consulted two experts working in the infection control department of Kenyatta National hospital. They evaluated each item on the instruments (questionnaire and checklist) in relation to variables that were to be examined and concurred with the researcher that the items in this research instrument were relevant. This ensured a certain degree of content validity. In view of the objectives of this study no distinction was made between the Registered Nurses with a degree or diploma background because their training is regulated by one authority. It is therefore assumed that all Registered Nurses are likely to be representative of the nursing staff population at the Kenyatta National hospital. Content validity of this research was therefore judged before data collection.

The pilot study was to assess, the feasibility of this study, adequacy of the questionnaire, and problems of data collection strategies and the proposed methods. It was done, prior to the actual data collection, to ensure validity and reliability of the data collection instruments. The questionnaire was answered anonymously so that participants could answer without fear of being linked to their responses. In this way the researcher assumed that threats to validity were minimized. Detailed field notes were kept on observations made, events and factors relating to context of data collected. During collection of observational data,

the researcher made sure her intentions were unknown to the nurses in order to avoid Hawthorne's effect (change of behaviour which could result if nurses were aware of being observed) (Burns and Grove 2001). Respondents taking part in the pilot study were excluded from the final study. There was risk of bias since some respondents were known to the researcher. Hence, questionnaire was the most feasible method to obtain data. The respondents were assured that the information given was to be kept confidential and was not to be used for any performance evaluation. They were also assured that the result of the study was to contribute towards improving the uptake of Universal Precaution guidelines for handling blood and body fluids, and thus may reduce the incidences of accidental exposures among them in future.

According to Chan *et al* (2002) nurses' knowledge of, and compliance with universal precautions had a good internal consistency, with a Cronbach's alpha of 0.72 while in this study, the overall Cronbach's alpha coefficient was 0.58 and is considered slightly less reliable than Cronbach's alpha coefficient of at least 0.7 that normally reflects a good reliability of a scale (Pallant, 2003). Questions in the questionnaire of this study had less than 10 items in the scale and therefore gave smaller Cronbach's alpha coefficient (Pallant, 2003).

3.4.4 Data gathering

The researcher was the primary data collector and handed out the questionnaires (Appendix I) herself. She was also available for any problems that arose during filling in of the questionnaires. She administered the checklist (Appendix II) herself. Data collection was done over a period of two months. Data was collected by means of self-administered questionnaires (Appendix I) and a checklist (Appendix II) whereby the nursing activities of the subjects were observed and recorded by the researcher. The checklist identified the occurrence and frequency of specified Universal Precaution practices (Appendix II). A letter (briefly and clearly explaining the study) and consent form (Appendix III) was distributed by the researcher to 185 randomly selected subjects. Once the informed consent was obtained, the questionnaire was given out and the subjects were requested to answer the questions honestly and appropriately. In each of the units where questionnaires were distributed, the participants willing to fill out questionnaires immediately did

so and returned them to the researcher. Others filled the questionnaires and left them with the respective Nurse in charge of their Ward since it was much easier to collect from one individual when filled in the researcher's absence. Since the questionnaires were coded and given out by the researcher herself it was possible to track down the participant in case of missing or inconsistent data. Observational data was also collected using a checklist to assess the compliance with Universal Precautions during procedures whereby contact with or splashing of blood and body fluids was anticipated. Precautions observed included use of appropriate protective barrier devices such as gloves, waterproof gown/apron, and use of protective eyewear. The practice of needle recapping and hand-washing before and after each procedure was also observed among the Registered Nurses in their respective workstations. The Registered Nurses were observed while performing procedures whereby either cutaneous or splashing of blood and other body fluids was anticipated. Procedures were categorized into those which mucocutaneous exposure to (1) blood and (2) other body fluids was anticipated. The length of a single observation period ranged from 10 minutes to one hour depending on the nature and length of the procedure. Participants were not aware that they were being observed and total number of observations done was 100.

3.4.5 Ethical considerations

A written request for permission together with this research proposal was presented to the Ethics and Research Committee of Kenyatta National Hospital, Nairobi. Informed consent (Appendix III) was sought from each subject after clearly explaining the nature of the study to the subject. Each questionnaire was coded and the subjects' names did not appear on the questionnaires for the purpose of anonymity and confidentiality. The subjects were free to withdraw from the study at any time. They were assured that the results of the study were not to be used for any performance evaluation. The subjects were also informed that they were not going to be remunerated.

It was anticipated that questions about occupational exposures could have evoked distress in respondents who were HIV-positive due to occupational exposure. Nevertheless, none of the participants displayed any distress. In case this had

happened, the data collection process would have been terminated and the affected individual would have been offered appropriate psychological support.

3.4.6 Data analysis

Data analysis was done by use of computer software package, Statistical Package for Social Sciences (SPSS) version 11.0 with the help of a statistician. For the closed-ended questions the variables (gender, educational qualification, length of practice, working area) were assigned numbers. For example, for the variable "gender", sex was coded 1=males, 2=females, therefore a score other than 1 or 2 was an error. For open-ended questions content analysis data was undertaken. Data was synthesized and reduced into conceptual categories - that is, themes sharing similar meanings (Burns and Grove, 2001; Polit and Hungler, 1999). These conceptual categories were then entered into the codebook and each category was assigned a number. Open-ended responses of each question were assigned to those conceptual categories. All the variables in the questionnaire were listed in the codebook. Non-responses were coded "0" and Not applicable (N/A) "88"; this was uniform for all the variables. The codebook was used to enter the data into Microsoft Excel program and then imported into SPSS version 11.0 for analysis. Descriptive statistics was obtained by running frequencies. Tables, graphs, and percentages are used in this study to explain the results. For data analysis the checklist consisted of all the findings from the observed practice of use of protective barriers during procedures whereby contact with or splashing of blood and body fluids was anticipated, with a "Yes" and a "No" column against each finding. The "Yes" column confirmed that use of specific protective barrier device had been observed. In the "No" column it was indicated that a protective device was not used.

3.5 Limitations

Time and financial constraints limited the researcher to one hospital. However, the researcher was of the opinion that, since the other hospitals are governed by the same policies of Kenyan government, the same practices were likely to be applicable to all healthcare institutions in Kenya.

The second limitation was that the questionnaire was based on participant recall. Some questions involved recall period of over 5 years. This may have contributed to recall bias. Furthermore, those respondents who had experienced occupational exposures may have been more or less willing to participate in the study.

The third limitation was the use of open-ended questions in some sections of the questionnaire. Many responses were limited; some nurses were not specific when responding to the questions. For instance, when asked to describe circumstances during which mucocutaneous exposures occurred some nurses were not specific but responded that the exposure occurred when attending to patients. A more complete description may have been obtained through individual interviews, but this approach would have been less effective in protecting respondents' anonymity since respondents interact face to face with the interviewer. Furthermore, this approach would have required that the researcher engage more personnel to assist in data collection, which would have made the exercise more costly and lengthy. Questionnaires as compared to interview require less time to administer.

The fourth limitation was the selection of participants in the study, some degree of selection bias could not be ruled out as those with past history of occupational exposure might have been more eager or perhaps declined to participate in the study. The fifth limitation was the use of the Health Belief Model as a conceptual framework for the study. Perhaps "Standard Precautions" would have been a better framework for this study. The researcher will consider applying "Standard Precautions" as a conceptual framework should such a study be carried out in future.

3.6 Conclusion

An explorative-descriptive design was used in this research study. A modified random sampling technique was used to select individuals to participate in the study. The study was primarily a quantitative one based on the data obtained from questionnaires and observations. The research methodology of this study has been discussed in depth. A pilot study was conducted first with ten Registered Nurses to refine the methodology. Questionnaires were distributed to 185 randomly selected participants subject to informed consent and data collection

carried out. A brief description has been given of how data analysis was executed. Limitations of the study were identified and discussed. The findings of the analyzed data have been presented, interpreted and discussed in the next chapter.

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Introduction

In this chapter the findings of the analyzed data will be presented and discussed. Data were collected using a three-part questionnaire specifically designed for this study. The first part elicited demographic information of the respondents, who were Registered Nurses. The second part elicited knowledge of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) among the Registered Nurses, while the third part elicited perceptions about the risk of exposure to blood-borne pathogens. One hundred and fifty eight questionnaires were returned out of 185 self-administered questionnaires. The response rate was 85.4%, which compares favourably with other studies (Nsubuga and Jaakkola, 2005; Cutter and Jordan, 2004). The respondents were drawn from selected departments or working areas. Working areas were those with exposure-prone procedures and were categorized as: Medical, 14.6% (23/158); Surgical, 15.2% (24/158); Gynaecology, 12.7% (20/158); Paediatrics and Neonatology wards, 15.8% (25/158); Specialized Units (Burns, Intensive Care, Renal), 13.3% (21/158); Emergency department, 12.7% (20/158); and Operating Theatres, 15.8% (25/158); Findings are organized into (1) Nursing Educational Qualifications and Experience, (2) Knowledge of Universal Precautions Policy, (3) Practice of Universal Precautions Policy, (4) Percutaneous and Mucocutaneous exposures, (5) Risk Perception.

4.1.1 Nursing educational qualifications and experience

The respondents were Registered Nurses of only two levels of nursing qualifications (Table 4.1). Majority of the respondents, 91.8% (145/158), were educated up to diploma level with a few up to Bachelor of Science (Bsc) in Nursing level, 8.2% (13/158), and none with Master of Science (Msc) or doctorate (PhD), in Nursing. Out of the 91.8% (145/158) nurses educated up to diploma level, 41 were male while the remaining 104 were female. Of the 8.2% (13/158) respondents with Bsc in Nursing, four were male while the remaining nine respondents were female. The respondents were predominantly female, which is a

reflection of the traditional gender distribution within the nursing profession in Kenya.

Table 4.1 Nursing qualifications of respondents by gender

		Qualification		Total
		Diploma	Bsc∞	
Gender	Male	41	4	45
	Female	104	9	113
Total		**145**	**13**	**158**

∞ Bachelor of Science in nursing

Twenty-seven percent (43/158) had been in nursing practice for 5 years and less, 45.6% (72/158) had been practising for between 6 and 10 years, 21.5% (34/158) had been practising for between 11 and 20 years while the remaining 5.7% (9/158) had been in nursing practice for 21 years and over (Table 4.2). Majority of the respondents 45.6% (72/158) were those who had been in practice for between 6 and 10 years.

