

**Adherence to Standard Precautions in clinical nursing practice:
a comparative study**

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DECLARATION

By submitting this research assignment electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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ABSTRACT

The aim of this study was to compare the impact of a four-day structured Basic Infection Prevention and Control course on the knowledge of, and adherence to, Standard Precautions in clinical nursing practice amongst nurses who had completed the course and those who did not. The specific precautionary measures of investigation included hand hygiene, personal protective equipment (PPE) and sharps management. The secondary aim of the study was to identify any personal and contextual factors that influenced the application of such Standard Precautions measures in public healthcare facilities within the Cape Winelands and Overberg District. Sixty eight students (those who had been trained) with a similar number of controls (who had not been trained) were enrolled in the study. Although both the participants and controls had the knowledge, their adherence to hand hygiene, PPE and sharps management in clinical nursing practice was poor. Staff attitude was found to be the main factor for non-adherence. The knowledge of the participants was good as they had answered most of the questions correctly. It seems as if there was retention of knowledge after the four-day Basic Infection Prevention and Control course. There were, however, no significant differences between the two groups. For both groups attitude and behavioural change must be addressed in order to improve adherence to hand hygiene, PPE and sharps management. The findings of the study will form recommendations towards improved infection prevention and control practices at public healthcare facility level in the Cape Winelands District.

ABSTRAK

Die doel van die studie was om die impak van 'n 4-dag gestruktureerde Basiese Infeksiebeheerkursus op die kennis en toepassing van Standaard Voorsorgmaatreëls in kliniese praktyk in die Kaapse Wynland en Overberg Distrikte ondersoek, vergeleke met 'n groep wat nie die kursus bygewoon het nie. Die spesifieke Voorsorgmaatreëls wat ondersoek is, het handigiëne, die gebruik van beskermende drag en die hantering en beheer van skerpvoorwerpe ingesluit. Die studie het ook gekyk na enige kontekstuele en persoonlike faktore wat die toepassing van Standaard Voorsorgmaatreëls in openbare gesondheidsorgfasiliteite beïnvloed. Agt en sestig verpleegkundiges het die 4-dag Basiese Infeksiebeheerkursus bygewoon en 'n gelyke aantal kontrole studente het nie die kursus bygewoon nie. Alhoewel beide groepe die kennis van handigiëne, die dra van beskermende drag en die hantering van skerpvoorwerpe gehad het, was die toepassing van die Standaard Voorsorgmaatreëls in kliniese praktyk baie swak. Personeel se houding was die grootste faktor wat gelei het tot die nie-toepassing van Standaard Voorsorgmaatreëls. Die kennis van die kursusgangers was goed, want albei groepe het die meeste van die vrae korrek beantwoord. Die waarneming wat gemaak is, is dat die kursusgangers se kennis wel verbeter het na die bywoning van die 4-dag Basiese Infeksiebeheerkursus. Data weerspieël egter geen noemenswaardige verskille tussen die groepe nie. Beide groepe se houding en gedrag moet aangespreek word om die toepassing van handigiëne, die dra van beskermende drag en die hantering van skerpvoorwerpe te verbeter. Die bevindinge van die studie sal gebruik word om aanbevelings te maak ten einde infeksiebeheerpraktyke in die Kaapse Wynland Distrik te verbeter.

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LIST OF ABBREVIATIONS

HAIs: healthcare associated infections

IPC: infection prevention and control

NSI: needle stick injuries

PI: principal investigator

PPE: personal protective equipment

SP: Standard Precautions

CHAPTER 1

SCIENTIFIC FOUNDATION OF THE STUDY

1.1 Introduction

Chapter 1 provides an overview of the rationale, the aims and objectives of the study on adherence to Standard Precautions in clinical nursing practice. This chapter also briefly describes the design, conceptual framework and approach of the study as well as the structure of the thesis. The content offers a description of the ethical considerations applied in the study.

1.2 Rationale and background literature

The study focused on the adherence to Standard Precautions in clinical practice by nurses who had attended a four-day structured Basic Infection Prevention and Control (IPC) course versus those who had not attended the course during the period November 2009 to August 2010.

During clinical observations at healthcare facilities in the Cape Winelands District, the Principal Investigator (PI) noted poor adherence to basic and standard precautionary practices by the nursing personnel (Nieuwoudt, 2009:np). It is well-documented that poor adherence to Standard Precautions contributes to hospital acquired infections. In response to these observational findings, the PI developed and implemented a four-day structured Basic IPC course which was endorsed by Worcester Hospital, Cape Winelands District (Strauss, 2009). The course was offered at the hospital to nursing staff within the Cape Winelands District between November 2009 and August 2010 (Nieuwoudt, 2009:7np).

1.2.1 Standard Precautions

IPC is the discipline concerned with the identification, prevention, monitoring, investigation and management of the spread of infections within healthcare settings (Kaminsky, 2004:np). It is an essential, though often underrecognised and undersupported part of the infrastructure of healthcare (Kaminsky, 2004:np).

IPC originated in 1818 when Ignaz Semmelweis, a Hungarian born physician who was known as the "father of infection control", introduced hand washing among doctors for the prevention of sepsis at the birth of babies. This practice of hand hygiene led to a decline in the number of post-natal sepsis cases after the birth of the babies (Kaminsky, 2004:38).

Health personnel have realised through the decades that there was a need for measures that prevent the spread of diseases. Over time, Standard Precautions were developed, which included a variety of interventions that need to be implemented in clinical practice (Forder, 2007:18). Standard Precautions are designed to prevent cross transmission from recognised as well as unrecognised sources of infection (Bjerke, 2002:18). The purpose of Standard Precautions is to break the chain of infection based on the mode of transmission and then put standard operating procedures into place to address the different areas of the infection control chain (Bjerke, 2002:18). Standard Precautions comprise of several interlinked procedures, including hand hygiene, personal protective equipment (PPE), waste management, linen management, patient care equipment, respiratory hygiene and cough etiquette, prevention of needle stick injuries and the safe discarding of sharps (Boyce and Pittet, 2002:53).

Standard infection control precautions are essential to ensure the safety of both the healthcare workers and patients who are at risk of acquiring infection (John, 2005:569). Accordingly, a healthcare provider must assume that all patients are potentially infected or colonised with an organism which can be transmitted to another person during service delivery.

Adherence to recommended infection control practices, including Standard Precautions, decreases transmission of infectious agents, the number of hospital acquired infections and average length of stay for the patients (John, 2005:569-574). Equally, poor adherence to Standard Precautions by healthcare workers remains a worldwide problem (John, 2005:569) and contributes to healthcare associated infection (John, 2005:569). Observational findings at public healthcare facility level in the Cape Winelands District showed limited adherence to recommended standard precautionary procedures by nursing personnel. The procedures of main concern observed in clinical care were hand hygiene, PPE and sharps management, including prevention of needle stick injuries and the safe discarding of sharps (Nieuwoudt, 2009:9np). Based on these observations, the knowledge of and adherence to these three vital standard precautionary measures among clinical nurses comprised the focus of the study.

1.2.1.1 Hand hygiene

Hands are the most common way in which micro-organisms can be transported and cause an infection in individuals who are most susceptible (Boyce and Pittet, 2002:51). The goal is to improve hand hygiene practices in all healthcare facilities. This is considered to be the single most important practice to reduce the transmission of healthcare associated infections

(HAIs) during the delivery of care to patients (Zerr et al., 2005:397-403). The importance of hand hygiene in preventing the spread of disease is universally accepted. Many healthcare workers are, however, not always vigilant in carrying out hand hygiene (Birks, 2011:10-13).

1.2.1.2 Personal Protective Equipment (PPE)

The use of PPE protects not only healthcare workers, but also the patients from transmission of infection (Kanemitsu, 2006:211-4). PPE refers to a variety of specific barriers used either alone or in combination to protect the mucous membranes, airways, skin and clothing of healthcare workers from contact with infectious agents. These barriers include gloves for hand protection, gowns and aprons for the protection of the skin and clothes, masks and respirators to protect the mouth and the respiratory tract, goggles for eye protection, and face shield to protect the entire face (Bertin et al., 2006:581-5).

1.2.1.3 Sharps management

The process of sharps management includes the prevention of incidents through sharps and needle stick injuries. Needle stick injuries is one of the more frequent routes by which blood-borne infections are transmitted from patients to healthcare providers (Zungu et al., 2008:48). Injuries due to needles and other sharps have been associated with the transmission of blood-borne viruses, including HIV (Wilburn, 2004:5-7). Despite these risks, little progress has been achieved with regard to the reduction and prevention of needle stick injuries. Developing countries report the highest number of needle stick injuries. African healthcare workers suffer between two and four needle stick injuries per year (Wilburn, 2004:5-7). According to the World Health Organisation (WHO), the exact numbers of needle stick injuries globally are unclear, because of the blame and stigma attached to the reporting of sharp injuries and the lack of post-exposure prophylaxis (Zungu et al., 2008:48). Data from Centres of Disease Control (CDC) shows that the number of needle stick injuries and other percutaneous injuries among healthcare workers are growing every year. Half of the injuries are unreported. There are more than 100 000 needle stick injuries in the United Kingdom (UK) each year. Needle stick injuries are virtually undocumented in many developing countries (www.hpa.org.UK/infections).

1.2.1.4 Infection prevention and control training

The findings from telephonic consultations with various Heads of Nursing Colleges in the Western Cape indicated that IPC is not a standard component of the training curriculum for under or postgraduate courses (Strauss, 2009). Only a few post-basic IPC courses were available to nursing staff in South Africa. In the Western Cape there is a two-year Postgraduate Diploma in IPC at Stellenbosch University (Mehtar, 2009), and a six-month

post-basic course at both the Netcare group (Crafford, 2010) and Stellenbosch University (Mehtar, 2009). None of the available courses were accredited by the Nursing Council of South Africa (SANC), who did not recognise IPC as a speciality (www.sanc.co.za.Info). This stance is being challenged by practitioners and experts in the field since IPC is endorsed by the National Department of Health as a core standard of healthcare (ANON, 2010:11,28).

1.3 The research problem

Global evidence suggests that nurses fail to adhere to Standard Precautions (John, 2005: 569-574). It is well-reported in literature that poor adherence to Standard Precautions contributes to hospital acquired infections (John, 2005:569-574). The results of clinical observations undertaken by the PI among nurses in the Cape Winelands District revealed poor adherence to Standard Precautions with regard to hand hygiene, PPE and sharps management (Nieuwoudt, 2009:7np). In response to the observational findings, the PI developed and implemented a four-day Basic IPC course which was endorsed by Worcester Hospital (Strauss, 2009). The course was offered at the hospital to nursing staff within the Cape Winelands and Overberg District between November 2009 and August 2010 (Nieuwoudt, 2009:7np). A group of 96 nurses completed the course during this period.

Following completion of the four-day Basic IPC course to address these deficits in practice, the retention of knowledge and application of these precautions in clinical practice remain unknown. Furthermore, the factors influencing adherence to these precautionary measures are unexplored. Based on the findings from the literature, there were no published South African investigations into knowledge of, and factors influencing adherence to hand hygiene, PPE and sharps management which form part of Standard Precautions in clinical nursing practice.

1.4 Research question

The question explored in the study was: *"Following completion of a four-day structured Basic IPC course, what is the level of knowledge, level of adherence to, and factors influencing adherence to Standard Precautions amongst clinical nurses who had completed the course, compared with those who did not?"*

1.5 Research aim

The aim of the study was to evaluate the impact of a four-day structured Basic IPC course on the knowledge of, and adherence to, Standard Precautions in clinical nursing practice compared with those who did not attend the course. The secondary aim of the study was to

identify the factors that influenced the application of such Standard Precautions measures in public healthcare facilities within the Cape Winelands and Overberg District.

1.6 Research objectives

The specific objectives of the study were to:

- (a) assess the level of knowledge of hand hygiene, PPE and sharps management Standard Precaution measures amongst clinical nurses who completed a four-day structured Basic IPC course and those who did not attend the course;
- (b) measure adherence to hand hygiene, PPE and sharps management Standard Precaution measures in clinical practice after completion of the structured Basic IPC course;
- (c) identify any personal (e.g. attitude and practice) and contextual factors (e.g. resources and management) which influence adherence to hand hygiene, PPE and sharps management Standard Precaution measures in clinical nursing practice.

1.7 Research methodology

1.7.1 Research approach and design

Findings from clinical observations among nurses in the Cape Winelands District revealed poor adherence to Standard Precautions, especially the three Standard Precautions of hand hygiene, PPE and sharps management (Nieuwoudt, 2009:8np). A comparative study design, employing a self-completion questionnaire and an observational checklist, was deemed most suited to investigate the knowledge of and adherence to Standard Precautions in clinical practice among nurses who had completed the four-day structured Basic IPC course six months earlier. The controls comprised of clinical nurses who had not attended the course but might have been exposed to in-service IPC training. The participants were matched by rank, age, experience, clinical speciality and healthcare facility. The study was predominantly quantitative, with the inclusion of three open-ended questions to identify the factors influencing the application of, and adherence to, hand hygiene, PPE and sharps management. The open-ended questions also provided participants with the opportunity to offer recommendations and additional information not covered in the data collection tool.

1.7.2 Population and sampling

The study population comprised of clinical nurses (N=96) from public healthcare facilities in the Cape Winelands and Overberg District who registered for and completed the four-day structured Basic IPC course at Worcester hospital between November 2009 and August 2010. The participants (course attendees) were from hospitals in Ceres (n=12), Worcester

(n=42), Robertson (n=3), Caledon (n=0), Hermanus (n=1) and Montagu (n=2); from clinics in the Witzenberg (n=0), Langeberg (n=3) and Breede Valley (n=0); and from Brandvlei Correctional Services in Worcester (n=5).

The controls comprised of a random sample of clinical nurses (N=68) in the Cape Winelands District who did not attend the four-day Basic IPC course, and who matched the cases by rank, age, years of experience, clinical speciality and healthcare facility. The personnel offices at the respective facilities availed an updated list with the names of all the clinical nurses. From this list the controls were randomly chosen by the PI.

1.7.2.1 Sample size

The study sample (N=136) comprised participants (N=68) and controls (N=68). The sample size was verified by a statistician (Mr Harvey) from Stellenbosch University.

1.7.2.1.1 Participants

The total of 96 nurses from the Cape Winelands and Overberg District completed the four-day structured Basic IPC course at Worcester hospital but only 68 volunteered to participate in the study. Twenty eight of the participants declined, of which some (n=6) wanted to be paid to participate, and others (n=16) were not interested in participating. One participant died in a motor vehicle accident and five had moved to other provinces. The contact numbers of those who had moved had changed, making it impossible to locate them.

