

**EFFECTIVENESS OF SIMULATION TRAINING TO IMPROVE PUPIL NURSES'  
CLINICAL COMPETENCE**

by

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**SUPERVISOR: PROF E POTGIETER**

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### DECLARATION

I declare that **EFFECTIVENESS OF SIMULATION TRAINING TO IMPROVE PUPIL NURSES' CLINICAL COMPETENCE** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



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15 February 2013

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## ABSTRACT

The aim of this study is to determine the effectiveness of simulation training in improving the clinical competence of pupil nurses.

A quantitative, quasi-experimental, non-equivalent control group before-after design is used. The method of data collection is observation using check lists.

The population for this study includes the second-year pupil nurses (N=43) following the two-year programme leading to enrolment as a nurse at the Gauteng learning centre of a private hospital group during 2011-2012.

The results reveal that although there is proof that clinical training in simulation improves the competence levels of the experimental group in the procedure *administration of oral medication* over a period of time, there is no proof that this is true for the procedure *observation of patients' neurological functions* and, therefore, the researcher cannot come to a definite conclusion about the effectiveness of simulation training.

### Key concepts

Simulation; nursing education; pupil nurses; clinical competence.

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## *Dedication*

*I dedicate this dissertation to my husband, Jesse Powell, and my two children,  
Ryno and Christi-Mari.*

*Without your love, support, understanding and prayers  
this would not have been possible.*

**Annexure A**

**Ethical Clearance Certificate from Health Studies Higher  
Degrees Committee, Unisa**

**Annexure B**

**Letter of permission – private hospital group and Permission granted – private hospital group**

**Annexure C**

**Letter of information – pupil nurses**

## **Annexure D**

**Information to nurse educators (data collectors)**

**Annexure E**

**Data instruments Administer oral medication and  
Neurological functions**

# CHAPTER 1

## ORIENTATION TO THE STUDY

### 1.1 INTRODUCTION

Nursing education is aimed at the individual and professional development of student nurses to produce skilled nurse practitioners. Student nurses must be able to think critically to interpret scientific data, plan and deliver safe nursing care to patients. Clinical experience, which takes place at the bedside of the patient, enables students to become proficient in the knowledge, skills and attributes required for effective nursing practice.

Newly qualified nurses are expected to be competent practitioners once they graduate from a nursing programme (Alinier, Hunt, Gordon & Harwood 2006:360). According to Kurtz, Lemley and Alverson (2010:38), today's nurses must be care providers, mentors, teachers and managers from the beginning of their nursing careers. The main reason for this is the nursing shortage (Hauber, Cormier & Whyte 2010:242). Raines (2009:1), states that one goal of nursing education is to prepare graduates for assuming the role of a professional nurse in the real-world clinical setting.

Dickson, Walker and Bourgeois (2006:416), assert that clinical experience is essential for the development of competent and skilled nurses, and yet according to a study they conducted in Australia, exposure to clinical experience tends to pose a problem as students lacked clinical experience and were not competent in performing clinical procedures. This is affirmed by Krautscheid, Kaakinen and Warner (2008:431), who report on the lack of clinical learning opportunities and ineffective exposure to clinical learning. They regard simulation as a powerful and safe strategy to enhance the faculty's ability to effectively facilitate learning in clinical settings. There is a need for drastic measures to find new teaching techniques to develop competence in nursing professionals.

According to Hovancsek, Jeffries, Escudero, Foulds, Husebo, Iwamoto, Kelly, Petrini, and Wang (2009:124) and Schlairet and Pollock (2010:43), clinical simulation training in nursing education increased rapidly in recent years. Dillard, Sideras, Ryan, Carlton, Lasater and Siktberg (2009:99) and Simones (2008:131), contend that simulation is a

teaching-learning practice that has been used increasingly in nursing education programs nationwide. Schlairet and Pollock (2010:43), explored the effects of simulated clinical experiences on undergraduate students' knowledge acquisition in a fundamental nursing course. They found that simulation training was as effective as traditional clinical experiences with regard to knowledge acquisition. Beaubien and Baker (2004:52), emphasise that simulation training creates a safe learning environment for students where clinical skills can be acquired.

In a study done by Rothgeb (2008:489), to determine whether supplementing simulation time for clinical time would be beneficial to nursing education, a statement was made that simulation could be used across the span of nursing education to model clinical events in a safe environment. The participants, from a wide variety of ages and experiences, developed clinical skills, which included critical thinking, problem-solving and decision-making skills. Sears, Goldsworthy and Goodman (2010:52), did a study on 54 student volunteers to examine whether the use of clinical simulation in nursing education could help reduce medication errors. They identified the main problems experienced by Canadian nursing schools as finding adequate clinical placements to meet the needs of student nurses. These authors concluded that simulation training may contribute to a reduction in medication errors among novice nurses (Sears et al 2010:55).

Parsh (2010:569), did a study on the characteristics of effective simulated clinical experience, after identifying the need of simulation training due to the shortage of clinical placement sites and lack of clinical experience. Undergraduate nursing students at two universities in Northern California were interviewed. The students indicated that in the absence of clinical experience, simulation training gave them self-confidence and self-efficiency. Bambini, Washburn and Perkins (2009:79), found similar results with regard to improved confidence in clinical competence and self-efficiency of students after simulation learning experiences during their quasi-experimental study to evaluate the outcome of clinical simulation. They evaluated a sample of 112 students' confidence in performing various skills, both before and after simulation experiences.

In this study the researcher adopts a quasi-experimental research design to examine the contribution of simulation training to the clinical competence of pupil nurses enrolled at a private hospital group offering the two-year programme leading to enrolment as a nurse (SANC Regulation 2175 of 1993, as amended) (SANC 1993b). The aim of this study was to determine whether training through simulation methods can improve the level of

competency of pupil nurses in two selected clinical procedures, namely: *administration of oral medication and observation of patients' neurological functions*. The target group included the final-year pupil nurses of a private hospital group's learning centre in Gauteng.

## **1.2 BACKGROUND TO THE PROBLEM**

Three basic categories of nurses are trained in South Africa, namely professional nurses, enrolled nurses and enrolled nursing auxiliaries (South Africa 2005:25). The South African Nursing Council (SANC) accredits nurse training providers in both the public and private sector. The learning centre where this study was conducted is one of the approved nursing schools in Gauteng offering nurse training for the private sector. The learning centre is accredited by the SANC for the programme leading to enrolment as a nurse (SANC Regulation 2175 of 1993, as amended) (SANC 1993b) and the programme leading to enrolment as a nursing auxiliary (SANC Regulation 2176 of 1993, as amended) (SANC 1993c).

Each nursing school must have accredited facilities for clinical practica. There are seven hospitals accredited by the SANC for the Gauteng learning centre where the pupil nurses can do their clinical practica for the programme leading to enrolment as a nurse (SANC Regulation 2175 of 1993, as amended) (SANC 1993b:3(c)).

A pupil nurse must undergo a minimum of 2 000 hours of clinical training, which has to be spread over the two academic years of the programme. 'Academic year' refers to a period of at least 44 weeks in any calendar year. The 2 000 hours clinical practica must be done in the accredited clinical facilities (SANC 1993b:1, 3(a), 5).

During the second year of study the pupil nurses attend 10 weeks of theoretical classes at the learning centre and during the remainder of the period, the pupil nurses are allocated to the accredited clinical facilities. A nurse educator is responsible for facilitating the clinical accompaniment of pupil nurses during their clinical placement in the approved clinical facilities.

Due to changes in clinical environments, the changing face of health care in South Africa and current staffing problems, the facilitation of the learning and skills development of pupil nurses faces challenges in the clinical environment influencing the opportunities the pupil nurses are exposed to in the clinical field. Conrick, Lucas and Anderson (2001:1),

identify two of the main problems with clinical exposure as the lack of experienced registered nurses to mentor students and the early discharge of patients resulting in insufficient learning opportunities for the students. Medical aids put pressure on the private sector to discharge patients earlier than before to save costs, and medical technology make it possible for patients to be discharged earlier, because less invasive techniques are used, which lead to quicker recovery.

Mallaber and Turner (2005:112, 114), contend that students need more preparation before practical assessments and report that in 2004 the Nursing and Midwifery Council (NMC) of the United Kingdom (UK) announced that student nurses might be allowed to gain some of their clinical practice time in skills laboratories.

The researcher has been a nurse educator in a private hospital group for the past nine years. Part of the job description of the researcher is to do the clinical accompaniment of pupil nurses and to conduct formative and summative assessments of students. During the past nine years it was observed that the second-year pupil nurses were not competent in the procedures pertaining to the *administration of oral medication* and the *assessment of neurological observations*. This observation was made during summative assessments of final-year pupil nurses. Discussions with other nurse educators and second-year pupil nurses revealed that the pupil nurses were not given the opportunity in the clinical field to gain clinical experience in these two procedures. These two procedures were chosen from a list of 30 procedures in which the final-year pupil nurses have to obtain competency. The researcher chose these two procedures because these require critical thinking from students, hence the choice of the two procedures for the final summative practical assessment of pupil nurses. *Administration of oral medication* is a critical procedure in which the final-year pupil nurse must be competent due to the fact that after qualifying, it is expected of the enrolled nurse to administer oral medication. *Observation of patients' neurological functions* is a procedure that is not often found in the clinical setting and these two procedures were previously used in summative practical assessments. Due to a lack of clinical experience in these two procedures, the researcher chose them to see if simulation training can make a difference to the outcome of the clinical assessment of these two procedures.

### **1.3 STATEMENT OF THE PROBLEM**

Second-year (final-year) pupil nurses, who follow the programme leading to enrolment as a nurse (Regulation 2175 of 1993, as amended) (SANC 1993b) in selected private hospitals, appear not to be competent in the clinical procedures *administration of oral medication* and *observation of patients' neurological functions*. This leads to the research question: can simulation training improve students' competence in the procedures *administration of oral medication* and *assessment of neurological observations*?

### **1.4 PURPOSE OF THIS STUDY**

The purpose of this study was to determine whether training through simulation methods can improve pupil nurses' level of competency in two selected clinical procedures, namely *administration of oral medication* and *observation of patients' neurological functions*.

The following hypothesis was formulated in this study:

Simulation training improves pupil nurses' competency levels in the clinical procedures, *administration of oral medication* and *observation of patients' neurological functions*.

Nil hypothesis 1: Simulation training will not improve pupil nurses' competency levels in the clinical procedure, *administration of oral medication*.

Nil hypothesis 2: Simulation training will not improve pupil nurses' competency levels in the clinical procedure, *observation of patients' neurological functions*.

### **1.5 SIGNIFICANCE OF THE STUDY**

Nursing education strives to improve nursing competence to benefit not only the pupils and student nurses, but also to benefit the patient. The research findings and recommendations may assist nurse educators to plan effective clinical learning environments and exposure to clinical experiences through simulation training. Simulation training provides a safe learning environment wherein pupil nurses may get the opportunity to practise clinical skills without the possibility of harming patients. The findings of the study may lead to the improvement of nursing education and hopefully produce more competent enrolled nurses in future. The patients may benefit by being nursed by more competent and skilled enrolled nurses.

## 1.6 DEFINITIONS OF KEY CONCEPTS

For the purpose of this study, the following concepts are relevant as defined below.

### **Enrolled nurse programme**

In this study the term 'enrolled nurse programme' refers to a two-year programme of education and training approved by the SANC, which is offered by an approved nursing school as referred to in regulation 3, and which leads to the obtaining of a qualification that confers on the holder thereof the right to enrolment as a nurse in terms of section 16 of the Nursing Act (SANC Regulation 2175 of 1993, as amended) (SANC 1993b).

### **Nursing school**

Nursing school means any institution where persons are educated and trained for the profession of nursing and/or midwifery. An approved nursing school means a nursing school approved by SANC in terms of the Nursing Act (South Africa 2005:2). The nursing school in this study refers to the Gauteng learning centre of a private hospital group.

### **Pupil nurse/Student nurse**

The *Oxford Advanced Learner's Dictionary* (2010:1484), defines a student or pupil as a person who is studying at a university or college to enter a particular profession. A student or pupil can be an undergraduate or postgraduate. In this study the pupil nurse is an undergraduate student, which according to the *Oxford Advanced Learner's Dictionary* (2010:1484), refers to a student who is studying for his/her first degree at a university or college. SANC Regulation pertaining to the enrolled nurse programme refers to pupil nurses but, in general, they are referred to as student nurses. The word 'pupil' is only used in British English and is starting to become old-fashioned and is replaced by the term 'student' (*Oxford Advanced Learner's Dictionary* 2010:1484). According to Mntambo (2009:23), the word 'student' refers to a person who is in the process of being educated. In this study both terms will be used interchangeably. A nurse is a qualified person whose job is to take care of sick or injured people, usually in a hospital (*Oxford Advanced Learner's Dictionary* 2010:1009).

## **Qualification**

Qualification refers to “the formal recognition of the achievement of the required number and range of credits and such other requirements at specific levels of the National Qualifications Framework as may be determined by the relevant bodies registered for such purpose by the South African Qualifications Authority” (Vasuthevan & Viljoen 2003:113). Davidson (2004:182), refers to a qualification being a prerequisite, requirements met or with the understanding that outcomes are met. According to the *Concise Oxford Dictionary* (1982:984), ‘qualification’ refers to a condition that has to be fulfilled before a right can be acquired or an office held.

## **Clinical practice**

‘Clinical’ is derived from a Greek word *klinikos*, meaning a bed. It originated from the word ‘bedside’, which implicates that the patient receives clinical care being in bed (Mellish, Brink & Paton 2000:207). Clinical practice is referring to clinical training in the wards and departments (SANC 1993b:3(b)). Davidson (2004:271), refers to practice as hospital care, medical art, medical advice, medical practice, health care and medical care.

## **Clinical environment**

Clinical environment must be a place where the students feel safe and wanted and where they can learn (Billings & Halstead 2005:330). It is also a setting where students need to learn to solve clinical problems. The clinical environment, in this study, refers to a hospital setting and the simulation laboratory in which pupil nurses are placed for the acquisition of practical nursing skills.

## **Clinical training**

Clinical training refers to learning experiences that are considered to be essential to the curriculum. They are specific types of experiences that faculty have agreed that all students must achieve before successfully completing a nursing programme (Billings & Halstead 2009:159). Clinical training refers to practica in the hospital wards and departments for the prescribed period of training (SANC 1993b:3(b)).

## **Competence**

Competence consists of the knowledge, skills, judgement and personal attributes that are required for being able to perform all the tasks of a competent nurse (Mntambo 2009:24). Van der Horst and McDonald (2001:257), view competence as the capacity for performing within specified ranges and contexts resulting from the integration of a number of specific outcomes. To be declared competent a minimum of 80% must be obtained for basic nursing procedures according to the private hospital's standards and policy (Wepener 2009:7). This standard was set by the standard committee of the private hospital group. The reason for this was to train competent and skilled professionals and to maintain high standards of education.

## **Effectiveness**

Effectiveness is producing the result that is wanted or intended (*Oxford Advanced Learner's Dictionary* 2010:469). According to Billings and Halstead (2009:468), effectiveness is to examine the results of a strategy after implementation. Effectiveness in this study refers to the extent to which simulation training influence clinical competence of pupil nurses.

## **Clinical facilities**

Clinical facilities include hospitals and other health care facilities that are accredited with the SANC for a nursing school, allowing the pupil nurses to gain clinical competence in the clinical facility when not attending theoretical classes in the nursing school (South Africa 2005:27). In this study clinical facilities refer to seven private hospitals accredited by the SANC for the Gauteng learning centre.

## **Clinical experience**

Experience refers to the know-how gained through practice (Benner 2001:294). Davidson (2004:286), refers to experience as skilfulness, handiness, competence and accomplishment. He also describes it as knowledge and experience or being well-practised. According to the *Oxford School Dictionary* (2004:162), experience refers to what you learn from doing or seeing things.

Clinical experience in the context of this study is the experience gained by the participants during their first year of training, before commencing the second year, for those who started the course after leaving school. For the participants who were auxiliary nurses previously, the clinical experience gained during their time as nurses is seen as clinical experience obtained.

## **Simulation**

Binstadt (in Smith & Roehrs 2009:74), describes simulation as “the use of a device or series of devices to emulate a real patient simulation for the purpose of education, evaluation, or research”. According to Brown (2008:638), simulation is the artificial representation of a phenomenon or activity that allows participants to experience a realistic situation without real-world risks. Billings and Halstead (2009:160), define simulation as an event or situation constructed to reflect clinical practice as closely as possible to teach procedures and facilitate critical thinking.

In this study simulation took place in a simulation laboratory, where the pupil nurse practised the two procedures, *administration of oral medication*, by using a mannequin, through which they would experience a realistic situation without risks and *observation of patients’ neurological functions* by using a real person to simulate a patient, on whom neurological functions would be practised.

## **Simulation laboratory**

According to the *Oxford Advanced Learner’s Dictionary* (2010:829), ‘laboratory’ is defined as a room or building used for scientific research, experiments or testing. Ellis and Symons (2001:1), define a simulation laboratory as a place that resembles a hospital ward where students can learn clinical skills in a safe and direct environment.

In the learning centre where the study was conducted, the simulation laboratory is a room that represents a patient’s room with the necessary mannequins and equipment to reflect the clinical practice as accurately as possible.

## **Assessment**

Assessment refers to the gathering of information about the learner to measure and make decisions about his or her performance. It involves a task or a series of tasks set in order to obtain information about the learner’s competence. These tasks can be workplace/

coursework/classroom/homework/project-based or they can be set in an examination paper (Van der Horst & McDonald 2001:257). According to Davidson (2004:180), assessment refers to measurement, evaluation or appraisal. Assessment refers to the measurement of students' abilities, knowledge, skills and attitudes during and after participation in courses and programmes (Billings & Halstead 2009:391). In this study assessment is the measurement of the students' knowledge, skills and attitudes through direct observation using a check list as assessment tool.

## **1.7 RESEARCH DESIGN AND METHODOLOGY**

A quantitative approach, using a quasi-experimental research design was chosen for this study. A non-equivalent control group before-after design was adopted. Quasi-experimental designs make use of interventions but lack randomisation (Polit & Beck 2008:265).

### **1.7.1 Research design**

Quantitative research is a research design that flows directly from research questions or hypotheses (Brink 2006:92). The researcher follows logical steps to answer research questions.

According to Stommel and Wills (2004:92), quasi-experimental designs evaluate the causal effect of intervention. In this study subjects were selected purposefully, assigned to either the experimental or control group, according to the clinical facility where they have to do their clinical practica, so as to make data collection possible. It is, therefore, also called a non-randomised trial or a controlled trail without randomisation (Polit & Beck 2008:265).

The intervention was clinical training through simulation. The researcher examined the causal effect that training through simulation had on the competency of second-year pupil nurses with regard to the two procedures, *administration of oral medication* and *observation of patients' neurological functions*.

### **1.7.2 Population and sample**

The population for this study was the second-year (final-year) pupil nurses in the Gauteng learning centre of a private hospital group who do their clinical practice in seven participating hospitals.

## **Sample**

The sample included the entire population of second-year pupil nurses of both the February 2011 and August 2011 intake at the learning centre. The entire population consisted out of 51 enrolled pupil nurses. Only 43 enrolled pupil nurses participated in this study; eight subjects withdrew early in the study due to various reasons as explained in chapter 3. The experimental group consisted out of 17 subjects and the control group out of 26 subjects.

### **1.7.3 Data collection**

Data collection is a systematic way of gathering information relevant to the research purpose or question (Burns & Grove 2005:60). Data were collected by direct observation. A pre-test, post-test and post-post-test were conducted during this study. The evaluation instruments that were used were the standard evaluation instruments (check lists) used during the formative and summative clinical assessments of second-year pupil nurses.

### **1.7.4 Data analysis**

Data analysis, according to Polit and Beck (2008:68), can be explained as the measurement of relationship. This is concerned with the correlation between the two variables. Quantitative information is analysed through statistical procedures (Polit & Beck 2008:68).

After the data had been collected, it was quantified and these numerical data were statistically analysed by a professional statistician. The SAS JMP 9.0 computer programme was used to analyse the data.

Statistics are either descriptive or inferential. Descriptive statistics are used to describe and synthesise data. Inferential statistics are used to make inferences about the population (Polit & Beck 2008:556), and are based on the laws of probability (Polit & Beck 2008:583). Descriptive and inferential statistics were used in this study.

This will be discussed in detail in chapter 3.

## **1.8 VALIDITY AND RELIABILITY**

According to Brink (2006:209), validity shows the ability of the instrument to measure the variables that are intended to be measured. Reliability of a research instrument shows the extent to which the instrument measures the same results on repeated measures.