Table 4.2 Years of service as a Registered Nurse

Years	Frequency	Percent
5 years and less	43	27.2
6-10 years	**72**	**45.6**
11-20 years	34	21.5
21 years and over	9	5.7
Total	**158**	**100.0**

4.2 Universal Precautions Policy

4.2.1 Knowledge of Universal Precautions Policy

The respondents were asked to explain briefly what Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) entails. Response rate to this question was 68.4% (108/158) and some of the explanations given by the respondents are highlighted in Table 4.3. Thirty-two percent (34/108) of the respondents were able to fully describe Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996,

1988) as stated that “Healthcare workers should consider all patients as positive for HIV, HBV or other blood-borne infections till proven otherwise and that all body fluids are potentially infectious for these pathogens”. Twenty-six percent (28/108) described it as involving use of personal protective barriers such as gloves, masks, aprons/gowns, protective eyewear and covering cut wounds during all procedures. However, majority of respondents, 38% (41/108), were less specific and generally described Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) as Infection Control Guidelines which include measures taken to reduce chances of acquiring occupational infections; and policies that aim at minimizing transmission of HIV, HBV and HCV from Healthcare worker and patients and vice versa. At least, a few of respondents were aware that proper safety precautions during medical waste disposal (2.8%; 3/108) and vaccinations (1.8%; 2/108) could be included in the Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988). The present study showed low (32%) understanding of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) as Infection Control measures. Low understanding of this principle is also found in other studies (Kermode *et al* 2005; Ayranci and Kosgeroglu, 2004) and is likely to lead to poor safety culture (Lymer *et al* 2004).

According to Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988), an educational programme should be provided by the employer and repeated annually for every employee who might be exposed. KNH has an Infection Control department that is supposed to conduct continuous medical education seminars for its staff to enhance uptake of Universal Precaution Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988). However, the high level of non-respondents, 31.6% (50/158), to the question about knowledge of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) could suggest lack of regular or inadequate training of staff at this hospital but this should be interpreted with caution since it was not possible to identify the characteristics of the registered nurses who did not respond to this question.

Respondents were asked to indicate when they learnt about Universal Precautions Policy, response rate was 68.4% (108/158). Fifty-five percent (59/108) had learnt about Universal Precautions during basic nursing training, 17.6% (19/108) during

post basic nursing training, while 27.8% (30/108) during an in-service programme on Universal Precautions. It can be assumed that those respondents, 31.6% (50/158), who did not respond to the question of knowledge of Universal Precautions, lacked the knowledge of it since it corresponds to the percentage of those who did not indicate when they learnt about it (Table 4.4). The finding that only 19% (30/158) of the respondents (Table 4.4) have had in-service training in Universal Precautions Policy suggests that education and training in Universal Precautions Policy (CDC, 1998a, 1996, 1988) or infection control guidelines of Kenyatta National Hospital (Mboloi, 1999) were not being regularly and adequately offered to the nursing staff. However, those nurses in exposure-prone areas may not be able to regularly attend the infection control seminars due to contextual factors such as pressure of work and overcrowding of patients in the wards of this hospital. Furthermore, the surveillance systems (Ducel *et al* 2002; McCoy *et al* 2001) of Universal Precautions Policy (CDC, 1998a, 1996, 1988) or KNH's infection control guidelines (Mboloi, 1999) could be weak in this hospital. It is the role of the hospital management to provide enabling environment for proper adherence to its infection control policies, such as providing necessary equipment and products for prevention of occupational exposures (Ducel *et al* 2002). The hospital management should also put in place active surveillance systems to monitor the changing infectious risks and identifying the need for changes in infection control measures.

Table 4.3 Descriptions of Universal Precautions Policy

Descriptions of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988)	Frequency	Percentage
Treat all patients as positive for HIV/HBV or other blood-borne infections till proven otherwise and that all body fluids are potentially infectious for these pathogens	34	31.5
Use of protective barriers such as gloves, masks, aprons/gowns, protective eyewear and covering cut wounds during all procedures	28	25.9
Infection Control Guidelines which include measures taken to reduce chances of acquiring occupational infections and policies that aim at minimizing transmission of HIV, HBV and HCV from Healthcare worker and patients and vice versa	41	38.0
Proper safety precautions during medical waste disposal	3	2.8%
Prevention of transmission of infections with Prophylactic Treatment such as vaccinations	2	1.8%

Table 4.4 When the Registered Nurses learnt about Universal Precautions Policy

Reply from respondents	Frequency	Percent
Basic nursing training	59	37.4
Post basic nursing training	19	12.0
In-service training	30	19.0
No response	50	31.6
Total	**158**	**100.0**

Respondents were asked whether they change their personal protection habits if they were aware of their patient's HIV, HBV, and HCV status. Fifty-four percent (86/158) respondents admitted they would change their personal protection habits while the remaining, 45.6% (72/158), would not change their personal protection habits. Of the 54.4% (86/158) respondents who would change their personal

protection habits, 73.3% (63/86) stated that they would change by using more protective devices when aware of their patient's HIV, HBV, and HCV status. Only 26.7% (22/86) respondents specifically mentioned that they would ensure that they wore gloves when contact with blood or body fluid was anticipated. Eighty-one percent (58/72) stated that they did not need to change their personal protection habits when aware of patient's infectious state since they always used protective devices regardless of patient's diagnosis as required by KNH's infection control guidelines (Mboloi, 1999). The remaining, 19.4% (14/72), did not justify why they do not change their personal protection habits.

Slightly more than one-half of the respondents 54.4% (86/158) reported modifying their personal protection habits on knowing the patient's HIV, HBV and HCV status. The number of respondents who would modify their personal protection habits was more than those who would adopt KNH's infection control guidelines (Mboloi, 1999) at all times. Changing personal protection habits when aware of patient's blood-borne viral status is inconsistent with the goal of KNH's infection control guidelines (Mboloi, 1999) that all patients be treated equally. Majority of infected patients are not known to be infected making KNH's infection control guidelines (Mboloi, 1999) necessary. The finding that 54.4% (86/158) of the respondents modify their personal protection habits when aware of patient's blood-borne viral status is, therefore alarming. These respondents added that they change their habits by avoiding contact with blood and body fluids without any protective barrier such as gloves, aprons/gowns, masks and protective eyewear. This could mean that they are either careful only when taking care of known infected patients or extra careful when attending to these known infected patients. The response by Registered Nurses in this study that they would take more precautions when a patient was infected with HIV, HBV and HCV is an obstacle to compliance with KNH's infection control guidelines (Mboloi, 1999). Since over 50% of respondents were trained after the enforcement of Universal Precautions (OSHA, 1992; CDC, 1988) and adoption of KNH's infection control guidelines (Mboloi, 1999), it would have been expected that a higher percentage of respondents would adopt barrier precautions irrespective of the patients' blood-borne viral status. This finding is consistent with the findings of other studies in which up to 80% of healthcare workers claim they would only comply with

Universal Precautions or if they knew patients were either infected or at risk of infection with blood-borne pathogens (Cutter and Jordan, 2004; Leliopoulou *et al* 1999; Knight and Bodsworth, 1998; Henry *et al* 1994; Ronk and Girard, 1994; Williams *et al* 1994).

4.2.2 Knowledge of transmission routes of blood-borne pathogens

In this study, blood-borne pathogens comprised HIV, HBV, or hepatitis HCV infections. Knowledge of transmission routes of these blood-borne infections was meant to assess the understanding, among the Registered Nurses, of the body fluids to which Universal Precautions (CDC, 1998a, 1996, 1988) do or do not apply. Knowledge of transmission of HIV, HBV and HCV infection was assessed by asking whether blood, urine, faeces, breast-milk or contaminated food is respectively associated with transmission of these infections to the nurse while assisting, nursing or caring for patients (Table 4.5). Response to transmission of HIV, HBV and HCV infections through contact with blood was 81.6% (129/158), 88.0% (139/158) and 62.0% (98/158); urine was 43.7% (69/158), 67.1% (106/158) and 46.2% (73/158); faeces was 39.2% (62/158), 60.1% (95/158) and 53.2% (84/158); breast milk was 46.2% (73/158), 46.8% (74/158) and 30.4% (48/158); contaminated food was 4.4%(7/158), 23.4% (37/158) and 29.7% (37/158) respectively.

Table 4.5 Knowledge of transmission of HIV, HBV and HCV

Infection	Response	Blood		Urine		Faeces		Breast-milk		Contaminated food	
		N	%	*N*	%	*n*	%	*N*	%	*n*	%
HIV	No response	13	8.2	28	17.7	26	16.5	19	12.0	22	13.9
	True	**129**	**81.6**	**69**	**43.7**	**62**	**39.2**	**73**	**46.2**	**7**	**4.4**
	False	16	10.1	61	38.6	70	44.3	66	41.8	129	81.6
	Total	158	100.0	158	100.0	158	100.0	158	100.0	158	100.0
HBV	No response	15	9.5	22	13.9	25	15.8	29	18.4	21	13.3
	True	**139**	**88.0**	**106**	**67.1**	**95**	**60.1**	**74**	**46.8**	**37**	**23.4**
	False	4	2.5	30	19.0	38	24.1	55	34.8	100	63.3
	Total	158	100.0	158	100.0	158	100.0	158	100.0	158	100.0
HCV	No response	31	19.6	41	25.9	35	22.2	43	27.2	25	15.8
	True	**98**	**62.0**	**73**	**46.2**	**84**	**53.2**	**48**	**30.4**	**47**	**29.7**
	False	29	18.4	44	27.8	39	24.7	67	42.4	86	54.4
	Total	**158**	**100.0**	**158**	**100.0**	**158**	**100.0**	**158**	**100.0**	**158**	**100.0**

n represents frequency; % represents percent; HIV represents Human Immunodeficiency virus; HBV represents hepatitis B virus; HCV represents hepatitis C virus

Contact with blood was correctly associated with occupational transmission of HIV, HBV and HCV infections by 81.6% (129/158), 88.0% (139/158) and 62.0% (98/158) respondents respectively (Figure 4-1). The results of this study suggest that respondents had a good understanding of transmission modes of these blood-borne pathogens. According to CDC (1988), urine and faeces can transmit HIV only if they contain visible blood. Breast-milk and contaminated foods have not been documented to transmit these infections to the healthcare worker. However, in this study, slightly less than half of the respondents attributed occupationally acquired infections to contact with breast-milk. It is not clear why more than 20%

respondents associated contaminated food with transmission of hepatitis B and C viruses.