1.7.2.1.2 Controls

Clinical nurses (n=68) from the Cape Winelands District who did not attend the four-day structured Basic IPC course were matched to the cases by rank, age, years of experience, clinical speciality and healthcare facility. A minimum sample size of 50 was determined by a statistician, Mr Justin Harvey, from Stellenbosch University. However, a sample of 68 was considered more appropriate to give a better scientific value to the study.

1.7.2.2 Specific sampling criteria

1.7.2.2.1 Participants

The study participants included all clinical nurses who:

- (a) completed the four-day structured Basic IPC course at Worcester Hospital between November 2009 and August 2010;
- (b) were registered with the South African Nursing Council as either a Registered or Enrolled Nurse; and

- (c) worked in clinical practice in public healthcare facilities within the Cape Winelands and Overberg District.

1.7.2.2.2 Controls

The study controls included all clinical nurses who:

- (a) did not attend the four-day structured Basic IPC course at Worcester Hospital between November 2009 and August 2010;
- (b) were registered with the South African Nursing Council as either a Registered or Enrolled Nurse;
- (c) worked in clinical practice in public healthcare facilities within Cape Winelands District and Overberg District; and
- (d) matched the participants by rank, age, years of experience, clinical speciality and healthcare facility.

1.7.3 Data collection tools

The study employed a clinical observational checklist and a self-completion questionnaire for data collection.

The data yielded from the clinical observational checklist (Appendix 1) which include SP, hand hygiene, PPE and sharps management, was used to evaluate procurement and adherence to Standard Precautions in clinical practice.

A validated IPC administered questionnaire (Marais, Mehtar, McVay and Chalkey, 2009), (Appendix 1) was modified based on the findings in clinical practice at facilities in the Cape Winelands District, and adapted for self-completion. Three open-ended questions were added to the existing IPC questionnaire.

The self-completion questionnaire (Appendix 2) assessed the following key domains:(a) demographic profile, including years of practice after registration, current workplace and previous IPC training; and provision, knowledge and application of (b) hand hygiene, (c) PPE, and (d) sharps management, including the safe discarding of sharps; and attitude.

The questionnaires were completed in English by the participants and controls. English was the language best understood by the majority of the participants and the control group.

1.7.3.1 Pilot test

A random sample of 10 nurses (representing 10% of study population) who did not attend the four-day structured Basic IPC course participated in the pilot testing of both the clinical observation list and self-completion questionnaire. The participants were sampled randomly from public healthcare facilities in the Cape Winelands District. The purpose of the pilot test was to establish the ability of the tool to achieve the stated study objectives and determine the logistics, such as time taken to complete the clinical observation checklist and questionnaire. The participants and findings from the pilot test were excluded from the main study.

1.7.3.2 Validity and reliability

Validity refers to the degree to which a measurement instrument measures what it is intended to measure. Reliability is the consistency of the data measurement technique (Burns & Grove, 2009:43).

There were two data collection tools used in this study. The first was a clinical observational checklist developed, based on findings from the literature (Centre of Disease Control and Prevention, 2007:1-10) and previous clinical observations undertaken at healthcare facilities in the Cape Winelands District (Nieuwoudt, 2009:8np). The content of the checklist was reviewed and approved by two experts in the field, Prof Shaheen Mehtar and Dr Frederick Marais, and by the statistician, Mr Harvey, from Stellenbosch University. The checklist was piloted and the amendments included in the final version.

The second tool was a self-completion questionnaire which was filled in by the participants and controls. The tool comprised of a modified version of a previously validated tool (Marais et al., 2009). The modifications were the inclusion of three open-ended questions and questions on attitude. It was reviewed by the two supervisors and minor adjustments were made to the final version before releasing it for data collection.

The applicability of both data collection tools was tested prior to the empirical phase to ensure that they accurately captured the required information in order to achieve the objectives of the study.

The PI met the participants and controls individually to obtain written informed consent prior to the data collection, using a Participant Information and Consent Form (Appendix 3). The PI entered the data into an electronic database (Excel 2010) with cross-checks for validation. The statistician tested the data analysis method.

1.7.4 Data collection

The study used two tools for data collection, as described above in section 1.8.3.2. The consent forms, checklists and questionnaires were kept separately, and a list with the code numbers was kept in a locked cabinet by the PI.

The data was collected by the PI to ensure consistency. Data was collected from August to November 2011.

1.7.4.1 Clinical observational checklist

The PI undertook all the clinical observations to ensure consistent measurement. Unannounced visits were undertaken over a period of one month at the healthcare facilities where the respective participants and controls were employed. The checklist was completed before the interview questionnaire, to reduce the risk of participants modifying their behaviour and practices.

1.7.4.2 Self-completion questionnaire

During a lunch break, the participants were brought together and handed the self-completion questionnaires, each with unique code numbers. The completed questionnaires were collected by the PI on the same day and put into a sealed envelope to maintain anonymity and confidentiality.

1.7.5 Data management and analysis

The PI entered the data into an electronic database (MS Excel version 2007). Following cleaning of the data, the PI validated the data by cross-checking a random sample of 25% for accuracy. Subsequently the data were analysed with the assistance of the statistician, Mr Harvey, using STATISTICA (version 9).

The purpose of the study was to examine differences between participants and controls in terms of knowledge and adherence to hand hygiene, PPE and sharps management in a clinical environment. This was tested by means of a questionnaire with specific questions structured to test different aspects of knowledge and adherence. Most questions were of a categorical nature. Therefore, the primary analysis objective was to determine whether there is an association between the group status (participants/controls) and their response to specific questions. For categorical/dichotomous data this was analysed by means of a chi-squared analysis, where a p-value of less than 0.05 was used to indicate significant association between the variables analysed.

Summary statistics was used to describe the variables. Distributions of variables were presented with histograms and/or frequency tables. The relation between two nominal variables was investigated with contingency tables and likelihood ratios chi-square tests.

The qualitative data yielded from the open-ended questions were analysed inductively, using a thematic approach (Braun, 2006:3(2):83). Qualitative data was quantified to provide a measurement to group data into clusters for a clearer answer on the research question of the study. The data was transcribed, coded, analysed, and themes were defined and named. Subsequently findings were quantified using a process of data coding for the themes using inductive analysis (Braun, 2006:3(2):83).

1.8 Significance of the study

Based on the literature review, this was the first study to investigate knowledge and application of, and adherence to, hand hygiene, PPE and sharps management in clinical nursing practice at public healthcare facilities in the Cape Winelands District. The findings from the study will form recommendations towards improving IPC practices at healthcare facilities in the Cape Winelands District.

1.9 Ethical considerations

The study was approved by both the Human Research Committee of Stellenbosch University (Appendix 5) and the Department of Health of Western Cape (Appendix 6).

The prospective participants in the study were telephoned by the PI and the nature of the study and the data collection methods were explained to the participants before the start of the study. The participants were informed that participation was voluntary, but if they wanted to participate they must complete a written consent form. They were also informed that they were free to withdraw from the study at any time. Written consent (Appendix 3) was obtained from each participant after the purpose of the study was explained and before data collection.

The data was collected by means of a self-completion questionnaire and an observational checklist. The questionnaires and observational checklists had a unique code to ensure anonymity and confidentiality of the participants.

On completion, the questionnaires and the observational checklists were put in separate boxes and locked in a cabinet at the PI's office. Only the PI had access to the

questionnaires and observational checklists until the time the data were captured on the Excel spread sheet.

The participants knew the PI as presenter of the four-day structured Basic IPC course. It is acknowledged that this familiarity could have affected their responses, but they were encouraged at all times to answer the questions truthfully. Due to resource restrictions it was not possible to employ an independent researcher for data collection. The participants were reassured of confidentiality and anonymity throughout the study. The participants and the controls completed the questionnaire separately. The PI handed out the questionnaires and left the room while the participants and controls were completing the self-completion questionnaires. The questionnaires were collected by the PI after completion.

1.10 Timeframe

The data collection was undertaken from August to November 2011.

1.11 Recommendations

Recommendations were identified from the empirical findings of the study. The results of the study will be disseminated in a report to the heads of all the healthcare facilities which were involved in this study, and to the Western Cape Department of Health. The results and recommendations will be presented at relevant conferences and workshops, and published in a peer reviewed journal.

1.12 Conclusion

Standard Precautions, specifically hand hygiene, PPE and sharps management contain the basic level of clinical infection control measures that are designed for the care of all patients, regardless of diagnosis. Routine practice of these precautions should become part of the daily activities and procedures performed by all healthcare workers.

Findings from the literature and clinical observations in the Cape Winelands District revealed that nursing personnel often failed to adhere to these precautions. Poor adherence to Standard Precautions poses huge health risks and financial implications for the patient and his/her family, and to the healthcare facility.

Based on the findings from the literature review, the comparative study was the first to examine the impact of a Basic IPC course on the knowledge of, and adherence to, hand hygiene, PPE and sharps management in clinical nursing practice at healthcare facilities in

the Cape Winelands District. The study also identified the personal and contextual factors that influence the application of such standard precautionary measures in patient care. The findings of the study could form recommendations towards improved IPC practices at healthcare facility level in the Cape Winelands District.

Chapter 2 will present the findings from a review of the pertinent literature that supports the rationale of the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents the findings from the review of pertinent literature applicable to the study. Literature was reviewed on the existing body of scientific evidence about the importance of and adherence to Standard Precautions in clinical practice. For the purpose of the study the review focused specifically on hand hygiene, personal protective equipment (PPE) and sharps management.

2.2 Reviewing of literature

Articles were researched from electronic data bases from the internet and intranet, (Nursing Journals, British Journal of Infection Control and Infection Control Today), the Centre of Disease Control's guidelines on infection control, Pubmed journals, a variety of articles on infection control as well as a search through different reference lists. Articles within the past 10 years (2002-2013) printed in English were used for the literature review.

2.3 Presenting the findings from the literature

The findings from the literature are presented under the following headings: Standard Precautions, hand hygiene, PPE, sharps management, IPC training and the application of knowledge.

2.3.1 Standard Precautions

Standard infection control precautions are designed to prevent transmission from recognised as well as unrecognised sources of infection.

Standard Precautions are a set of infection control practices used to prevent transmission of diseases that can be acquired by contact with blood, body fluids, non-intact skin and mucous membranes. These measures are to be used when providing care to all individuals, whether or not they appear infectious or symptomatic (WHO, 2003:7).

Standard Precautions are the basic infection prevention practices that should be applied by all healthcare workers for all potential risk prone procedures in patient care, regardless of suspected or confirmed infections of the patient, in any healthcare facility where healthcare is delivered. Standard Precautions are designed to protect both the healthcare worker and prevent healthcare workers from spreading infections among patients

(<http://www.cdc.gov/HAI:2011>). Today nurses utilise the most advanced knowledge and technology, but they may lack the basic comprehension of standard precautionary measures of infection control (Boyce and Pittet, 2002:53).

Both the healthcare workers and patients in a healthcare setting are at risk of contracting an infection. Treating all patients in the healthcare facility with the same basic level of Standard Precautions involves work practices that are essential to provide a high level of protection to patients, healthcare workers and visitors (WHO, 2003:7).

The purpose of Standard Precautions is to break the chain of infection with the focus on the mode of transmission and then put standard operating procedures into place to address the different areas of the infection control chain (Bjerke, 2002:18).

With the adherence to Standard Precautions in mind the question arises as to how professionals can neglect such important practices in their professional practice which requires that the quality of care rendered is of a high standard?

Several factors associated with healthcare workers' adherence to Standard Precautions have been documented. Gammon et al. (2007:157-167) reported that healthcare workers often have limited knowledge and training on infection control. As such they are not able to adhere to Standard Precautions in their day to day clinical activities pertaining to patient care. Poor knowledge had been associated with poor attitude and poor practice of Standard Precautions (Gammon et al., 2007:157-167).

Adherence on the part of healthcare workers to Standard Precautions has been recognised as being an efficient means to prevent and control healthcare associated infections. Non-adherence causes adverse incidents like healthcare associated infections for the patient. These infection control measures not only protect the patient but also the healthcare workers and the environment (Kanemitsu, 2006: 211-4).

Hand hygiene is considered to be the most important one among the Standard Precaution measures advocated (WHO, 2006:7-18). Other important measures are the adequate use of personal protective equipment, whose purpose is to protect the healthcare worker as well as the patient (Kanemitsu, 2006:211-4). The third precautionary measure for this study is the adoption of safe practices for handling and managing sharps, to prevent needle stick injuries and other sharp object injuries (Wilburn, 2004:9(3):5-7).

This means that Standard Precautions need to be reinforced frequently, with attention to appropriate hand hygiene, the correct use of personal protective equipment to minimise the potential of coming into contact with another person's blood or body fluids, and best practices for sharps management (Kanemitsu, 2006:211-4).

2.3.2 Hand hygiene

The Centre for Disease Control and Prevention has stated "that the most important measure for preventing the spread of pathogens is effective hand washing". Hand hygiene is mandatory in the healthcare settings and required by state and local regulations in the United States (Dancer, 2006:340).

Hand hygiene has been summarised by the Patient Safety Alliance, WHO in "Your Five Moments for Hand Hygiene". This approach encourages healthcare workers to clean their hands: (1) before touching a patient, (2) before cleaning/aseptic procedures, (3) after body fluid exposure, (4) after touching a patient, and (5) after touching patient surroundings (WHO, 2009:7).

Studies documented the pivotal role of healthcare workers' hands in the propagation of micro-organisms within the healthcare environment and ultimately to patient. Patient-to-patient transmission of pathogens via healthcare workers' hands involves five steps. Patients' skin can be colonised by transient pathogens that are subsequently shed onto surfaces in the immediate patient surroundings, leading to environmental contamination. Consequently healthcare workers contaminate their hands by touching the environment or patients' skin during routine care activities, despite glove use. Organisms are capable of surviving on healthcare workers' hands for several minutes following contamination. Thus if hand hygiene practices are suboptimal, microbial colonisation is more easily established and direct transmission to patients or a fomite indirect contact with the patient may occur (WHO, 2009:02).

Based on evidence and the demonstration of its effectiveness to reduce the transmission of micro-organisms optimal hand hygiene behaviour is considered the cornerstone of healthcare-associated infection prevention (Pittet et al., 2004:141:1-8).

Hand hygiene is the single most important infection control measure (Boyce and Pittet, 2002:51). It refers to hand washing or the use of alcohol-based hand rubs. Improved adherence to hand hygiene has been shown to terminate outbreaks in healthcare facilities,

reduce transmission of antimicrobial resistant organisms and reduce the overall infection rates (Centre of Disease Control, 2002:24-25). The connection between hand hygiene and infection is well-known, yet healthcare workers often miss opportunities to wash their hands or fail to do proper hand washing (WHO, 2004:10).