Validity and reliability of the data collection instruments and design validity are discussed in detail in chapter 3.

## **1.9 ETHICAL CONSIDERATIONS**

Ethical clearance to conduct the study was obtained from the Department of Health Studies Higher Degrees Committee at Unisa. The researcher obtained written permission to conduct the study from the private hospital group as well as from all the nurse managers from the participating private hospitals. The subjects received written information about the study, but no informed consent was obtained due to the nature of the study.

Ethical considerations will be discussed in detail in chapter 3.

## **1.10 OUTLINE OF THE STUDY**

Chapter 1 provides an overview of the study.

Chapter 2 comprises a literature review.

Chapter 3 discusses the research design and methodology.

Chapter 4 presents the data analysis and interpretation of the results.

Chapter 5 provides the findings, limitations of the study, recommendations and the conclusion.

## **1.11 CONCLUSION**

This chapter contextualised the study and the purpose of the study, definitions of the key concepts were given and the design and methodology were indicated.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

This chapter provides a review of available literature on simulation training in a nursing education context. Polit and Beck (2008:757), define a literature review as a critical summary of research on a topic of interest to either clarify or prepare a research problem. According to Burns and Grove (2005:93), a literature review is a written presentation of other researchers' findings on a research problem in which the researcher is interested. A review of relevant literature assists the researcher to develop a broad conceptual context, into which the research topic will fit. The main purpose of a literature review is to find similar studies that will help to join together information previously obtained.

Simulation as teaching strategy in nursing education is explicated to provide an argument for the need for simulation training in nursing. Learning theories applicable in nursing education and simulation training and different types of simulation are discussed. The SANC Regulation relating to the programme leading to enrolment as a nurse no R2175 of 1993, as amended is explained.

Sources consulted during the literature review include books, journal articles, the SANC Regulations and dissertations. Data bases, for example CINHALL, Academic Search Premier and Health Source: Nursing/Academic edition, were used in this study.

#### **2.2 SIMULATION AS TEACHING STRATEGY**

Technological advances in health care and higher expectations on the part of patients have encouraged the development and use of new training tools in nursing education. Pupil nurses' experience gained by clinical practice has been diminished for patient safety and ethical reasons. Hence, there has been a need to reproduce that experience

by some other means. According to Cioffi (2001) (in Alinier et al 2006:360), simulation training enables experiential learning in a safe environment.

### **2.2.1 Simulation training**

The word 'simulate' is derived from the Latin words 'simulate' and 'similis', which mean to "imitate". Simulation training should simulate a situation as close to reality as possible (Klopper 2001:115). Schiavenato (2009:388), contends that simulation is the representation of the behaviour or characteristics of one system through the use of another system. Simulation simulates or resembles an event or situation to reflect clinical practice as closely as possible to teach procedures and facilitate critical thinking (Billings & Halstead 2009:160; Harder 2010:23).

Simulation has been used extensively in nursing education to teach, remediate, assess and reflect on the clinical practice of nursing students (Krautscheid et al 2008:431). The authors found that clinical simulations offer opportunities to observe and deliberately practise clinical skills before entering a clinical setting by demonstrating a nursing skill to students and then gathering feedback from the students to evaluate if learning took place.

Well-planned and debriefed simulations can be an effective clinical experience because they facilitate the application of clinical judgement, which is often overshadowed in practice by the complexity of care and the need to complete tasks. This was the conclusion of a study done by Dillard et al (2009:103). The authors did a study on application and evaluation of clinical judgement through simulation. They collected quantitative and qualitative data from faculty and student evaluations and students' reflective statements.

Simones (2008:132), created a home care simulation laboratory where 40 nursing students had to complete a group assignment in which they conducted an environmental safety observation and assessment project. Students were required to observe the home care environment, make a conclusion regarding the safety of the clients, and formulate a professional recommendation based on their assessment. A Likert scale identifying the benefit of the laboratory in meeting the learning outcomes of the course was used for feedback. The conclusion of the study was that on the basis of

the student and faculty evaluations, the home care laboratory achieved a very important goal. As a result, students began their clinical home care setting with greater confidence in their ability to assess and care for home care clients.

Laboratory simulations are being used to foster clinical competence in nursing students. Jeffries, Rew and Cramer (2002) (in Kurtz et al 2010:38), compared traditional teaching methods to interactive, student-centred strategies to teach students basic nursing skills in a simulation laboratory. They concluded that there were no differences in cognition or skill performance ability between the groups, but students in the interactive groups were more satisfied with their learning. The authors suggested that increased satisfaction leads to greater student participation in learning, thereby improving academic and clinical performance.

Simulation training uses nursing actions, to demonstrate nursing care, in a controlled and safe simulated environment. The student does not endanger the patients by practising procedures on the patients; instead these procedures are practised on special mannequins in a simulated environment that resembles a patient's room or hospital ward. Simulation as clinical teaching strategy is valuable because the student nurses are equipped with technical skills before they apply these skills in the clinical setting.

### **2.2.2 Learning theories applicable during simulation**

Learning theories focus on how people learn and are descriptive in that they focus on and describe the processes used to bring about changes in either the way in which students perform or the way in which they understand or organise elements in their environment (Billings & Halstead 2005:236).

The following learning theories' principles are very relevant to nursing education as nursing is a practice discipline allowing adult learners into the nursing profession. These learning theories are specifically applicable during simulation training.

### **2.2.2.1 Behaviouristic learning theory**

Behaviourism focuses on positive reinforcement as a reward and motivation for students to learn (Billings & Halstead 2005:110). Skinner distinguishes between two types of behaviour, namely respondent and operant behaviour, the former being elicited by specific stimuli and the latter being emitted spontaneously by the organism such as the random pecking behaviour of pigeons (Klopper 2001:52). Operant behaviour occurs spontaneously. Respondent behaviour is evoked by a known stimulus and it can cause behavioural changes on the presentation of the conditioned and unconditioned stimulus.

Skinner found that positive reinforcement resulted in respondent behavioural changes. The more positive reinforcement is used, the better the behaviour. Learning takes place with continuous positive reinforcement (Quinn & Hughes 2007:94).

During simulation training the nurse educator appraises correct actions and gives immediate feedback after the students has practised a procedure. This may lead to positive reinforcement.

### **2.2.2.2 Adult learning theory**

Student nurses are adult learners and need to take responsibility for their own learning by setting goals and objectives for themselves. Quinn and Hughes (2007:17) describe adult learners in nursing as individuals that differ widely from each other. These individual differences encompass physical characteristics, such as age and gender, and psychological characteristics, including motivation, personality, intelligence, learning styles and expectations. One aspect that adult learners have in common is being voluntary participants. It is important for the adult learner to feel that he/she has reached his/her goals and not get demotivated if he/she does not become competent in a skill or procedure. If the adult learner feels satisfied with his/her accomplishments and, therefore, is motivated, he/she will participate in learning.

Knowles (in Quinn & Hughes 2007:29), described adult learning (andragogy). Andragogy is the art of teaching adults.

Knowles originally identified the assumptions of adult learning, which include the following:

- *The need to know* – adults want to know why they need to learn and how they can use the knowledge in real-life settings (Knowles 1986:55-56).
- *The learner's self-concept* – adults have an independent self-concept, which allows them to be self-directed. They want to independently plan and evaluate their learning abilities (Brookfield 1991:40).
- *Role of learner's experience* – they have a rich source of experience, which they want to share with fellow students in group discussions, laboratory methods and case studies (Knowles 1986:57-58).
- *Readiness to learn* – adults become ready to learn when they experience a need to know. When their existing knowledge is deficient to cope effectively in real-life situations, curiosity, mastery and challenge will influence their readiness to learn according to Knowles (1986:58-59). Readiness to learn can be induced through exposure to simulation exercises and role models.
- *Orientation to learning* – is life-centred and problem-centred, adults learn to be able to complete a task or solve a problem. They acquire new skills when these are presented in the context of application to real-life situations (Knowles 1986:59-60).
- *Motivation to learn* – adults respond to internal motivation, for example, recognition, self-esteem, job satisfaction, quality of life, challenge, mastery, curiosity (Knowles 1986:61).

Simulation training is setting the physical and psychological climate for learning. The simulation laboratory ensures a safe place for students where they can learn clinical skills without the fear that they may harm a patient. The students can share their experience with fellow students during the peer assessment and group discussions in the simulation laboratory.

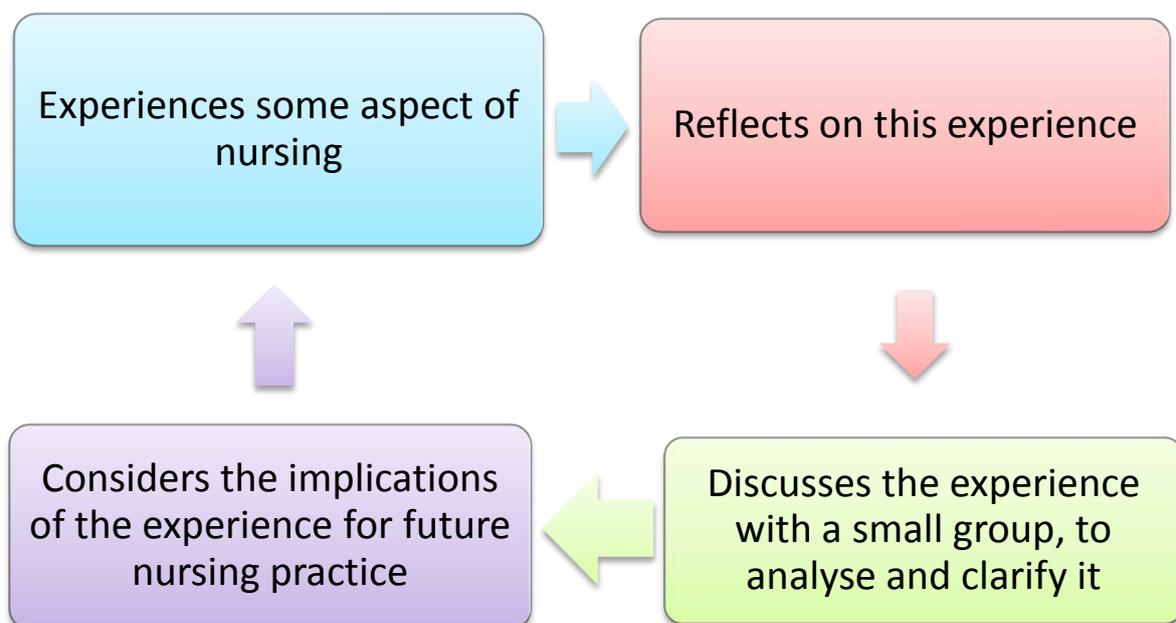
### **2.2.2.3 *Experiential learning***

Experiential learning is learning that results from experience (Quinn 1988:187) and, therefore, Quinn states the fact that nursing education takes place in the clinical setting.

Thus, the result is that experiential learning is happening all the time. Quinn and Hughes (2007:33), emphasise that experiential learning is learning by doing and not by listening to other people or reading about it. The characteristics of this form of learning are active involvement of the student together with student-centredness, a degree of interaction, some measure of autonomy and flexibility and a high degree of relevance.

David Kolb suggests that the experiential learning cycle is a continuous process in which knowledge is created by transforming experience (Billings & Halstead 2005:322). Figure 2.1 outlines the process through which student nurses experience an aspect of nursing and then follows this with a period of reflection (Quinn 1988:188).

In clinical training in simulation students experience some aspect of nursing. Procedures are demonstrated to them. They have time to reflect on this experience by observing the procedures in the wards in their daily nursing activities and when practising these procedures in the simulation laboratory. During clinical accompaniment the students share their experiences in the wards. They practise these procedures in the simulation laboratory and ask questions. Peer group evaluation, as well as discussions about the steps to follow when doing the procedures, takes place. The students reflect on the learning experience and consider how to apply this in future nursing practice.



**Figure 2.1** *The process of experiential learning in nursing*

### **2.2.3 Types of simulation**

There are different types of simulation strategies that can be used to facilitate student learning. These may include computer simulation, interactive video, and the use of mannequins, case studies, role-play, and clinical simulation (Wong, Cheung, Chung, Chan, Chan, To & Wong 2008:509).

#### **2.2.3.1 Clinical simulation**

Clinical simulation is the demonstration and practice of clinical procedures in a simulation laboratory. Clinical teaching can be managed effectively if simulation is used as one of the teaching methods. According to Conrick, Dunne and Skinner (2000:1), simulation is an effective method for managing clinical teaching because it can be presented in many ways and it encourages students to become active learners in the educational environment.

Simulation training provides an opportunity for student nurses to experience learning and participate in clinical decision-making skills within a safe environment before interacting with patients (Brannan, White & Bezanson 2007:495; Eggenberger & Regan 2010:550; Waxman 2010:29). It is essential to have a safe environment for the pupil nurses in which to practise the procedures in order to gain optimum clinical experience and to develop higher cognitive skills. Patients are well-informed about their rights, and student nurses' feel threatened when they have to perform a procedure on a patient, especially when they do not feel competent in that procedure.

Bambini et al (2009:79), evaluated students' confidence levels after clinical simulation training. They found that students learned how to deal with real problems during simulation exposure. Students developed a sense of self-efficiency in practice as they gained more confidence in doing a procedure, after being exposed to the procedure in a clinical simulation environment.

According to Waxman (2010:29), real-world problems can be created in simulation training by using scenarios for students to learn how to deal with these problems without harming themselves or the patients. They believe that simulation technology will improve health care providers' skills and knowledge. Weaver (2011:37), did a literature

review on the effect of high-fidelity patient simulation in nursing education. This review showed that patient simulation benefits nursing students and explained that simulation provides an ideal learning environment for student nurses, because it mirrors the clinical setting and mimics patients' responses in a controlled and safe setting.

Bambini et al (2009:79) and Parker and Myrick (2010:329), agree that simulation training used as clinical teaching strategy provides a safe environment for students in which theoretical principles of nursing care can be applied. Garrett, MacPhee and Jackson (2010:309), affirm that simulation training provides a safe environment where students can practise clinical skills in a laboratory, to ensure that they become competent practitioners, before being exposed to patients in the clinical setting.

Alinier et al (2006:359), did a study on the effect of scenario-based simulation training on student nurses' clinical skills and competence. Their sample was randomly allocated out of a population of second-year diploma nursing programme students. The conclusion of their study was that simulation training provides a safe environment for students to practise clinical procedures before attending to patients.

Clinical simulation training takes place in a simulation laboratory. Ellis and Symons (2001:1), explain that nursing laboratories in the Australian universities resemble or simulate a hospital ward, where students are allowed to explore how to perform various clinical procedures with mannequins or models before providing nursing care to actual patients.

The purpose of simulation is to reproduce some aspect of reality in order to give the student nurse the next-best thing to the real experience, while at the same time maintaining some degree of control over the process (Quinn 1988:192). Clinical simulation can be used to demonstrate procedures such as administration of oral medication, assessment of a patient's neurological observations, catheterisation of a patient, and it requires students to practise these procedures.

### **2.2.3.2 Role-play**

McCaughey (2010:828), describes role-play as an alternative interpretation of simulation whereby individuals are trained to portray patients in a consistent and

realistic manner, initiating the expectation of rapport and communication skills in addition to patient assessment and management. Role-play, according to McCaughey, benefits communication and team-working ability.

Brown (2008:640), explains that role-play is an important simulation training method necessary to teach and evaluate verbal responses in nursing students. To reinforce communication skills, students were paired in groups and they received a brief scenario which they then had to act out. Their peers were tasked with identifying the therapeutic technique to use in dealing with a psychiatric patient. Brown found that the student's anxiety was eased after exposure to simulation activities throughout the course and not just at the end for a competency assessment.

Role-play can be used to give students the opportunity to practise therapeutic skills. An individual may act as a patient and interact with the student. A scenario is set and the student nurse must then provide nursing care to, or interact with this "patient" like in a real hospital setting. This type of simulation teaching is especially effective when preparing students for encountering psychiatric patients, where the students can learn how to handle an aggressive patient. Specific scenarios may be developed to teach students counselling skills or interviewing skills.

Conrick et al (2000:3), used role-play in a study during which first-year students were exposed to simulation training by providing a simulated ward in the campus laboratory. Students were used to role-play as members of the hospital, for example the hospital manager, doctor and administrative personnel to give the students the opportunity to experience real-life situations that they may encounter. A scenario was set using the different role-players to simulate a real-life day in the ward. The "doctor" had to do his rounds; the "administrative officer" had to admit a patient and the "registered nurse" had to give the student tasks to do. Students reported that they enjoyed this learning activity, because they could learn how to deal with the different situations that could occur in the wards, within a safe environment.

Role-play is one of the experiential learning methods used in this study. Pupil nurses perform realistic behaviour in an imaginary setting (Quinn 1988:193). The procedure *observation of patients' neurological functions* was practised in a simulation laboratory by means of role-play. Pupil nurses had to take turns in playing the patient. Role-play

allows students to think critically and apply knowledge in decision-making and problem-solving scenarios during the role-play session.

#### **2.2.4 Advantages of simulation training**

Several advantages of simulation training are reported in the literature. Simulation proves to provide apart from a safe learning environment, more effective learning opportunities to students by stimulating critical thinking, decision-making and problem-solving skills.

##### *Development of critical thinking skills*

Guhde (2010:387) and Kurtz et al (2010:38), emphasise that patients' conditions became more complex and suggest that students need more effective learning opportunities in simulation. Nurses are expected to make clinical judgements that match complexity, but only a small percentage of new graduate registered nurses possess the critical thinking abilities required to handle a complex situation. To teach student nurses the critical thinking abilities, simulation training was used in both studies mentioned above. Participative simulation teaches nurses to think on their feet and instil independent decision-making skills in nursing staff, skills not always learnt in the clinical environment (Clancy, Effken & Pesut 2008:254; Wotton, Davis, Button & Kelton 2010:632). In the study done by Clancy et al (2008) and Wotton et al (2010), it was found that training in simulation enhanced cognitive skills and helped students to develop clinical reasoning.

Schiavenato (2009:389), re-evaluated simulation training in nursing education by asking questions as to why simulation is used in nursing. He indicates that simulation was implemented in the 1960's for training nurses in critical skills that were hard to find, for example cardiopulmonary resuscitation. He argues that to become competent in cardiopulmonary resuscitation nurses need to practise the required skills in simulation.

Baker (2001:58), states that in the book by Wanda Bonnel, the emphasis is on simulation training to bridge the gap between didactic content and clinical practice.

### *Safe learning environment*

In a study done by Curtin and Dupuis (2008:522), to develop cost-effective simulation training, the researchers came to the conclusion that the students learned in a safe environment and that students' critical thinking abilities were developed during simulation training.

Goudreau (2002:42), emphasises the importance of a safe environment for students to learn. He warns that nursing faculty members should be aware that they are at risk for litigation if found negligent in failing to protect students from injury. Injury includes psychological trauma if the student harms a patient because he/she is not competent in a procedure. Goudreau explains that students must not be exposed to potentially dangerous patients and the only alternative for the student to gain experience is to practise clinical skills in a safe environment, for example, a simulation laboratory.

### *Preparing students for specialisation-specific tasks*

Waxman's study on the development of evidence-based clinical simulation scenarios, investigated current scenarios written for simulation training. She felt that the development of evidence-based clinical simulation scenarios and guidelines for nurses is an important step in redesigning nursing education. In order to prepare students for specialisation areas high-fidelity simulation is used. High-fidelity simulation is the use of high-technology, life-like mannequins that breathe, talk, blink, have heart and bowel sounds, and are used for training purposes (Waxman 2010:29). Waxman found that in areas such as paediatrics or obstetrics, where hospital clinical experiences can be difficult to find, simulation training can provide students with deliberate, guaranteed clinical experience in a safe, controlled environment with no risk to patients.

Bricker and Pardee (2011:34) and Young, Frost, Bigl, Clauson, McRae, Scarbotough, Murphy, Jillings, and Gillespie (2010:1), contend that some specialisation areas need simulation training to prepare the student nurses to be competent at performing specialisation specific tasks. Sensitive specialities like spinal cord and traumatic brain injury rehabilitation units require competent nurses and are, therefore, not suitable for clinical placement of students (Bricker & Pardee 2011:34). Students need to be exposed to learning opportunities for these specialisation areas before working there.

Specialised areas like paediatrics or obstetrics also tend to have limited learning opportunities.