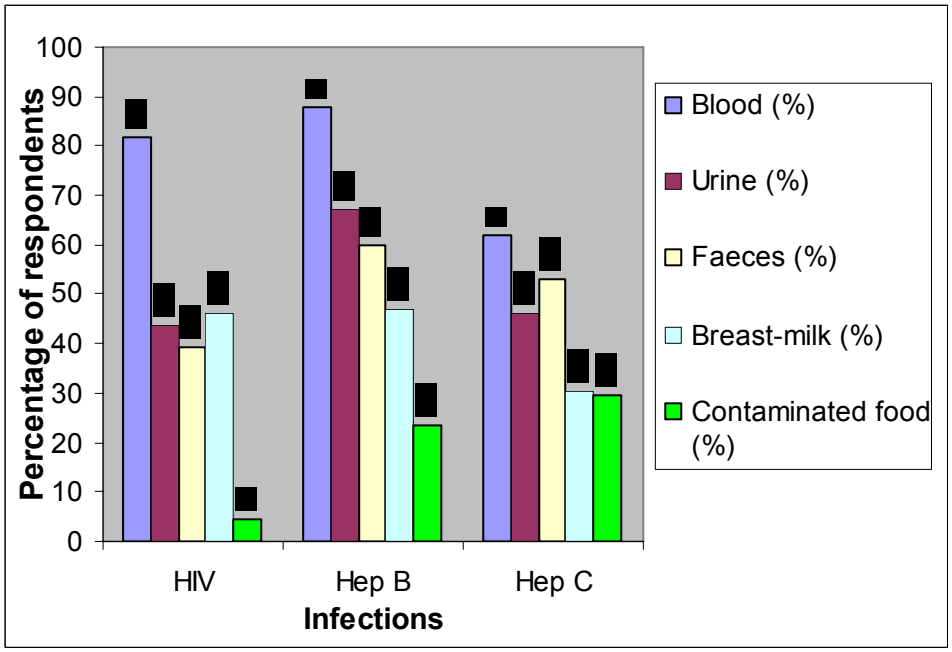

Figure 4-1 Comparison of the percentages of respondents who associated these transmission modes with HIV, HBV and HCV

4.3 Practice of Universal Precautions Policy

Both self-reported and observed adherence to the practice of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) was examined in this study.

4.3.1 Compliance with Barrier Precautions

Compliance with barrier precautions was assessed by asking respondents to respond to the statement "Thinking specifically about patients with HIV, HBV, or HCV infection, my practice is." Seventeen percent (27/158) would take more precautions when the patient was suspected to have either HIV, HBV or HCV, 2.5% (4/158) would take more precautions when patient has clinically proven HIV, HBV or HCV, only 0.6% (1/158) would take more precautions only when patient has full-blown symptoms while the majority 79.7% (126/158) would take more precautions whatever the condition the patient has, since patients are not routinely tested. The 17.1% (27/158) respondents who would take more precautions when the patient was suspected to have either HIV, HBV or HCV justified that it is wise

to take precaution to all suspected cases till proven otherwise, since one can easily get infected with these blood-borne pathogens, while the 2.5% (4/158) respondents who would take more precautions when patient has clinically proven HIV, HBV or HCV justified that it is safer to take extra precautions when diagnosis is confirmed. Those who practise KNH's infection control guidelines (Mboloi, 1999) on patients with full-blown symptoms did not justify their practice and this could suggest that obvious risk is anticipated in nursing patients with full-blown symptoms of the blood-borne infections. Some nurses think that when a patient is suspected, clinically proven or has full-blown symptoms of HIV, HBV, or HCV infection, then there is need to take special precautions. Since medical history and examination cannot reliably identify all patients infected with these blood-borne pathogens, KNH's infection control guidelines (Mboloi, 1999) should be used consistently in the care of all patients regardless of the perceived infectious state (Roberts, 2000). Recent studies (Kermode *et al* 2005; Le Pont *et al* 2003; Memish *et al* 2002; Ansa *et al* 2002; Sagoe-Moses *et al* 2001; Gilks and Wilkinson, 1998; Gumodoka *et al* 1997) have reported that the number of people infected with HIV/HBV is on the increase especially in the developing countries and in most cases these individuals are unknown. Since they are asymptomatic, healthcare workers are increasingly caring for people who may be infected but remain undiagnosed. Furthermore, determination of HIV, HBV and HCV infections of patients is not routinely done at KNH, the infectious status of many patients for these blood borne pathogens remain unknown.

4.3.1.1 Use of gloves and waterproof gowns/aprons

Ninety-three percent (147/158) of the respondents reported always using gloves when performing procedures whereby exposure to blood/body fluids is anticipated, while only 7% (11/158) admitted that sometimes they did not use gloves. No respondent reported never using gloves (Table 4.6). During the observation of procedures done by nurses that involved exposure to patient's blood, it was observed that gloves were always used (100%) when appropriate. Nurses were also observed to use gowns 84% of the time. Both self-reported and observed findings reflect high compliance with the use of these components of KNH's infection control guidelines (Mboloi, 1999), although some other studies have reported lower compliance rate (Chan *et al* 2002; Hersey *et al* 1994). For example,

Chan *et al* (2002) reported compliance rate of 79% with use of gloves in a Hong Kong hospital. This observation is expected since blood is thought to carry the highest risk for these blood borne pathogens. However, use of gowns or aprons was not evaluated in this present study.

Table 4.6 Reported glove use

Reply from respondents	Frequency	Percent
Sometimes	11	7.0
Always	147	93.0
Total	**158**	**100.0**

4.3.1.2 Use of protective eyewear

Respondents were asked to indicate the procedures during which they used protective eyewear. Thirty-four percent (54/158) respondents reported not using them at all and only 7.6% (12/158) use them during all procedures. Twenty-seven percent (42/158) respondents reported using protective eyewear while assisting in certain surgical procedures in operating rooms while 23.4% (37/158) use them during procedures which splashing and spattering of blood and body fluids is anticipated. Some respondents were specific and mentioned their use while assisting in endoscopies, 3.8% (6/158) and when conducting delivery of babies, 4.4% (7/158). These respondents indicated only procedures in which exposures are anticipated according to the requirements of KNH's infection control guidelines (Mboloi, 1999). The results are consistent with fact that protective eyewear is not routinely used for most nursing procedures in developing countries (Sadoh *et al* 2006). Some nurses are not aware of this requirement of KNH's infection control guidelines (Mboloi, 1999), with 34.2% (54/158) reported not using them at all. Furthermore, the researcher did not observe any use of protective eyewear at all even during the procedures where they are recommended. The unavailability of protective eyewear could explain the possible confusion about when to use them among the few respondents, 7.6% (12/158), who reported using them for all procedures. According to KNH guidelines for handling infectious diseases, protective eyewear should be worn during invasive procedures, which include operations, delivery of babies, and endoscopic procedures (Mboloi, 1999). These

instructions stated that they should be worn when droplets of blood and body fluids is anticipated; therefore the decision of when to use protective eyewear can be made by the individual healthcare worker. However, KNH's infection control guidelines (Mboloi, 1999) instructions for protective eyewear did not specify the procedures during which they should be worn.

On the other hand, 69.6% (110/158) respondents reported that prescription eyewear provided adequate protection in these situations while 30.4% (48/158) respondents reported that prescription eyewear did not provide adequate protection in this study. Although, most respondents, 69.6% (110/158), believed that prescription eyewear provided adequate protection in these situations, they do not meet Universal Precautions guidelines (Mboloi, 1999; CDC, 1998a, 1996, 1988) as protective eyewear. Out of the 110 respondents who believed that prescription eyewear provide adequate protection, 66.4% (73/110) respondents explained that they would protect the eyes from infection through splashes, while the remaining 33.6% (37/110) respondents did not comment. Those 66.4% (73/110) respondents who believed that prescription eyewear provide adequate protection justified it by saying that "chances of the body fluids splashing into the eyes are very minimal, as demonstrated by splashed fluids seen remaining on the prescription eyewear after an operation". That splashes of body fluids that may otherwise have entered the eyes, have been seen spotted on prescription glasses may suggest that prescription eyewear may, to a certain extent, offer some protective barrier to the eyes. Forty-four percent (21/48) respondents, who did not believe that prescription eyewear provided adequate protection, reported that prescription eyewear did not provide sufficient protection from fluid splashing into the eyes. This is supported by Ronk and Girard (1994), who argued that prescription eyewear, did not offer sufficient coverage to the eye area. Furthermore, prescription eyewear is not recommended for infection control and therefore should not be used as the only protective eyewear (Nelsing *et al* 1997; Henry *et al* 1992). The rest of 56.2% (27/48) respondents did not comment.

4.3.2 Hand-washing practice

Hand-washing was practised with 77.2% (122/158) respondents admitting washing hands at all times before and after removing gloves while 22.8% (36/158)

admitting not always washing hands before and after removing gloves (Table 4.7). Hand-washing was practised appropriately by most nurses, unlike previous reports in the literature that this practice is followed by 40-60% of nurses (Heenan, 1992). However, one study has reported higher compliance rate of 86.6% (Chan *et al* 2002). Seventy-seven percent (94/122) of those respondents who reported always washing hands before and after performing nursing procedures viewed hand-washing as the most important aspect of Infection Control. Observed hand-washing practice was 52% (26/50) for those procedures in which contact with blood was anticipated and 56% (28/50) for those procedures in which contact with other body fluids was anticipated. Percentages of self-reported hand-washing practice 77.2% (122/158) was more than the observed hand-washing practice when either contact with blood (52%) or other body fluids (56%) was anticipated. These findings suggest that self-reported survey is likely to result in over-estimates of Universal Precautions compliance (Henry *et al* 1992). Other studies have consistently reported over-estimates of self-reported Universal Precautions compliance (Nelsing *et al* 1997; Hersey and Martin, 1994; Henry *et al* 1994; Henry *et al* 1992). Those respondents 69.4% (25/36) who admitted not always washing hands before and after removal of gloves, cited lack of time as an obstacle to hand-washing. The rest of the respondents 11/36 (30.6%) felt that hand-washing was not necessary unless one had been in contact with blood/body fluids. Hand-washing should be done before and after patient contact and before and after removing gloves (Mboloi, 1999; CDC, 1998a, 1996, 1988). Although hand-washing is a routine recommendation for general infection measures, its compliance rate is expected to increase with the increase in incidences of HIV infections and enforcement of KNH's infection control guidelines (Mboloi, 1999).