Hand washing, excluding the hand scrub, refers to the action of washing hands with an unmedicated soap and water, or water alone, to remove dirt and loose transient flora to prevent cross contamination. Hand disinfection refers to any action when an antiseptic solution is used to clean hands, with alcohol (Boyce, 2002:23-40).

Observational studies in the Cape Winelands District revealed that the frequency and quality of hand hygiene practices among healthcare workers are considerably suboptimal (Nieuwoudt, 2009:np). Many barriers to practise appropriate hand hygiene have been reported over the years. These include hygiene agents that cause skin irritation, insufficient time to practice hand hygiene, high workload and understaffing (Pittet, 2008:4-10).

Most nosocomial infections are transmitted by the hands of healthcare workers (Pittet, 2008:4-10). However, studies have shown that hand hygiene practices are poor, especially among young healthcare workers (Pittet, 2008:1:4-10). Using hand hygiene as a sole measure to reduce infection is unlikely to be successful when other factors on infection control, such as environmental hygiene, crowding, staffing levels and education, are inadequate.

Hand hygiene must be part of an integrated approach to infection control. Adherence to hand hygiene practices is poor worldwide (Dancer, 2006:99). It is also recognised that improving compliance with hand hygiene recommendations depends on altering human behaviour. Interventions to increase compliance with hand hygiene practices must be appropriate for different cultural and social needs (Dancer, 2006:99).

Hand hygiene by healthcare workers is a basic measure of healthcare facility infection control. Despite the ease of its execution, the awareness of healthcare workers about its preventative role, usefulness and low cost, compliance of healthcare workers with hand hygiene is extremely low (Nieuwoudt, 2009:np). Improving attitude concerning hand hygiene in healthcare facilities is a hot issue for district, national and international authorities (Borg, 2009:855-857). The goal is to improve hand washing in all healthcare facilities and to perform adequate hand washing. This is considered in all literature to be the single most important practice to reduce the transmission of HAIs during the delivery of care to the patients (Zerr et al., 2005:397-403).

The Centre for Disease Control and Prevention has stated "that the most important measure for preventing the spread of pathogens is effective hand washing" (<http://www.cdc.gov>).

Hand hygiene can be summarised into "Your Five Moments for Hand Hygiene": To wash hands before and after patient contact; between individual patient contacts; after contact with body fluids, blood, secretions or excretions, whether gloves are worn or not; after handling of contaminated or soiled equipment; immediately after removal of gloves (WHO, 2009:7).

Healthcare workers must assume that every patient or person could be carrying potential harmful micro-organisms that can cause harm to others. Hand hygiene is the standard precaution that must be applied as standard hygiene measure (Jumaa, 2005:3-14).

2.3.3 Personal Protective Equipment (PPE)

PPE is a key asset to carrying out Standard Precautions to protect the healthcare workers and the patients from transmission of any infection (Kanemitsu, 2006:211-4).

PPE includes items such as gloves, aprons, face covers (masks and respirators) and eyewear used to create barriers that protect the skin, clothing, mucous membranes and the respiratory tract from infectious agents (Bertin et al., 2006:581-5).

2.3.3.1 Gloves

Gloves should be applied just before touching mucous membranes or contact with body fluids. Gloves should be removed promptly after use and discarded before touching non-contaminated items and surfaces and before providing patient care. Hands should be washed after the removal of gloves (Chandler, 2006:1159-63).

2.3.3.2 Gowns

Non-sterile, fluid resistant gowns must be used to protect clothes from soiling during activities that may generate splashes of body fluids, secretions, excretions or blood (Chandler, 2006:1159-63).

2.3.3.3 Mask, face shield and eye protection

These items protect the eyes, nose, mouth and mucous membranes from exposure to splash of blood and body fluids, and may also protect from airborne pathogens (Kanemitsu, 2006:211-4).

PPE should be used by all healthcare workers who provide direct care to patients and who work in situations where they may have contact with blood, body fluids, excretions or secretions (Bjerke, 2002:08:1).

PPE reduces but does not completely eliminate the risk of acquiring an infection. It is important that healthcare workers use PPE effectively, correctly, and at all times where contact with blood and body fluids may occur. Continuous availability of personal protective equipment and adequate training for its proper use are essential. Healthcare workers must also be aware that use of PPE does not replace the need to follow basic infection control measures such as hand hygiene. PPE should be chosen according to the risk of the procedure (Osborne, 2003:31:415-423).

Healthcare workers know that it is best to wear PPE and to handle sharps carefully in the operating room and in other units within our public healthcare facilities. In a survey released by Kimberley Clark Professional, 89 percent of workers observed were not wearing safety equipment when they should have been. The workers think that they don't need it; they said the PPE is uncomfortable, too hot and unattractive looking. To safeguard and protect healthcare workers is just as crucial as methods to save a patient; without them there would be few healthcare workers left to help our patients (Pyrek, 2011:1-4).

Standard Precautions should include use of protective barriers and prompt and frequent hand washing to reduce the risk of exposure to potentially infectious materials. Standard Precautions are there to protect healthcare workers.

Using PPE is so simple that healthcare workers just don't think to use it appropriately and properly, for example a healthcare worker will put on gloves, perform a procedure and in the process get the gloves contaminated. Soon after this he/she charts her/his findings while still wearing the contaminated gloves (Nieuwoudt, 2009:9np).

Conner (Bjerke, 2002:114-116) states that the biggest challenge concerning PPE is getting people to wear it outside the operating theatre such as when they are doing cleaning procedures or where there is a high risk of splash when people are in the decontamination areas. Healthcare workers say that the PPE is uncomfortable, especially the masks, which are difficult to breathe with, and the ones wearing glasses complained that their glasses fogged. Other complaints are that they cannot properly feel a vein to draw blood and it is time consuming to put on gloves and take it off between patients and procedures (Nieuwoudt, 2009:9np). Literature that focuses on factors leading to non-adherence to the

use of PPE, reports that factors were lack of knowledge, lack of time, uncomfortable equipment, skin irritations and forgetfulness, as well as the conflict between the need of care and self-protection (<http://www.biomedcentral.com/1472-6955/10/1>).

The comfort of PPE greatly affects staff willingness to be compliant. If a product is not comfortable, it is more difficult to get the healthcare workers to wear it. Convenience and ease of use also affect compliance and need to be considered in evaluating PPE before it is procured (Nieuwoudt, 2009:9np). Non-availability of personal protective equipment and safety devices to many healthcare workers may cause resistance to use it properly. Staff stated that they often come across situations where they must use PPE, but it is not possible due to the lack of availability of such equipment (<http://www.biomedcentral.com/1472-6955/10/1>). Unless supplies are readily available to use, the delay may cause poor decision making and will not facilitate best practice. Cost considerations of personal protective equipment should be weighed against patient safety, the safety of the healthcare worker, user preference and the cost for the facility if they fail to adhere to the use of personal protective equipment.

When choosing protective eyewear comfort, clear vision, accessibility, individual preference, protection and use with prescription glasses are critical if compliance with Standard Precautions is to be achieved.

Conner (Bjerke, 2002:114-116) recommends that double-gloving is of great essence for orthopaedic operations and procedures in theatre. She also stated that the biggest challenge encircling PPE is to get the healthcare worker to wear gloves, gowns and eye protection outside the operating theatre or where there is a high risk of splash when people are in a decontamination area. The recommendation about how to get personnel to adhere to the use of personal protective equipment is thorough communication and education (Bjerke, 2002:114-116).

Gloves are recommended for all activities that carry a risk of exposure to blood, body fluids, secretions or excretions, sharps or contaminated instruments, when touching mucous membranes and non-intact skin. Gloves should be put on immediately before patient contact and removed after the procedure is completed. Gloves should be disposed of as healthcare risk waste if contaminated with blood or body fluids. The use of gloves is procedure specific, but should be worn routinely during exposure to blood or body fluids (Standard Precautions, 2009:12).

Face protection consists of the following: (a) a fluid repellent mask with separate goggles, (b) face shield, and (c) fluid repellent mask with eye shield. It should be worn by the healthcare worker where there is a risk of blood, body fluids, secretions or excretions splashing into the face or eyes (Standard Precautions, 2009:13).

Healthcare workers must wear N95 respirators when treating patients with *Mycobacterium tuberculosis* (TB) and to protect themselves from airborne pathogens (Mehtar, 2010:175-176). The use of masks is required for coverage of the mouth and nose. Protection is focused on unanticipated splashes from potentially infective bodily fluids. Healthcare workers must use a new mask for each procedure. Disposal is immediate after care or completion of a procedure and not to be worn around the neck for reuse (Bjerke, 2002:1-3).

Long sleeved fluid repellent gowns may be required if there is a risk that the skin and/or the uniform may be exposed to blood, body fluids, or excretions and secretions. Disposable aprons should be worn for selected procedures by healthcare workers and disposed of immediately after completion of a procedure (Standard Precautions, 2009:13).

Protective eyewear, goggles, visors and face shields must be worn to protect the mucous membranes of the eyes when conducting procedures that are likely to generate splashes of blood, body fluids, secretions or excretions. If disposable, these items should be discarded in appropriate containers immediately after use (WHO, 2003).

PPE is part of the healthcare professionals' "collective construction" (Standard Precautions, 2009). This does not mean that there is enough commitment to get full adherence to the use of it. According to literature there are a few reasons for this non-adherence. Key reasons reported are the underestimation of risk, the unavailability of PPE, perceptions of discomfort for professionals and lack of knowledge on when to use the PPE. Convenience and the ease of use also affect the compliance of the proper use of PPE by healthcare workers. Accessibility to PPE and safety devices may result in resistance by nurses to use it properly (Schraag, 2007:211-4).

2.3.4 Sharps management

A lack of knowledge and failure to adhere to Standard Precautions are the key causes for needle stick incidents (Kosgeroglu, 2004:216-223). The lack of appropriate resources, knowledge, skills and the unavailability of, or poor adherence to, standard precautionary measures constitute high risk factors for needle stick injuries. In addition, factors such as the

lack of experience and knowledge about the correct procedure, no or poor orientation, and the lack of continuous in-service training are the greatest problems for healthcare settings to address proper management and prevention of needle stick injuries (Zungu et al., 2008:48). Adequate knowledge and adherence to policies and safety practices could prevent the occurrence of needle stick injuries as well as the resulting complications thereof (Zungu et al., 2008:48).

Precautionary measures include the safe handling of needles and other sharp devices to prevent injury to the user and others who may encounter the device during or after a procedure. These measures apply to routine patient care (Zungu et al., 2008:48).

Based on the findings from clinical observations at healthcare facility level in the Cape Winelands District, nurses had poor adherence to the prevention of needle stick injuries and the safe discarding of sharps in clinical practice (Nieuwoudt, 2009:7np). It has been documented that in the developing countries the number of needle prick injuries is the highest. According to statistics African healthcare workers suffer between two and four needle stick injuries per year (Wilburn, 2004:5-7).

There was very little progress after the training of the participants on the prevention of needle prick injuries in healthcare facilities in the Cape Winelands District. Monthly reports had proved that there were at least three to five per subdistrict (Nieuwoudt, 2012:4np).

Sharps waste is highly infectious and is considered one of the most dangerous categories of waste. Poorly managed, they expose healthcare workers, waste handlers and the communities to infections. Contaminated needles and syringes represent a particular threat and may be scavenged from waste areas and dump sites and be reused. It has been estimated that in 2000 injections with contaminated syringes caused 21 million hepatitis-B virus infections and 260 000 HIV infections (Wilburn, 2004:5-7).

A sharp injury (SI) is defined as "the par literal introduction into the body of a healthcare worker, during the performance of his/her duties, of blood or other potentially infectious material by a hollow-bore needle or sharp instrument, including but not limited to needles, lancet, scalpels and contaminated broken glass" (Kosgeroglu,2004:216-23).

Percutaneous injuries, caused by needle sticks and other sharps, are a serious concern for all healthcare workers and posed a significant risk of occupational transmission of blood-borne pathogens. NSI are wounds caused by sharps such as hypodermic needles, blood

collection needles, intravenous cannulae or needles used to connect parts of the intravenous delivery systems.

The causes include various factors like type and design of needle, recapping activity, handling or transferring of specimens, collision between healthcare workers or sharps during clean-up, manipulating needles in patient line related work, passing or handling devices or failure to dispose of the needle in puncture proof containers (Wilburn, 2004:451-6).

Needle prick injuries can occur during a variety of procedures including needle recapping, injuries sustained in the operating room, during blood collection or intravenous line administration, suturing, checking blood sugar, and careless disposal in garbage bags due to inadequate segregation at source.

The lack of knowledge about the seriousness of needle stick injuries, a careless attitude, coupled with the unavailability of the standard precautionary procedures and non-adherence, as well as indifference and apathy towards the subject was reported (Zungu, 2008:50(5):48).

The WHO (2003:7-9) stated that the exact numbers of needle stick injuries are unclear, because of the blame and stigma attached to the reporting of sharp injuries and the lack of post-exposure prophylaxis.

Needle prick injuries are the commonest route by which blood-borne infections are transmitted from patients to healthcare providers (Zungu, 2008:48). The lack of appropriate resources, knowledge and skills, with the unavailability of standard precaution procedures and the compliance thereof, constitutes a high risk for needle prick injuries. Adequate knowledge and adherence to policies and safety practices could prevent the occurrence of needle prick injuries as well as the complications thereof (Zungu, 2008:48).

There must be proper use of safety devices for all procedures and the proper disposal of needles and sharps, including the segregation and management of hazardous medical waste. In-service training on the do's and the don'ts for the prevention of needle prick injuries must be part of the orientation and training programmes of the nurses (Zungu, 2008:48).

Literature states that ignorance, not following standard precautionary measures, and lack of knowledge are the reasons for needle prick incidents. Needle prick injuries can be prevented

by the implementation of work practice and engineering controls and the adherence to standard operating procedures and policies (Kosgeroglu, 2004:216-23). Observational studies conducted in the Cape Winelands District found poor adherence to policies and ignorance to adhere to Standard Precautions of infection prevention and control (Nieuwoudt, 2009:10np). The attitude of staff towards the adherence to Standard Precautions can be one of the main reasons for needle stick injuries in clinical practice.

Needle stick and sharp injuries will continue to be a hazard that exposes the healthcare worker to blood-borne pathogens. Preventing needle stick injuries is an essential part of any blood-borne pathogen prevention programme in the workplace.

2.3.5 Infection prevention and control training

Clearly, "Teaching can occur without learning and learning can occur without teaching", and the report emphasises that infection preventionists must capture and hold the attention of adult learners (<http://infectioncontrolday.com/articles/2011/05>).