## **2.3 CLINICAL TEACHING AND TRAINING**

The SANC programme outline of the course leading to enrolment as a nurse includes clinical teaching. One of the conditions for enrolment as a nurse is that the nursing school or learning centre where the training was given should submit a satisfactory record of the pupil nurse's theoretical and clinical training to the SANC (Regulation R2175 of 1993, paragraph 2 (1) (a-e), as amended). Clinical teaching and training is, therefore, a very important part of the enrolled pupil nurses' programme.

Clinical teaching and training takes place in the health services where pupil nurses have to do the required clinical practice, which is part of their course. The SANC specifies the minimum number of hours that pupil nurses must complete in clinical learning experiences and provide guidelines regarding clinical skills that pupil nurses must develop and found competent in before graduating from the programme for enrolled nurses (SANC 1993b).

Clinical teaching involves student-teacher interaction in clinical situations (Billings & Halstead 2005:342). Clinical teaching is the means by which students learn to apply the theory of nursing so that theoretical knowledge and practical skills are integrated in the clinical situation (Ayo 2006:29). Mkhwanazi (2007:31), emphasises that the theoretical information given to the pupil nurse in class should be correlated with the clinical practice.

### **2.3.1 Clinical setting**

Billings and Halstead (2005:325), explain that a clinical practice setting is any place where students interact with patients and families for the purpose of acquiring critical thinking, clinical decision-making, psychomotor and affective skills. These clinical practice settings can be hospital wards, clinics, and awareness days at a community gathering or old-age homes. Clinical settings provide the environment where clinical teaching takes place and in this study it refers to the accredited clinical facilities (private hospital wards) where pupil nurses do their clinical practice. Billings and Halstead

(2005:540), suggest that the clinical setting must be evaluated on how well it meets the learning needs as well as the practice needs of the students, and that faculty has to evaluate if the students were given the opportunity to meet all the clinical objectives.

Teaching in the clinical setting is not a new concept, as explained by Fitzgerald, Gibson and Gunn (2010:159). They contend that practice placements offer students the opportunity to apply theory to practice.

According to Grossman (2007:28), pupil nurses are assigned to particular clinical settings and are formally or informally guided by experienced professionals in order for learning to take place. Informal guidance takes place in the form of registered nurses that mentor the students during on-the-spot training. Formal guidance takes place during formal practical guidance sessions scheduled with the nurse educator allocated to that specific clinical facility.

The clinical facility is an environment where pupil nurses can learn what they need to know through constructing their own knowledge and drawing their own conclusions from their contacts with the experienced nurses who support and guide them (Mntambo 2009:63).

### **2.3.2 Clinical learning environment**

A clinical learning environment can be described as “the interaction network of forces within the clinical setting that influence student learning outcomes” (Chan 2002:70). Accompaniment of students in the clinical environment involves ensuring that the environment is conducive to learning, by making sure that their competencies can be developed through the provisioning of adequate clinical exposure to learning opportunities and by ensuring a relaxed and friendly learning environment. Students need to be supported physically and psychologically, treated with kindness, respect and understanding and interest must be shown in them (Ayo 2006:38).

Ayo (2006:37), describes an ideal clinical learning environment as an environment where the student can obtain clinical learning experiences. She explains that the environment must be without disturbance, stress or anxiety-causing factors and must be conducive to learning. This environment includes an adequate physical environment to

deliver quality care, facilitates development of competencies and provides teaching and learning opportunities, resources, space and equipment. Hinchliff (2005:90), states that when the clinical environment is conducive, teaching and learning becomes comfortable and effective.

The nurse educator facilitates resources for students to meet their individual needs. The student needs to identify his/her own needs and objectives (Billings & Halstead 2005:111).

Carl Rogers, a psychotherapist, developed a client-centred therapy approach. This involves a non-directive role in which the client is encouraged to develop a deeper understanding of his or her 'self' (Quinn & Hughes 2007:24). This concept of client-centred therapy led Rogers to formulate his student-centred approach to learning in which he states ten principles of learning. Rogers explains that experiential learning is concerned with cognitive functioning involving the whole person. Experiential learning has qualities such as personal involvement, self-initiation, persuasiveness, self-evaluation and meaningfulness.

Rogers (in Quinn & Hughes 2007:25) states that the role of the nurse educator is that of helper and facilitator, rather than conveyor of information. The nurse educator becomes a learning resource for the learner.

In the real clinical environment service needs take precedence over learning needs due to the lack of clinical learning experiences and mentors in the wards, as seen in the studies done by Wong et al (2008:513), Smith (2009:126) and Parsh (2010:569). This contributes to the need for simulation training.

### **2.3.3 Lack of clinical learning opportunities**

Warland (2010:2), reports on the current shortage of nurses and the effect of surging numbers of undergraduate students, which leads to a lack of clinical experience due to a lack of clinical placement. Elfrink, Kirkpatrick, Nininger and Schubert (2010:97), came to the same conclusion in their study. They state that students' opportunities to deal with practical situations are reduced due to the increased demand for clinical placements and the limited availability of supervisors or mentors in the clinical settings.

Wotton et al (2010:638), argue that there is a shortage of clinical sites and that it poses a challenge to the placement of students to gain optimum exposure to learning opportunities. Students lack authentic clinical exposure to many medical conditions, skills and knowledge. They explored the perceptions of third-year undergraduate student nurses' perceptions of simulation training. Data were collected using an evaluation form completed by student nurses after completion of training in simulation. Students perceived simulation as enjoyable, with an appropriate degree of challenge yet possessing congruency with concepts studied in the course. The conclusion to this study was that simulation in nursing education is not only a solution, but a powerful bridge between theory and practice.

Wong et al (2008:513), agree with this by arguing that student placement tends to be a problem, due to the lack of clinical learning opportunities and the great number of students who need to be accommodated in a clinical facility. These authors adopted a problem-based learning approach in a simulated clinical setting to address the problem of a lack of clinical learning opportunities for student nurses, the problem being further complicated by decreased time spent on learning needs due to the increased demand of service needs. Their findings were that simulation training did benefit the subjects in their study to reach their clinical objectives.

McNelis (2011:64), did a study on addressing the lack of clinical sites and how to optimise learning in clinical settings. In this study a national survey was conducted to examine clinical education in a pre-licensure registered nurse programme. The most frequent barriers to clinical education identified were the lack of quality clinical sites, which lead to a lack of clinical exposure for students. Clinical rotation was also seen as an obstruction, due to the difficulty of providing clinical rotations on evenings, weekends and holidays. It was found that to optimise learning in clinical settings the use of training in simulation was an option as well as providing more observational experiences for students during clinical time.

Kilmond, Brown, Ghosh and Mikitiuk (2010:314) and Harder (2010:23), are in agreement that in the real clinical environment learning experiences may lack or may not be available for students to gain the necessary experience and clinical practice continues to put pressure on students to be competent. Chun-Heung and French

(1997:458) (in Ayo 2006:26), caution about students spending most of their time doing routine work and menial tasks, thus wasting time for clinical learning.

Getting students competent can be a costly exercise for assessors or supervisors due to the great numbers of students and the lack of clinical learning experiences (Hutton, Coben, Hall, Rowe, Sabin, Weeks & Woolley 2010:610). A total of 50 third-year students at a large nursing school in England were tested on calculation of medication by means of computer-based assessment programmes. It was found that it is better to teach students how to calculate the correct dosage of medication to be administered in simulation, due to the lack of clinical exposure and pressure in the real world for giving the correct dose of medication to a patient.

#### **2.3.4 Clinical accompaniment**

Ayo (2006:25) quotes Potgieter (in Potgieter et al 2000:69), in stating that clinical accompaniment refers to the direct assistance or guidance and support given to a student by the tutor to develop competent independent practitioners. The purpose of clinical accompaniment is to ensure that clinical learning objectives are met and that practical competence occurs. Competence is the capacity for performing within specified ranges and contexts resulting from the integration of a number of specific outcomes (Van der Horst & McDonald 2001:257).

According to Mellish et al (2000:213), student nurses must be guided to perform their independent functions in the knowledge that they are responsible for their actions and omissions. Hinchliff (2005:101), cautions that to guide students towards independent learning depends on the planned teaching and learning activities and the way the guidance is done.

In a study conducted by Smith (2009:126), about creative clinical solutions, she states that the problem with clinical training is that current clinical observations provide limited opportunities to learn problem-solving skills due to the decrease in student-faculty numbers in the clinical area. She argues that in the fast-paced, acute-care settings like the emergency departments and cardiac catheterisation laboratories, students have little time to reflect on a client's situation and to provide appropriate nursing interventions.

According to Carnwell, Baker, Bellis and Murray (2007:924, 926, 927), in the UK, clinical education is provided throughout the students' programme and is the responsibility of registered nurses in the clinical setting. Mentors are responsible for teaching clinical skills and facilitating learning opportunities while supervising the students. In their study the concern was the preparation, recruitment and quality of clinical facilitators or mentors. Role conflict was identified as one of the reasons why mentors fail to facilitate clinical learning of nursing students. The study recommended that mentors should be supernumerary to make time available for them to facilitate clinical learning opportunities and on-the-spot training.

According to O'Driscoll, Allan and Smith (2010:212), the ward manager must lead learning at ward level, but they are limited due to their absence in the ward as a result of managerial demands. They found in their study that mentors then lead the learning that takes place in the clinical field, but they also have to balance training with caring for patients. This makes it difficult for the mentor to spend the much-needed time with the student nurse and the modelling of bedside care then often falls on the shoulders of health care assistants.

In a study done by Alinier et al (2006:360), to examine the effectiveness of simulation training technology in undergraduate nursing education, they discussed the limited availability of mentors or registered nurses and, therefore, the need of clinical simulation training. They found that simulation is a useful training technique that enables small groups of students to practise in a safe and controlled environment how to react adequately in a critical patient care situation.

Fetter (2009:44), in his study about the effectiveness of human-patients simulation, contends that there is a shortage of nurse faculty and preceptors as well as fewer clinical hours. He investigated the barriers to the facilitation of learning in undergraduate student nurses. One of the barriers identified was the limited skills and interest of the mentors. He found that clinical simulation increases clinical experience, but that it requires a high cost in technical and human resources.

Luhanga, Yonge and Myrick (2008:227), contend that mentors and preceptors need more support when guiding a student. They interviewed 22 preceptors and in their conclusion they state that faculty's role in supporting preceptors is crucial to the success

of the preceptorship experiences and that faculty also needs to evaluate the clinical skills of preceptors on a regular basis to make sure that effective clinical training takes place.

In a study done by Young et al (2010:1), about a competency-based curriculum in a nursing workplace, they state that it is important for mentors to be trained by nurse educators, in order to gain skilled mentors to facilitate student learning. The purpose of the study was to develop a curriculum to prepare nurses through a four-level career pathway model in order to gain skills to practise various education-related roles within the practical settings.

Campbell and Filer (2008:45), express their concern with the increased number of students and no increase in the number of faculty members. They developed a homeroom-mentoring model to assist faculty in mentoring students. In this programme a student is assigned to a baccalaureate-prepared staff nurse who acts as his or her mentor for the two years of the nursing course. This enables the student to form a relationship with a professional nurse and also offers opportunities for immediate application of knowledge in the clinical setting. The homeroom-mentoring programme increases clinical faculty capacity by allowing one faculty member to indirectly supervise 24 students.

Quinn (2001:185), emphasises that a learning environment and appropriate support from skilled educators are needed for learning to take place in the clinical setting. In the current study, nurse educators from the private hospital group's learning centre are mainly responsible for the accompaniment of the pupil nurses. Mentors (registered nurses that did a mentorship course) and registered nurses in the clinical facilities are responsible for supervising the pupil nurses in the wards in the absence of the nurse educators.

During clinical accompaniment, formative clinical assessments are done in order to observe if student learning takes place.

### 2.3.5 Clinical assessment

Klopper (2001:117), remarks that assessment is based on values, norms and criteria to evaluate if all the practical objectives of a course were met. Oral and written examinations cannot reveal the clinical skills of student nurses, because they do not measure the students' clinical reasoning and diagnostic abilities (Shawler 2008:528).

Billings and Halstead (2005:521), point out that the goal of clinical assessment is to evaluate safe, quality patient care and report about the competencies and quality of clinical performance, while using many methods and tools to measure learning in the clinical setting. They explain that faculty (nurse educators) have the primary responsibility for the student's clinical assessment, while nursing staff (registered nurses) also play an important role in assisting faculty in assessing students' competence in the clinical practice (Billings & Halstead 2005:522).

The three learning domains assessed during clinical assessments are the cognitive, affective and psychomotor domains as described in Bloom's taxonomy of educational objectives. Klopper (2001:118), emphasises that knowledge without understanding serves no purpose when nurses are expected to apply the scientific method of nursing (nursing process). Therefore, cognitive thinking skills of understanding, applying, analysing, synthesising and evaluation are required. Psychomotor skills, knowledge, development of attitudes and clinical problem-solving abilities are developed during practical placements of students (Fitzgerald et al 2010:159).

In order for students to be assessed on clinical procedures, the procedures first need to be demonstrated to them and the students need to practise these procedures during clinical accompaniment in a clinical environment or in simulation.

The evaluation instruments used to assess the clinical skills of the pupil nurses in this study assess learning in the cognitive, affective and psychomotor domains.

The *cognitive domain* focuses on the functioning of acquired knowledge and skills. Bloom identified six different categories in the cognitive domain, namely *knowledge*, *comprehension*, *application*, *analysis*, *synthesis* and *evaluation* (Billings & Halstead 2005:200; Klopper 2001:118). In the assessment instruments currently in use for

formative and summative assessment of clinical competence in the selected two procedures, the theoretical knowledge is tested in the cognitive skills domain. There are questions asked to evaluate knowledge and understanding of the procedure to determine if the pupil nurse can apply theoretical knowledge in the clinical setting. In the two procedures *administration of oral medication* and *observation of patients' neurological functions*, the pupil nurse have to recall theoretical *knowledge* in order to know the normal values of an adult patient's neurological functions and vital data, as well as the anatomy of the brain and the effects and side effects of the different medications, in order to identify if there are any abnormalities or possible complications that may harm the patient. *Comprehension* is understanding and implies that the pupil nurse interpret ideas and is able to predict and plan a possible outcome of the procedure. The pupil nurse has to be able to predict the effect of medication on a patient. The pupil nurse will be able to *apply* a concept in an appropriate situation. The pupil nurse must be able to divide information and *analyse* it in order to predict the correct action and outcome of the procedure, using *synthesis*. The pupil nurse has to *evaluate* the outcome of the procedure and predict if there are any additional actions required (Klopper 2001:118).

The ***affective domain*** involves attitudes and interpersonal skills and encompasses attitudes, beliefs, values, feelings and emotions (Billings & Halstead 2005:201; Klopper 2001:118).

In this domain, in the evaluation instrument, the verbal and non-verbal communication strategies of the pupil nurses are assessed. The pupil nurse's comprehensive approach with regard to the patient's basic needs is also assessed. According to Heigan (2006), the following skills must be continuously applied and maintained by all nurse practitioners (figure 2.2).

- Always smile.
- Greet the patient in a friendly manner using the appropriate title and surname.
- The nurse practitioner always introduces him/herself to the patient.
- Reassure the patient.
- Explain the procedures that are to be carried out to the patient.
- Obtain the patient's verbal consent.
- Talk to the patient to allay fears.
- Act empathetically at all times.
- Show respect to the patient and family.
- Give feedback to the patient.
- Ensure the patient's safety.
- Give information and health education.
- Speak in an understandable language.
- Use appropriate verbal and non-verbal communication.
- Be professional.

**Figure 2.2 Affective skills**

The **psychomotor domain** includes three types of skills, namely fine motor, manual and gross motor skills (Billings & Halstead 2005:203). *Fine motor skills* are those needed to implement tasks requiring exactness. Fine motor skills such as preparing and administration of medication, manipulating instruments to test pupil response during the neurological observations, are examples of skills that were used during these two procedures. *Manual motor skills* are those involving some common coordinated movements of the hand, arm and eye. Any physical assessment falls into this category. *Gross motor skills* are those skills that require use of large muscle masses in the body movements. Repositioning of a patient or lifting a patient's legs or arm during the observation of neurological functions requires gross motor skills. Klopfer (2001:119), explains psychomotor in finer detail by describing perception as the ability to show sensory awareness of objects. Set is the ability to be able to perform a specific action acquired to do the procedure or task. Guided response is the response and ability to act when guided by the tutor or mentor. Mechanism is the ability to repeatedly perform the steps of a skill with a degree of confidence. Complex overt response is the ability to automatically perform a difficult motor action independently with a high degree of skill.

Adaptation is the ability to make modifications in a motor process to suit the needs and condition of the patient, without harming the patient or any other individual in the process. Origination is the ability to create new motor acts as a result of understanding the skill (Klopper 2001:119).

In the evaluation instruments used in this study the psychomotor domain was assessed by observing the pupil nurse's clinical skill to administer oral medication to a patient, as well as to physically assess a patient's neurological observations. The pupil nurse must be able to adapt to each situation and modify the actions to suit the needs of the patient without putting the patient in any danger. The pupil nurse's reasoning and critical thinking skills (cognitive domain) are evaluated throughout the procedure as they cannot be separated from the psychomotor domain.

## **2.4 PROGRAMME LEADING TO ENROLMENT AS A NURSE (R2175)**

The enrolled nurse is one of the three categories of nurses trained in South Africa. In this study second-year (final-year) pupil nurses were used as subjects.

Pupil nurse refers to a person who is following a programme leading to enrolment as a nurse in any nursing education institution in South Africa according to the SANC (SANC Regulation R2175 of 1993, as amended). The duration of the programme is two years (SANC 1993b).

### **2.4.1 Conditions for enrolment as a nurse**

The conditions that are applicable to this study are as follows according to SANC Regulation 2175 of 1993, paragraph 2 (1) (a-e), as amended:

The pupil nurse should have attained the course objectives stated in the above regulation and should have passed examinations referred to or should have been exempted from the examination as set out in terms of the regulation relating to examinations of SANC (Regulation 7 of 1993, as amended).

Part of the course objectives are the clinical objectives that the pupil nurse has to be found competent in. The two procedures, *administration of oral medication* and

*observation of patients' neurological functions*, form part of the clinical course objectives for the course leading to enrolment as a nurse. According to SANC Regulation 2175 of 1993, as amended, the pupil nurse should have passed the examinations; these include theoretical and practical examinations, which are conducted by the nurse educators from a learning facility or nursing school.

The focus of this study was to explore if clinical training in simulation could improve the second-year pupil nurses' competency levels in these two clinical procedures.

#### **2.4.2 The curriculum**

According to Regulation 2175 of 1993, paragraph 6 (1-2), as amended, the following course objectives and course content are applicable to the course leading to enrolment as a nurse.

The pupil nurse must be able to recognise and respect the dignity and worth of patients and must be able to understand the influence of social, cultural and physical circumstances on the health and behaviour of the patient. During assessment of the two procedures, *administration of oral medication* and *observation of patients' neurological functions*, affective skills, addressing the above-mentioned course objective, are evaluated. Affective skills include addressing patients with respect, dignity and worth. The pupil nurse must take care of the patient in totality taking into consideration the ethical, moral and legislative aspects that apply to nursing. Legislation applicable to the procedure *administration of oral medication* is the Medicines and Related Substances Control Amendment Act 90 of 1997. This Act stipulates the legal requirements that a prescription chart should have in order for the pupil nurse to hand out medication to a patient without causing any medical legal hazard. The pupil nurse must cooperate with other health team members and work within the prescribed scope of practice, by doing correct record-keeping of medication and neurological observations (SANC 1993:paragraph 6 (1)).

According to R2598 of 1984, chapter 5, as amended, the scope of practice of the enrolled nurse entails the following acts and procedures, applicable to this study, as part of the nursing regimen planned and initiated by a registered nurse and carried out under direct or indirect supervision. In paragraph (b) of chapter 5 of R2598 (SANC Regulation

R2598 of 1984, as amended), the enrolled nurse must execute a nursing care plan for a patient, including the monitoring of vital signs, which includes observation of patients' neurological functions, and observation of any reactions to medications administered (SANC 1984).

The preparation of pupil nurses should be such that it promotes both personal and professional development (Regulation 2175 of 1993, paragraph 6 (1), as amended).

Professionalism refers to the professional attributes of the nurse practitioner meaning that this person must fulfil the norms and expectations of a professional person (Muller 2010:7). The professional nurse practitioner's behaviour must be in line with the codes of conduct, rules and principles of behaviour as determined by the profession. The attributes of professionalism include accountability, knowledge, skills, values and attitudes, leadership, self-regulation, commitment to excellence, social values, honour and respect for others.