Table 4.7 Reported hand washing behavior before and after removal of gloves

Reply from respondent	Frequency	Percent
Sometimes	36	22.8
At all times	122	77.2
Total	**158**	**100.0**

4.4 Percutaneous and mucocutaneous exposures of Registered Nurses

4.4.1 Percutaneous exposures

Percutaneous exposures can also be referred to as inoculation injuries (Cutter and Jordan, 2004). While the Centres for Disease Control and Prevention (CDC, 1998a, 1996, 1988); OSHA (2001; 1992) and Kenyatta National Hospital (Mboloi, 1999) have mandated a number of valuable safety precautions their emphasis on barrier precautions may perhaps obscure the need for increased vigilance in needle-stick prevention. It is needle-stick, after all, that can introduce the virus into the healthcare worker's body. Prevention programmes should include everything necessary and available to eliminate this possibility, including new equipment, training on how to use this equipment, and safe disposal systems. Such programmes should also include time spent helping employees break bad habits such as the very common and dangerous practice of recapping used needles.

4.4.1.1 Types and frequency of percutaneous exposures

The respondents were asked the frequency of inoculation injuries they recalled sustaining and slightly more than a half of the respondents, 59.5% (94/158), reported sustaining at least one inoculation injury (Table 4.8) in their working lifetime. This compares favorably with other studies reported in Eastern African countries (Le Pont *et al* 2003; Newsom and Kiwanuka, 2002), although most of these studies evaluated these injuries in a period of one year. Of these 59.5% (94/158) respondents, 39.4% (37/94) had sustained needle-stick injury once, 12.8% (12/94) had sustained needle-stick injury two times, and 34.0% (32/94) had sustained needle-stick injury more than two times. Fourteen percent (13/94) respondents could not recall the number of times they had sustained needle-stick injury. The failure to recall may have been partly contributed by the longer period (that is, during the entire period of nursing practice) in which they were required to remember such injuries. Forty-one percent 64/158 respondents had never sustained any needle-stick injury in this study sample. Comparison of proportions and numbers of needle-stick injuries reported should be viewed with caution because there is considerable variability in a range of critical factors that were not entirely controlled in this present study. These factors include the method of data

collection, sample size, type of healthcare workers surveyed and the extent of involvement in risk procedures.

Table 4.8 Recalled sharp injuries by respondents

Recalled Sharp injuries	Frequency	Percent
Never	64	40.5
Once	37	23.4
two times	12	7.6
more than two times	32	20.3
cannot remember	13	8.2
Total	**158**	**100.0**

Circumstances related to needle-stick injuries were investigated by asking the respondents to give a narrative description of how the exposure incident occurred (Table 4.9). Needle-stick injuries were commonly caused by administration of injections which accounted for 25.5% (24/94) of the injuries (due to unexpected movement of patients when administering the injections), followed by recapping needles which caused 20.2% (19/94) of the injuries. Thirteen percent (12/94) involved suturing (episiotomies or patients with cuts), 6.4% (6/94) were accidental from a colleague, 7.4% (7/94) were caused by a carelessly placed used needle, 6.4% (6/94) were caused by unused needles, 6.4% (6/94) involved putting up an intravenous line, 4.3% (4/94) involved disposal of used needles, 1/94 (1.1%) involved removal of blood specimen, 2.1% (2/94) were caused by a scalpel when shaving a patient while 1/94 (1.1%) occurred when cleaning instruments after surgery.

Table 4.9 Causes of sharp injuries sustained by respondents

Cause of injury	Frequency	Percent
No response	6	6.4
Unused needles	6	6.4
Recapping a needle	19	20.2
Administration of injections	24	25.5
Carelessly placed used needle	7	7.4
Disposal of used needles	4	4.3
Putting up intravenous line	6	6.4
Removing blood specimen	1	1.1
Stitching a patient	12	12.8
Cut by scalpel when shaving a patient	2	2.1
Injury caused by a colleague	6	6.4
Cleaning instruments after surgery	1	1.1
Total	94	100.0

Needle-stick injuries were commonly caused by administration of injections, 25.5% (24/94). The second common cause of needle-stick injuries was recapping needles which accounted for 20.2% (19/94) of the injuries. The third common cause of needle-stick accidents were those that involved suturing 12.8% (12/94). Respondents were also asked how often they recap needles before disposal after undertaking a procedure. Fifty eight percent (91/158) reported never recapping needles, 25.3% (40/158) admitted recapping needles sometimes while 17.1% (27/158) admitted recapping needles at all times (Table 4.10) suggesting that recapping needles is still a common practice in the hospital despite educational efforts to discourage the practice. Contaminated needle-stick or cut with a sharp object is also the most common mode of occupational transmission of blood-borne pathogens in healthcare settings in other parts of the world (Twitchell, 2003; Ippolito *et al* 1999).

Table 4.10 Reported needle recapping practice

Reply from respondent	Frequency	Percent
Never	91	57.6
Sometimes	40	25.3
At all times	27	17.1
Total	**158**	**100.0**

Needle-stick injuries may not be preventable through rigid adherence to Universal Precautions (Eisenstein and Smith, 1992; Fahey *et al* 1991; Wong *et al* 1991; Willy *et al* 1990); nonetheless they can be reduced through good work practices. Needle-stick injuries caused by unexpected movement of patients (25.5%) can be minimized by preparing patients before procedures to reduce unexpected patient movement. Inoculation injuries caused by recapping needles can be minimized if nurses stop the practice of recapping. For instance, the findings of this study suggest that recapping needles accounted for 20.2% of the needle-stick injuries, with 42.4% of the respondents still practising needle recapping and observational survey in this study also revealed that 14% (7/50) of participants do practise recapping of needles. This finding is consistent with findings of other studies (Sadoh *et al* 2006; Le Pont *et al* 2003; Newsom and Kiwanuka, 2002; Aiken *et al* 1997; Henry *et al* 1994; Hersey and Martin, 1994; Willy *et al* 1990; Mangione *et al* 1991), in which needle recapping was common among healthcare workers but particularly less common among the registered nurses (Sadoh *et al* 2006). Sadoh *et al* (2006) also reported that compliance with non-recapping of used needles was highest (57.6%) among the nurses in a survey of all healthcare workers. Other studies (Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Newsom and Kiwanuka, 2002; Adegboye *et al* 1994; Henry *et al* 1994; Hersey and Martin, 1994; Eisenstein and Smith, 1992; Mangione *et al* 1991; Willy *et al* 1990) on needle-stick injuries reported similar findings in which needle-stick injuries were associated with administration of injections and recapping of needles.

4.4.2 Mucocutaneous exposures

One hundred and fifty eight respondents recalled a total of 323 mucocutaneous exposure incidences. Eighty two percent (130/158) respondents recalled being soiled on the hands, 62.7% (99/158) recalled being soiled on the arms and 59.5% (94/158) recalled mucocutaneous exposures in the face area (Table 4.11).

Table 4.11 Reported contamination of hands, arms, and face with blood/body fluids

Reply from respondents	Hands		Arms		Face	
	n	%	*n*	%	*N*	%
No response	6	3.8	20	12.7	16	10.1
Yes	**130**	**82.3**	**99**	**62.7**	**94**	**59.5**
No	22	13.9	39	24.7	48	30.4
Total	**158**	**100.0**	**158**	**100.0**	**158**	**100.0**

n represents frequency; % represents percent

When asked to describe circumstances of mucocutaneous exposures most respondents listed the body fluid responsible for their exposures, which implies a misunderstanding of the question. Blood accounted for 28.5% (45/158) of the mucocutaneous exposures, amniotic fluid accounted for 10.8% (17/158) of mucocutaneous exposures, saliva, sputum and vomitus cumulatively accounted for 5.1% (8/158) mucocutaneous exposures while urine accounted for only 1.9% (3/158). Thirty-four percent (53/158) respondents did not specify the fluid responsible for their mucocutaneous exposure. Of the mucocutaneous exposure involving the hands, 12% (19/158) were due to torn gloves during nursing procedures. Splashes of body fluids including blood and amniotic fluid were reported during surgery, childbirth and in nursing trauma patients. Few exposures involved saliva, sputum, vomitus, and urine. Occupational exposure also may occur through splash to mucous membranes of the facial region such as the eyes, nose and mouth; or through exposure to non-intact skin, such as chapped, abraded, infected, or cut skin of the facial region (Ippolito *et al* 1999). Prospective studies indicate that the estimated risk for Human Immunodeficiency virus infection after mucocutaneous exposure to HIV-infected blood ranges between 0.03% and 0.09% (Cutter and Jordan, 2004; Twitchell, 2003; Beltrami *et al* 2000).

However, no prospective study has been reported in any Kenyan hospital. Many respondents did not respond to the question regarding circumstances under which mucocutaneous exposures occurred. This may have implied another misunderstanding of the question. Having predefined categories (closed-ended questions) for such responses may have been a better method of designing such questions although open-ended questions allow a fuller description of events surrounding injury.

4.4.3 Reporting mechanism of exposures

All occupational exposures should be reported so that accurate risks assessments, appropriate preventive measures and post exposure prophylaxis can be undertaken (Haiduven *et al* 1999). Failure to report inoculation injuries and mucocutaneous exposures according to institutional and national protocol indicates a disregard to personal safety, management policy, and national guidelines (Ducel *et al* 2002; Moran, 2000). Out of the percutaneous and mucocutaneous exposure incidence; only 27.2% (43/158) were reported. Slightly more than one half of respondents, 54.4% (86/158), admitted not reporting percutaneous and mucocutaneous exposures experienced; 13.9% (22/158) did not indicate whether they had reported or not. Reasons for not reporting included subjective judgement that patient was not high risk was given by 15.2% (25/158) of respondents, 12.0% (18/158) respondents considered the reporting mechanism too cumbersome, 5.1% (8/158) were not aware of reporting procedure/relevant policy, 5.1% (8/158) considered it time consuming while, 2.5% (4/158) did not know what to do. Various other reasons (27.9%; 24/158) for not reporting were given which included the following: sustained needle-stick injuries when there wasn't any reporting mechanism in place yet, no open skin or cuts, pricked by clean needle, and wanting to forget about the incident (Table 4.12). The most common reason cited for not reporting was that respondents did not consider patient to be high risk, 15.2% (25/158), followed by reporting mechanism being too cumbersome 12.0% (18/158). Poor reporting could also be related to a will to sustain a positive self-image (Lymer *et al* 2004).