Pittet says infection preventionists face a number of barriers to effective education in the healthcare setting, including rapid change, information overload, constant healthcare worker turnover and the complexity of the educational message. There are a number of topics that bear repeating, such as hand hygiene, when to use Standard Precautions and PPE (<http://infectioncontrolday.com/articles/2011/05>).

Education played an important role in the training of nursing personnel, helping them to adopt adequate knowledge and attitudes related to infection control measures (Singh, 2007:1-9). All healthcare workers should be equipped with requisite knowledge, skills and attitudes for good infection control practices.

The four-day structured Basic IPC course addressed the importance of and highlighted the standard precautionary measures on hand hygiene, the use of PPE and sharps management. The aim of training is to guide best practices and reinforce the message of all infection prevention and control measures in clinical practice.

The benefits of training on Standard Precautions must not be underestimated, and that just by taking a minute to stop and practise proper hand hygiene, one can make a vital contribution to the prevention and control of infections (WHO, 2003:7-9).

Regular training programmes should be run for the staff on essential infection control practices. Periodic re-training or orientation of staff with regard to infection prevention and control should be provided as well as a review of the impact of training (Nieuwoudt, 2009:np).

In the Western Cape, the Academic Unit for Infection Prevention and Control at Tygerberg Hospital and the Faculty of Medicine and Health Sciences at Stellenbosch University offers several short courses and specialist courses (www.sun.ac.za/uipc).

The current nurse training curriculum does not include Infection Control. The South African Nursing Council does not recognise IPC as a speciality and have no accreditation for the post basic IPC courses (www.sanc.co.za/info).

Whilst there is no accredited IPC course, the teaching must be strengthened, to the application of Standard Precautions for every patient, use of PPE and hand hygiene.

Additionally, in South Africa the recent National Core Standards were decreed by means of legislation by the Minister of Health in 2011 for implementation by the DOH (<http://www.doh.gov.za/docs/notice/2013>). The importance of, and adherence to, Standard Precautions are emphasised in this document. A high and uniform standard of patient safety (IPC) practice is expected. It is also expected from the Human Resource Department to provide proof of training with regard to infection control for compliance with the National Core Standards. The aim is to improve patient centred experience and the quality of services.

Currently there is no published evidence of the impact of the National Core Standards on practice nationally since provincial data is being collected.

2.4 Conclusion

This chapter reported the findings from the literature on Standard Precautions, hand hygiene, PPE and sharps management. Standard Precautions contain the basic level of infection control, precautions that are designed for the care of all patients regardless of their diagnosis and their status. The goal for the use of and adherence to Standard Precautions is to reduce the risk of transmission of microbes or pathogens from both the recognised and the unrecognised sources of infection. Routine practice of these precautions should become part of the daily activities and procedures performed by healthcare workers.

Although Standard Precautions are important for infection control, nursing personnel tend to overlook their importance and ignore these precautions in their daily activities as observed in clinical practice. The conclusion is that there is poor adherence to these precautions, not only in healthcare facilities in the Cape Winelands District, but according to the literature it is an international problem.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology is defined as the methods, techniques and procedures that are used for implementing the research design, as well as the underlying principles and assumptions that justify their use (Babbie, Mouton, Vorster & Prozesky, 2006: 647). The research methodology refers to a research plan relating to the context within which the research should be conducted. This chapter provides a detailed description of the methodology applied in the study.

3.2 Research question

The study was initiated by the formulation of a research question. The research question focuses on the description of the variables, a determination of differences between two or more groups regarding the selected variables, an examination of relationships among variables and the use of independent variables to predict a dependent variable (Burns & Grove, 2009:167).

The question explored in the study was: *"Following completion of a four-day structured Basic IPC course, what is the level of knowledge, level of adherence to, and factors influencing adherence to Standard Precautions amongst clinical nurses who had completed the course, compared with those who did not?"*

3.3 Research aim

The aim of the study was to evaluate the impact of a four-day structured Basic IPC course on the knowledge of and adherence to Standard Precautions in clinical nursing practice, compared to those who did not attend this formal course. The secondary aim of the study was to identify the factors that influence the application of such Standard Precaution measures in public healthcare facilities within the Cape Winelands District.

3.4 Research objectives

Specific objectives were formulated to address the research question. Study objectives are clear, concise and declarative statements, which are formulated to direct the PI in identifying variables and the relationship between them (Burns & Grove, 2007:553).

The objectives of the study were to:

- (a) Assess the level of knowledge of hand hygiene, PPE and sharps management Standard Precautions measures among clinical nurses who completed the four-day structured Basic IPC course and among those who did not.
- (b) Assess adherence to hand hygiene, PPE and sharps management Standard Precautions measures in clinical practice after completion of the four-day structured Basic IPC course.
- (c) Identify personal (e.g. attitude and practice) and contextual factors (e.g. resources) that may impede the adherence to Standard Precautions in clinical nursing practice.

3.5 Research methodology

The research methodology applied during this study will be discussed in the following subsections: research approach and design, population and sampling, data collection tools, pilot study, validity and reliability, data collection and management, data analysis, ethical consideration and limitations.

3.5.1 Research approach and design

A research design is a plan according to which one intends to carry out the research. Research designs provide blueprints, or systems of rules, to be followed in the conduct of a study (Stommel & Wills, 2004:33-34).

This was a comparative study to evaluate the knowledge of, and adherence to, Standard Precautions in clinical nursing practice. The focus was specific on the three identified areas of concern which were hand hygiene, PPE and sharps management (Nieuwoudt, 2009:8np) amongst the nurses in the study population. The study was predominantly quantitative, with the inclusion of three open-ended questions, to identify the factors influencing the application of and adherence to hand hygiene, PPE and sharps management. The open-ended questions also provided participants the opportunity to offer recommendations and additional information not covered in the data collection tool.

Quantitative research was applicable for this study because the participants were matched with a control group. This method was used to research the problem and to see if there were any personal or contextual factors that impeded adherence to Standard Precautions in clinical practice. The data was collected by means of a self-completion questionnaire and an observational checklist as described below in section 3.7. Statistics were used to identify differences between the participants and the controls.

Quantitative research is a formal, objective, systematic process in which numerical data is used to obtain information. The method is used to describe variables, examine relationships among variables, and determine cause-and-effect interactions between variables (Burns & Grove, 2009:22).

3.6 Population and sampling

3.6.1 Study population

A study population includes all individuals who meet the sample criteria for inclusion in a study (Burns & Grove, 2009:714). Sample size is the number of subjects or participants recruited and consenting to take part in a study (Burns & Grove, 2009:721). Sampling includes selecting groups of people, events, behaviours or elements with which to conduct a study (Burns & Grove, 2009:721).

The study population comprised participants (study) and controls. Participants were clinical nurses from healthcare facilities in the Cape Winelands District who had completed a four-day structured Basic IPC course at Worcester Hospital between November 2009 and August 2010. Training registers with the names of the participants were kept at the Human Resource and Development Department of Worcester Hospital and Cape Winelands District Office. The study population comprised all clinical nurses (N=96) from public healthcare facilities in the Cape Winelands and Overberg District who completed the four-day structured Basic IPC course at Worcester Hospital between November 2009 and August 2010. The participants (course attendees) were from hospitals in Ceres (n=12), Worcester (n=42), Robertson (n=3), Caledon (n=0), Hermanus (n=1) and Montagu (n=2); from clinics in the Witzenberg (n=0), Langeberg (n=3) and Breede Valley (n=0); and from Brandvlei Correctional Services in Worcester (n=5).

The controls comprised a sample of clinical nurses from healthcare facilities in the Cape Winelands District who did not attend the four-day structured Basic IPC course, and who matched the cases by rank, age, years of experience, clinical speciality and healthcare facility. The management of the respective healthcare facilities enabled the identification of the controls. A list of names according to the different categories of nurses was handed to the PI. A subsequent list was constructed of the nurses who matched the study participants according to age, rank, years of experience and healthcare facility. Due to the extensive geographical distances between the facilities, the PI selected a convenience sample of those who were on duty at the time of the sampling visit.

3.6.1.1 Specific sampling criteria

The study sampled the participants (clinical nurses) who:

- (a) were registered with the South African Nursing Council as either a Registered or Enrolled Nurse;
- (b) completed the four-day structured Basic IPC course at Worcester Hospital between November 2009 and August 2010;
- (c) worked in clinical practice in public healthcare facilities within the Cape Winelands District and Overberg District.

The controls included clinical nurses who:

- (a) were registered with the South African Nursing Council as either a Registered or Enrolled Nurse;
- (b) did not attend the four-day structured Basic IPC course at Worcester Hospital between November 2009 and August 2010;
- (c) worked in clinical practice in public healthcare facilities within the Cape Winelands and Overberg District;
- (d) who matched the participants by rank, age, years of experience, clinical speciality and healthcare facility.

3.6.2 Sample size

Sample size is the number of participants recruited and consenting to participate in a study (Burns & Grove, 2009:721).

The study sample (N=136) comprised 68 study and 68 controls. The sample size was verified by Mr Harvey, a statistician at Stellenbosch University.

A total population (N=96) was considered but only 68 were sampled as explained below.

3.6.2.1 Participants

The total of 96 nurses from the Cape Winelands and Overberg District completed the four-day structured Basic IPC course at Worcester Hospital, but only 68 participated in the study. Thirty of the participants declined, of which some (n=6) wanted to be paid to participate, and others (n=16) were not interested in participating. One participant died in a motor vehicle accident and five had moved to other provinces. The contact numbers of those who had moved had changed, making it impossible to locate them.

3.6.2.2 Controls

Clinical nurses (n=68) from the Cape Winelands District who did not attend the four-day structured Basic IPC course and who matched the cases by rank, age, years of experience, clinical speciality and healthcare facility. A minimum sample size of 50 was determined by a statistician, Mr Justin Harvey, from Stellenbosch University. However, a sample of 68 was considered more appropriate for the purpose of the study in order to get more scientific value from the study.

3.7 Data collection tools

Quantitative research requires the use of structured interviews, questionnaires and/or observations (Burns & Grove, 2009:24). The study made use of a clinical observational checklist (Appendix 1) and a self-completion questionnaire (Appendix 2).

3.7.1 Clinical observational checklist

A clinical checklist was compiled by the PI following the literature review and personal experience in clinical practice. Data was collected by employing a structured clinical observational checklist (Nieuwoudt, 2009:8np). The checklist was used to evaluate provisions for, and adherence to, hand hygiene, PPE and sharps management in clinical nursing practice.

The checklist was reviewed and approved by two IPC experts, Prof Shaheen Mehtar and Dr Frederick Marais, as well as the statistician, Mr Justin Harvey, from Stellenbosch University. The checklist was tested prior to the empirical phase of the study.

3.7.2 Self-completion questionnaire

The study used a slightly modified version of a previously validated IPC assessment questionnaire (Marais, Mehtar, McVay and Chalkley, 2009:np). The quantitative questionnaire assessed the following key domains: (a) demographic profile, including years of practice after registration, current workplace, and previous (b) IPC training; and (c) knowledge of hand hygiene, PPE and sharps management, including the safe discard of sharps. The PI added two additional domains: (d) factors impeding application in practice; and (e) attitude towards Standard Precautions.

Three open-ended qualitative questions were included in the questionnaire to identify: (a) any additional factors influencing adherence to hand hygiene, PPE and sharps management, precautionary measures, and (b) recommendations towards improved

adherence to Standard Precautions in clinical nursing practice. The added questions were reviewed and approved by Prof Mehtar and Dr Marais.

3.8 Pilot study

A pilot study is a smaller version of a proposed study conducted to refine the methodology and to develop various steps in the research process (Burns and Grove, 2009:44). Accordingly, a pilot study was completed before the main study to test the questionnaire and the observational checklist with nurses who had not attended the four-day structured IPC course.

A sample of 10 nurses (representing 10% of the study population) participated in the pilot study of the clinical observation list and self-completion questionnaire. Participants were sampled from healthcare facilities in the Cape Winelands District. The purpose of the pilot study was to establish the ability of the tool to achieve the stated study objectives and to determine logistics, such as the completion time of the questionnaires and observational checklists.

The pilot study's findings confirmed the content, clarity and completion of the data collection instrument.

The participants, data and findings of the pilot test were excluded from the main study.

3.9 Validity and reliability

Validity of an instrument refers to the degree to which a measurement instrument measures what it is intended to measure (Burns & Grove, 2009:43).

Validity addresses whether the research explains or measures what you said you would be measuring or explaining. It therefore deals with the appropriateness of the method to the research question (Flick, 1998).

The clinical observational checklist was developed based on the findings from the literature and previous clinical observations undertaken at healthcare facilities in the Cape Winelands District (Nieuwoudt, 2009:8np). The content of the checklist was reviewed and approved by two experts in the field, Prof Shaheen Mehtar and Dr Frederick Marais, and by the statistician, Mr Harvey, from Stellenbosch University. In addition, the checklist was piloted. A

previously validated, self-completion questionnaire was validated for face and content validity by Prof Mehtar and Dr Marais.

The applicability of both data collection tools was tested prior to the empirical phase to ensure that they capture the required information accurately in order to achieve the objectives of the study.

Subsequent amendments to the tools or variables were made to ensure appropriate and quality data capturing. The data was collected by means of a self-completion questionnaire completed by the participants and controls. The PI entered the data into an electronic database (Excel 2010) for the statistician to test the data analysis method. The accuracy of 34/136 (25%) of the entered data was validated by the PI.

The self-completion questionnaire was explained to the participants as well as the controls. The groups were separated with completion of the questionnaires. The observational checklist was completed first to prevent behaviour modification. All the data collection was done and captured by the PI.

Reliability is the consistency of the data measurement technique (Burns & Grove, 2009:43). The data from both the participants and controls were collected by the PI. The participants' and controls' knowledge, attitude, procurement and management of sharps were tested. The self-completion questionnaire was completed. The participants and the control group completing the questionnaire at different times were assured in the study.

The PI trained a registered nurse to help with the observations to minimise the Hawthorne effect (Burns and Grove, 2009:702); unfortunately she was withdrawn and the PI had to do the observations herself.

The PI explained the research to all the participants and controls, and the self-completion questionnaires were completed by the participants who had attended the four-day Basic IPC training at Worcester Hospital and the controls who did not attend the four-day Basic IPC course at Worcester Hospital. The questionnaires were completed by the participants without any influence of the PI. It increased the validity and reliability of the study.

The PI undertook all data collection to ensure data quality, and entered the data into an electronic database (Excel 2010) for the statistician to test the data analysis method. The PI also did the clinical observational checklist with the participants and controls.

3.10 Data collection

Data collection is the precise, systematic gathering of information relevant to the research or the specific objectives, questions or hypotheses of a study (Burns & Grove, 2009:695).