According to Muller (2010:353), professional development can be defined as the individual's or student's own personal development responsibilities that must be in accordance with regulatory requirements. Each individual must take responsibility for their own personal and professional development. In nursing there are always changes and new technologies and medications and, therefore, the nurse practitioner should try to keep up to date in order to deliver quality and safe nursing care.

The second-year (final-year) pupil nurse must improve his/her cognitive knowledge and practical skills. The professional development referred to in this chapter of the study reflects on the advancement of the pupil nurse to reach competency in the required clinical skills to master theory-practice integration.

The course content is divided into two academic years and the following subjects, as illustrated in table 2.1, are compulsory.

**Table 2.1 Content of the programme leading to enrolment as a nurse (SANC R2175 of 1993, as amended)**

FIRST YEAR SUBJECTS	SECOND YEAR SUBJECTS
<ul style="list-style-type: none"> <li>• Nursing history and ethics</li> <li>• <b>Basic nursing care</b></li> <li>• Elementary nutrition</li> <li>• First-aid</li> <li>• <b>Elementary anatomy and physiology</b></li> <li>• Introduction to comprehensive health care</li> </ul>	<ul style="list-style-type: none"> <li>• Basic science applicable to basic nursing care, including the following:               <ul style="list-style-type: none"> <li>○ <b>Anatomy and physiology</b></li> <li>○ <b>Social science</b></li> </ul> </li> <li>• General nursing care, including the following:               <ul style="list-style-type: none"> <li>○ Nutrition</li> <li>○ Ward organisation</li> <li>○ <b>Pharmacology</b></li> <li>○ Microbiology</li> </ul> </li> </ul>

The second-year (final-year) pupil nurses have pharmacology as a subject to teach them about the indications, contra-indications, side-effects and actions of medication. This subject is important for the procedure *administration of oral medication*. The knowledge acquired during studying pharmacology will prepare the pupil nurses to administer medication in a safe and effective way, without harming the patient. The procedure *observation of patients' neurological functions* requires from the pupil nurses to have knowledge about the anatomy and physiology of the neurological system. Anatomy and physiology are subjects that are taught to the students during the first and second years of study. Basic nursing care and sociology are subjects that prepare the pupil nurses to communicate with patients, health team members and the community and to take care of patients and to observe abnormalities when carrying out clinical procedures such as the selected two procedures.

### **2.4.3 Nursing procedures**

The two nursing procedures selected to be included in this study are described.

#### **2.4.3.1 Administration of oral medication**

The purpose of this nursing procedure is to administer oral medication, which includes capsules, tablets and syrups, to a patient, according to the private hospital group's procedure manual (Heigan 2006:NPR65). The pupil nurses have to complete a theoretical component on pharmacology and submit a pharmacology assignment before

they are allowed to hand out oral medication. Before the commencement of the assessment, the pupil nurse needs to explain the effect, side-effects and contra-indications of the medication that she/he is going to administer. The pupil nurse must know the drug classification and pharmacological effect of the medication.

The specific outcomes for this procedure, according to Heigan (2006:NPR65), is to assess, plan, implement and record the procedure.

The evaluation instrument assesses all three learning domains. The pupil nurse must be able to:

- Identify the patient to prevent giving medication to the wrong patient.
  - The pupil nurse must confirm the patient's identity by looking at the patient's identification band and prescription chart.
- Check the prescription chart.
  - The prescription chart must be checked for legality by taking in consideration the five golden rules of giving medication, namely:
    - identifying the patient before the procedure in order to make sure that it is the correct patient; and
    - controlling correct medication given by checking the medication label on the medication container, to control the dose of the medication and patient's name. The prescription chart is checked for legality and to control the dose, frequency and route of the medication given.
- Check the patient care plan. To ensure that the patient's condition is taken into consideration before medication is administered.
- Assess the heart rate and or blood pressure of the patient. This is to ensure the medication is not going to cause an adverse effect to the patient. Certain medications cannot be administered if the blood pressure is too low or if the patient has a bradycardia, a pulse rate below 60 rates per minute.
- Check the MIMS or package insert for extra information about the medication. The pupil nurse must note what the effect, side-effects and contra-indications of the medication are.

- Assess the patient's pain. The pupil nurse asks the patient if he or she has pain. If the answer is yes, the patient has to rate the pain on a scale of 1 to 10. One being no pain and 10 being unbearable pain. This is to ensure that the patient is comfortable and pain-free.

The following medical-legal risks must be prevented during this procedure, according to Heigan (2006:NPR65), as set out in the pharmacology subject:

- Medication administered to the incorrect patient due to failure to identify the patient.
- Incorrect medication or dosage administered due to absence of two nurse practitioners present to check the correct medication and dose.
- Anaphylactic shock due to failure to check for the presence of allergies.
- Side-effects, due to failure to evaluate the patient's reaction to the medication.
- Medication found in the wrong person's hands, due to failure to lock the medication trolley.
- Patient injury due to failure in being prepared for the effects of the medication, for example dizziness or confusion.

The pupil nurse must show knowledge about prevention of infection principles, which form part of the general nursing care subject. This is demonstrated by prior cleaning of the medicine trolley, washing of hands, using clean equipment (medicine cups) for each patient and avoiding hand contamination by handling medicine with spoons.

During assessment of the affective domain, the following actions are observed:

- The pupil nurse must be able to attend to the patient's basic needs before administering oral medication.
- The pupil nurse must be able to identify and assess the patient's psychological needs.
- The effective verbal and non-verbal communication skills of the pupil nurse are observed. These include a friendly and professional approach towards the patient.

According to Wepener (2009:7), to be declared competent in this procedure, all critical points must be met and a minimum of 80% must be obtained. The 80% requirement is not from SANC, but is a policy of the private hospital group. Critical points are actions that can cause harm to the patient and can lead to medical legal hazards, according to the private hospital group's procedures. In this procedure the critical points include the identification of the patient, observing any allergies and adhering to giving the correct medication, dose and frequency. If the pupil nurses omit these actions, medical legal hazards can occur, which can lead to injury or the death of the patient.

#### **2.4.3.2 Observation of patients' neurological functions**

Neurological functions are assessed in patients with head injuries. This examination includes assessment of motor, sensory and reflex functions (McQuillan, Makic & Whalen 2009:580). Brain injuries can exhibit neurological changes from moment to moment (Carlson 2009:525). According to McQuillan et al (2009:476), brain injury severity and degree of consciousness are most commonly assessed with the internationally recognised Glasgow Coma Scale (GCS). Possible scores on this scale range from 3 to 15. The score is calculated by adding the values determined on three subscales, namely eye opening, motor response and verbal response. The total GCS is used to classify the severity of brain injury (McQuillan et al 2009:476). According to Carlson (2009:529), a score of 3 to 8 represents severe brain injury, while a score of 13 indicates a representation of mild brain injury.

The purpose of the nursing procedure, *observation of patients' neurological functions*, according to Heigan (2006:NPR62), is to implement the steps to determine a patient's neurological function, by using the GCS.

The affective skills that are observed in this procedure are the same as for the procedure, *administration of oral medication*.

Before doing this procedure the pupil nurse must have studied the theoretical content on the neurological system including the GCS. Pupil nurses must also be competent in observing vital signs (blood pressure, pulse and temperature).

The cognitive and psychomotor skills that are assessed include the following:

- Identification of the patient to make sure the procedure is done on the correct patient. The pupil nurse also needs to look at the nursing care plan that is drawn up by the registered nurse, to make sure that the nursing care of the patient is according to the patient's condition. The indication for the neurological observations needs to be established.
- The following neurological observations need to be made by the pupil nurse:
  - *Glasgow Coma Scale*
    - *Best eye response is evaluated by looking at eye opening when speaking to the patient, or when no spontaneous eye opening appear, the student must see if the patient opens his/her eyes when applying an appropriate stimulus.*
    - *Asking appropriate questions to determine a patient's best verbal response.*
    - *Best motor response is tested by asking the patient to obey a simple command.*
  - *Motor strength*
    - *Motor strength in the arms are tested by asking the patient to make a muscle, push the nurse's hands away, extend arms in front of him/her and squeeze the nurse's fingers.*
    - *Motor strength in the legs are tested by asking the patient to wiggle his/her toes, pull the toes up and step on the petrol or push against the nurse's hands with his/her feet.*
  - *Pupil reaction*
    - *The light in the room must be dimmed.*
    - *Pupil size is assessed before shining a torch into the eye of the patient.*
    - *Pupil shape and reaction to light are assessed. To assess the reaction of the pupil a bright, narrow beam torch is used.*

The medico-legal risks for this procedure (they are also the critical points for the procedure) are doing the procedure on the wrong patient due to omission of identification, injury due to poor technique, incorrect findings due to poor technique and severe complications due to failure to identify abnormalities and/or report the abnormalities.

According to Wepener (2009:7), to be declared competent in this procedure, all critical points must be met and a minimum of 80% must be obtained.

## **2.5 CONCLUSION**

This chapter discussed the literature review on simulation as teaching strategy in nursing education, relevant learning theories and different types of simulation appropriate for teaching specific clinical procedures as pertaining to this study. Clinical teaching and training were explicated.

The SANC's Regulation relating to the programme leading to enrolment as a nurse no R2175 of 1993, as amended was discussed with reference to specific objectives relevant to the study.

In chapter 3 the research methodology will be discussed.

## CHAPTER 3

### RESEARCH DESIGN AND METHODOLOGY

#### 3.1 INTRODUCTION

This chapter describes the research design and methodology used in the study, including the research setting, population and sample. The data collection process and the data collection instruments, reliability and validity, and ethical considerations are discussed.

The purpose of this study was to determine whether training through simulation methods can improve pupil nurses' level of competency in two selected clinical procedures, namely *administration of oral medication* and *observation of patients' neurological functions*.

The following hypothesis was formulated:

Simulation training improves pupil nurses' competency levels in the clinical procedures, *administration of oral medication* and *observation of patients' neurological functions*.

Nil hypothesis 1: Simulation training will not improve pupil nurses' competency levels in the clinical procedure, *administration of oral medication*.

Nil hypothesis 2: Simulation training will not improve pupil nurses' competency levels in the clinical procedure, *observation of patients' neurological functions*.

#### 3.2 RESEARCH DESIGN

A quantitative approach was adopted for this study using a quasi-experimental non-equivalent control group before-after design.

A research design refers to the overall plan for obtaining answers to the research questions (Polit & Beck 2008:66). Burns and Grove (2005:211), describe a research design as a guide to implement research with the goal to achieve an outcome.

### **Quantitative approach**

Quantitative research is traditionally a positivist scientific method that requires orderly and disciplined procedures to acquire information. Deductive reasoning is used to test predictions in the real world. Quantitative researchers move in an orderly and systematic fashion, and progress logically through a series of steps, in order to solve the problem (Polit & Beck 2008:16).

Burns and Grove (2005:747), explain that quantitative research is a formal, objective and systematic process in which numerical data are used to obtain information about a phenomenon. It describes variables, examines relationships between variables and determines cause and effect interactions between the variables. Polit and Beck (2008:763), define quantitative research as the investigation of a phenomenon that lends itself to precise measurement and quantification. The researcher decided to use a quantitative approach because of the purpose of the study. The aim of the study was to determine whether training through simulation methods can improve second-year (final-year) pupil nurses' level of competency in two selected clinical procedures. Hypotheses were formulated and objective numerical data had to be collected using structured data collection instruments.

### **Quasi-experimental design**

A quasi-experimental design is similar to an experiment in that it involves an intervention, but is different because it lacks randomisation (Polit & Beck 2008:763). According to Stommel and Wills (2004:92), quasi-experimental designs evaluate the causal effect of intervention. The intervention in this study was simulation training. The researcher examined the causal effect that simulation training had on the competency of second-year pupil nurses with regard to the procedures, *administration of oral medication* and *observation of patients' neurological functions*.

A quasi-experimental design's strength lies in the fact that it is practical. True experiments may be impossible to conduct in the real world and nursing research usually occurs in the real-life settings. Quasi-experimental designs introduce some research control (Polit & Beck 2008:271).

The limitation of quasi-experimental designs is that the results are usually less conclusive due to several rival hypotheses competing with the experimental manipulation. The result may be an outcome of an unforeseen intervention and not due to the manipulation of the intervention (Polit & Beck 2008:271). In this study the intervention comprised that the experimental group received an additional opportunity to practise the two selected procedures under a nurse educator's guidance in a simulation laboratory. The control group did not receive an additional opportunity to practise the two procedures in a simulation laboratory. The assumption was that the experimental group would do better in the two selected clinical procedures than the control group, but if the experiment proved that the control group did better, it might be due to unforeseen clinical guidance by a mentor in the clinical setting (hospital). The researcher needs to be aware of the limitations of a quasi-experimental design and take steps to counteract those weaknesses or take them into account (Polit & Beck 2008:271).

### **Non-equivalent control group before-after design**

According to Burns and Grove (2005:247), a non-equivalent control group before-after design is when a comparison group is not selected randomly, meaning that one group is more non-equivalent than the other. Stommel and Wills (2004:96), state that with the non-equivalent control group design, the random assignment of subjects to the comparison group will not be feasible. Brink (2006:98), remarks that with the non-equivalent control group design, there is no random placement of subjects to the experimental or control group.

The second-year pupil nurses that participated in this study were allocated to seven different hospitals (clinical facilities) for logistical reasons. All seven hospitals formed part of this study and the subjects were placed in the experimental and control groups, according to the availability of simulation laboratories at the clinical facilities (hospitals) where pupil nurses were allocated for clinical practice. Therefore, random sampling was not feasible. Figure 3.1 depicts this study symbolically.

Group	Pre-test	Intervention	Post-test	Post-post-test
Experimental group	01	X	02	03
Control group	01		02	03

0=Observation (Direct)

X=Intervention

**Figure 3.1 Pre-test and post-test non-equivalent control group design**

### 3.3 RESEARCH SETTING

Brink (2006:64), refers to the research setting as a place where the research data are collected. The study was conducted at the clinical facilities (seven private hospitals) accredited by the SANC for a private hospital group's learning centre in Gauteng. Permission to conduct the study at the hospitals was obtained from the relevant stakeholders (see annexure B). These stakeholders include the training manager and the nursing managers of each of the seven hospitals of the private hospital group.

Table 3.1 illustrates the total number of pupil nurses at each of the clinical facilities (hospitals) and the availability of simulation laboratories at these hospitals. Due to attrition, a total of eight subjects dropped out during the early phases of the study, as indicated in table 3.1.

**Table 3.1 Sample of subjects and clinical facilities**

Hospital	Total subjects	Total subjects that withdrew per hospital	Simulation laboratory (Experimental group)	Withdrew: experimental group	No simulation laboratory (Control group)	Withdrew: control group
Hospital A	8	2	8	2		
Hospital B	10				10	
Hospital C	3	1			3	1
Hospital D	12	1	12	1		
Hospital E	5	3			5	3
Hospital F	9				9	
Hospital G	4	1			4	1
Total subjects	51	8	20	3	31	5
<b>Total subjects</b>	<b>43</b>					

### **3.4 POPULATION**

The population is the total group of persons who meet the criteria established by the researcher (Burns & Grove 2005:160). Brink (2006:123) refers to a population as the entire group of persons that is of interest to the researcher.

The population for this study included the second-year (final-year) pupil nurses (following the two-year programme leading to enrolment as a nurse), in the Gauteng learning centre of a private hospital group from 2011–2012.

### **3.5 SAMPLE**

Polit and Beck (2008:339), state that a sample is a portion of a population from which information is collected. The sample for this study consisted of the entire population of second-year pupil nurses of both the February 2011 and August 2011 intakes at the Gauteng learning centre. Burns and Grove (2005:354), state that a sample should at least contain 30 subjects. The researcher had to include both groups for the study (because of the small numbers of pupil nurses in each group) to enable meaningful statistical testing of results.

#### **Sample size**

The selection process was performed according to the hospitals (clinical facilities). The group where simulation training was used was allocated to the clinical facilities (hospitals) with access to simulation laboratories; these included hospitals A and D. These 17 subjects were in the experimental group. The subjects in the control group who were not subjected to the intervention (simulation training), were allocated for clinical practice at clinical facilities (hospitals) C, E, F and G, where there were no simulation laboratories. The sample size of the control group was 26 subjects. The total number of subjects was 43.

#### **Inclusion criteria**

To be included in the sample, the subjects had to meet the following criteria:

- They had to be enrolled with the SANC as pupil nurses in accordance with Regulation 2175 of 1993 (as amended).
- They had to be undergoing education and training at the Gauteng learning centre of the selected private hospital group.
- They had to be second-year pupil nurses.
- They had to be in the February 2011 or August 2011 intake groups.

### **Exclusion criteria**

- Any student that does not meet the above-mentioned criteria.

### **3.6 DESIGN VALIDITY**

Research control or rigour is the means through which research integrity and competence is demonstrated. Rigour can be enhanced by minimising biases and controlling extraneous variables (Polit & Beck 2008:265). In quantitative research, design validity must be established to strengthen the inferences, which may be made about cause-and-effect relationships.

Validity in the context of design is defined by Shadish, Cook and Campbell (2002) (in Polit & Beck 2008:286), as the approximate truth of an inference. Researchers should anticipate potential threats to the validity of the study and then introduce features to minimise or eliminate these threats. In this way the validity of the inference can be strengthened to make the evidence more persuasive (Polit & Beck 2008:286).

Four different aspects of a good research design are proposed by Shadish, Cook and Campbell (2002) (in Polit & Beck 2008:286), which include statistical conclusion validity, internal validity, construct validity and external validity.

- **Statistical conclusion validity** concerns the validity of inference that there is a definite relationship between the presumed cause and the effect (Polit & Beck 2008:286). According to Polit and Beck (2008:292), the researcher should be aware of the possibility of low statistical power. Statistical power refers to the ability to detect true relationship among variables. In this study a small sample was used and, therefore, the statistical power could be low. This could cause the

analyses to fail to show that the independent and dependent variable is related. Polit and Beck (2008:350), emphasise that if the independent and dependent variable is expected to be strongly related, a small sample should be adequate as was the case in this study. Non-parametric statistics with lower statistical power were used. The non-parametric statistics that were used in this study were the Kruskal-Wallis and Chi-square tests. According to Polit and Beck (2008:591), non-parametric tests do not estimate parameters. They involve less restrictive assumptions about the variable.

- **Internal validity** refers to the extent to which an inference can be made that the experimental treatment (independent variable) rather than uncontrolled extraneous variables caused the effect (Polit & Beck 2008:756). This threat would be applicable if, for example, clinical guidance was given to a greater extent to the subjects in the control group during clinical practice in the hospitals. In this study it was mentioned that the problem observed by the researcher included all seven hospitals and, therefore, differences in clinical guidance was not seen as a threat to the study.
- **Selection bias** can cause a threat to the internal validity of a study (Polit & Beck, 2008:295). The subjects in the experimental and control groups were selected according to clinical facilities and according to availability of a simulation laboratory at the clinical facilities. Non-equivalent groups pose to be problematic to a study due to the possibility that the outcome may result from differences of a group rather than the effect of the independent variable. Baseline data on the subjects such as age, gender, race and highest qualification were gathered before the commencement of the study. According to the statistical analysis there were no significant differences between the experimental and control groups.
- **Construct validity** involves possible errors in the construct of the study, which may lead to the risk that the evidence will be misleading (Polit & Beck 2008:299).
  - According to Brink (2006:101), reactive effects occur when the subjects react in a certain way because they know that they are being observed. This is the reason why the researcher decided not to let the students give informed consent. The students were informed about the study in writing, but not about the details around the data collection and procedures (see annexure C).

- The researcher's expectations can also threaten the construct validity of a study (Polit & Beck 2008:300). These threats occur when the researcher's characteristics or behaviour influences subjects (Brink 2006:101). This could happen if the researcher communicates the desired outcomes to the subjects or if the researcher's expectations become part of the manipulation of the independent variable. In this study the researcher was not part of the clinical mentoring of the experimental and control groups. The researcher thus could not manipulate the independent variable.
- Novelty effect is when subjects and research agents might alter their behaviour in various ways due to the fact that they might be either enthusiastic or sceptical about the new methods of doing things (Polit & Beck 2008:301). In this study the methods used to gather data were direct observation and check lists (evaluation instruments). The evaluation instruments (check lists) were the standardised check lists usually used by the nurse educators for assessment of pupil nurses who do their clinical practica in the clinical facilities (hospitals) of the selected private hospital group. No new data collection instruments were designed for the study.
- Polit and Beck (2008:301), explain that the compensatory effect is a compensatory rivalry from the control group members' desire to demonstrate that they can do as well as those who are exposed to the independent variable. "A feeling of deprivation may occur in the control group when subjects realise that they are receiving less desirable interventions. They may withdraw, give up or become angry" (Brink 2006:101). The subjects were not informed about the specifics of the study. The control group would be exposed to the same variable than the experimental group before their summative examination, to ensure that equal opportunities were given to both groups.
- **External validity** is the degree to which a study's results can be generalised to other settings or populations (Polit & Beck 2008:753).
  - There is no external validity due to the absence of random sampling. The findings of this study cannot be generalised to other private hospital groups or be applicable to other second-year pupil nurses.