From the results of this study reporting of occupational exposures appears to be influenced by perception of risk to blood-borne infection, 15.2% (25/158).

Respondents tend to judge patients' probable blood-borne viral status before deciding whether to report or not (Table 4.12). Respondents may perceive an injury (for instance, being stuck with a clean needle while wearing bloody gloves) as clean/sterile, which may not be the case depending on the circumstances of the injury. Respondents may also not report the exposure considering the patient HIV status only, without considering other blood-borne infections. The patient may have been negative for HIV but positive for hepatitis B/C or other blood-borne infections, which may have placed the healthcare worker at risk of acquiring these other infections. Furthermore, these injuries carry potential hazards such as tetanus and accidental injection of drugs, including chemotherapeutic agents and should still be thoroughly evaluated (Hamory, 1983). Ignoring inoculation injuries prevents administration of appropriate treatment (Haiduven *et al* 1999). The resulting under estimation of the number of injuries leads to inaccurate information on the overall risk of infection and could decrease hospital's incentive to provide safer working conditions.

Table 4.12 Reasons for not reporting occupational exposures

Reasons for not reporting percutaneous/mucocutaneous exposures	Frequency	Percent
No response	27	19.6
Did not know what to do	4	2.5
Reporting mechanism too cumbersome	18	12.0
Not aware of reporting procedure/relevant policy	8	5.1
Did not have time	8	5.1
Did not consider patient to be high risk	25	15.2
Other reasons	18	11.4
Not applicable	50	29.1
Total	158	100.0

Most of the respondents, 91.8% (145/158), did not experience any complications following either percutaneous or mucocutaneous exposures, only 8.2% (13/158) reportedly experienced some kind complication. The absence of complications

immediately following the exposures could make the respondents believe that the exposure did not constitute a risk and could also be a contributing factor to underreporting. Low perception of risk following these occupational exposures suggests that low perception of risk was a major obstacle to reporting. This finding was consistent with findings of other studies (Cutter and Jordan, 2004; Knight and Bodsworth, 1998; Hamory, 1983), in which workers' decision to report was based on subjective judgment that patient was not high risk, and reporting mechanism was found to be time consuming among other reasons. From findings of this study, 72.8% of the percutaneous and mucocutaneous exposure incidences were not reported which suggests these nurses are at high risk for acquisition of blood-borne viral infections following occupational exposure. The respondents who had reported the needle-stick injuries and mucocutaneous exposure indicated the persons they had reported to. Seventy percent (30/43) respondents had reported to the nurse-in charge of their respective working area, 20.9% (9/43) had reported to the infection control nurse, 9.3% (4/43) had reported to the doctor concerned. The Kenyatta National Hospital policy (Mboloi, 1999) requires that following a needle-stick injury the affected individual should immediately sound for emergency to the nearest colleague and obtains immediate first aid that involves bleeding the site, washing it thoroughly with water or normal saline and covering it with a waterproof dressing. The incidence should be reported to a senior staff and recorded in the incidence book. The doctor is then informed so as to assess the risk associated with this exposure and evaluated the source and affected member of staff by providing counselling and clinical assessment. A doctor will then assess whether there is need for post-exposure prophylaxis (PEP) or follow-up for HIV, hepatitis B or C (Mboloi, 1999). The post exposure prophylaxis (PEP) should ideally be provided within 2- 4 hours (Ducel *et al* 2002).

When asked about the institutional reporting procedure, 22.8% (36/158) did not know their institution's reporting procedure at all, 62.6% (99/158) knew the correct procedure, while the rest 14.6% (23/158) had some information that did not seem to either represent Kenyatta National Hospital's reporting procedure or Universal Precautions Policy (CDC, 1998a, 1996, 1988). For example, some respondents stated that they would squeeze out blood as much blood as possible, test both patient and affected staff before starting treatment. And this does not constitute

the current Kenyatta National Hospital's reporting protocol. While more than one half of the respondents 62.6% (99/158) were aware of the hospital's reporting protocol, only 27.2% (43/158) who admitted experiencing percutaneous and mucocutaneous exposures reported them. The findings of this study in which only 27.2% of exposures were reported indicated gross underreporting of percutaneous and mucocutaneous injuries in most of the nurses who returned the questionnaires. The finding that 72.8%% of percutaneous and/or mucocutaneous exposure incidences were not reported was not uncommon to other studies. Injury reporting rates of other studies seem to follow same pattern, for example, in other studies from Africa and other developing countries, between 60% and 70% injuries were not reported (Nsubuga and Jaakkola, 2005; Ayranci and Kosgeroglu, 2004; Adegboye *et al* 1994). This picture was similar in the developed countries where findings of other studies (Cutter and Jordan, 2004; Haiduven *et al* 1999; Knight and Bodsworth, 1998; Hersey and Martin, 1994; Williams *et al* 1994; Mangione *et al* 1991; Hamory, 1983) on underreporting indicated that up to 80% of injuries were not reported.

4.5 Perception of risks towards exposures to blood-borne pathogens

4.5.1 Contact with infected patients

Respondents stated their frequency of contact with patients who have HIV, HBV or HCV infection. Most respondents, 73.4% (116/158), reported having daily contact, 5.7% (9/158) reported having weekly contact, 4.4% (7/158) reported having monthly contact and 16.5% (26/158) did not know how often they had contact with patients who have HIV, HBV or HCV infection. Most respondents admitted having contact with patients infected with blood-borne infections at least once in a month. These results reflect the high sero-prevalence of these blood-borne pathogens in this country. Latest statistics on HIV alone estimate that 1.3 million Kenyans (UNAIDS, 2007) are infected but few know whether they are infected or show outward symptoms of the disease. The rate of admission of HIV, HBV or HCV patients at Kenyatta National Hospital could not be established. This means that the nurses potentially provide healthcare to a significant number of HIV positive

patients whose status remains unknown. Furthermore, the prevalence and incidence of both HBV and HCV in the Kenyan population remains unknown.

Respondents were asked if they thought they were at risk of contracting blood-borne infections such as HIV and HBV through exposure to blood and body fluids of patients. The majority of respondents, 89.2% (142/158), agreed that they were at risk, very few 5.1% (8/158) reported that they were not at risk while 5.1% (8/158) were uncertain as to whether they were at risk or not. Of the 89.2% (142/158) respondents who perceived a risk of contracting blood-borne infections such as HIV and HBV through exposure to blood and body fluids of patients, 70.4% (100/142) reported that their perception was influenced by frequency of contact with patients who were infected with these blood-borne viruses. These respondents listed blood or body fluids entering through cuts or open area on the skin as a mode of transmission and added that they were still at risk despite following Universal Precautions because accidental pricks (with needles and scalpels) was still bound to occur. Ten percent (14/142) of the respondents felt that they were only at risk if adequate barrier protection was not used. Twenty percent (28/142) of the respondents offered no explanation as to why they perceived that they were at risk. Those respondents, 5.1% (8/158), who did not perceive a risk stated that since they took all precautionary measures to protect themselves they were not at risk of contracting these blood-borne infections. These findings suggest that most nurses in this study, 70.4% (100/142), highly perceived a risk of contracting blood-borne infections such as HIV and HBV through exposure to blood and body fluids of patients despite using adequate barrier protection. Frequency of contact with patients with these infections provides visible reminders of the prevalence of the diseases. Leliopoulou *et al* (1999) received similar responses in a UK hospital based survey. It can be assumed that those respondents, 5.1% (8/158), who did not perceive a risk may not have had the opportunity for frequent contact with patients infected with these blood-borne viruses. Furthermore, individuals who believe that they are at risk of exposure are more likely to practise protective barriers perceived as feasible and effective (Williams *et al* 1994).

Respondents were asked about the likelihood of infection following a needle-stick injury contaminated with HIV, HBV or HCV infection (Table 4.13). Thirty-one percent (49/158) stated that it was likely, 32.9% (52/158) stated that it was very likely, 3.8% (6/158) stated that it was inevitable, 28.5% (45/158) believed that it was possible but unlikely while 3.8% (6/158) thought that it was very remote. At least more than one half (67.7%) of the respondents were aware that there was risk of infection following a needle-stick injury contaminated with HIV HBV or HCV infection. Needle-pricks are the most common mode of transmission of these blood-borne pathogens (McNabb and Keller, 1991; Wong *et al* 1991; Gerberding, 1990b). Furthermore, high sero-prevalence of these blood-borne viral infections in this country heightens the possibility of healthcare workers acquiring these infections following exposure.

Table 4.13 Awareness of risk of infection from infected sharps

Reply from respondents	Frequency	Percent
Likely	49	31.0
Very likely	52	32.9
Inevitable	6	3.8
Possible but unlikely	45	28.5
Very remote	6	3.8
Total	**158**	**100.0**

Respondents were asked whether they thought they were at personal risk of contracting HIV/HBV or HCV infection in the place of work. Fifty-six percent (89/158) agreed that there was high risk, 19.0% (30/158) said there is high theoretical risk but took some preventive measures to reduce it, 18.4% (29/158) believed there was high theoretical but took all preventive measure to reduce it while the remaining 6.3% (10/158) thought there was very little risk (Table 4.14). These 56.3% (89/158) respondents reported working under immense situational pressures and may not have time to engage in safe and effective nursing practice. Respondents consistently mentioned that they were frequently in contact with patients who were not screened for HIV, HBV or HCV infections, and yet nursing

procedures exposed them to blood of these patients. For instance, one respondent from Emergency Department reported "that during emergency situations, chances of forgetting to use precautions are high, therefore chances of accidental contact with blood and body fluids of patients with these infections is also high; sharps are placed carelessly; since we handle sharps, it is not possible to be careful at all times; most patients are not routinely tested for these infections and we handle sharps used on them". The other respondents, 43.7% (69/158), felt that they were taking adequate protection and, therefore, did not consider themselves at significant risk of contracting HIV/HBV or HCV infection in their place of work. The respondents who perceived a high risk of contracting high HIV, HBV or HCV infection in their place of work related their perception of risk to; pressure of time, prevalence of patients with those blood-borne pathogens in the hospital and nature of the procedures done which predisposed them to occupational exposure. The respondents further cited shortage and/or lack of supplies such as gloves, masks and protective eyewear as factors that predisposed them to risk of contracting these infections. The finding that nurses sometimes work under immense situational pressures and may not have time to engage in safe effective nursing practice is supported by some other studies (Williams *et al* 1994; McNabb and Keller, 1991).