The study employed two tools for data collection as described in section 3.7. The clinical observational checklist and questionnaire each had a unique code to assure anonymity and confidentiality of the participants. The PI had meetings with the various participants and controls to explain the study and inform them of the aim of the study, and that participation is voluntary, anonymous and confidential.

Following the completion of the written Consent Form, the participants and controls were issued with the self-completion questionnaire. The completed questionnaires were placed in a sealed box. The PI had to have different sessions with the participants on day and night duty at the different healthcare facilities. The average completion time for the questionnaire was 25-30 minutes. The completed questionnaires were stored in a secure place at the workplace of the PI who was the sole person to have access to the raw data. The consent forms, clinical observational checklists and questionnaires were kept separately and a list with the code numbers was kept in a locked cabinet. The completion of the questionnaires across the Cape Winelands District was accomplished over a three month period.

The PI conducted unannounced visits to the different healthcare facilities to observe procedures on hand hygiene, PPE and sharps management. The completion of the clinical observational checklist took two and a half months due to the number of participants who were on night duty and on leave.

The checklist was completed before the questionnaire to prevent the participants from modifying their behaviour and practices. Observations were done on procurement and procedures of hand hygiene, PPE and sharps management.

3.11 Data analysis

The analysis is based on the research objectives, questions and data to be collected, and research design. The data analysis is the technique that is used to reduce, organise and give meaning to the data (Burns & Grove, 2009:43-44).

The quantitative data yielded from the self-completion questionnaires and the observational checklists were captured electronically by the PI, using Microsoft Excel (Office 2010). The

completeness and accuracy of data capturing were assured by checking the data. After cleaning the data, the PI validated the data by cross-checking a random sample of 25% for accuracy. Subsequently the data was analysed with the assistance of a statistician, Mr Harvey of Stellenbosch University, using STATISTICA (version 9).

The data questions in the questionnaire was themed in demographic data, IPC training, knowledge of Standard Precautions (hand hygiene, PPE and sharps management), factors impeding adherence to Standard Precautions, attitude towards Standard Precautions, provision of IPC resources, and adherence to Standard Precautions (hand hygiene, PPE and sharps management). The response rate of the participants as well as the control group was captured into a database and analysed separately.

The knowledge of the participants and controls was tested by means of a self-completion questionnaire with specific questions structured to test different aspects of knowledge and adherence. Most of the questions were of a categorical nature. The primary analysis objective was to determine whether there was an association between the group status (participants/control) and their response to specific knowledge of and adherence to Standard Precautions. The categorical/dichotomous data was analysed by means of a chi-squared analysis where a p-value ≤ 0.05 indicated significant association between the variables that were analysed. In the case of dichotomous data the Fisher's exact test may be used as well.

Furthermore, for all other analysis, the following general guidelines held:

- (a) summary statistics was used to describe the variables;
- (b) distribution of variables was presented with histograms and/or frequency tables;
- (c) medians or means were used as the measures of central location for ordinal and continuous responses and standard deviations and quartiles as indicators of spread.

Relationships between two continuous variables were analysed with regression analysis and the strength of the relationship measured with the Pearson correlation. The ANOVA (analysis of variance) was used to analyse the relationships between continuous variables and nominal input variables. When ordinal response variables were compared versus a nominal input variable, non-parametric ANOVA methods were used.

The relation between two nominal variables was investigated with contingency tables and likelihood ratio chi-square tests.

The qualitative data yielded from the open-ended questions were analysed inductively, using a thematic approach (Braun, 2006:(2):83). A theme captures something important about the data in relation to the research question and represents a level of patterned response within the data set. Data was generated from questions answered by the respondents. The PI then searched for themes while reviewing the data of the open-ended questions, looking for similarities and differences in the different data themes, then analysed and reported the data.

The data was themed as IPC training, knowledge of Standard Precautions (hand hygiene, PPE and sharps management), factors impeding adherence to Standard Precautions, attitude towards Standard Precautions, provision of IPC resources, and adherence to Standard Precautions (hand hygiene, PPE and sharps management). The response rate to the questions and emergence of the inductive themes across the participants and control group was captured into a database and analysed separately. Qualitative data was quantified to provide a measurement to group data into clusters for a clearer answer on the research question of the study. The data was transcribed, coded, analysed, and themes were defined and named. Subsequently, findings were quantified using a process of data coding for the themes using the inductive analysis (Braun, 2006:3(2):83).

3.12 Conclusion

Chapter 3 described the methodology used in the study. The methodology consisted of a descriptive research design, with sampling of 136 participants. A pilot study was conducted to ensure the validity and reliability of the questionnaire and observational checklist used for the data collection. After the written informed consent of the participants had been obtained, the observational checklists were completed first to prevent behaviour modification, then the participants were handed the self-completion questionnaire to complete. After completion the coded questionnaires and observational checklists were put in sealed envelopes and kept separately in boxes in a locked cabinet.

The data from the completed questionnaires and observational checklists were captured electronically by means of Microsoft Excel, and validated by the PI for accuracy. The quantitative data were analysed with the use of the statistical programme STATISTICA (version 9), and the assistance of a statistician. The qualitative data yielded in response to the open-ended questions were analysed thematically and quantified.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents and interprets the results of the analysed data of the study. This study was predominantly quantitative with three additional open-ended questions.

4.2 Presentation and discussion of the study findings

The results of the knowledge questionnaire will be presented and discussed sequentially under the following sections: demographic data, IPC training, knowledge of Standard Precautions, provision of IPC resources, factors impeding adherence to Standard Precautions, and attitude towards Standard Precautions. Subsequently, the results of the observational checklist will be presented and discussed under the following headings: provision of IPC resources, adherence to Standard Precautions (hand hygiene, PPE and sharps management) procedures and procurement.

A significance level of 5% was used with $p \leq 0.05$ to determine the statistical significance of relationships. Associations will be reported only when it is statistically significant. A thematic approach was used to analyse and subsequently quantify the qualitative data in response to the open-ended questions (Braun, 2006:3(2):83).

4.2.1 Demographic data

The study sample (N=136) consisted of 68 participants and 68 controls. The demographic data revealed a distribution of participants and controls in terms of the type of healthcare facilities, category of nursing, the attendance of the participants and the controls who did or did not attend the four-day Basic Infection and Prevention Control course.

The majority of the study participants, 60/68 (88.2%) worked in hospitals, three in primary healthcare facilities and five at the Department of Correctional Services. The controls were from hospitals, 57/68 (83.8%) and clinics, 6/68 (8%).

In the participants and control groups, 60/68 (88.2%) and 62/68 (91.1%) respectively were females while the males were 8/68 (11.7%) and 6/68 (8.8%). The ages of the participants and the controls ranged from 23 to 60. The mean age was 38 years as per Table 4.1.

Table 4.1: Demographic data of the participants and controls

Variables	Participants N=68		Controls N=68	
	N	%	N	%
Place of work				
Worcester/District hospitals	60	88.00	65	95
Correctional Services	5	0.07	0	0
Clinic/Community Health Centre	3	0.04	3	0.04
Nurse Category				
RN	45	66.1	42	61.7
EN	23	33.8	26	38.2
Sex				
Female	60	88.2	62	91.1
Male	8	11.7	6	8.8
Age				
Minimum	24.00	n/a	23.00	n/a
Mean	38,56		37.26	
Maximum	58.00		60.00	

4.2.2 IPC training

Structured IPC short courses are the means by which the basic principles of infection control are taught to the nurses of the clinics and district hospitals in the Cape Winelands District. A total of 96 participants enrolled for and completed the four-day Basic IPC course but only 68/96 (70%) participated in the study as explained in Chapters 1 and 3. The control group (n=68) did not attend this specific course.

Forty five percent (31/68) of the participants and 43/68 (63.2%) of the controls indicated that IPC was not part of their undergraduate or post-basic course's training curriculums. Seventy five percent (51/68) of the participants had never attended a structured IPC seminar or workshop before they had attended the four-day Basic IPC course. The results show that none of the controls had attended an IPC workshop or seminar, nor had they attended the four-day structured Basic IPC course.

However, in-service training was more commonly attended by the control group, compared with the participants, on hand hygiene, 60/68 (88.2%) versus 8/68 (11.7%); injection and intravenous therapy, 57/68 (41.1%) versus 28/68 (16.1%); and safe use and disposal of sharps, 14/68 (20.5%) versus 33/68 (48.5%). The participants did not attend because they had the four-day Basic IPC course. The reason for this reported difference is unclear as it was not investigated. Data as stipulated in Table 4.2.

In-service training refers to training of healthcare professionals to help them develop specific clinical skills. It is an essential component to help the nurses to keep up to date with the developments in nursing and to improve the quality of patient care. At Worcester hospital more in-service training sessions are currently being done in the form of on the spot teaching and peer group training. In-service training needs to be done due to the fact that there is fast progress in the approach to patient care and the use of new technology. In-service training at Worcester Hospital was done on a daily basis, just after the changing of shifts for 15 to 20 minutes. The nursing staff was involved in the training and each one received a different topic to give training on. Peer group training is a part of their in-service training and also the demonstration of procedures in the ward.

Table 4.2: IPC training

Variables	Participants N=68					Controls N=68				
	Yes	%	No	%	DK	Yes	%	No	%	DK
Did you receive any IPC training during your undergraduate training?	31	45.5	31	45.5	3	22	32.3	43	63.2	3
Was IPC part of a post-basic qualification?	9	0.1	59	86.7	0	9	0.1	58	85.2	1

Have you ever attended an IPC workshop/seminar?	17	25.0	51	75.0	0	0	0.0	68	100.0	0
Did you receive In-service training on the following?										
- Healthcare Waste Management	36	52.9	32	47.0	0	11	16.1	57	83.8	0
- Safe use and disposal of sharps	33	48.5	35	51.4	0	14	20.5	54	79.4	0
- Appropriate use of PPE	32	47.0	36	52.9	0	7	10.0	61	89.7	0
- Injection and IV Therapy Procedures	28	16.1	39	57.3	1	57	41.1	0	0.0	0
- Hand hygiene	8	11.7	30	44.1	0	60	88.2	7	10.2	1

Legend: DK = don't know

4.2.3 Knowledge of Standard Precautions

Data in Table 4.3 reveals that the knowledge on Standard Precautions (hand hygiene, PPE and sharps management) of both groups was similar. Findings show that the participants, 68/68 (100%) knew the correct answer to the questions on the different procedures. Although they knew the correct way of doing the procedure it was different when observing their practices in clinical practice.

Data in Table 4.4 shows that the control group's knowledge on Standard Precautions was similar than that of the participants. Their knowledge could be linked to the fact that they had more in-service training on the topics discussed in this study. The participants indicated that they had limited in-service training after completion of the four-day structured Basic IPC course.

Both groups indicated that there should be more regular training on infection prevention and control, specifically on Standard Precautions. Although both groups indicated that there is a

training need, there were no statistical significant differences observed between the two groups in terms of knowledge of Standard Precautions.

4.2.3.1 Hand hygiene

The participants had more knowledge on when to wash their hands than the controls. The participants, 68/68 (100%) knew when to wash their hands and 64/68 (94.1%) of the controls were familiar with the regulations. Both the participants and the controls had problems remembering to wash their hands after the removal of gloves. Although they had similar knowledge, results revealed that on some variables the controls did better in reported clinical practice than the participants and vice versa, as findings show in Table 4.3.

The study findings show that both groups were well trained on hand hygiene, whether it was at the four-day structured Basic IPC course or as part of in-service training. The results in Table 4.3 suggest that the training impacted positively on the knowledge of the participants on hand hygiene, because the majority answered the questions correctly. Though not statistically significant overall, the participants reported a higher level of knowledge compared with the control group.

Data in Table 4.3 show that both groups had similar knowledge on when to use alcohol hand rub.

Table 4.3: Knowledge of hand hygiene

Variables	Participants N=68				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
When should you wash your hands?								
- Before a procedure	68	100.0	0	0.0	64	94.1	4	5.8
- After patient contact	68	100.0	0	0.0	59	86.7	9	13.2
- Between individual patient contact	68	100.0	0	0.0	60	44.1	8	11.7
- After contact with body fluids	68	100.0	0	0.0	65	95.5	3	4.4
- Immediately after removal of gloves	67	98.5	1	0.0	54	79.4	14	20.5
- Don't know	0	0.0	0	0.0	1	1.4	67	98.5
When should you use a disinfectant such as alcohol hand rub?								
- Before and after each patient contact	65	95.5	3	4.4	63	92.6	5	7.3
- Before a procedure	59	86.7	9	13.2	59	86.7	9	13.2
- Before leaving work	40	58.8	28	41.1	38	55.8	30	44.1
- After going to the toilet	39	57.3	29	42.6	43	63.2	25	36.7
- When coming on duty	36	48.5	35	51.4	33	52.9	35	51.4
- Do not use alcohol rub	3	4.4	65	95.5	1	1.4	67	98.5
- Don't know	0	0.0	68	100.0	0	0.0	68	100.0

4.2.3.2 PPE

The participants, 68/68 (100%), as well as the controls, 66/68 (97%), had knowledge on when to wear gloves. Data in Table 4.4 shows no significant statistical differences. The participants' results, 68/68 (100%), showed that there was retention of knowledge after the attendance of the four-day structured Basic IPC course, when observed in clinical practice. The results of the controls could be linked to the in-service training that they had in clinical practice. However, this was not investigated in this study.

Table 4.4: Knowledge of PPE

Variables	Participants N=68				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
Which procedures are included in SP:								
- Hand hygiene	67	98.5	1	1.4	68	100.0	0	0.0
- Prevention of needle stick injuries/safe discarding of sharps	65	95.5	3	4.4	63	92.6	5	7.3
- Personal protective equipment	64	84.1	4	5.8	61	89.7	7	10.2
- Waste management	64	94.1	4	5.8	62	91.1	6	8.8
- Linen management	62	91.1	9	13.2	59	86.7	9	13.2
- Respiratory hygiene and cough etiquette	56	82.3	12	17.6	54	79.4	13	19.1
- Patient care equipment	55	80.8	13	19.1	45	66.1	22	32.3
- Other	0	0.0	0	0.0	0	0.0	0	0.0
Do you wear gloves before touching mucous membranes and non-intact skin?	68	100.0	0	0.0	66	97.0	2	2.9
Do you remove your gloves and gown immediately upon leaving an isolation room?	67	98.5	1	1.4	66	97.0	2	2.9

Do you wear gloves and a gown when entering an isolation room?	66	97.0	1	1.4	65	95.5	3	4.4
Is wearing goggles to protect mucous membranes of eyes during procedures a part of PPE?	62	91.2	4	5.8	57	83.8	11	16.1

4.2.3.3 Sharps management

The management of sharps and prevention of sharps injuries are intended to reduce the risks associated with the use of needles and other sharps. It also includes the introduction of sharps disposal containers, needle intravenous line connectors and protective syringes.