### 3.7 DATA COLLECTION INSTRUMENTS

The method of data collection was observation using check lists. The check lists comprised the standard evaluation instruments (check lists) used during pupil nurses' formative and summative clinical assessments (see annexure E). The researcher did not design new check lists. The check lists used were developed by subject specialists employed by the private hospital group for the specific reason of doing research about clinical procedures, development of check lists for specific procedures according to outcomes and according to specific assessment criteria.

Structured observation involves the collection of data using formal check lists and protocols that dictate what to observe and how to record the required information. Check lists specify in advance the behaviours or events to be observed and are designed to produce numeric information (Polit & Beck 2008:433).

The check lists (data collection instruments) for the two procedures, *administration of oral medication* and *observation of neurological functions*, each contains different tasks that are evaluated but have the following in common, namely both were designed according to the scientific nursing process. Outcome 1 is the assessment phase. During this phase the pupil nurses' ability to assess the need to perform this procedure and the identification of the patient is done. Outcome 2 is the planning phase where the student has to plan how to perform the procedure. Outcome 3 is the implementation phase. During this phase cognitive and psychomotor skills are evaluated. Outcome 4 is the evaluation and record-keeping phase. During this phase the student needs to evaluate if the procedure was done successfully and if the patient's needs were fulfilled. During all these phases affective skills were observed. Specific tasks were allocated to each of the four outcomes for the nursing process. The pupil nurse had to complete the specific task in order to gain 1 mark next to the specific task. If the task was not done, 0 was allocated next to the task. Critical points were allocated to specific tasks under each outcome. The critical points were marked with an asterisk (\*). If the pupil nurse missed the specific task, 25% were deducted from the final score. The student could be found not competent if he or she missed a critical point. The student had to obtain 80% to be found competent. Critical points are allocated to actions that must be performed in order to prevent a medical legal hazard.

## **3.8 VALIDITY AND RELIABILITY OF INSTRUMENT**

### **3.8.1 Instrument validity**

Validity is the ability of an instrument to measure the variable that it is intended to measure (Burns & Grove 2005:755). According to Brink (2006:100), the utilising or exposure to a test measurement technique can bias a subject's result.

#### **3.8.1.1 Content validity**

Content validity requires that an instrument include all the relevant major elements that are relevant to the construct being measured. It can be attained through a literature review and an expert on the construct's input into the development of a measuring instrument (Burns & Grove 2001:400). The two evaluation instruments (check lists) used in this study measure the competence of subjects according to the basic nursing procedures *administration of oral medication* and *observation of patients' neurological functions*. The instruments used in this study were developed by subject experts, and tested and reviewed by the examination committee of the private hospital group. These instruments are used in the summative and formative assessment of all students of the private hospital group's learning centres. The check lists are based on the assessment criteria for the specific relevant learning outcomes with regard to each procedure.

### **3.8.2 Reliability of instrument**

Reliability refers to the degree of consistency with which an instrument measures an attribute. If an instrument is administered to the same individuals again at different times, the individuals' responses will remain the same if the instrument is reliable (Burns & Grove 2001:395-6; Polit & Beck 2008:764). Subject experts in the private hospital group developed the evaluation instruments in line with the specific outcomes and assessment criteria for the two nursing procedures selected for this study. These evaluation instruments (check lists) proved to be consistent and dependable in measuring the intended outcomes every time when used in the past.

Four data collectors (nurse educators) did the direct observations of the subjects (pupil nurses) using standardised evaluation instruments (check lists) during this study. All

the learning centres in this private hospital group have been using these evaluation instruments for a few years.

If the nurse educators were biased, then this study could fail. In this study, the data collectors (nurse educators) used the same standardised evaluation instruments (check lists) and all received training by the researcher to conduct the assessments in the same manner. This addressed the inter-rater reliability, which can be defined as the degree to which two or more observers, operating independently, assign the same ratings or values for an attribute being observed (Polit & Beck 2008:756). The nurse educators involved in this study are a team who work together and assist each other during assessments of pupil nurses in the hospitals of the selected private hospital group. There are always two assessors (nurse educators) completing the check list for any one student during the practical examination (summative evaluation) of a specific procedure. The mark that is agreed upon by the two nurse educators is taken as the final mark. The nurse educators who assess the pupil nurses are moderated annually by the head nurse educator of the Gauteng learning centre of the selected private hospital group where the study was conducted.

### **3.9 DATA COLLECTION PROCESS**

Data collection is a systematic way of gathering information relevant to the research purpose or question (Burns & Grove 2005:60). Data were collected by doing direct observation using a check list. The subjects were given a letter informing them about the research. Informed consent was not obtained due to the nature of the study.

#### **Phase 1: Baseline data**

Baseline data from the subjects that were collected were race, gender, age and highest qualification. The baseline data were collected before the pre-test was conducted.

#### **Phase 2: Initial demonstration of clinical procedures.**

Two weeks before the commencement of the second year, at the Gauteng learning centre, the experimental and control groups received demonstrations in a simulation laboratory on the two selected procedures as well as the other procedures that they had

to be competent in. They had time to practise all the procedures under supervision of the nurse educators who demonstrated the particular procedures. It was observed during previous years that pupil nurses did not use the opportunity to practise these procedures.

### **Phase 3: Pre-test**

The pupil nurses (subjects) worked in the clinical facilities for a month. During this month the subjects in the experimental and control groups obtained clinical experience in the wards. There was no extra exposure to the two procedures from the nurse educators. Any exposure or guidance received by the subjects in both the experimental and control groups from the mentors or ward personnel was by chance.

Both groups, the experimental and control group, returned to the Gauteng learning centre for a four-week theoretical block. After this theoretical block, both groups returned to the clinical facilities (hospitals) during which time the pre-test was done.

The pre-test was conducted in the wards and the subjects had to perform the two procedures on patients after having obtained the patients' permission. The evaluation instruments that were used were the standard evaluation instruments (check lists) used during formative and summative clinical assessments of all second-year pupil nurses. During this phase one nurse educator assessed the subjects allocated to her. There were four nurse educators (data collectors) in total.

### **Phase 4: Intervention**

The intervention took place after the pre-test was conducted while the subjects were still doing clinical practica in the hospitals. The intervention with the experimental group comprised that they were given a special opportunity to spend six hours in a simulation laboratory where they had to practise the two selected clinical procedures under supervision and guidance of a nurse educator. The procedure *administration of oral medication* was practised in simulation on a mannequin. The procedure *observation of neurological functions* was done by role-play. A co-student acted as a patient during the role-play simulation. The control group was only exposed to these two procedures if the mentors or ward personnel gave them the opportunity to practise these procedures

in the hospital wards. Other than the intervention with the experimental group, subjects in the experimental group also had the same chance as the control group to be exposed to and practise the two procedures in the hospital wards. The problem identified in this study was that the second-year pupil nurses were not exposed to the two procedures in the wards.

The control group had no access to a simulation laboratory after the initial demonstrations of the two procedures at the learning centre. The students were only exposed to the clinical environment.

### **Phase 5: Post-test**

A post-test was done, on both the experimental and control groups, at the clinical facilities three months after the pre-test. The post-test was conducted in the wards and the pupil nurses (subjects) had to obtain permission from patients to do the two procedures for assessment purposes. The evaluation instruments were the same check lists used during the pre-test. The same data collector (nurse educator) observed and conducted the pre-test and post-test for a specific subject (pupil nurse) to ensure reliability.

### **Phase 6: Post-post-test**

A post-post-test was done, on both the experimental and control groups, at the clinical facilities nine months after the pre-test. The post-post-test was conducted in the wards where the subjects had to perform the procedures on patients. The same evaluation instruments (check lists) were used as for the pre-test and post-test. Two nurse educators were involved in these observations and assessments, one being a moderator. The assessor was the nurse educator that assessed the pre-test and post-test.

Table 3.2 provides a summary of the data collection process.

**Table 3.2 Data collection phases**

Comparison of "Intact," pre-existing groups	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
			Observations of outcomes before intervention	Manipulation of independent variable: simulation training	Observation of outcome after intervention	Observation of outcome after intervention
Experimental group (n=17)	Baseline data gathering	Demonstration of clinical procedures	Pre-test measure by direct observation using a check list	New intervention	Post-test measure by direct observation using a check list	Post-post-test measure by direct observation using a check list
Control group (n=26)	Baseline data-gathering	Demonstration of clinical procedures	Pre-test measure by direct observation using a check list	Absence of intervention	Post-test measure by direct observation using a check list	Post-post-test measure by direct observation using a check list

### 3.10 DATA ANALYSIS

Data analysis can be explained as the measurement of relationships. This is concerned with the correlation between two or more variables. Quantitative information is analysed through statistical procedures (Polit & Beck 2008:68).

After the data had been collected, it was quantified and this numerical data was statistically analysed. Data analysis was done with the help of a statistician. The SAS JMP 9.0 computer program was used to analyse the data. Both descriptive and inferential statistics were used in data analysis. Descriptive statistics allow the researcher to organise the data in ways that give meaning and facilitate insight (Burns & Grove 2005:734). Descriptive statistics used were the mean scores. Inferential statistics were used to test hypotheses and differences in subsets of the sample used in the study (Burns & Grove 2005:739).

An inferential statistical test used in this study was the t-test that is often used when small samples are available for analysis (Burns & Grove 2005:527). The t-test is also used to test the differences between two group means (Polit & Beck 2008:593). Differences between the mean scores of the experimental and control group must be tested for statistical significance, therefore the multivariate analysis of variance was used. The analysis of variance (ANOVA) was done. One-Way ANOVA tested the

hypotheses. ANOVA test for the difference in means between two or more groups. Multivariate analysis of variance (MANOVA) is the extension of ANOVA to more than one dependent variable (Polit & Beck 2008:627). The MANOVA tests for the difference in two or more vectors of means. The MANOVA test was used to assess the effect of the independent variable on all three of the dependent variables (pre-, post- and post-post-test). The Shapiro-Wilk W test was done, which is a goodness of fit test. This test was done due to a lack of normality.

Tables and diagrams were used to display the results of the analysis. The diagrams used were pie diagrams, line diagrams and stock diagrams.

### **3.11 ETHICAL CONSIDERATIONS**

Ethics relates to customs, conventions, character or moral beliefs. It is a branch of philosophy that has different meanings to different people. Pera and Van Tonder (2011:5), define ethics as the study of ideal human behaviour and ideal ways of being. Ethics is an individual's decision about what is seen as being wrong and what is perceived to be right. In research it refers to the researcher's obligation to do no harm to the subjects. Due to the fact that right and wrong for one individual is not necessary the right and wrong of another person, the ethics in research needs to be investigated by an ethical committee. Human rights must be protected when humans are used as study subjects and, therefore, all research that includes human subjects needs approval from a research ethics committee (Gelling 2010:1; Polit & Beck 2008:167). Ethical clearance to conduct the study was requested and granted by the Department of Health Studies Higher Degrees Committee at the University of South Africa (Unisa). Permission to conduct the study was granted by the following persons:

- The training manager of the private hospital group.
- Nursing managers of the various hospitals in the Northern region of Gauteng.

Various ethical codes have been developed in response to human rights violations, which underwrite specific ethical principles to be adhered to when conducting research when humans are involved (Polit & Beck 2008:168).

## **Beneficence**

- *The right to freedom from harm and discomfort.* Polit and Beck (2008:170), contend that the researcher has an obligation to prevent or minimise harm to subjects. This includes all types of harm and discomfort, for example, physical, emotional, social and financial harm. No physical risks were involved in this study. The subjects did not experience more emotional stress than normal during an assessment. The procedures they were doing are part of their course and the assessments done during the study had to be done even in the absence of this study.
- *The right to protection from exploitation.* Polit and Beck (2008:170), emphasise that the subjects must not be disadvantaged during the study. The control group was granted the same opportunity (as the experimental group had) to spend time in a simulation laboratory to practise the two selected procedures under the supervision and guidance of a nurse educator after the data for the study had been collected. Therefore, the control group was not disadvantaged in any way. The researcher's aim with this research was to establish whether simulation training could improve teaching and student learning to benefit all future students.

## ***Respect for human dignity***

- *The right to self-determination.* According to Polit and Beck (2008:171), the subjects must have the right to decide whether they want to participate or not. This could not be adhered to in this study due to the study design and purpose of the study. Adhering to this might have influenced the study to such an extent that validity could be compromised. The assessment of the procedures *administration of oral medication* and *observation of patients' neurological functions* is compulsory for the completion of the course leading to enrolment as a nurse and, therefore, all subjects were assessed on these procedures.
- *The right to confidentiality.* This right refers to the protection of subjects so that data provided are never publicly divulged (Polit & Beck 2008:750). The subjects

were assured that the data would be kept locked by the researcher and statistician and destroyed after the study.

- *The right to anonymity.* Anonymity is the protection of subjects' confidentiality (Polit & Beck 2008:747). Subjects could not be linked to data gathered. Numbers were used on the evaluation instruments (check lists). The researcher had a list of names of the subjects with assigned numbers to each subject in order to match the pre-, post- and post-post-tests' results, but the evaluators and the statistician only worked with the numbers.
- *The right to full disclosure:* Polit and Beck (2008:172), explain that full disclosure means that the subjects know what the study is about and that the subjects then have the right to refuse participation. Full disclosure can create inaccurate data if the subjects know about the study and, therefore, the researcher can use other techniques, for example, covert data collection or concealment. Covert data collection or concealment is the collection of information without subjects' knowledge about the research and thus not consenting to it (Polit & Beck 2008:172). The subjects in this study must be assessed on the procedures *administration of oral medication and observation of patients' neurological functions* for the purpose of completing the course for enrolled nurses successfully. The subjects (second-year pupil nurses) were informed about the study, but signed informed consent was not obtained due to the study design and purpose of the study. Students were informed that the study would involve no physical risks to them as pupil nurses. As a group, they would be involved in the research study and by the end of the study all of them would have been exposed to the various teaching strategies the researcher planned to use to ensure that none of them would be disadvantaged in any way. There would not be any monetary benefits from participating in this study. The issue of confidentiality and anonymity was also clarified to the subjects (second-year pupil nurses), (see annexure C). Polit and Beck (2008:172) state that deception is the deliberate withholding of information about the study or providing false information. No false information was given to the subjects. The subjects were not being deceived. Assessment took place as it would have even if there was no study. This study did not focus on sensitive behaviour and the right to privacy was not violated. This study may benefit future pupil nurses. Nursing education could

become more effective by using simulation-learning opportunities in addition to clinical learning opportunities (Polit & Beck 2008:175).

## **Justice**

According to the Belmont Report in Polit and Beck (2008:173), justice is defined as the right of subjects to be treated fairly and also their right to privacy.

- *The right to fair treatment:* According to Polit and Beck (2008:173), the selection of subjects must be according to the requirements of the study. In this study subjects were selected according to availability of subjects and the requirements of the study design. Because the two procedures are compulsory for the students to complete their course, this is not a form of forcing the students to participate. This study is to observe and improve on providing a solution to help the second-year pupil nurses to get the best possible education. The control group and experimental group were selected according to the availability of simulation laboratories in the clinical facilities where the pupil nurses (subjects) were allocated. Previous assessments indicated that clinical accompaniment alone did not assist the students to get competent in performing the two procedures, *administration of oral medication* and *observation of patients' neurological functions*. The different hospitals (clinical facilities) included in this study experienced the same problems, which is lack of trained mentors and of clinical learning opportunities for student nurses.
- *Distributive justice*, according to Polit and Beck (2008:173), imposes duties to neither neglect nor discrimination against individuals and groups. An ethical consideration during this study that was a concern to the researcher is that the control group would have less exposure to reach competency than the experimental group. That is why the assessment that took place was a formative assessment and not a summative assessment to make sure that the control group would be exposed to the same simulation training as the experimental group after completion of the study and before the final practical examination.
- *The right to privacy:* Polit and Beck (2008:174), contends that the research study must not be more intrusive than it needs to be to ensure the privacy of the

subjects. Data collected in this study were kept in strictest confidence. Anonymity was assured since linking the evaluation instrument to the subjects was not possible. Numbers were used for statistical reasons and not for identifying the subjects. The data were kept under lock and key in a safe place.

### ***Scientific integrity of the research***

Scientific honesty is a concept that is of importance to the researcher and the institution the researcher is related to. The researcher did not commit plagiarism; all sources consulted were indicated in the references and the bibliography. All the data collected were reported on without any falsification.

### **3.12 CONCLUSION**

This chapter described the research design and methodology, population and sample, the data collection instrument and process, reliability and validity, the method of data analysis, and ethical considerations. Chapter 4 presents the data analysis and interpretation of the findings.

## CHAPTER 4

### DATA ANALYSIS AND INTERPRETATION

#### 4.1 INTRODUCTION

This chapter presents the analysis and interpretation of the data. The purpose of this study was to determine whether training through simulation methods can improve the level of competency of pupil nurses in two selected clinical procedures, namely *administration of oral medication* and *observation of patients' neurological functions*. A quasi-experimental research design was used.

The following hypothesis was formulated in this study:

Simulation training improves pupil nurses' competency levels in the clinical procedures, *administration of oral medication* and *observation of patients' neurological functions*.

Nil hypothesis 1: Simulation training will not improve pupil nurses' levels of competency in the clinical procedure *administration of oral medication*.

Nil hypothesis 2: Simulation training will not improve pupil nurses' levels of competency in the clinical procedure *observation of patients' neurological functions*.

Data were collected by direct observation. The data collection process included the establishment of baseline data, and a pre-test, post-test and post-post-test were conducted during this study. The data collection instruments that were used were the standard evaluation instruments (checklists) used by the selected private hospital group learning centre for formative and summative evaluation of the second-year pupil nurses' clinical skills in the selected two procedures.

Data analysis was done with the assistance of a statistician. The statistical tests mentioned below were used during the analysis of data:

**Descriptive statistics** were used to describe and summarise data. Averages and percentages were used as part of the descriptive statistics (Polit & Beck 2008:556).

- Frequency distributions were used to organise numeric data. Frequency distribution is a systematic arrangement of values from lowest to highest, together with a count of number of times each value was obtained (Polit & Beck 2008:560).
- Histograms, tables and frequency polygons display the interval data in this study.
- Central tendency was measured by analysing the mean scores. Mean scores are the sum of all scores, divided by the number of scores (Polit & Beck 2008:563). The mean is the most widely used measure of central tendency.

**Inferential statistics** were used to observe whether results in a sample are likely to occur in the larger population and to establish parameters and hypothesis testing in this study (Polit & Beck 2008:585). It is based on the law of probability. The level of significance signifies the probability of incorrectly rejecting a true null hypothesis. The two most frequently used significance levels are 0.05 and 0.01. In this study 0.05 level was used, indicating that we accept the risk that out of 100 samples drawn from a population, a true null hypothesis would be rejected 5 times (Polit & Beck 2008:588). In this study any computed probability greater than 0.05 indicates a non-significant relationship. Significant statistics indicate that the mean results are not likely to have been the result of chance at a specified level of probability. A non-significant result means that an observed difference or relationship could have resulted from chance fluctuations (Polit & Beck 2008:590).

A *t-test*, a parametric statistical test for analysing the difference between two means (Polit & Beck 2008:768), was used in this study because of the two independent groups (experimental and control group).

The one-way *ANOVA* was conducted to examine whether there were statistically significant differences among the scores of the experimental and control groups. Analysis of variance (ANOVA) is a statistical technique for helping to infer whether there are real differences between the means of three or more groups or variables in a population (Polit & Beck 2008:596).

If the construct score is not normally distributed, then a non-parametric test is used. In this study the *Kruskall-Wallis test* was used due to lack of normality. The Kruskal-Wallis test is a non-parametric test used to compare three or more independent groups of sampled data (Polit & Beck 2008:600).

The *Chi-square test*, a non-parametric statistical test, was used in this study for comparing observed frequencies and expected frequencies (Polit & Beck 2008:600).