Table 4.14 Perception of personal risk of contracting HIV/hepatitis B or C infection in the place of work

Reply from respondents	Frequency	Percent
Yes, there is high risk	89	56.3
There is high risk but I take some preventive measures	30	19.0
High theoretical risk but I take all preventive measures	29	18.4
Very little risk	10	6.3
Total	**158**	**100.0**

Most respondents (97.5%; 154/158) perceived Universal Precautions as necessary (Table 4.15). Furthermore, most respondents, 97.5% (154/158), agreed

or strongly agreed with the statement that “Following Universal Precautions Policy decreases risk of acquiring HIV and HBV or other blood/body fluid transmitted infections” (Table 4.16). Respondents agreed that using protective barriers reduces the risk of exposure of the healthcare workers’ skin or mucous membranes to potentially infected blood and body fluids. Seventy-seven percent (121/158) respondents reported that use of Universal Precautions Policy in the nursing care of patients had no effect on the nurse patient relationship (Table 4.17). Their justification was that application of Universal Precautions Policy in the nursing care of patients should not have a negative effect on the nurse-patient relationship because these precautions also protected patients from acquiring infections from infected healthcare workers. Twenty-three percent (37/158) were concerned that application of Universal Precautions Policy in the nursing care of patients had an effect on the nurse-patient relationship, that patients may feel stigmatized. A few respondents (8.9%; 14/158) were concerned that barrier precautions interfered with their nursing skills, and argued that protective devices are cumbersome at times.

Table 4.15 Do you perceive Universal precautions as necessary?

Reply from respondents	Frequency	Percent
Yes	154	97.5
No	4	2.5
Total	**158**	**100.0**

Table 4.16 Universal Precautions Policy decreases risk of acquiring HIV/HBV or blood/body fluid transmitted infections

Reply from respondents	Frequency	Percent
Agree	82	51.8
Strongly agree	72	45.6
Disagree	2	1.3
Strongly disagree	2	1.3
Total	**158**	**100.0**

Table 4.17 Universal Precautions Policy in nursing care interfering with nurse-patient relationship

Reply from respondents	Frequency	Percent
Yes	37	23.4
No	121	76.6
Total	**158**	**100.0**

After almost all respondents (97.5%) agreed that Universal Precautions were necessary (Table 4.15), few respondents (23.4%) were still concerned that barrier precautions during patient care may offend patients (Table 4.17). Other studies have reported similar findings whereby respondents reported interference with nurse patient relationship and decreased dexterity as obstacles to compliance (Ramsey *et al* 1996; Henry *et al* 1994; Henry *et al* 1992; Willy *et al* 1990). However, comparatively in this study, fewer respondents (23.4%; 37/158) reported interference with nurse-patient relationship and decreased dexterity (8.9%; 14/158) as obstacles to compliance than in these studies. These studies were carried out in areas of relatively low HIV sero-prevalence suggesting that in such areas of low HIV sero-prevalence compliance with Universal Precautions may also be low. The finding suggests that respondents who perceive low risk may feel that use of protective devices may interfere with nurse-patient relationship and may also find protective devices cumbersome. Nurses have an obligation to themselves as well as their patients to practise safely which can only be achieved if all patients are assumed to be potentially infected with HIV, hepatitis B and C viruses or other blood-borne pathogens (Leliopoulou *et al* 1999).

4.6 Conclusion

The purpose of this study was to determine the knowledge of Universal Precautions Policy (CDC, 1998a, 1996, 1988), KNH's infection control guidelines (Mboloi, 1999) and perception towards risk of exposure to blood-borne pathogens; assess the compliance of Registered Nurses with these guidelines when handling blood and body fluids; and to identify types and frequency of occupational exposure among the Registered Nurses at the Kenyatta National Hospital.

Accordingly, specific objectives were identified, as listed in section 1.5, and achieved during the study.

Study objective 1: To determine the knowledge of Registered Nurses working at Kenyatta National Hospital regarding of the Universal Precautions Policy (CDC, 1998a, 1996, 1988) and Kenyatta National Hospital's infection Control guidelines (Mboloi, 1999). The study findings suggest, as described in section 4.2.1, a lack of regular or inadequate training of staff. This is demonstrated by the high level of non-response about knowledge of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988), and by the discovery that only 19% of the respondents had attended an in-service course in Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988); identified as risk factors for occupational exposures. The study demonstrates low (32%) understanding of Universal Precautions Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) as Infection Control measures by the Registered Nurses despite their good understanding of transmission modes of HIV, HBV and HCV infections. The majority of nurses surveyed were using Universal Precautions; however, it was observed that they were not as familiar with Universal Precautions as they thought they were. Respondents admitted modifying personal protection habits based on subjective judgement regarding patient's probable HIV, HBV and HCV infectious state which may lead to exposure to infected body fluids from patients considered to be "low risk". Respondents believed that when a patient was either suspected, clinically proven or has full-blown symptoms of HIV, HBV or HCV infection, then there was need to take special precautions. Universal Precautions policy (CDC, 1998a, 1996, 1988) and Kenyatta National Hospital's infection Control guidelines (Mboloi, 1999) were not only insufficiently and inappropriately applied but also selectively practised. This finding suggests a need for effective education about potential risk of contamination by every patient. Low understanding of this principle of Universal Precautions is also found other studies (Kermode *et al* 2005; Ayranci and Kosgeroglu, 2004) and is likely to lead to poor safety culture (Lymer *et al* 2004).

Study objective 2: To assess the compliance of Registered Nurses with Universal Precautions when handling blood and body fluids at the Kenyatta National Hospital. The study findings, described in section 4.3.1, suggest that both self-

reported and observed data reflect that respondents' compliance with the use of gloves was generally good (reported, 93%, 147/158; and observed, 100%). However, the difference in self-reported and observed compliance with the Universal Precaution Policy (Mboloi, 1999; CDC, 1998a, 1996, 1988) was not statistically tested. Compliance with the use of protective eyewear was generally poor; the researcher did not witness any use of protective eyewear and suggesting that this protective device was either not readily available in the hospital or their use was not being emphasized as recommended by (Mboloi, 1999; CDC, 1998a, 1996, 1988). Furthermore, respondents believed that "prescription eyewear" can provide protection as protective eyewear. Misconceptions such as the belief that "prescription eyewear" can provide protection as protective eyewear demonstrates a need for better education and staff training. Similar to the situation in many other hospitals in developing countries (Sadoh *et al* 2006; Nsubuga and Jaakkola, 2005; Newsom and Kiwanuka, 2002; Gumodoka *et al* 1997), in this study, shortage of gloves, masks, gowns/aprons and protective eyewear were cited as factors which increased the risk for occupational exposure and acquisition of blood-borne pathogens. Recapping of needles and use of personal protective equipment are factors that can be improved by staff training. Shortage of personal protective equipment can partly be blamed for poor safety culture reported and observed in this study. Hand-washing before and after removal of gloves was appropriately practised by most nurses (reported, 77.2% and observed 52%). These findings suggest that a self-reported survey is likely to result in over-estimates of Universal Precautions compliance. Studies have consistently reported over-estimates of self-reported Universal Precautions compliance (Nelsing *et al* 1997; Hersey and Martin, 1994; Henry *et al* 1994; Henry *et al* 1992). The findings of this study suggest that most occupational exposures went unreported (54.4%). Underreporting of exposures could be indicative of disregard for personal safety. Underreporting seems to be influenced by respondents' judgement of patients' probable blood-borne viral status and lack of good safety culture (Lymer *et al* 2004). Difficulties in reporting of occupational exposures were related to subjective judgement that injury did not constitute risk, and the reporting mechanism being found to be cumbersome and time consuming among other reasons.

Study objective 3: To determine the types and frequency of occupational exposures to blood and body fluids among the Registered Nurses in Kenyatta National Hospital. The study findings, described in section 4.4, suggest that percutaneous and mucocutaneous exposures continued to occur, despite the use of barrier precautions; placing the nurses at this hospital at risk of acquiring blood borne pathogens (HIV, HBV or HCV). Most percutaneous exposures were caused by administration of injections (25.5%); recapping needles, (20.2%), and while suturing (12.8%). Contaminated needle-stick or cut with a sharp object is also the most common mode of occupational transmission of blood-borne pathogens in healthcare settings in other parts of the world (Twitchell, 2003; Ippolito *et al* 1999). Needle-stick injuries may not be preventable through rigid adherence to Universal Precautions (Eisenstein and Smith, 1992; Fahey *et al* 1991; Wong *et al* 1991; Willy *et al* 1990); nonetheless they can be reduced through good work practices. Needle-stick injuries caused by unexpected movement of patients (25.5%) can be minimized by preparing patients before procedures to reduce unexpected patient movement. Inoculation injuries caused by recapping needles can be minimized if nurses stop the practice of recapping. For instance, the findings of this study suggest that recapping needles accounted for 20.2% of the needle-stick injuries, with 42.4% of the respondents still practising needle recapping; observational data in this study also revealed that 14% (7/50) of participants practised recapping of needles. This finding is consistent with findings of other studies (Sadoh *et al* 2006; Le Pont *et al* 2003; Newsom and Kiwanuka, 2002; Aiken *et al* 1997; Henry *et al* 1994; Hersey and Martin, 1994; Willy *et al* 1990; Mangione *et al* 1991), in which needle recapping was common among healthcare workers but less common among the Registered Nurses (Sadoh *et al* 2006). Sadoh *et al* (2006) also reported that compliance with non-recapping of used needles was highest (57.6%) among the nurses in a survey of all healthcare workers. Other studies (Nsubuga and Jaakkola, 2005; Le Pont *et al* 2003; Newsom and Kiwanuka, 2002; Adegboye *et al* 1994; Henry *et al* 1994; Hersey and Martin, 1994; Eisenstein and Smith, 1992; Mangione *et al* 1991; Willy *et al* 1990) on needle-stick injuries reported similar findings in which needle-stick injuries were associated with administration of injections and recapping of needles.