Data in Table 4.5 shows that both groups knew how to follow correct procedures to handle sharps in clinical practice. Nearly all the participants, 67/68 (98.5%) and controls, 67/68 (98.5%) incorrectly reported that it is the right practice to re-use needles for infusion of antibiotics. This result is of concern because this practice is an infection control risk for the patient. The 67/68 (98.5%) of the controls indicated that they did not know what type of container they had to use for the different types of healthcare risk waste

Table 4.5: Knowledge of Sharps Management

Variables	Participants N=68				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
Is reuse of needles for infusion of antibiotics a safe practice?	67	98.5	1	1.4	67	98.5	1	1.4
Should hypodermic needles be recapped	5	7.3	63	92.6	3	4.4	65	95.5

before disposal?								
Is it safe to bend needles before disposal?	1	1.4	66	97.0	2	2.8	66	97.0
What types of containers can be used to properly dispose of sharps?								
- Containers labelled as sharps boxes by the manufacturer	60	88.2	8	11.7	58	85.2	8	11.7
- Corrugated boxes	54	79.4	14	20.5	4	5.8	65	95.5
- Plastic bins	20	29.4	48	70.5	11	16.1	57	83.8
- Don't know	0	0.0	0	0.0	1	1.4	67	98.5
What will the safest syringe be to prevent needle stick injuries (NSIs):								
- Syringe with a sliding cover or retractable needle (safety syringe)	46	67.6	22	32.3	40	58.8	28	41.1
- Needleless syringe system	13	19.1	55	80.8	13	19.1	55	80.8
- Standard syringe with needle and cap	9	13.2	59	86.7	10	14.7	58	85.2
- An auto disabled syringe	5	7.3	63	92.6	11	16.1	55	80.8
- Don't know	2	2.9	66	97.0	0	0.0	28	41.1

4.2.4 Factors impeding adherence to Standard Precautions

The theme findings yielded from the open-ended question analysis suggest that adherence to Standard Precautions was influenced by several impeding factors, including IPC training, IPC resources, finance, staff attitude and management support. These findings are reported in Table 4.6.

4.2.4.1 IPC training

The participants, 56/68 (82.3%) and controls, 47/68 (69.1%) indicated that the lack of IPC training was the main factor for non-adherence to Standard Precautions in clinical nursing

practice. Both groups suggested more regular and frequent infection control training. They also indicated that nursing staff did not know what Standard Precautions were, so they did not adhere to it. The PI also observed that nursing staff did not adhere to Standard Precautions in clinical practice.

4.2.4.2 IPC resources

Resources were a problem for the participants, 18/68 (26.4%) from the district hospitals and the clinics, 3/68 (4.4%) due to the unavailability of certain personal protective equipment and the long waiting times for delivery of equipment. Shortages of resources impact on the adherence to Standard Precautions in clinical practice.

The participants, 40/68 (58.8%) and the controls, 37/68 (54.4%) stated that they have to wait for long periods of time before they receive their consumables. Due to the consumables being out of stock it is impossible for them to adhere to Standard Precautions.

4.2.4.3 Finance

Both the participants, 45/68 (66.1%) and controls, 30/68 (44.1%) indicated that the budget allocation has an impact on the availability of consumables and that they cannot afford to have the same products as the secondary hospitals.

4.2.4.4 Staff attitude

Results in Table 4.6 show that both the participants, 51/68 (75.0%) and control groups, 49/68 (72.2%) indicated staff attitude as a huge problem with regard to the adherence to Standard Precautions. The participants had the knowledge and they knew the procedures with regard to Standard Precautions. On observation in clinical practice by the PI it was, however, found that they did not adhere to these Standard Precautions and both groups continued with poor practices, although they knew the PI as the course presenter.

The nursing staff was reported as being negative towards infection control and saw adherence to Standard Precautions as additional work for them. The impact of staff attitude on adherence to Standard Precautions needs further investigation.

4.2.4.5 Management support

Lack of management support was also indicated by 29/68 (42.6%) of participants and 17/68 (25%) of the control group, although the numbers were not of statistical significance as results revealed in Table 4.6.

Table 4.6: Factors impeding adherence to Standard Precautions

Factors impeding application of Standard Precautions in clinical practice	Participants N=68				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
THEMES								
IPC TRAINING								
- Lack of IPC training	56	82.3	12	17.6	47	69.1	21	30.8
IPC RESOURCES								
- Insufficient resources	40	58.8	28	41.1	37	54.4	31	45.5
- Shortage of staff	45	66.1	23	33.8	41	60.2	25	36.7
FINANCIAL CONSTRAINTS								
- Financial constraints (budgets)	45	66.1	23	33.8	30	44.1	38	55.8
STAFF ATTITUDE								
- Attitude of staff	51	75.0	17	25.0	49	72.2	19	27.9
MANAGEMENT SUPPORT								
- Lack of managerial support	29	42.6	39	57.3	21	30.8	47	69.1
- Attitude of managers	26	38.2	42	61.7	17	25.0	51	75.0

4.2.5 Attitude towards Standard Precautions

Attitude was defined for the purpose of this study as someone's reaction or response toward the infection control principles or recommendations on precautions.

Data in Table 4.7 shows that 13/68 (19.1%) of the participants indicated that it was an effort to remember to perform hand hygiene and 7/68 (10.2%) of the controls agreed. Eight (11.7%) of the participants and eleven, 11/68 (16.1%) of the controls stated that it was not necessary to wash your hands between patient contact, knowing that most of the micro-organisms are transmitted by the hands of nurses in clinical practice.

The vast majority of participants, 60/68 (88.2%) and 9/68 (13.2%) of the controls indicated that it was not necessary for nursing staff to wear a mask while treating a patient with pulmonary tuberculosis. This is alarming, considering that the participants are the ones that had attended the four-day structured Basic IPC course. They had indicated on the knowledge part that they knew they must wear a mask.

Nearly all the participants, 66/68 (97.0%) of the participants and controls, 62/68 (91.1%) indicated that Standard Precautions were relevant to clinical practice at all times.

Although both groups, 66/68 (97%) participants and 62/68 (91.1%) of the controls indicated that Standard Precautions are relevant to clinical practice they just don't care and do not follow the correct procedures. The participants knew the PI as the presenter of the four-day Basic IPC course, yet there was no behaviour modification while they were observed in clinical practice. Their attitude towards Standard Precautions needs to be investigated.

Table 4.7: Attitude towards Standard Precautions

Factors	Participants N=68				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
Hand Hygiene (HH):								
- Failure to perform HH in recommended situations can be considered as negligence	61	89.7	7	10.2	62	91.1	8	11.7
- I can't always perform HH in recommended situations because my patients' needs come first	17	25.0	51	75.0	27	39.7	40	58.8
- It is an effort to remember to perform HH	13	19.1	55	80.8	7	10.2	61	89.7
- It is not necessary to wash your hands between patient contacts	8	11.7	60	88.2	11	16.1	57	83.8
- I follow the example of senior HCW when deciding whether or not to perform HH	7	10.2	61	89.7	6	8.8	62	91.1

- It is acceptable to wear jewellery while performing aseptic technique	0	0.0	68	100.0	7	10.2	61	89.7
Personal Protective Equipment (PPE):								
- It is not necessary to wear a mask while treating a patient with pulmonary tuberculosis	60	88.2	8	11.7	9	0.1	59	86.7
- I am not concerned about needle stick injuries when not wearing PPE	9	13.2	59	86.7	11	16.1	57	83.8
- There is no need to clean or discard an apron after contact with patients	6	8.8	62	91.1	8	11.7	60	88.2
- One can take blood specimens without gloves	0	0.0	68	100.0	4	0.5	64	94.1
Sharps Management:								
- It is not necessary to use a kidney dish to carry used needles and syringes	6	8.8	62	91.1	8	11.7	60	88.2
- Sometimes it is acceptable to recap	3	4.4	65	95.5	4	5.8	64	94.1
- It is safe to walk with a needle and syringe from one area to another to discard of sharps	0	0.0	68	100.0	1	0.0	67	98.5
- After failing to put up an infusion it is acceptable to put the needle into the mattress	0	0.0	68	100.0	0	0.0	68	100.0

SP are more important in the private health sector than in the public sector	0	0.0	68	100.0	5	7.3	62	91.1
SP is relevant to clinical practice at all times	66	97.0	2	2.9	62	91.1	4	5.8

4.2.6 Provision of IPC resources

The cleanliness and accessibility of hand basins appeared to have been a problem for 43/63 participants. This section reports the findings from the clinical observations that were done. The denominator of the participants for the data collection on the observational checklist changed from 68 to 63. The reason for the change in the denominator is that the PI was not granted permission to access the facilities of the Correctional Services to undertake any observations.

The participants, 60/63 (88.2%) and the controls, 63/68 (92.6%) indicated that they were never out of stock except for the clinics that indicated long waiting times for resources. Delays in delivery of consumables causing shortage of personal protective equipment can impede adherence to Standard Precautions in clinical practice, according to 66.1% of the participants and 37/68(54.4%) of the controls. Where the basins were not accessible there was only cold water, and liquid soap was not regularly available. In the clinics, when the paper towel was out of stock they had to use a towel. In some of the clinics the basins had stains and around the outlet was grime.

Infrastructure was not examined in the study but does need further investigation. The shortages and access to hand washing facilities are inadequate ties that could lead to non-adherence. The results revealed that access to hand washing facilities can contribute to non-adherence to hand hygiene practices. The observation's findings indicate that both the participants and the controls had a positive attitude towards hand hygiene, although they knew there was non-adherence.

Table 4.8: Procurement of hand hygiene, PPE and sharps management

Provisions	Participants N=63				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
Hand hygiene:								
- Hand basin clean and accessible	20	31.7	43	66.1	31	45.5	37	54.4
- Liquid soap available	59	93.6	4	6.3	68	100.0	0	0.0
- Paper hand towel available	58	92.0	5	7.9	68	100.0	0	0.0
- Alcohol rub present	58	92.0	5	7.9	67	98.5	1	1.4
Personal protective equipment (PPE):								
- PPE available for all staff	63	100.0	0	0.0	66	97.0	2	2.9
- Right sizes available – small, medium, large	51	80.9	12	19.0	54	79.0	13	19.1
- Gloves	63	100.0	0	0.0	13	19.1	0	0.0
- Aprons	62	98.4	1	1.5	68	100.0	0	0.0
- Surgical masks available	63	100.0	0	0.0	63	92.6	5	7.3
- N95 respirators available	39	61.9	24	38.0	13	19.1	22	32.3
- Goggles	57	90.4	6	9.5	52	76.4	2	2.9
Sharps management:								
- Sharps container available	63	100.0	0	0.0	67	98.5	1	1.4
- Lid correctly secure	63	100.0	0	0.0	68	100.0	0	0.0
- Not more than 2/3 full	63	100.0	0	0.0	68	100.0	0	0.0
- Sharps container not free standing	53	84.1	10	15.8	61	89.7	7	10.2

Legend: C=Compliant (Yes) NC=Non-Compliant (No)

4.2.7 Adherence to Standard Precautions

4.2.7.1 Hand hygiene

The controls and participants were observed in clinical practice on hand hygiene, the use of PPE and sharps management. Out of the participants, 60/68 (88.2%) were from hospitals, 5/68 from correctional services and 3/68 from the clinics. Assessment of adherence to hand hygiene practice was done by direct observation by the PI in clinical practice.

The observations were done on the opportunities the nurses of both groups had to practice hand hygiene and their responses when handling contaminated linen and equipment in clinical practice.

Non-compliance on wearing jewellery on the hands of the participants was observed in 41/63 (65.0%) and in the controls 37/68 (54.4%), although they knew that they should not be wearing jewellery while doing hand hygiene procedures. The hand washing method (Ayliffe) compliance for the controls was 47/68 (69%) and for the participants 51/63 (80.9%).

Controls, 53/68 (77.9%) as well as participants, 27/63 (42.8%) were non-adherent on contact between patients. They reported in the self-completion questionnaire that they knew what to do, but did not adhere to the basic principles of hand hygiene in clinical practice. The reason for the poor adherence to Standard Precautions, despite the presence of the PI, is unknown and requires further investigation.

Table 4.9: Adherence to hand hygiene procedures

Observations	Participants N=63				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
Short/clean nails without nail polish	57	90.4	0	9.5	62	91.1	6	6.6
Hand washing method	51	80.9	12	19.0	47	69.1	20	29.4
Handling of contaminated equipment	41	65.0	22	34.9	58	85.2	10	14.7

Between patient contact	36	57.1	27	42.8	15	22.0	53	77.9
Jewellery on hands	22	34.9	41	65.0	31	45.5	37	54.4

Legend *C=Compliant* *NC=Non-compliant*

4.2.7.2 PPE

The use of PPE procedures specific in clinical practice was directly observed by the PI. The observations of concern were the handling of contaminated equipment and linen after use in clinical practice. Participants, 35/63 (55.5%) and controls, 46/68 (67.6%) were non-compliant with the use of PPE while handling contaminated equipment. Upon observation the nurses of the groups tended to store the equipment without cleaning it properly or getting it cleaned. If or when the nurses cleaned the equipment they did not use gloves to protect themselves. On consultation the nurses mentioned that they did not see the need to wear PPE while cleaning the equipment.

Table 4.10: Adherence to PPE procedures during observation

Observations	Participants N=63				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
Proper discarding of PPE after use	60	95.2	3	4.7	67	98.5	1	1.4
Appropriate PPE procedure specific	53	84.1	10	15.8	65	95.5	3	4.4
Handling contaminated linen	52	82.5	11	17.4	48	70.5	11	16.1
Handling contaminated equipment	28	44.4	35	55.5	2	2.9	46	67.6

Legend *NC=Non-compliant* *C=Compliant*

4.2.7.3 Sharps management

The practical procedures of handling sharps and other sharps products were directly observed by the PI.

The participants, 19/65 (30.1%) were non-compliant on recapping and 42/63 (66.6%) on not carrying a needle and syringes in a kidney dish. The nursing staff did not see the safety need to carry a needle and syringe in a kidney dish; they experienced it as extra work to do.

The controls, 50/68 (73.5%) were non-compliant on the recapping of sharps and 44/68 (64.7%) on not carrying a needle and syringes in a kidney dish. The controls indicated in their questionnaires that they knew the risks involved in recapping and the risk to contain a blood-borne pathogen disease. This raises a concern that needs to be addressed by training intervention and behaviour modification to prevent needle stick injuries in clinical practice.