**MANOVA (Multivariate Analysis of Variance)** is the extension of ANOVA to more than one dependent variable. It is used to test for the differences in two or more vectors of means (Polit & Beck 2008:627). The MANOVA analysis is used in the SAS JMP computer program to analyse the data in this study. This is used to perform a single test that assessed the effect of the independent variable on all three of the dependent variables (pre, post and post-post-tests) simultaneously. Performing a MANOVA allows the researcher to test nil hypotheses.

## 4.2 THE POPULATION

The population of this study consisted of second-year (final year) pupil nurses of a selected private hospital group. These pupil nurses were studying a two-year programme leading to enrolment as a nurse.

The whole population of second-year pupil nurses registered for 2011, consisting of fifty-one pupil nurses, was targeted for the study, but due to attrition, a total of 8 subjects dropped out during the early phases of the study as indicated in table 4.2. The total sample size was therefore 43 subjects, with 17 subjects in the experimental and 26 subjects in the control group respectively.

**Table 4.1 Number of subjects**

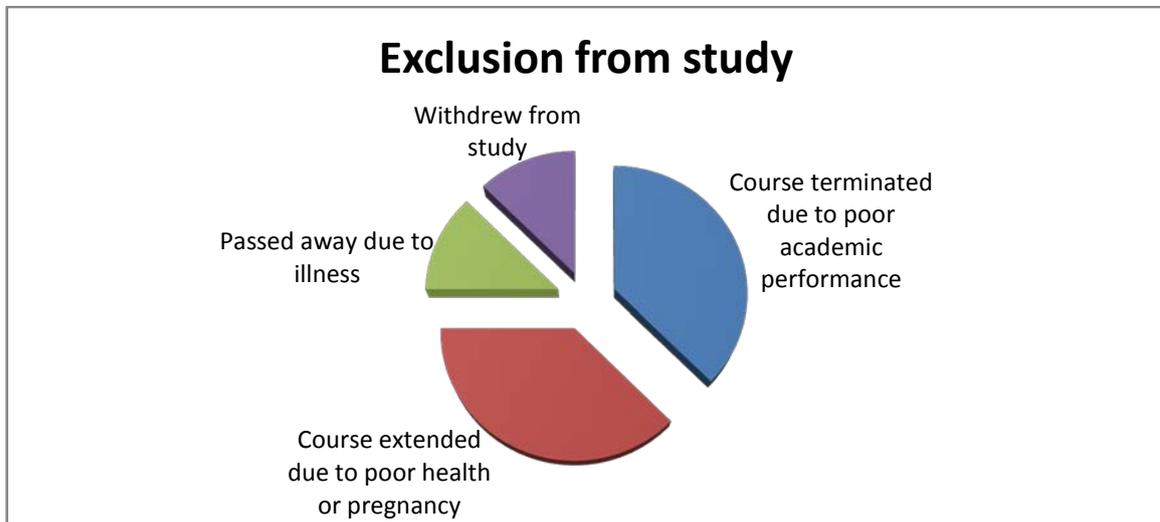
February 2011 second-year intake	17	- 2
August 2011 second-year intake	34	- 6
<b>Total subjects</b>	<b>51</b>	<b>- 8</b>

Table 4.1 is a breakdown of the population that was used during this study. Two intake groups were included in this study due to the small number of pupil nurses. The

February 2011 second-year intake consisted out of 17 pupil nurses and as indicated in red, 2 left the study before the pre-test phase. The August 2011 second-year intake consisted out of 34 pupil nurses and 6 left the study, as indicated in red. Table 4.2 provides an indication of the reasons for exclusion.

**Table 4.2** Number of subjects that were excluded from the study

Course terminated due to poor academic performance	3
Course extended due to poor health or pregnancy	3
Subject passed away due to illness	1
Subject withdrew from study	1
Total subjects	8



**Figure 4.1** Subjects excluded from the study

### 4.3 DATA ANALYSIS

The data are discussed according to the hypotheses. The baseline data obtained from the subjects are presented first, followed by a discussion of the pre-test, post-test and post-post test results for each of the two nil hypotheses respectively.

#### 4.3.1 Baseline data

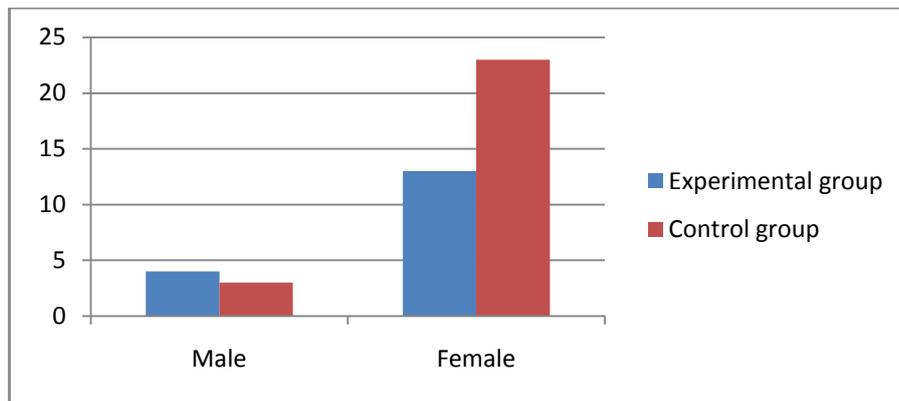
Baseline data from the subjects were obtained from their training records and included race, gender, age and highest qualification. The baseline data were determined before the pre-test was conducted. Table 4.3 indicates the baseline data of the subjects.

There were more female subjects than male subjects in this study. The subjects in this study were predominantly black pupil nurses. Subjects between the ages 19 and 29 were in the majority. This indicates that pupil nurses that took part in this study started with their studies after leaving school and only some of them (those who did the auxiliary nursing certificate) had a few years' experience in nursing. The effect of age on the study was tested and the results are described. Nineteen subjects had a higher qualification than matric and 24 subjects only had matric. This indicates that the 24 subjects with matric did not have a nursing qualification or previous experience in nursing other than the first year of the programme for enrolled nurses, before commencing the second year of study. Nineteen subjects obtained a nurse auxiliary qualification and are taken into the enrolled programme at second-year level. They received exemption from the first year of the programme for enrolled nurses.

**Table 4.3 Baseline data of subjects (N=43)**

		<b>Experimental group</b>	<b>Control group</b>
Gender	Male	4	3
	Female	13	23
Race	Black	11	23
	Coloured	1	0
	White	5	3
Age	19-29	12	16
	30-40	4	6
	41-50	1	4
Highest qualification	Matric	12	12
	Auxiliary nurse	5	14
	Certificate		

Figure 4.2 gives a breakdown of the gender of the subjects as represented in each group. There were more female subjects than male subjects, and the experimental group had one more male subject than the control group. The nursing profession is dominated by females, so this is not an unfamiliar phenomenon.



**Figure 4.2 Gender of subjects**

Table 4.4 indicates the effect of gender on the pre- and post-test scores of the procedures *administration of oral medication* and *observation of patients' neurological functions*. This illustrates that both male and female subjects did better in the pre-test for both procedures, but the male subjects' percentages declined more in the procedure *observation of patients' neurological functions*.

**Table 4.4 Gender of subjects: Pre- and post-tests**

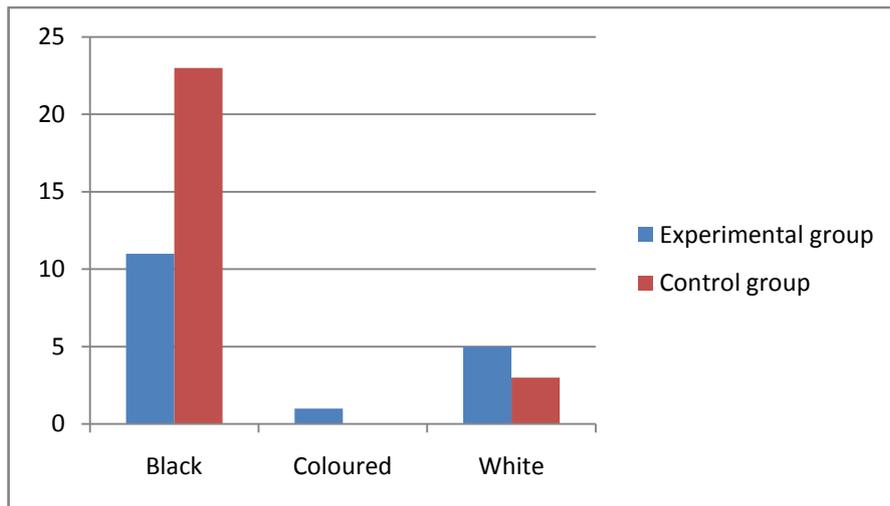
Gender	Pre-oral medication	Post-oral medication	Pre-neurological observation	Post-neurological observation
Female	90.4968353	88.2138498	77.0179584	69.3416533
Male	82.9783779	81.0558583	90.162274	62.5857047

Table 4.3 indicates that there were more female subjects than male subjects and thus this is not a reliable indication that there is a difference between the genders. As indicated in table 4.5, the Prob>F is in both instances higher than 0.05 and, therefore, not a significant difference between the mean scores of the two genders.

**Table 4.5 Statistical value of gender on procedures**

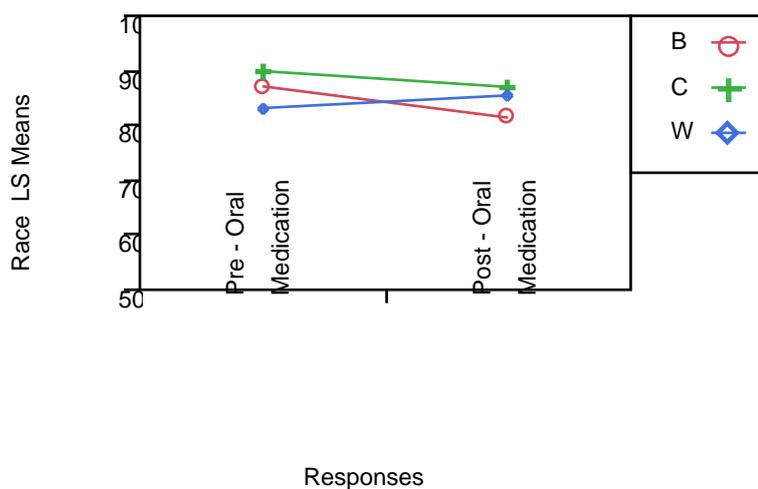
Procedure	Test	Value	Exact F	NumDF	DenDF	Prob>F
Oral medication	F Test	0.0775	2.8694	1	37	0.0987
Neurological observation	F Test	0.0009752	0.0273	1	28	0.8699

Figure 4.3 gives a breakdown of the different race groups within the study who participated in this study. Figure 4.3 indicates that the majority of the subjects were black. There were more black subjects than white subjects in both the control and experimental groups. There were more black subjects in the control group than in the experimental group. There were more black subjects in the control group than in the experimental group. There was only one coloured subject in the experimental group and none in the control group. There were more white subjects in the experimental group than in the control group.



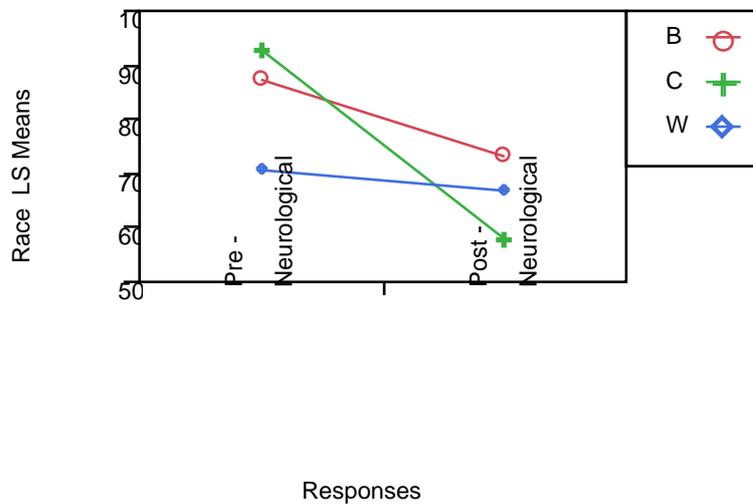
**Figure 4.3 Race of subjects**

Figure 4.4 indicates that white subjects scored better in the post-test whereas the scores of black and coloured subjects decreased in the post-test.



**Figure 4.4 Race: Oral medication**

Figure 4.5 indicates that all the subjects scored lower percentages in the post-test on the procedure *observation of patients' neurological functions*, but the coloured subjects' marks declined more than the black and white subjects' marks.



**Figure 4.5 Race: Neurological observations**

Table 4.6 indicates that all the subjects' marks declined with the post-test in both procedures, except for the white subject who scored higher marks in the post-test oral medication.

**Table 4.6 Race of subjects: Pre- and post-tests**

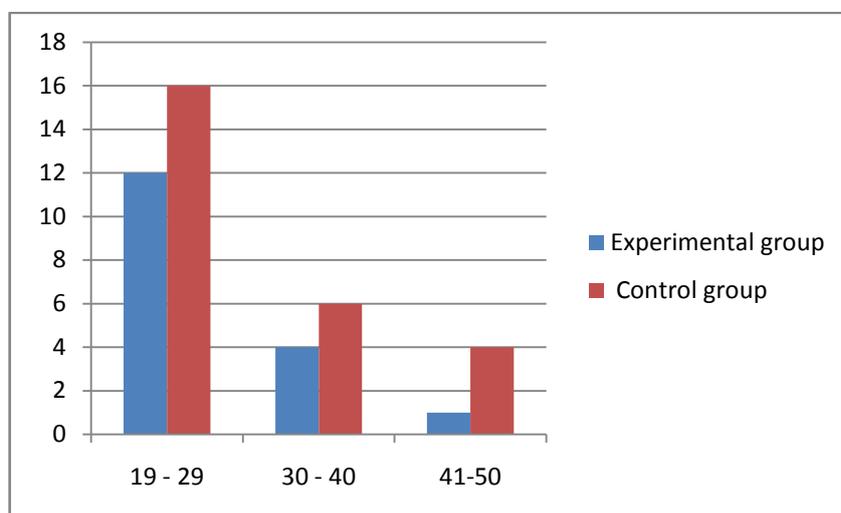
Race	Pre-oral medication	Post-oral medication	Pre-neurological observation	Post-neurological observation
Black	87.130063	81.4127079	87.3006547	73.1402471
Coloured	89.9210983	87.0094573	92.8358861	57.930281
White	83.1616585	85.4823969	70.6338078	66.8205089

Table 4.7 indicates that there were no significant differences between the mean scores of the different races, in this study. The Prob>F is higher than 0.05.

**Table 4.7 Statistical value of race on the procedures**

Procedure	Test	Value	Exact F	NumDF	DenDF	Prob>F
Oral medication	F Test	0.0046468	0.0860	2	37	0.9178
Neurological observation	F Test	0.0365636	0.5119	2	28	0.6049

Figure 4.6 shows the age groups within the study. Figure 4.6 indicates that the majority of subjects that participated in this study were between the ages 19 and 29. The reason for this is that the subjects that participated in this study started their nursing training directly after finishing matric and that they continued with their second year of study after completing the first year without interrupting their studies. The minority of subjects were between the ages 41 and 50. There were more subjects between the ages 19 and 29 in the control group than in the experimental group. This pattern was repeated in the 30 to 40, and 41 to 50 age ranges. This was due to the number of subjects allocated to each group. There were 17 subjects in the experimental group and 26 subjects in the control group.



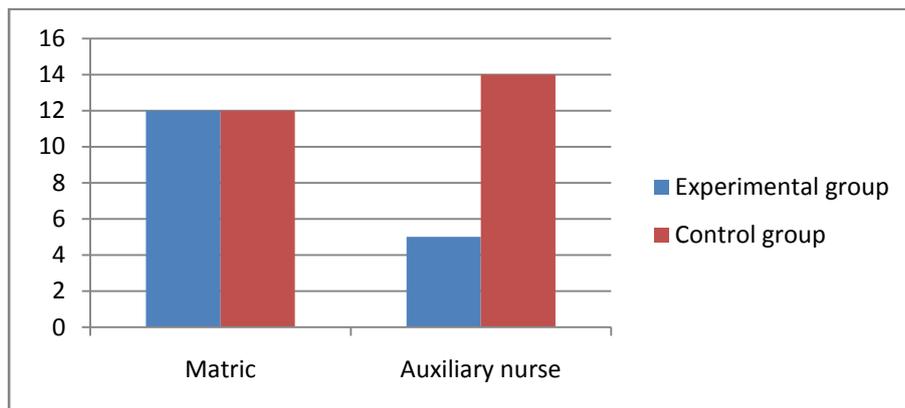
**Figure 4.6** Age of subjects

Table 4.8 indicates the statistical value of age on the procedures. The Prob>F is higher than 0,05, which indicates that there is no significant difference between the mean scores of the different ages of the subjects and that age, therefore, did not have an influence on the outcome of the study.

**Table 4.8** Statistical value of age on the procedures

Procedure	Test	Value	Exact F	NumDF	DenDF	Prob>F
Oral medication	F Test	0.01367	0.5058	1	37	0.4814
Neurological observation	F Test	0.0088587	0.2480	1	28	0.6223

Figure 4.7 outlines the highest qualification that the subjects involved in this study obtained. There were the same number of subjects with a Matric certificate in the experimental and control groups. There were more subjects with an auxiliary nursing qualification in the control group than the experimental group. The subjects who obtained an auxiliary nursing qualification and gained practical experience during the years they worked as nurses before commencing the second year could influence the outcome of the study. As seen in previous examination results of second-year (final-year) pupil nurses, it was concluded that the experience obtained by the auxiliary nurses before commencing the second year of study was not ensuring them to obtain competence in the two selected procedures: *administration of oral medication* and *observation of patients' neurological functions*. This conclusion was made due to the marks obtained by the second-year pupil nurses in previous years' final practical examinations. The auxiliary nurse is not allowed to perform the above-mentioned procedures according to the Scope of Practice of the Auxiliary Nurse (SANC Regulation R2598 of 1984, as amended). Any exposure to these procedures would have been by chance.



**Figure 4.7 Highest qualifications of subjects**

#### **4.3.2 Initial demonstration of clinical procedures**

Two weeks before the commencement of the second year, the experimental and control groups received demonstrations on eleven procedures including the two procedures, *administration of oral medication* and *observation of patients' neurological functions*, in a simulation laboratory at the Gauteng learning centre. During this period, the pupil nurses received one demonstration of each procedure that they had to be competent in and they had time to practise these procedures under supervision of the nurse educators demonstrating the particular procedures. The time allocated for the students

to practise these procedures was from 13:00 to 15:00 daily during the two-week period. The pupil nurses worked in groups and demonstrated the procedures to the group. This was not compulsory and, therefore, seldom happened. The researcher gained this information from personal experience and from discussions with other nurse educators on duty in the simulation laboratory. During this study it was observed that the pupil nurses rather use the time in the afternoons to summarise what they have learned and to work out the cognitive questions applicable to each procedure. This theoretical component of the procedures forms part of the theoretical block that will follow during the second year of study.

#### **4.3.3 Data analysis: Administration of oral medication**

##### **Nil hypotheses 1: Simulation training will not improve pupil nurses' levels of competency in the clinical procedure: *administration of oral medication***

The results for the pre-test, post-test and post-post-test are presented and the intervention for the experimental group is described. In accordance to a suggestion made by the statistician the researcher agreed that a post-post-test could be conducted as no meaningful differences were detected between the experimental and control group after the post-test.

##### **4.3.3.1 Pre-test: Administration of oral medication**

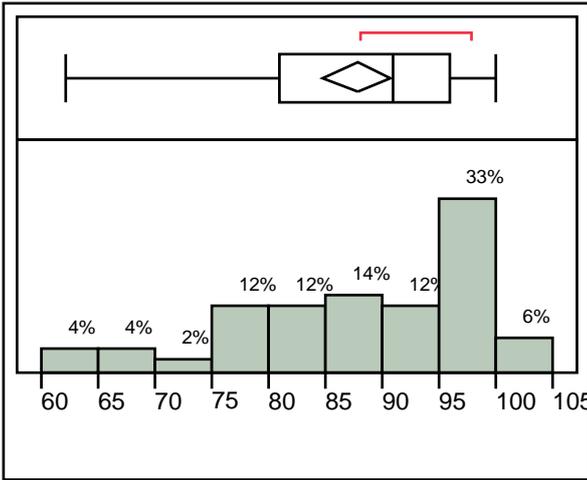
The pupil nurses worked in the clinical facilities for a month. During this month the subjects in the experimental and control groups obtained clinical experience in the wards. There was no extra exposure to the two procedures from the nurse educators from the learning centre. The nurse educators from the learning centre are also responsible for clinical guidance to the students at the clinical facilities. Any exposure or guidance received by both the experimental and control groups from the mentors or ward personnel would have been by chance.