Mucocutaneous exposures involved hands (82.3%) and arms (62.7%). Occupational exposure occurred through splash to mucous membranes of the facial region (59.5%); such as the eyes, nose and mouth; or through exposure to non-intact skin, such as chapped, abraded, infected, or cut skin of the facial region (Ippolito *et al* 1999). Most respondents did specify the fluid responsible for their mucocutaneous exposure: blood accounted for 28.5% (45/158) of the mucocutaneous exposures; amniotic fluid accounted for 10.8% (17/158) of mucocutaneous exposures; saliva, sputum and vomitus cumulatively accounted for 5.1% (8/158) of mucocutaneous exposures; while urine accounted for 1.9% (3/158). Of the mucocutaneous exposure involving the hands, 12% (19/158) were due to torn gloves during nursing procedures. Splashes of body fluids including blood and amniotic fluid were reported during surgery, childbirth and in nursing trauma patients. However, many respondents did not respond to the question regarding circumstances under which mucocutaneous exposures occurred. This may imply a misunderstanding of the question. Having predefined categories (closed-ended questions) for such responses may have been a better method of designing such questions although open-ended questions allow a fuller description of events surrounding injury.

Study objective 4: To determine the perception of Registered Nurses towards their risk of exposure to blood-pathogens. The study findings, described in section 4.5, suggest that risk perception was apparent and respondents identified prevalence of blood-borne pathogens among patients, nature of the procedures done, shortage or lack of protective barrier devices as factors that predisposed nurses to occupational exposure at Kenyatta National Hospital. Respondents were aware of the likelihood of infection following a needle-stick injury contaminated with HIV, HBV or HCV infection. They were also aware that there was risk of acquiring infections through exposure to blood and body fluids of patients. Respondents admitted not taking enough precautions owing to a lack of time associated with situational pressures. Nevertheless, respondents perceived Universal Precautions as necessary and agreed that protective barriers reduced risk of acquiring infections through exposure to blood and body fluids of patients.

Most respondents (83.5%, 132/158) admitted having contact with patients infected with blood-borne infections at least once a month: daily (73.4%, 116/158), weekly, (5.7%, 9/158), and monthly (4.4%, 7/158); while 16.5% (26/158) did not know how often they had contact with patients who have HIV, HBV or HCV infection. These results reflect the high sero-prevalence of these blood-borne pathogens in this country. The rate of admission of HIV, HBV or HCV patients at Kenyatta National Hospital could not be established. This means that the nurses potentially provide healthcare to a significant number of HIV positive patients whose status remains unknown. Furthermore, the prevalence and incidence of both HBV and HCV in the Kenyan population remain unknown.

The majority of the respondents, 89.2% (142/158), agreed that they were at risk of contracting blood-borne infections; very few, 5.1% (8/158), reported that they were not at risk while 5.1% (8/158) were uncertain as to whether they were at risk. Most respondents, 70.4% (100/142), reported that their perception was influenced by the frequency of contact with patients who were infected with the blood-borne viruses. These respondents were still at risk despite following Universal Precautions because accidental pricks (with needles and scalpels) were still bound to occur. Twenty percent (28/142) respondents offered no explanation as to why they perceived that they were at risk. Only 5.1% (8/158) did not perceive a risk and thought that since they take all precautionary measures to protect themselves they were not at risk of contracting these blood-borne infections. These findings suggest that most nurses in this study, 70.4% (100/142), highly perceived a risk of contracting blood-borne infections such as HIV and HBV through exposure to blood and body fluids of patients despite using adequate barrier protection. Frequency of contact with patients with these infections provides visible reminders of the prevalence of the diseases. Leliopoulou *et al* (1999) received similar responses in a UK hospital based survey. Individuals who believe that they are at risk of exposure are more likely to practise protective barriers (Williams *et al* 1994).

The likelihood of HIV, HBV or HCV infection following a contaminated needle-stick was reported as: likely, 31% (49/158); very likely, 32.9% (52/158); inevitable, 28.5% (45/158); possible but unlikely, 3.8% (6/158); unlikely 28.5% (45/158; very

remote 3.8% (6/158). At least more than one half (67.7%) of the respondents were aware that there was a risk of infection following a needle-stick injury contaminated with HIV HBV or HCV infection. High sero-prevalence of these blood-borne viral infections in this country heightens the possibility of healthcare workers acquiring these infections following exposure.

Most respondents 56.3% (89/158) agreed that there was a high personal risk of contracting HIV/HBV or HCV infection in their place of work. The other respondents, 43.7% (69/158), felt that they were taking adequate protection and, therefore, did not consider themselves at significant risk of contracting HIV/HBV or HCV infection in their place of work. The respondents (56.3%, 89/158) who perceived a high risk of contracting high HIV, HBV or HCV infection in their place of work related their perception of risk to; pressure of time, prevalence of patients with those blood-borne pathogens in the hospital and nature of the procedures done which predisposed them to occupational exposure. These respondents further cited shortage and/or lack of supplies such as gloves, masks and protective eyewear as factors that predisposed them to risk of contracting these infections. The finding that nurses sometimes work under immense situational pressures and may not have time to engage in safe effective nursing practice is supported by some other studies (Williams *et al* 1994; McNabb and Keller, 1991).

Almost all respondents (97.5%, 154/158) agreed that Universal Precautions were necessary, while a few respondents (23.4%, 37/158) were concerned that barrier precautions during nursing care may offend patients. Other studies have reported similar findings whereby respondents reported interference with nurse patient relationship and decreased dexterity as obstacles to compliance (Ramsey *et al* 1996; Henry *et al* 1994; Henry *et al* 1992; Willy *et al* 1990). Nurses have an obligation to themselves as well as their patients to practise safely. This can only be achieved if all patients are assumed to be potentially infected with HIV, hepatitis B and C viruses or other blood-borne pathogens (Leliopoulou *et al* 1999).

Study objective 5: To make recommendations towards the reduction of occupational exposures to blood and body fluids to Kenyan healthcare workers. Several recommendations were identified and presented in Chapter 5.

CHAPTER 5
RECOMMENDATIONS

Underpinned by the study findings, several recommendations were identified with reference to nursing education, nursing management, patient care and future research and surveillance. Although this study was undertaken at the Kenyatta National Hospital in Kenya, the recommendations also pose implications for policy and practice at other healthcare settings. These recommendations are described below.

5.1 Nursing Education

Regular educational programmes will help healthcare workers to perceive both the risk and the respective magnitude of risks for occupational acquisition of blood-borne pathogens, such as HIV, HBV, and HCV infections. Occupational exposures can be significantly reduced by organizing adequate training to improve knowledge and produce clear policies to deal with faulty perceptions. Educational programmes should focus on the following:

1. Epidemiology of occupationally acquired blood-borne pathogens and their modes of transmission.
2. Risk of occupationally acquired blood-borne infections at work place.
3. Emphasis on the principle and practice of Universal Precautions Policy.
4. Current protocol on reporting mechanism.

All healthcare workers who handle blood and other body fluids should regularly attend infection control seminars which review Universal Precautions and the current mechanisms for reporting occupational exposures. The ongoing infection control seminars should be made mandatory for all healthcare workers in the hospital. A system of identifying those healthcare workers who do not attend these programmes should be put in place. Reasons for non-attendance of these programmes should be investigated and addressed. Lastly, “Standard Precautions” guidelines should be integrated in the current basic student training curriculum in Kenyan nursing institutions.

5.2 Nursing management

The nursing management and the infection control team should take a leadership role in ensuring safe practices as recommended by the Infection Control Committee (ICC) of the hospital. Various categories of nurses should be involved in the ICC, participating in the development and improvement of nursing technique, and ongoing review of aseptic nursing policies; approved by the ICC. The Infection Control Department should develop a yearly work-plan to assess and promote appropriate infection control measures and staff training. They should supervise the implementation of infection control guidelines in specialized areas such as operation theatres, critical care units, maternity and newborn units. And lastly, the Department should monitor adherence to these policies by nurses.

5.3 Patient care

Proper psychosocial preparation of patients before procedures can also reduce needle-stick injuries associated with unexpected movement of patients. Availability and accessibility of protective materials need to be improved. Healthcare institutions must ensure that these protective devices are readily available, easy to use, effective and comfortable, in order to encourage use of protective devices. Appropriate placement of needle disposal puncture-proof containers can further minimize needle-stick injuries. The nurse in charge of a ward should identify and maintain hygiene standards consistent with infection control policy of the hospital and good nursing practice. Aseptic techniques including hand-washing and use of isolation should be monitored. Prompt reporting to the attending doctor is required of any evidence of infection in patients under the nurse's care. Patient exposure to visitors, hospital staff, other patients, or equipment used for diagnosis or treatment should be limited. A safe and adequate supply of ward equipment, drugs and patient care supplies must be maintained (Ducel *et al* 2002).

5.4 Future research and surveillance

This study design could be improved in future studies by minimizing the recall period (for example, recall of occupational exposure in the last six months). More research is needed to focus on other risk factors which contribute to occupational exposures, such as overcrowding of the wards and high patient to nurse ratios. Future research studies should also address the magnitude and cause of

underreporting, and seek strategies for improving the reporting of these exposures. Future research studies should also have mechanisms to manage emotional distress or trauma that might be evoked by recalling psychological stress due to occupationally acquired infections.

Surveillance of the incidence and prevalence of occupational exposures and acquired infections in Kenyatta National Hospital should be undertaken, and trends monitored, at both local and national levels.

CHAPTER 6
CONCLUSIONS

This research study was conducted between the months of May and July 2006 among a group of Registered Nurses at the Kenyatta National Hospital in Kenya. The explorative and descriptive research study was conducted to assess and describe the management of blood and body fluids, examine risk perception of occupational exposure, and identify the types and frequency of occupational exposure in this category of nurses. A self-administered questionnaire and checklist were used to collect data. The questionnaire sought demographic information, knowledge of Universal Precautions Policy and perception of risk of occupational exposure to blood-borne pathogens. The checklist was used to assess compliance of these Registered Nurses with Universal Precautions when handling blood and body fluids.