The participants and controls knew that they were being observed by the PI, but they still continued with their daily practices. Despite the presence of the PI, it was observed that the participants and the controls continued with poor infection control practices on hand hygiene, the use of PPE and sharps management in clinical practice.

Table 4.11: Adherence to sharps management procedures

Observations	Participants N=63				Controls N=68			
	Yes	%	No	%	Yes	%	No	%
Manipulation of the needle	61	96.8	2	3.1	62	91.1	4	5.8
Discard syringe and needle	60	95.2	3	4.7	68	100.0	0	0.0
Safe discarding of all the sharps after use	60	95.2	3	4.7	68	100.0	0	0.0

No walking around with sharps	59	93.6	4	6.3	42	61.7	17	25.0
No recap	44	69.8	19	30.1	18	26.4	50	73.5
Carry needle/syringe in kidney dish	21	33.3	42	66.6	24	35.2	44	64.7

Legend

NC=Non-compliant

C=Compliant

4.3 Conclusion

The findings show that there was no significant difference between the results on knowledge of the participants and the controls; both groups answered the majority of the questions correctly.

The observational findings differ from the knowledge results. Both groups continued to implement poor infection prevention and control practices.

Data of the study revealed that there was no significant difference on adherence to Standard Precautions in clinical practice between the two groups. The conclusion was made that in-service training might be just as good as formal structured training to develop knowledge and improve the adherence to Standard Precautions in clinical practice.

The reported barriers to the adherence of Standard Precautions in clinical practice were lack of training, resources, financial (budget) constraints, staff attitude, shortage of staff and management support.

Discussions and recommendations on the analysed data will be done in chapter 5.

CHAPTER 5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Grounded in the study findings, this chapter draws conclusions regarding the knowledge of and adherence to hand hygiene, PPE and sharps management amongst clinical nurses. The conclusions will be discussed according to the study objectives, demonstrating the achievement thereof. Based on empirical evidence, recommendations on the improvement of adherence to the Standard Precautions discussed will be made. Recommendations will be aligned to the Standard Precautions discussed in chapter 2. This chapter also describes certain limitations and draws together the final conclusions of the study.

5.2 Achievement of the aim and objectives of the study

The aim of the study was to evaluate the impact of a four-day Basic Infection Prevention and Control course on the knowledge of, and adherence to, hand hygiene, PPE and sharps management amongst clinical nurses. The study also aimed to identify the factors that influenced the application of such precautionary measures.

5.2.1 Study objective 1: To evaluate the knowledge of hand hygiene, PPE and sharps management standard precautionary measures in clinical practice

The findings revealed that there was retention of knowledge as the majority of the participants had answered the questions correctly after they had attended a four-day Basic IPC course.

5.2.2 Study objective 2: To evaluate adherence to hand hygiene, PPE and sharps management standard precautionary measures in clinical practice

The adherence of the above was measured by an observational checklist. The findings revealed that the participants as well as the controls had knowledge. There was no behaviour modification. The participants and controls knew that the PI would observe them on the adherence of hand hygiene, the use of PPE and sharps management. Still there was no behaviour modification. Poor adherence was observed with both the participants and the controls in clinical practice despite the presence of the PI.

It is reported that there are several factors associated with healthcare workers' adherence to Standard Precautions. Gammon et al. (2007:157-167) reported that healthcare workers often have limited knowledge and training on infection control. Poor knowledge has been

associated with poor attitude and poor practice of Standard Precautions (Gammon et al., 2007:157-167).

Hand hygiene must be part of the integrated approach of infection control. Dancer (2006:99) reported that hand hygiene practices is poor worldwide. Compliance with hand hygiene must be improved and therefore the recommendations must address altering of human behaviour (Dancer, 2006:99).

5.2.3 Study objective 3: To identify any personal (e.g. attitude) and contextual factors (e.g. resources) which influence the application of hand hygiene, PPE and sharps management standard precautionary measures in clinical practice

The results of the participants and the controls indicated that a lack of IPC training, resources, financial constraints, staff attitude and support from management are the factors that impeded on the adherence to Standard Precautions in clinical practices. Attitude was not investigated in this study and needs further exploration.

It is recommended that human behaviour and attitude of staff must be addressed to improve adherence to Standard Precautions in clinical practice

5.3 Recommendations

5.3.1.1 IPC Training

Training will be discussed under the following headings: structured training for under- and postgraduates and in-service training, demonstration and mentoring.

5.3.1.1.1 Structured

5.3.1.1.1.1 Undergraduate

The current nurse training curriculum in the Western Cape and Cape Winelands for the bridging students (enrolled nurses to registered nurses) and those on training for enrolled nurses have very little information and time spent on infection prevention and control and the adherence to Standard Precautions (Strauss, 2009:np). Hours spent on structured training in these two mentioned curriculums with regard to Standard Precautions are two hours. The recommendation is that the nurse training curriculums should be reviewed by the relevant people involved with training curriculums at the universities and nursing colleges. Based on data and the outcome of the study it is highly recommended that IPC must be incorporated in all training programmes.

5.3.1.1.1.2 Postgraduate

Stellenbosch University currently has a two year Post Graduate Diploma in infection control (www.sun.ac.za/uipc). IPC is not in the training curriculums of most of the other post basic courses, e.g. Midwifery or Primary Health Care. Literature revealed that there is a lack of infection control training for nurses in most of the post graduate courses in South Africa as well as in the Western Cape's universities and nursing colleges, which raises a concern for the adherence to the basic principles of infection control. Currently there is no accreditation for the IPC course at the South African Nursing Council, and it is recommended that the council must give immediate attention to this matter.

Based on study findings there was no difference between the outcome of structured and in-service training. This raised the question whether our training methods are not outdated and need to be reviewed.

5.3.1.1.1.3 In-service training

Based on the study findings the participants (cases) had attended a structured four-day Basic IPC course, while the controls only had in-service training in the workplace from their peers and senior staff. The data revealed that the controls' knowledge with regard to the three Standard Precautions (hand hygiene, use of PPE and the management of sharps), that was researched for this study, was in some instances better than the participants that had attended the four-day Basic IPC course.

Data of the study revealed that there was no big difference in adherence to Standard Precautions in clinical practice between the two groups. The conclusion was made that in-service training might be just as good as formal training to improve the adherence to Standard Precautions in clinical practice. In-service training might give the opportunity for better group interaction and discussions, which could lead to improved adherence to Standard Precautions in clinical practice.

WHO's multimodal hand hygiene improvement strategy state that all healthcare workers require full training and education on the importance of hand hygiene. The aim of the training should be to induce behavioural and cultural change to ensure that competence and adherence is maintained among all healthcare workers (WHO, 2009). Teaching must be strengthened, with respect to the application of Standard Precautions (hand hygiene, PPE and sharps management) on every patient to decrease the transmission of hospital acquired infections and to prevent injuries to the staff as well.

Mentors and clinical facilitators will be in charge to deliver training and education to healthcare workers, including the providing of practical demonstration to the "My 5 Moments for Hand Hygiene" approach (WHO, 2009).

5.3.2 Policy

The National Core Standards had become legislation and must be implemented as per the Minister of Health and the Department of Health to improve the quality of infection prevention and control standards and practices (<http://www.doh.gov.za/docs/notice/2013>). The aim of the National Core Standards is to standardise practices (IPC) to improve patient centred experience and the quality of services (<http://www.doh.gov.za/docs/notice/2013>).

Adherence to Standard Precautions needs to be enforced by the implementation of policies and adherence to the National Core Standards by all healthcare workers to prevent the transmission of hospital acquired infections and to improve the quality of care rendered to patients. However, with the last National Core Standards audit it was observed by the peer auditors that there was a lot of window dressing in clinical practice and that after the audit the healthcare workers continued with their poor infection prevention and control practices.

National and provincial infection prevention and control policies must be implemented, monitored and evaluated at facility level, to create a safe environment for our patients. The results of the study show that although the participants in the study knew, and had the knowledge, observation in clinical practice proved that the participants had continued with poor practices.

The non-adherence to policies, guidelines of WHO's Five Moments of Hand hygiene and the National Core Standards in South Africa, can be seen as bridging of the guidelines.

5.3.3 Procurement and supplies

Both the participants and the controls indicated that from time to time they ran out of stock and consumables. Certain things being out of stock had an impact on the adherence to Standard Precautions in clinical practice as the nurses had limited or no resources to properly use personal protective equipment and practice optimal hand hygiene.

The availability of PPE and safety devices to many healthcare workers may cause resistance to wear the PPE properly. The participants and the controls indicated that they had found them

in several situations where they had to use PPE but due to the lack of ability they were unable to do so (<http://www.biomedcentral.com./1472-6955/10/01>).

5.3.4 Management

The participants (cases) and the controls indicated that there was a lack of management support with regard to the implementation of infection control measures. Both the groups indicated that the lack of support had an impact on the adherence to Standard Precautions and that budget restraints have made it difficult for them to implement infection control measures.

It is strongly recommended that the management of healthcare facilities must attend infection prevention and control courses to improve their knowledge and insight on the importance of the correct infection control practices.

Infection prevention and control should be included in all training curriculums of undergraduate and post graduate courses; and staff must also be responsible and accountable for the acts and omissions.

5.3.5 Practice

The National Core Standards (<http://www.doh.gov.za/docs/notice/2013>) is a standardised set of standards whereby infection prevention and control practices can be measured. Monitoring the evaluation of infection prevention and control practices in clinical practices should be a standard procedure to improve adherence to Standard Precautions and the quality of patient care.

Observational studies that were conducted in the Cape Winelands District found poor adherence to Standard Precautions and that the healthcare workers' ignorance added to the non-adherence of Standard Precautions of infection prevention and control. Continuous observation, training, motivation, monitoring and evaluation of practices must be done to maintain adherence to Standard Precautions in clinical practice.

5.3.6 Patient empowerment

The empowerment of patients and the community to help improve infection prevention and control practices, by teaching them proper hand hygiene and the use of personal protective equipment while they are in the care of the healthcare worker, is of utmost importance.

5.4 Research

5.4.1 Behavioural aspects and infection control training

The participants and the controls indicated that attitude was one of the key factors that impeded adherence to Standard Precautions in clinical practice. Both the participants and the controls indicated that attitudes must be addressed, looking at the altering of human behaviour. Behavioural aspects were not investigated in this study and needs further research.

5.5 Limitations

The number of participants that had participated in the study was 68 out of the 96 that had completed the four-day Basic IPC course. The 68 participants excluded the 10 participants of the pilot study. Thirty of the participants declined, while others wanted to be paid to participate and others were not interested in participating. Five participants moved to other provinces and their contact details were not available or had changed.

The PI trained a registered nurse to help with the observations in clinical practice but she had withdrawn after the observation of two participants. The PI performed the observational checklists and collected the data herself.

The travelling distances between the facilities in the different sub-districts and the availability of the participants and controls due to scheduled working hours, leave and absenteeism became a real problem. This forced the PI to take a convenience sample for the controls.

5.6 Conclusion

The study findings suggest the importance and need of continuous structured and in-service education for all nurses on infection control measures.

This study demonstrates from data yielded in chapter four that training does help with the retention of knowledge and the adherence to Standard Precautions in clinical practice. Although there was retention of knowledge in the participants, it seemed, however, as if it had no impact on the attitude of the participants or the controls. Standard Precautions (hand hygiene, PPE and sharps management) are the basic principles of infection prevention and control. Training on Standard Precautions should be incorporated in the pre- and post-graduate training curriculums of all healthcare workers.

Data yielded from the study revealed that there was no significant difference in the outcome in the participants that had attended the four-day Basic IPC course, and the in-service training that the control group had. It seems that in-service training might be just as good as structured training.

The results also reaffirmed the importance of the right attitude for compliance with infection prevention and control measures.

The level of knowledge on infection control measures was good amongst the participants and the controls but the adherence to Standard Precautions in practice was poor.

The practical procedures and attitude needs to be addressed in clinical practice. Education and knowledge are important but it does not always lead to improved adherence to Standard Precautions, as the observational results of this study showed. Other interventions need to be put in place to address the deficits of attitude, and there should be a focus on behaviour modification.

The study also identified factors that impeded on adherence to Standard Precautions, such as shortage of staff, lack of training and staff attitude. The impeding factors were not investigated in this study.

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APPENDICES

APPENDIX 1

**OBSERVATIONAL CHECKLIST FOR EVALUATION OF HAND HYGIENE PRACTISES,
USE OF PERSONAL PROTECTIVE EQUIPMENT AND SHARPS MANAGEMENT**

DATE:

OBSERVED BY:

TYPE OF FACILITY OBSERVED:

PARTICIPANT CODE:

HAND HYGIENE	C	NC	NO	NA	COMMENTS
Procurement					
Hand basin clean and accessible					
Liquid soap available					
Paper hand towel available					
Alcohol rub present					
Procedure					
No jewellery on hands					
Nails short and clean without nail polish					
Ayliffe hand washing method					
After removal of gloves					
Between and after patient contact					
After handling contaminated equipment					
PERSONAL PROTECTIVE EQUIPMENT (PPE)					
Procurement					
PPE Available for all staff					
Is right sizes available: small, medium, large					
Gloves					
Aprons					
Surgical masks available					
N95 masks available					
Caps					

Goggles					
Procedure					
Appropriate PPE according to procedure observed					
Handling contaminated linen					
Handling contaminated equipment					
Proper discarding of PPE after use					
SHARPS MANAGEMENT					
Procurement					
Sharps container available					
Sharps container not free standing					
Lid correctly secure					
Not more than 2/3 full					
Procedure					
Discard syringe and needle					
Carry needle/syringe in kidney dish					
No recap					
No manipulation of the needle					
Safe discarding of all sharps after use					
No walking around with sharps					

C – Compliant

NO – Not Observed

NC – Non Compliant

NA – Not Applicable

APPENDIX 2

Rev 4, 30/01/09

IPC KNOWLEDGE QUESTIONNAIRE					
1 Date Interviewed	____/____/____ yyyy/mm/dd		2. Healthcare facility:		
	3. Participant number				
<p>1. Interviewee is located in following <i>place</i> (mark one from list below)</p> <p>Hospital (mark one below): <i>Place of work</i></p> <p>ICU / High Care ER/Casualty</p> <p>Labour ward NNU Acute Care Unit</p> <p>Surgery unit Paediatric ward Out-Patient Clinic</p> <p>Medical ward CSSD Other (Specify below)</p> <ul style="list-style-type: none"> • District Hospital • Worcester Hospital • Health/Community Health Centre • Correctional Services 					
2. Interviewee is a (mark one)	• Enrolled Nurse	• Professional Nurse	Male/Female	Age	
IPC TRAINING – UNDERGRADUATE			Yes	No	Don't remember/ Know
3. Did you have any IPC training during your training?					
4. Do you have any post-basic qualifications where IPC was part of the training curriculum?					
5. <ul style="list-style-type: none"> • Have you attended the four-day Basic IPC course at Worcester Hospital? 					