Both groups, the experimental and control group, returned to the Gauteng learning centre for a four-week theoretical block. Theoretical information regarding the two specific procedures was given during this theoretical block. After this theoretical block,

both groups returned to the clinical facilities (hospitals) during which time the pre-test was done.

The pre-test was conducted in the wards where the pupil nurses had to do the procedures on patients. Four nurse educators including the researcher conducted the pre-test on the subjects by doing direct observation using the standard evaluation instruments (check lists) for assessing pupil nurses' competence in *administration of oral medication*. The researcher did the assessment on ten subjects from the control group. One of the nurse educators did the assessment on subjects from the control group and the other two nurse educators did the assessment on subjects from both the control and experimental groups. The nurse educators were allocated to the different clinical facilities in order to save time and resources.

Figure 4.8 indicates that 22% of the subjects obtained less than 80% for the pre-test in *administration of oral medication*. For competency in the procedure the subjects had to have a minimum of 80%, according to the policies and procedures of the private institution where the study was conducted. During the pre-test 22% of subjects were not yet competent in the procedure *administration of oral medication*. A small minority, 6% of the subjects, scored 100% for the procedure. Data excluded in this study (1%) was due to subjects excluded in the study as indicated in table 4.2.



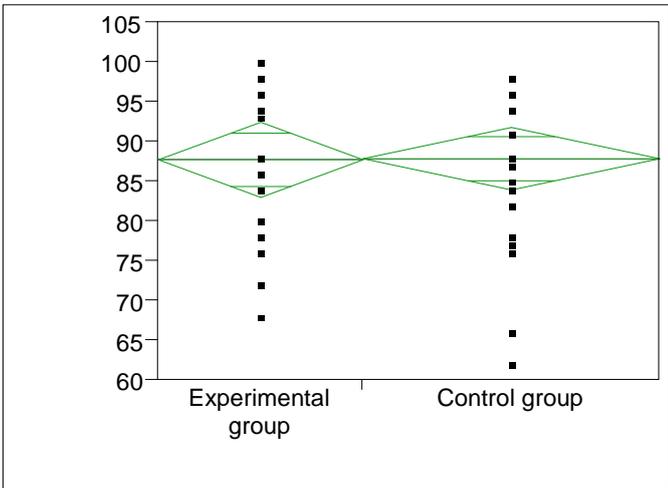
**Figure 4.8 Distribution: Pre-test oral medication**

Table 4.9 and figure 4.9 indicate, according to the data analysis, that there was no significant difference between the mean scores of the experimental- and control group

in the assessment of the procedure *administration of oral medication*, during the pre-test phase. The Shapiro-Wilk W test was used to indicate if the difference was significant or not. The Prob<W was 0.0002 and, therefore, of no significance.

**Table 4.9 Mean scores between the experimental and control group for oral medication: Pre-test**

Group	Pre-test oral medication
Experimental group	88.8823529
Control group	88.32
<b>Prob&lt;W: 0.0002</b>	



**Figure 4.9 Means of pre-test for oral medication**

Although the control group had more subjects who already had an auxiliary nurse qualification, it appears that the qualification did not assist them with becoming competent in the procedure as explained in the discussion on the baseline data (see 4.3.1).

**4.3.3.2 Intervention: Administration of oral medication**

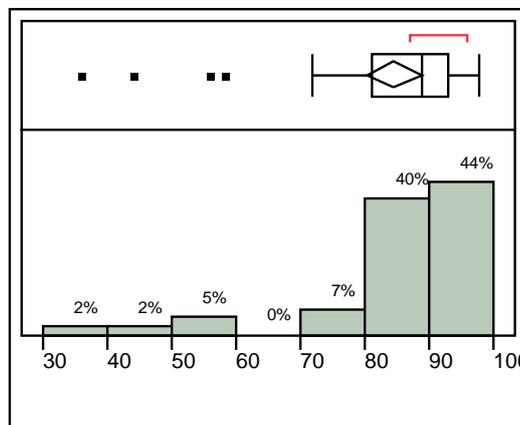
The intervention with the experimental group comprised that they were given a special opportunity to spend six hours in a simulation laboratory where they had to practise the two selected clinical procedures under supervision of a nurse educator. They received guidance from a nurse educator during the practice of the clinical procedures. The procedure *administration of oral medication* was practised in simulation on a

mannequin. The control group had no access to a simulation laboratory after the initial demonstrations of the two procedures at the learning centre.

#### 4.3.3.3 Post-test: Administration of oral medication

A post-test was done on both the experimental and control group at the clinical facility three months after the pre-test. The post-test was conducted in the wards where the subjects had to perform the two procedures on patients. The evaluation instruments (check lists) were the same as for the pre-test. One nurse educator assessed a specific number of pupil nurses and the same subjects with each test to ensure reliability.

Figure 4.10 indicates that 16% of the subjects were not yet competent in the procedure *administration of oral medication* during the post-test. This shows a 6% improvement in competency as the percentage of subjects not yet competent in the pre-test was higher, 22% (see 4.3.3.1). The subjects did improve by gaining better marks in the post-test as compared to the pre-test. However, 4% of the subjects scored between 30-49% in the post-test, which means these subjects performed worse in the post-test than in the pre-test (compare figures 4.8 and figure 4.10).

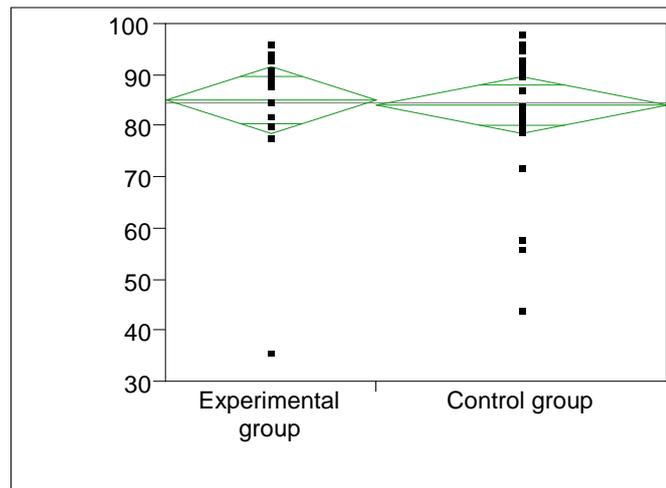


**Figure 4.10 Distribution: Post-test oral medication**

Table 4.10 and figure 4.11 indicate that there was no significant difference between the mean scores of the experimental and control groups in the post-test for the procedure *administration of oral medication*. The Prob<W was <.0001 indicating no significant difference.

**Table 4.10 Mean scores between the experimental and control group for oral medication: Post-test**

Group	Pre-test oral medication	Post-test oral medication
Experimental group	88.8823529	84.7647059
Control group	88.32	84.24
		<b>Prob&lt;W: &lt;.0001</b>



**Figure 4.11 Means of post-test for oral medication**

The experimental group had more opportunity to practise the procedure in the simulation laboratory and yet they did not score significantly higher than the control group in the post-test.

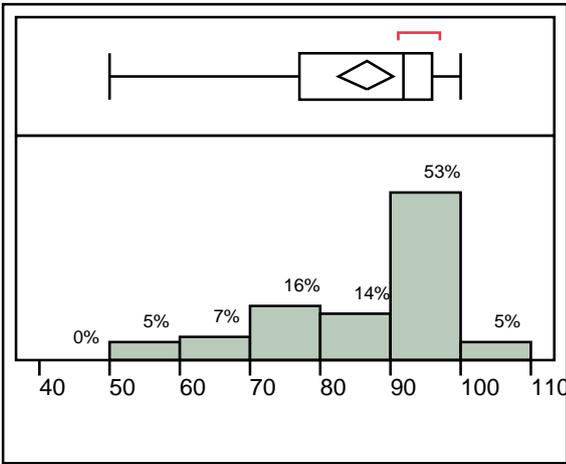
#### **4.3.3.4 Post-post-test: Administration of oral medication**

A post-post-test was done, on both the experimental and control group, at the clinical facility after nine months of the pre-test. The post-post-test was conducted in the wards and the subjects had to obtain permission from patients to do the two procedures for assessment purposes. The evaluation instrument that was used was the same standard check list used during the pre-test and post-test. Two nurse educators were involved in these assessments, one being a moderator. The assessor was the same nurse educator who assessed the pre-test and post-test.

Figure 4.12 indicates that 28% of the subjects were not yet competent in the procedure *administration of oral medication* during the post-test. Data from the pre-test show that

22% of subjects were not competent yet, and data from the post-test show that 16% of the subjects were not competent. This indicates that after initial improvement in the post-test the competency declined again in the post-post-test.

The difference between the mean scores of the experimental and control group was tested for statistical significance. The Multivariate Analysis of Variance (MANOVA) test was used for this. Multivariate analysis of variance is the extension of ANOVA to more than one dependent variable. It is used to test for the differences in two or more vectors of means (Polit & Beck 2008:627).



**Figure 4.12 Distribution: Post-post-test oral medication**

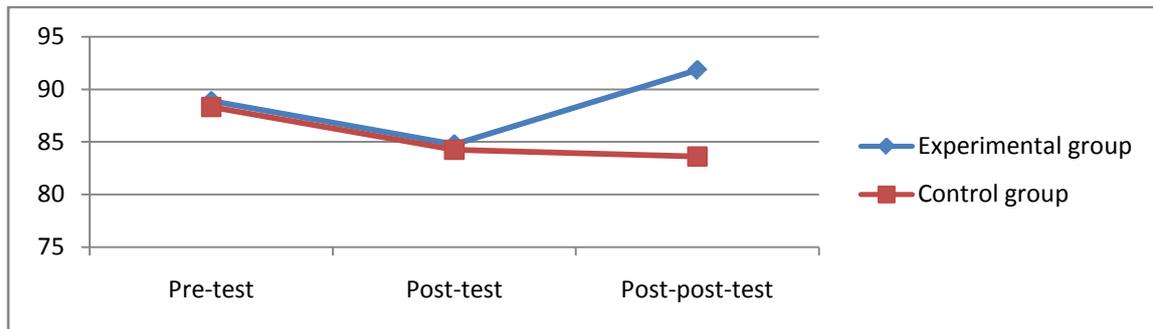
Table 4.11 demonstrates that there were no significant differences between the experimental group and control group in the pre-test and the post-test. It was only after the post-post-test that a significant difference was noticed.

**Table 4.11 Mean scores between the experimental and control group for oral medication – post-post-test**

Group	Pre-test oral medication	Post-test oral medication	Post-post-test oral medication
Experimental group	88.8823529	84.7647059	91.8235294
Control group	88.32	84.24	83.6

The polygon in figure 4.13 indicates that the mean scores of the control group declined, while the mean scores for the experimental group improved with the post-post-test. To test the statistical significance of this, a MANOVA was conducted. Probability values (p-

values) were produced, which indicate statistical significance. If the p-value is smaller than 0,05, a significant difference exists at a 95% level of confidence.



**Figure 4.13 Mean scores between the experimental and control group for oral medication**

In table 4.12 the p-value for the interaction is more than 0.05 ( $p=0.2751$ ) and, therefore, indicating no significant difference for the interaction term at a 95% level of confidence.

**Table 4.12 Probability value for oral medication**

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.068434	1.3345	2	39	0.2751

To determine if the mean oral medication scores of the experimental and control groups differ significantly the analysis of variance (ANOVA) test was used. Analysis of variance is a statistical technique for helping to infer whether there are real differences between the means of three or more groups or variables in a population (Polit & Beck, 2008:596). Table 4.13 indicates that the experimental group ( $M=91,82$ ) shows higher mean scores than the control group ( $M=83.19$ ).

**Table 4.13 Means for one-way analysis of variance for oral medication**

Level	Number	Mean	Std error	Lower 95%	Upper 95%
Experimental group	17	91.8235	2.9076	85.952	97.696
Control group	26	83.1923	2.3511	78.444	87.940

To determine if the difference between the means is statistically significant, the F-test was used, which produced a probability value. The p-value will only indicate statistical significance at a 95% level of confidence, if the p-value is smaller than 0,05.

In table 4.14 the p-value is 0.0261, which is smaller than 0,05, indicating that there is a significant difference between the groups at a 95% level of confidence. The experimental group scored significantly higher than the control group in the post-post-test.

**Table 4.14 Analysis of variance for oral medication**

Source	DF	Sum of squares	Mean square	F-ratio	Prob>F
Subject group	1	765.7700	765.770	53282	0.0261
Error	41	5892.5090	143.720	-	-
<b>C. total</b>	<b>42</b>	<b>6658.2791</b>	-	-	-

In this study a non-parametric Wilcoxon Rank Sum Test (Kruskall-Wallis) was used due to a lack of normality. This is a non-parametric test used to compare three or more independent groups of sampled data (Polit & Beck 2008:600).

Table 4.15 and table 4.16 indicate that the p-value from the Kruskal-Wallis test is less than 0,05 ( $p=0.0267$ ) indicating a significant difference between the mean ranks of the groups when considering oral medication scores.

**Table 4.15 Wilcoxon/Kruskal-Wallis Test (Rank Sums) for oral medication**

Level	Count	Score sum	Expected score	Score mean	(Mean-Mean0)/Std0
Experimental group	17	463.000	374.000	27.2353	2.204
Control group	26	483.000	572.000	18.5769	-2.204

**Table 4.16 One-way test, Chi-square approximation for oral medication**

ChiSquare	DF	Prob>ChiSq
4.9109	1	0.0267

Several statistical tests demonstrate significant differences between the mean scores of the experimental and control group. The nil hypothesis that simulation training will not improve pupil nurses' levels of competency in the clinical procedure *administration of oral medication* is, therefore, rejected.

#### 4.3.4 Data analysis: Observation of patients' neurological functions

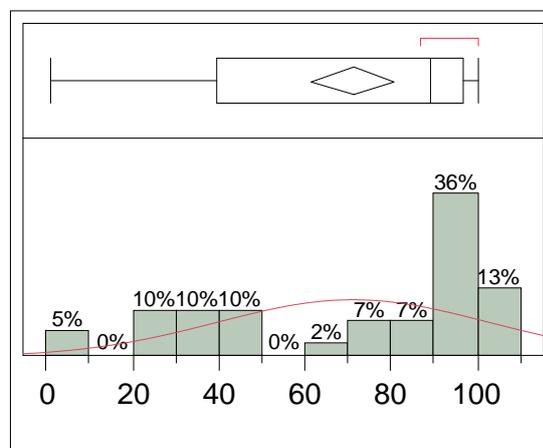
##### Nil hypothesis 2: Simulation training will not improve pupil nurses' levels of competency in the clinical procedure – *observation of patients' neurological functions*

The results of the pre-test, post-test and post-post-test are presented and the intervention for the experimental group is described.

##### 4.3.4.1 Pre-test: Observation of patients' neurological functions

The pre-test for *observation of patients' neurological functions* was conducted in the wards on the same patients that the subjects used for the procedure *administration of oral medication* due to the lack of patients with a neurological problem or condition. The two procedures were assessed on the same day by the same nurse educator on the same patient during the subjects' second month in the clinical facilities.

Figure 4.14 indicates that 44% of the subjects were not yet competent in the procedure *observation of patients' neurological functions*. Almost half, 44% of the subjects, obtained less than 80% in the pre-test.

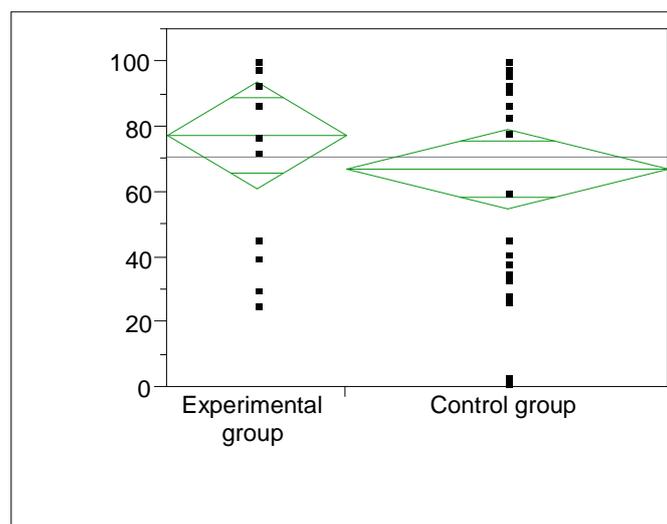


**Figure 4.14 Distribution: Pre-test neurological observations**

Table 4.17 and figure 4.15 indicate that the control group's mean score was 11 % less than the experimental group in the pre-test assessment of the procedure *observation of patients' neurological functions*.

**Table 4.17 Mean scores between the experimental and control group for neurological observations: Pre-test**

Group	Pre-test neurological observations
Experimental group	82.75
Control group	71.952381



**Figure 4.15 Means of pre-test neurological observations**

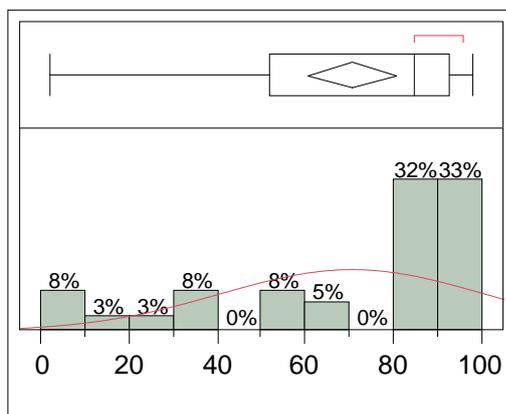
Although the control group had more subjects who already had an auxiliary nurse qualification it appears that the qualification did not assist them to obtain competency in the procedure as explained in the discussion on the baseline data (see 4.3.1).

#### **4.3.4.2 Intervention: Observation of patients' neurological functions**

The intervention for the experimental group comprised an opportunity of having a six-hour period to practise the procedure *observation of patients' neurological functions* under the supervision of a nurse educator in a simulation laboratory. The procedure *observation of neurological functions* was practised in a role-play simulation with a co-student acting as a patient. The subjects had the opportunity to interact with the "patient" and could, therefore, make interpretations during the role-play.

#### 4.3.4.3 Post-test: Observation of patients' neurological functions

Figure 4.16 indicates that 35% of the subjects were not yet competent in the procedure *observation of patients' neurological functions*. This shows a slight improvement from the pre-test in which more, 44% of subjects, were not yet competent.

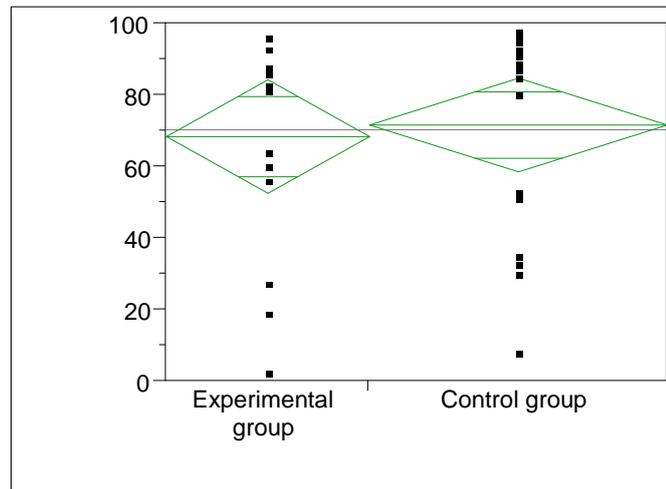


**Figure 4.16 Distribution: Post-test neurological observations**

Table 4.18 and figure 4.17 indicate that there were differences between the mean scores of the experimental and control groups. Both groups did have a lower mean score, but the experimental group's mean score decreased more than the control group. This had no significant value to the study due to the Prob<W score that was <.0001.