The study findings suggest a lack of regular and inadequate training of staff about Universal Precautions Policy. Non-compliant behaviours with barrier precautions were identified, including: failure to use gloves, gowns and protective eyewear; failure to wash hands; and recapping used needles. Compliance with barrier precautions seems to be associated with patients' perceived blood-borne status. The study illustrated a high level of occupational exposure, of which the majority of incidents were not reported. The low injury reporting rate among nurses places them at risk of acquiring blood-borne infections and subsequently transmitting these infections. Respondents were aware of the risks of acquiring blood-borne pathogens infections following occupational exposure to blood and body fluids of patients infected with these pathogens.

When interpreting the findings of this study, certain limitations should be considered. The results of this study should be generalized with caution since the study was carried out in one hospital. But the other hospitals are governed by the same policies of the Kenyan government, so the same practices are likely to be applicable and reflect the Universal Precautions practices in all other healthcare institutions in Kenya. Furthermore, it is likely that working conditions of these nurses at Kenyatta National Hospital are somewhat better than other healthcare

institutions since this hospital is the largest teaching and referral hospital in Kenya. Respondents were asked questions about the number of personal incidences of percutaneous and mucocutaneous exposure in their working lifetime, subjecting responses to recall bias.

However, despite certain limitations, this study reveals the need for interventions to enhance occupational safety of healthcare workers in Kenya. The study identified several recommendations for guiding healthcare institutions in Kenya towards improving overall safety of both healthcare workers and patients. Commitment at the governmental, organizational and individual level is necessary if healthcare workers are to be protected from risk of occupational blood-borne pathogen infection.

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APPENDICES

Appendix I - Questionnaire

Questionnaire: please indicate your answer with a tick (√).

Section-A Demographic Data

1. Gender
   - □ Male
   - □ Female

2. What is your highest nursing education/qualifications attained?
   - □ Diploma in Nursing,
   - □ Bachelor of Science in Nursing,
   - □ Master of Science in Nursing,
   - □ PhD in Nursing.

3. How long have you been practising as a registered nurse?
   - □ 5 years and less,
   - □ 6-10 years,
   - □ 11-20 years,
   - □ 21 years and over

4. Indicate your working area (unit or ward).
   - □ Medical Ward
   - □ Surgical Ward
   - □ Gynaecology/Labour Ward
   - □ Paediatrics/Neonatology Ward
   - □ Specialised Units (Burns, Renal and Intensive Care). Specify
   - □ Emergency department
   - □ Operating theatres

Section-B. Knowledge on Universal Precautions Policy

5. a). Indicate TRUE or FALSE, appropriately in the following table.

Are these methods of transmission associated with these infections to the nurse while assisting/nursing/caring for the patient?	HIV	Hepatitis B	Hepatitis C
Contact with blood during delivery			
Contact with □ Urine without gloves □ faeces without gloves			
Contact with breast milk			
Eating contaminated food			

b). Explain briefly what the Universal Precautions Policy entails:

……

c) When did you learn about the Universal Precautions Policy?

□ during basic nursing training
□ during post basic nursing training
□ attended an in-service program on Universal Precautions
□ others (specify) …….

6. How often do you have contact with patients who have HIV, Hepatitis B or C?

□ Daily
□ Weekly
□ Monthly
□ I don't know

7. Do you change your personal protection habits if you know that your patient has HIV, Hepatitis B or C?

□ Yes,
No,
Explain…….

8. Thinking specifically about patients with HIV, Hepatitis B or C infection my practice is:

a) I take more precautions when patient is suspected to have either HIV or Hepatitis B/C.
b) I take more precautions when patient has clinically proven HIV or Hepatitis B/C.

c) I take more precautions only when patient has fully blown symptoms of HIV or Hepatitis B/C.

d) I take more precautions whatever the condition the patient has.

Justify your answer……

9. a). During which procedures do you use protective eyewear?

……

b). Do you believe that prescription eyewear give adequate protection in these situations?

□ Yes

□ No

Justify your answer……..

10. a). How many times have you had a needle-stick injury since you started practicing as a registered nurse?

□ never

□ once

□ two times

□ more than two times

□ cannot remember

b). If you had a needle-stick injury, briefly explain the circumstance(s) in which the injury/injuries occurred……

……

11. a) Have you been soiled with blood or body fluids of a patient as follows:

i.	Hands	Yes	No
ii.	Arms	Yes	No
iii.	Facial	Yes	No

b). If **Yes** to any of the above, briefly describe the circumstance(s)…….....

……..

12. a). If you have had needle-stick injury or mucocutaneous exposure to blood/body fluids, did you report the incident?

Yes

No

b) If **Yes** indicate to whom you reported……..

c) If **No**, give reasons:

□ Did not know what to do

□ Reporting mechanism too cumbersome

□ Not aware of reporting procedure/relevant policy

□ Did not have time

□ Did not consider the patient to be "high risk"

□ Other reasons (specify)……..

13. Did you experience any complication following a needle-stick injury/soiling with blood/body fluids?

□ Yes

□ No

14. What does your institution's procedure of reporting percutaneous and mucocutaneous exposures entail?

……..……..

15. Do you use gloves when performing procedures whereby exposure to blood and body fluids of patients is anticipated?

□ Never

□ Sometimes

□ Always

16. Do you wash your hands each time you remove gloves?

□ Never

□ Sometimes

□ At all times

Justify your answer……

17. After undertaking a procedure do you recap the needle before disposal?

□ Never

□ Sometimes

□ At all times

18. If you suffer a needle-stick injury and the needle in question has been used on a patient who has HIV/ Hepatitis B infection, how likely is it that you will get infected?

□ Likely

□ Very likely

□ Inevitable

□ Possible but unlikely

□ Very remote

Section-C. Perceptions about the risk of exposure to blood-borne pathogens

19. Do you think you are at risk of contracting blood-borne infections such as HIV and Hepatitis B through exposure to blood and body fluids of patients?
    □ Yes
    □ No
    □ Uncertain
    Justify your answer…….

20. Do you feel that you are at personal risk of contracting HIV/ Hepatitis B or C infection in the place where you work?
    □ Yes, there is high risk
    □ There is high theoretical risk but I take some preventive measures
    □ High theoretical risk but I take all preventive measures
    □ Very little risk
    □ Risk is non-existent
    Justify your answer……..

21. Do you agree that following universal precautions policy decreases your risk of acquiring HIV and HBV or other blood/body fluid transmitted infections?
    □ Agree
    □ Strongly agree
    □ Disagree
    □ Strongly Disagree
    Justify your answer……

22. Do you think the application, or following, of the Universal Precautions Policy in your nursing care of the patient interferes with nurse-patient relationship
    □ Yes
    □ No
    Explain……..

23. Do you think that protective devices interfere with your nursing skills?
    □ Yes

□ No

Explain……

24. Do you perceive Universal Precautions as necessary?

□ Yes

□ No

Explain……..……...

Appendix II - Checklist

To evaluate the management of blood/body fluids at Kenyatta National Hospital

Management of blood

Observations	Yes	No
Put on gloves before undertaking procedures that involve blood		
Remove gloves correctly after procedure		
Wash hands after every procedure and after removing gloves		
Wear protective gowns when undertaking procedures that involve blood		
Wear eye protection before undertaking procedures that involve splashing of blood and body fluids		
Dispose used needles without recapping		

Management of body fluids

Observations	Yes	No
Put on gloves before undertaking procedures that involve body fluids		
Remove gloves correctly after procedure		
Wash hands after every procedure and after removing gloves		
Wear protective gowns when undertaking procedures that involve body fluids		
Wear eye protection before undertaking procedures that involve splashing of body fluids		

Appendix III - Informed consent

Dear Respondent

Please read and understand before signing the consent form below.

Title: The management of blood and body fluids in a Kenyan University Hospital: A nursing perspective.

By Anna A. Ngesa
(Stellenbosch University - Republic of South Africa)

This exploratory and descriptive study is designed to determine the knowledge of Universal Precautions Policy and perception towards risk of occupational exposures amongst the registered nurses at Kenyatta National Hospital. This study will also evaluate the management of blood and body fluids, and determine the frequency and types of occupational exposures to blood and body fluids at this hospital. The results of the study might provide information that may help to improve the use of universal precaution guidelines for handling blood/body fluids, and thus may reduce the incidences of accidental exposures among nurses.

This study and its procedures have been approved by Ethics and Research Committees of both Stellenbosch University and Kenyatta National Hospital. The procedures includes: 1) responding honestly and accurately to the questionnaire. The questionnaire comprises 24 questions of both closed- and open-ended types. 2) A checklist to observe and record the relevant nursing activities in randomly selected departments. You are free to ask any questions about the study or being a subject.

Your participation in this study is voluntary and you are not under any obligation to participate. You are free to withdraw at any stage of this study. All information that you will have given will be anonymous and confidential. The study data will be analysed by the researcher, and the results of the study will presented to

Stellenbosch University as partial fulfilment of the requirements for the degree of *Magister Curationis* (Nursing) and as publication in any reputable journal.

CONSENT

I have read, understood and voluntarily consent to participate in this study. I have understood the nature and purpose of this study, and that my identity will not be revealed in the study.

Subject's Signature: Date:

I have explained the nature of this study to the above subject, in writing, and have sought his/her understanding for informed consent.

Researcher's Signature: Date:

Appendix IV - Approval letter from the ethics and research committee of the Kenyatta National Hospital

KENYATTA NATIONAL HOSPITAL
Hospital Rd. along, Ngong Rd.
P.O. Box 20723, Nairobi.
Tel: 726300-9
Fax: 725272
Telegrams: "MEDSUP", Nairobi.
Email: **KNHplan@Ken.Healthnet.org**

Ref: KNH-ERC/ 01/ 3497 **Date: 15th May 2006**

Anna Adhiambo Ngesa
Stellenbosch University
Republic of South Africa

Dear Anna

RESEARCH PROPOSAL: "THE MANAGEMENT OF BLOOD AND BODY FLUIDS IN A KENYAN UNIVERSITY HOSPITAL: A NURSING PERSPECTIVE" (P35/02/2006)

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and **approved** revised version of your above cited research proposal for the period 15th May 2006 – 14th May 2007.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH-ERC

c.c. Prof. K.M.Bhatt, Chairperson, KNH-ERC
The Deputy Director CS, KNH
The HOD, Medical Records, KNH
Supervisors: Prof. E.B. Welmann