<ul style="list-style-type: none"> • If yes, have you attended any additional IPC related courses since completion of the Basic IPC course? • If no, have you ever attended an IPC related workshop, seminar or course? 			
<p>6. How long have you been working in clinical practice?</p> <ul style="list-style-type: none"> • < than 5 years • 5-10 years • 10-20 years • 20-30 years • > than 30 years 			
INFECTION CONTROL TRAINING			
<p>Have you attended training* or been formally educated in the following IPC procedures (*case group: since completion of the four-day basic IPC courses):</p>	Yes	No	Don't remember/ Know
<p>7. Hand Hygiene?</p>			
<p>8. Appropriate use of PPE?</p>			
<p>9. Injection and IV Therapy Procedures?</p>			
<p>10. Safe use and disposal of sharps?</p>			
<p>11. Health Care Waste?</p>			
Knowledge in specific IPC procedures.			

A: HAND HYGIENE

12. When should you wash your hands? *(Mark answers spontaneously mentioned without prompting or suggesting any answer)*

- Before a procedure
- After patient contact
- Between individual patient contact
- After contact with body fluids
- Immediately after removal of gloves
- Don't know
- Other _____

13. When should you use a disinfectant such as alcohol hand rub? *(Mark answers spontaneously mentioned without prompting or suggesting any answer)*

- Before a procedure
- When coming on duty
- Before leaving work
- Before and after each patient contact
- After going to the toilet
- Do not use alcohol rub
- Don't know
- Other _____

B: PERSONAL PROTECTIVE EQUIPMENT (PPE)

Yes	No	Don't remember/ Know
-----	----	-------------------------

14. Do you know what Standard Precautions are? If yes, which procedures are included: (spontaneous answers)

- hand hygiene
- personal protective equipment
- prevention of needlestick injuries and the safe discarding of sharps
- respiratory hygiene and cough etiquette

<ul style="list-style-type: none"> • linen management • waste management • patient care equipment • other _____ 			
15. Do you wear gloves and a gown when entering an isolation room?			
16. Do you remove gloves and gown immediately upon leaving an isolation room?			
17. Do you wear gloves before touching mucous membranes and non-intact skin?			
18. Is wearing goggles to protect mucous membranes of eyes during procedures a part of PPE?			
C: SHARPS MANAGEMENT	True	False	Don't know
19. Should hypodermic needles be recapped before disposal?			
20. Is it safe to bend needles before disposal?			
21. Is reuse of needles for infusion of antibiotics a safe practice?			
22. What types of containers can be used to properly dispose of sharps? <i>(mark answer spontaneously mentioned without prompting or suggesting any answer)</i> <ul style="list-style-type: none"> • Corrugated boxes • Plastic bins • Containers labelled as sharps boxes by the manufacturer • Don't know _____ • Other _____ 			
23. What is the SAFEST place to dispose of a used needle if a sharps container is NOT near a bed? <i>(prompt each answer but mark one answer only)</i> <ul style="list-style-type: none"> • Corrugated box • Kidney dish • Plastic waste bin • Sticking needle in the mattress • Recapping and placing in your pocket • Walk from the ward to the sharps container 			

- Don't know

24. Of the following items, what is the SAFEST syringe to prevent NSIs?

(prompt each answer but mark one answer only)

- Standard syringe with needle and cap
- Syringe with a sliding cover or retractable needle (safety syringe)
- An auto disabled syringe
- Needleless syringe system
- Don't know

25. Do any factors impede application of Standard Precautions in clinical practice?

If yes, please explain which factors: (spontaneous – don't prompt)

- Shortage of staff
- Insufficient resources
- Lack of IPC training
- Lack of managerial support
- Financial constraints (budgets)
- Attitude of staff
- Attitude of managers
- Other (list)

- _____
- _____
- _____
- _____
- _____

26. Do you have any comments concerning factors which would promote adherence to Standard Precautions in clinical practice?

27. Do you have any recommendations to improve adherence to Standard Precautions in your clinical practice?

ATTITUDE	YES	NO	DON'T KNOW
----------	-----	----	------------

<p>28. HAND HYGIENE</p> <ul style="list-style-type: none"> a) I can't always perform hand hygiene in recommended situations because my patients' needs come first. b) I follow the example of senior healthcare workers when deciding whether or not to perform hand hygiene. c) Failure to perform hand hygiene in recommended situations can be considered as negligence. d) It is an effort to remember to perform hand hygiene. e) It is not necessary to wash your hands between patient contacts f) It is acceptable to wear jewellery while performing aseptic technique. 			
--	--	--	--

<p>29. PERSONAL PROTECTIVE EQUIPMENT</p> <ul style="list-style-type: none"> a) One can take blood specimens without gloves. b) It is not necessary to wear a mask while treating a patient with infectious pulmonary tuberculosis. c) I am not concerned about needlestick injuries when not wearing PPE. d) There is no need to clean or discard an apron after contact with patients. 			
---	--	--	--

<p>30. SHARPS MANAGEMENT</p> <ul style="list-style-type: none"> a) It is safe to walk with a needle and syringe from one area to another to discard of sharps. b) Sometimes it is acceptable to recap. c) After failing to put up an infusion it is acceptable to put the needle into the mattress. d) It is not necessary to use a kidney dish to carry used needles and syringes. 			
---	--	--	--

31. Standard Precautions are more important in the Private Health Sector than in the Public Health Sector. 32. Standard Precautions are relevant to clinical practice at all times.			
--	--	--	--

VERIFIED BY: (PI) _____ DATE OF VERIFICATION _____
--

Reference: Marais, F., Mehtar, S., McVay, P. & Chalkley, L., 2009, *Final Report of the Baseline Assessment. Strengthening TB Infection Prevention and Control in Swaziland*. Academic Unit for Infection Prevention and Control, Stellenbosch University, Cape Town, South Africa.

APPENDIX 3

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT: Adherence to Standard Precautions in clinical nursing practice – a case control study

REFERENCE NUMBER: 16336763

PRINCIPAL INVESTIGATOR: Susandra Nieuwoudt

ADDRESS: 28 Hugo Street

Meirings Park

Worcester

6850

CONTACT NUMBER: 084 5116 778

You are being invited to take part in a research project. Your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee (HREC) at Stellenbosch University and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about? Adherence to Standard Precautions in clinical nursing practice – hand hygiene, personal protective equipment and sharps management in healthcare facilities in the Cape Winelands District.

Why have you been invited to participate? All enrolled and registered nurses who have completed the four-day Basic IPC course are invited to participate, to evaluate their adherence to hand hygiene, personal protective equipment and sharps management in clinical nursing practice.

What will your responsibilities be? Participants must be willing to have a one-to-one interview to complete the questionnaire and observational checklist.

Will you benefit from taking part in this research? There will be no financial benefits.

Are there any risks involved in your taking part in this research? There are no risks involved in this study.

If you do not agree to take part, what alternatives do you have? Your participation in this research project is entirely voluntary and if you select not to participate you will not be penalised in any way.

Will you be paid to take part in this study and are there any costs involved? You will not be paid to take part in the study. There will be no costs involved for the participant, if you participate.

Is there anything else that you should know or do? No.

Declaration by participant

By signing below, I agree to take part in a research study entitled *Adherence to Standard Precautions in clinical nursing practice: a comparative study*.

I declare that:

- I have read or had read to me this information and consent form and it is written in a language in which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at Worcester on (*date*)

.....
Signature of participant

.....
Signature of witness

Declaration by investigator

I, Susandra Nieuwoudt, declare that:

- I explained the information in this document to
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above.
- I did/did not use an interpreter. (*If an interpreter is used then the interpreter must sign the declaration below.*)

Signed at (*place*)on (*date*)

.....
Signature of investigator

.....
Signature of witness

Declaration by interpreter

I (*name*) declare that:

- I assisted the investigator (*name*) to explain the information in this document to (*name of participant*)using the language medium of Afrikaans/Xhosa.
- We encouraged him/her to ask questions and took adequate time to answer them.

- I conveyed a factually correct version of what was related to me.
- I am satisfied that the participant fully understands the content of this informed consent document and has had all his/her questions satisfactorily answered.

Signed at (*place*)on (*date*)

.....

Signature of interpreter

.....

Signature of witness



STRATEGY & HEALTH SUPPORT

healthres@pgwc.gov.za
 tel: +27 21 483 9907; fax: +27 21 483 9895
 1st Floor, Norton Rose House,, 8 Riebeeck Street, Cape Town, 8001
www.capegateway.gov.za

REFERENCE: RP 148/2011
 ENQUIRIES: Dr V Appiah-Baiden

**28 Hugo Street
 Meirings Park
 Worcester
 6850**

For attention: Susandra Nieuwoudt

Re: Adherence to standard precautions in clinical nursing practice: a case control study

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact the following people to assist you with any further enquiries.

Worcester Hospital	Dr H Schumann	(023) 348 1113
Ceres Hospital	Dr C Prins	(023) 316 9600
Montagu Hospital	Dr P Spiller	(023) 626 8045
Robertson Hospital	Dr P Spiller	(023) 626 8045
Worcester CDC	Mrs Majiet	(023) 347 1954
Kogmanskloof clinic	Ms S Neethling	(023) 348 8120
Mcgregor clinic	Ms S Neethling	(023) 348 8120

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final report within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (healthres@pgwc.gov.za).
3. The reference number above should be quoted in all future correspondence.

Yours sincerely,

DR T NALEDI
DIRECTOR: HEALTH IMPACT ASSESSMENT
 DATE: 24/11/2011

CC **DR L PHILLIPS** **DIRECTOR: CAPE WINELANDS**



UNIVERSITEIT STELLENBOSCH-UNIVERSITY
jou kennisvenoot • your knowledge partner

07 September 2011

MAILED

Mrs S Nieuwoudt
Department of Nursing
2nd Floor
Teaching Block

Dear Mrs Nieuwoudt

Adherence to standard precautions in clinical nursing practice: a case control study.

ETHICS REFERENCE NO: N11/08/253

RE : MODIFICATIONS REQUIRED

A review panel considered the application for interim approval and registration of the abovementioned project on behalf of the Health Research Ethics Committee.

In principle the panel is in agreement with the project, but requested that you should attend to the following matter(s) before the project could be approved:

1. The informed consent form is incomplete and contains no information. Please include information pertinent to your study under each of the headings.

On receipt of the additional information/corrected document(s) the application will be reconsidered.

Please provide a letter of response to all the points raised IN ADDITION to HIGHLIGHTING or using the TRACK CHANGES function to indicate ALL the corrections/amendments of ALL DOCUMENTS, clearly in order to allow rapid scrutiny and appraisal.

Please note that the application for the approval and registration of this project would be cancelled automatically if no feedback is received from you, within 6 (six) months of the date of this letter

Please quote the abovementioned project number in ALL correspondence henceforth.

For standard HREC forms and documents please visit: www.sun.ac.za/rds

07 September 2011 15:38

Page 1 of 2



Fakulteit Gesondheidswetenskappe · Faculty of Health Sciences



Verbind tot Optimale Gesondheid · Committed to Optimal Health
Afdeling Navorsingsontwikkeling en -steun · Division of Research Development and Support
Postbus/PC Box 19063 · Tygerberg 7536 · Suid-Afrika/South Africa
Tel. +27 21 938 9075 · Faks/Fax. +27 21 931 3352

Att: Mr. Leksie
Please comment.
Forkum

Dauids, Carol

From: Sandra Nieuwoudt (snieuwou@qgwco.gov.za)
Sent: 24 January 2012 10:54 AM
To: Dauids, Carol
Cc: chrystel.scott@qgwco.gov.za
Subject: RE: Completion of research questionnaires
Attachments: Sandra Nieuwoudt4.vcf

Importance: High

2012/01/30

023 34 88141

Good day Mrs Dauids

I am MCur student in the process of collecting data for my research. The study is on Adherence to Standard Precautions in Clinical Nurse Practice.

Data will be collected by means of a self completion questionnaire, there will be no interference with operational work. The questionnaire will take only 20 minutes of the participants time to complete.

The participants are nursing staff who had attended a four day Infection Prevention and Control Course at Worcester Hospital during the period November 2009 and August 2010.

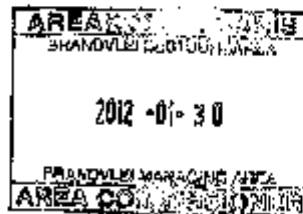
The participants are Mrs V Braaf, C Abrahams, B Titus, L February and R Phillander.

Herewith I would like to ask for permission to visit you facility to meet with the participants as a group to your convenience. I am open to any suggestions and enquiries you might have.

Can you please reply to me in writing on the decision made.

Regards

Sandra Nieuwoudt



Ms Sandra Nieuwoudt
Assistant Director Quality Assurance
Cape Winelands District Office
Worcester
Tel: 023 348 8141
Fax: 023 342 0601
Never accept failure, no matter how often it visits you. Keep on going. Never give up. Never!
Dr Michael Smurfit

The request/application is recommended.
The questionnaire can be completed in Mr Swadepoel's office.
Mikene
2012/01/30

Approved
P/P
AC: Brandelith
2012/01/30

Page: 1 of 1 01:00:00 01:00:00 2012-01-30 10:54:56 From: BRUNEL JET -440XMTN



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 11111 Main Road, Hazards Research Centre, Cape Town 7801
www.westerncape.gov.za

REFERENCE: RP 148/2012
 ENQUIRIES: Dr V Appiah-Baiden

26 Hugo Street
 Melring Park
 Worcester
 6850

For attention: Susuntha Mawhood

Re: Adherence to standard precautions in clinical nursing practice, a case control study

Thank you for submitting your proposal to undertake the above mentioned study. We are pleased to inform you that the department has granted you approval for your research. Please contact the following people to assist you with any further enquiries.

Hermanus Hospital	Dr E Mastert	(028) 312 1164
Caledon Hospital	Dr Ramblyana	(028) 212 1070
Brewersdorf Hospital	Dr D Theron	(028) 348 1301

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final report within six months of completion of research. This can be submitted to the provincial Research Coordinator (healthres@westerncape.gov.za).
3. The reference number above should be quoted in all future correspondence.

Yours sincerely,

[Signature]
DR T NALEDI
 DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: *30/01/2012*

CC **DR L PHILLIPS** **DIRECTOR: CAPE WINELANDS**
MR W SMAILL **ACTING DIRECTOR: OVRBERG DISTRICT**