**Table 4.18 Mean scores between the experimental and control group for neurological observation: Post-test**

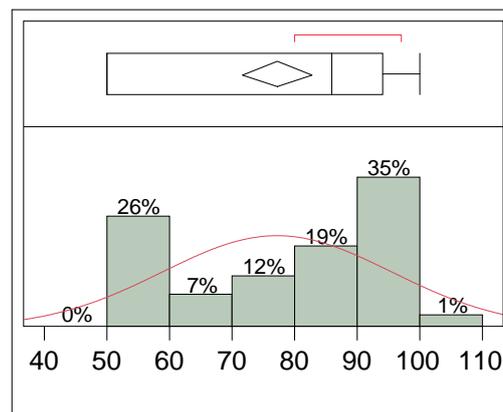
Group	Pre-test neurological observations	Post-test neurological observations
Experimental group	82.75	76.0833333
Control group	71.952381	70.9047619
		<b>Prob&lt;W: &lt;.0001</b>



**Figure 4.17 Means of post-test neurological observations**

#### **4.3.4.4 Post-post-test: Observation of patients' neurological functions**

Figure 4.18 indicates that 45% of the subjects were not yet competent after the post-post-test in the procedure *observation of patients' neurological functions*. Data from the pre-test showed that 44% of subjects were not competent, and from the post-test it showed that 35% of the subjects were not competent. During the post-post-test 45% of the subjects were not competent, which shows that after the initial improvement, competency declined over a longer period of time.



**Figure 4.18 Distribution: Post-post-test neurological observations**

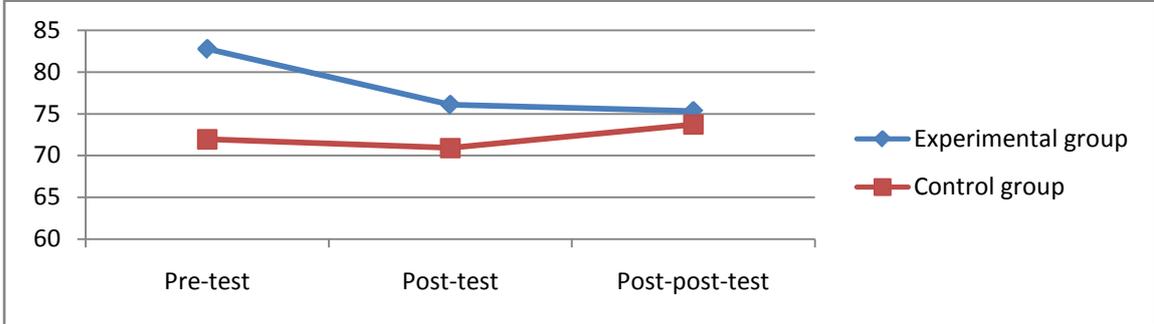
The difference between the mean scores of the experimental and control group was tested for statistical significance. The multivariate MANOVA test was used for this.

Table 4.19 indicates that the pre-test, post-test and post-post-test scores for the experimental group were slightly higher than the scores for the control group, but they were not significant to prove the hypothesis in this study.

**Table 4.19 Mean scores between the experimental and control group for neurological observations: Post-post-test**

Group	Pre-test neurological observations	Post-test neurological observations	Post-post-test neurological observations
Experimental group	82.75	76.0833333	75.3333333
Control group	71.952381	70.9047619	73.7142857

The polygon in figure 4.19 indicates that the mean scores for the control group and the experimental group showed no significant difference with the post-post-test. To test the statistical significance of this, a MANOVA was conducted. Probability values (p-values) were used to indicate statistical significance. If the p-value is smaller than 0,05, a significant difference exists at a 95% level of confidence.



**Figure 4.19 Mean scores between the experimental and control group for neurological observations**

Table 4.20 indicates that the p-value for the interaction is more than 0.05 (p=0.7854) and, therefore, indicating no significant difference for the interaction term at a 95% level of confidence.

**Table 4.20 Probability value for neurological observations**

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.0162323	0.2435	2	30	0.7854

To determine if the mean neurological observations scores of the experimental and control groups differ significantly, the ANOVA test was used.

Table 4.21 indicates that the experimental group (M=89.863) had no significant higher mean scores than the control group (M=81.661).

**Table 4.21 Means for one-way analysis of variance for neurological observations**

Level	Number	Mean	Std error	Lower 95%	Upper 95%
Experimental group	17	80.9412	4.4324	71.990	89.893
Control group	26	74.4231	3.5841	67.185	81.661

To determine if the difference between the means is statistically significant, the F-test was used, which produced a probability value. The p-value will only indicate statistical significance at a 95% level of confidence, if the p-value is smaller than 0,05.

Table 4.22 indicates that the p-value was 0.2595, which is higher than 0,05, indicating that there is no significant difference between the groups at a 95% level of confidence.

**Table 4.22 Analysis of variance for neurological observations**

Source	DF	Sum of squares	Mean square	F-ratio	Prob>F
Subject group	1	436.713	436.713	1.3076	0.2595
Error	41	13693.287	333.983	-	-
C. total	42	14130.000	-	-	-

In this study a non-parametric Wilcoxon Rank Sum Test (Kruskall-Wallis) was used due to a lack of normality.

Table 4.23 indicates that the p-value from the Kruskal-Wallis test is slightly higher than 0,05 ( $p=0.0860$ ), which implies that there is no significant difference between the mean ranks of the groups when considering neurological observation scores.

**Table 4.23 Wilcoxon/Kruskal-Wallis Test (Rank Sums) for neurological observations**

Level	Count	Score sum	Expected score	Score mean	(Mean-Mean0)/Std0
Experimental group	17	442.500	374.000	26.0294	1.705
Control group	26	503.500	572.000	19.3654	-1.705

**Table 4.24 One-way test, Chi-square approximation for neurological observations**

Chi-square	DF	Prob>ChiSq
2.9485	1	0.0860

Although the scores of the experimental group were slightly higher than those of the control group in the pre-, post- and post-post-tests for neurological observations, the differences were not found to be significant by various statistical tests, as illustrated above. The nil hypothesis that simulation training will not improve pupil nurses' levels of competency in the clinical procedure, *observation of patients' neurological functions*, cannot be rejected in this case.

#### **4.3.5 Data analysis of the different sections of the nursing process in the evaluation instruments**

The items in the evaluation instruments (check lists), are grouped into outcomes, which are based on the phases of the scientific nursing process consisting of the assessment, planning, implementation, evaluation and record-keeping phases, which require competence of students in clinical procedures. After an initial data analysis during the pre-test and post-test phase the researcher found that there was no statistical proof that the experimental group obtained better scores than the control group. The researcher

wanted to see if there is a difference in the scores between the two groups regarding the different phases of the scientific nursing process.

*Observation of patients' neurological functions:* Cognitive skills are assessed under the assessment, planning and evaluation section of the checklist. Cognitive and specifically psychomotor skills are assessed under the implementation section of the checklist. Affective skills are observed during the entire procedure.

*Administration of oral medication:* Cognitive and psychomotor skills are assessed during the assessment, planning, implementation and documentation (evaluation) section of the checklist.

Data analyses regarding the assessment, planning, implementation phases and affective skills were done. A MANOVA fit analysis was done to determine if there were any differences between the experimental or control groups with regard to the nursing process phases and affective skills.

#### **4.3.5.1 Assessment phase**

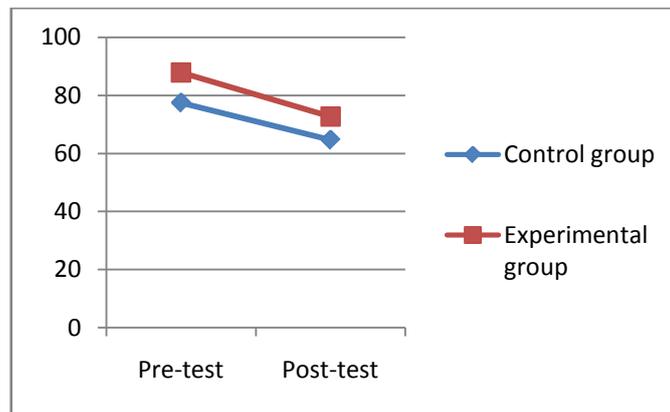
During this phase the subjects had to identify the patient and possible risk factors. The nursing care plan had to be evaluated. The assessment phase requires mainly cognitive skills.

#### **Administration of oral medication**

Table 4.25 and figure 4.20 indicate that both the control and experimental groups' marks declined in the post-test of the procedure *administration of oral medication*.

**Table 4.25 Oral medication assessment**

<b>Group</b>	<b>Assessment pre-test</b>	<b>Assessment post-test</b>
Control	77.4509804	64.7058824
Experimental	87.8787879	72.7272727



**Figure 4.20 Oral medication assessment**

Table 4.25 indicates that the experimental group performed better than the control group in both the pre-test and post-test scores. Table 4.26 indicates that the Prob>F is 0.1036, which is higher than 0.05 and is, therefore, not a significant change. This indicates that participants did not have a significant change in scores during the assessment phase.

**Table 4.26 Oral medication Prob>F assessment**

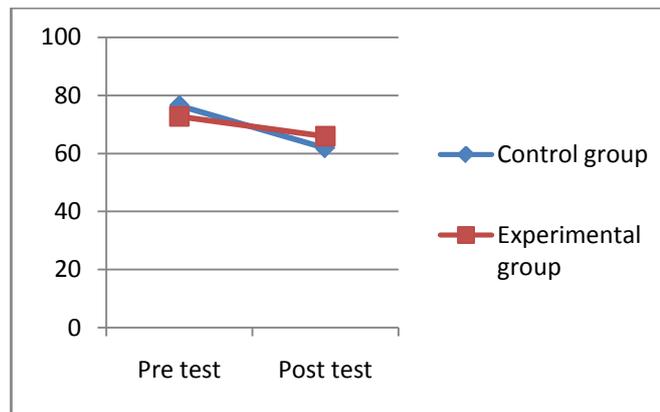
Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.1094337	2.8453	1	26	0.1036

### Observation of patients' neurological functions

Table 4.27 and figure 4.21 indicate that both the control and experimental groups' marks declined with regard to the assessment phase in the post-test of the procedure "observation of patients' neurological functions". This could be because the subjects became more confident in doing the procedures and therefore tend to omit to do the assessment necessary before starting the procedure.

**Table 4.27 Neurological functions assessment**

Group	Assessment pre-test	Assessment post-test
Control	76.4705882	61.7647059
Experimental	72.7272727	65.9090909



**Figure 4.21 Neurological functions assessment**

Figure 4.21 indicates that the experimental group performed better than the control group in the post-test scores. Table 4.27 indicates that the experimental group scored higher marks than the control group in the post-test of the procedure *observation of patients' neurological functions*. Table 4.28 indicates that the Prob>F is 0.9835, which is higher than 0.05 and is, therefore, not a significant change. The Prob>F indicates that the statistical value gained is of no significance although the scores show that the experimental group scored higher marks than the control group.

**Table 4.28 Neurological functions Prob>F assessment**

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.0000167	0.0004	1	26	0.9835

#### **4.3.5.2 Planning phase**

During this phase the subjects had to gather all the relevant equipment and prepare the environment before performing the procedures. Cognitive and psychomotor skills are required during this phase.

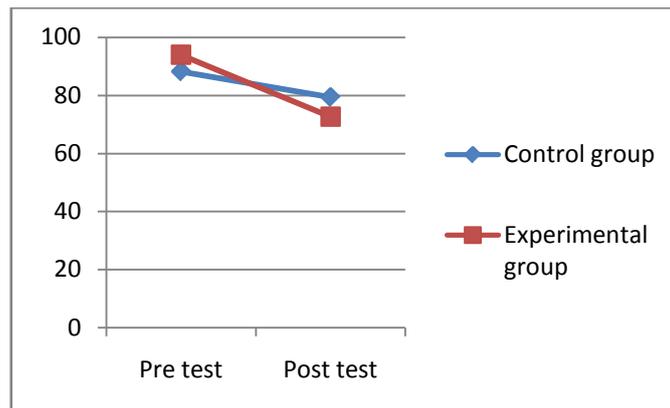
#### **Administration of oral medication**

Table 4.29 and figure 4.22 indicate that both the control and experimental groups' marks declined in the post-test of the procedure *administration of oral medication*. The experimental group's scores declined more than the control group's scores. This might be because of training in a simulation laboratory where all the equipment is already available for the subjects. The subjects could become used to having everything ready

for the procedure and, therefore, not plan ahead when performing the procedure in the real clinical setting with a patient.

**Table 4.29 Oral medication planning**

Group	Pre-test	Post-test
Control	88.2352941	79.4117647
Experimental	93.9393939	72.7272727



**Figure 4.22 Oral medication planning**

Figure 4.22 indicates that the control group performed better than the experimental group in the post-test scores, but as seen in table 4.30 the Prob>F is 0.9045, which is higher than 0.05 and, therefore, indicates that the difference is not significant.

**Table 4.30 Oral medication Prob>F planning**

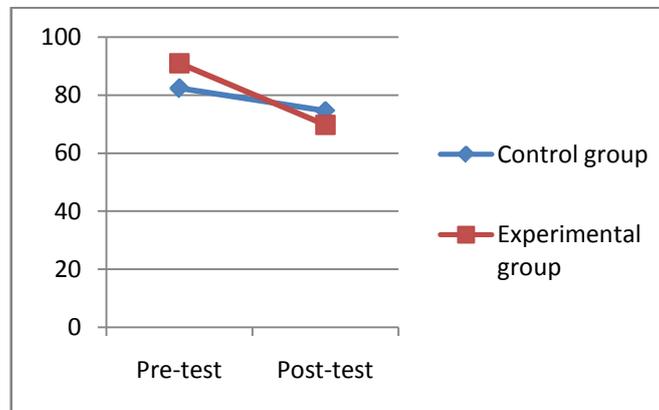
Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.0005644	0.0147	1	26	0.9045

### Observation of patients' neurological functions

Table 4.31 and figure 4.23 indicate that both the control and experimental groups' marks declined in the post-test of the procedure *observation of patients' neurological functions*. It is observed that in this procedure the experimental group's scores declined more than the control group's scores during the planning phase. This could be because of training in simulation where the subjects do not have to concentrate hard on the planning phase due to the availability of all the equipment in the simulation laboratory.

**Table 4.31 Neurological functions planning**

Group	Pre-test	Post-test
Control	82.3529412	74.5098039
Experimental	90.9090909	69.6969697



**Figure 4.23 Neurological functions planning**

Table 4.32 indicates that the Prob>F is 0.7503, which is higher than 0.05 and, therefore, does not indicate a significant difference in the scores with regard to the planning phase of the nursing process.

**Table 4.32 Neurological functions Prob>F planning**

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.0039793	0.1035	1	26	0.7503

#### **4.3.5.3 Implementation phase**

This phase is about the performing of the actual procedure and requires both cognitive and psychomotor skills.

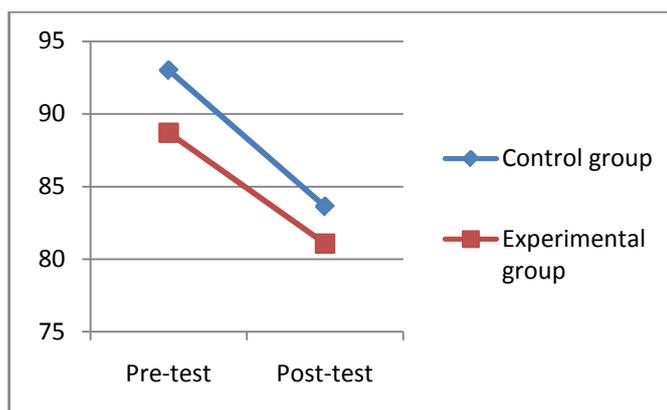
#### **Administration of oral medication**

Table 4.33 and figure 4.24 indicate that both the control and experimental groups' marks declined in the post-test of the procedure *administration of oral medication*. The experimental group's scores declined less than the control group's scores. This might

be because of experiential learning that took place with the extra exposure of the procedure during clinical simulation training in the simulation laboratory.

**Table 4.33 Oral medication Implementation**

Group	Pre-test	Post-test
Control	93.0047695	83.6248013
Experimental	88.6977887	81.0810811



**Figure 4.24 Oral medication Implementation**

Table 4.34 indicates that the Prob>F of the implementation phase of oral medication is 0.3469, which is higher than 0.05 and is, therefore, not significant. There is, therefore, no significant proof statistically that there is a difference in the scores obtained by the two groups during implementation phase.

**Table 4.34 Oral medication Prob>F implementation**

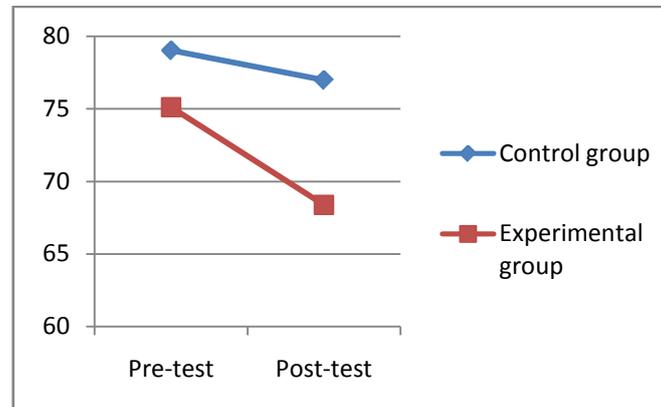
Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.0353017	0.9178	1	26	0.3469

### Observation of patients' neurological functions

Table 4.35 and figure 4.25 indicate that both the control and experimental groups' marks declined in the post-test of the procedure *observation of patients' neurological functions* with regard to the implementation phase of the nursing process. In this procedure the opposite of the above results is observed. The control group's scores declined less than the experimental group's scores.

**Table 4.35 Neurological functions implementation**

Group	Pre-test	Post-test
Control	79.028133	76.9820972
Experimental	75.0988142	68.3794466



**Figure 4.25 Neurological functions implementation**

Table 4.36 indicates that the Prob>F is 0.3231, which is higher than 0.05 and, therefore, there is no significant statistical proof that there are any changes during the implementation phase's pre- and post-test assessment.

**Table 4.36 Neurological functions Prob>F implementation**

Test	Value	Exact F	NumDF	DenDF	Prob>F
F Test	0.0390257	1.0147	1	26	0.3231

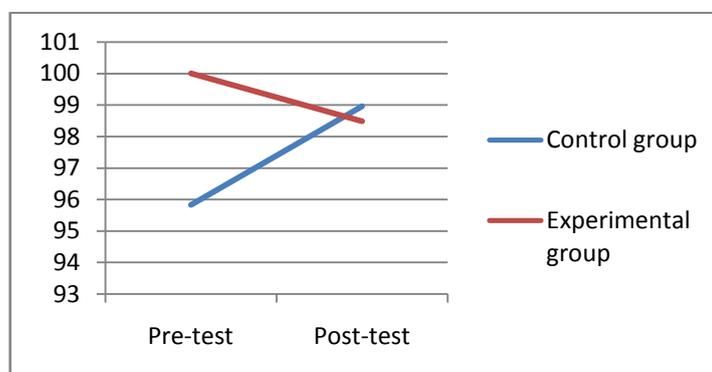
#### 4.3.5.4 Affective skills

##### Administration of oral medication

Figure 4.26 and table 4.37 indicate that the experimental group's affective skills in the procedure *administration of oral medication* decreased while the control group's affective skills increased. This could be due to the experimental group doing extra clinical training in simulation and not at a patient's bedside. Affective skills are learned and practised at a patient's bedside where the student has to interact with a patient.

**Table 4.37 Oral medication affective skills**

Group	Pre-test	Post-test
Control	95.83333333	98.95833333
Experimental	100	98.4848485



**Figure 4.26 Oral medication affective skills**

Table 4.38 indicates that the Prob>F is 0.1870 and, therefore, there is no significance in this statistical result showing a change in the post-test assessment of the affective skills.

**Table 4.38 Oral medication affective skills**

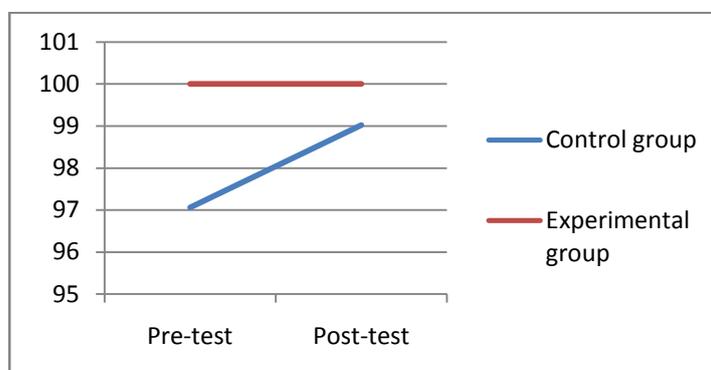
Test	Value	Exact	NumDF	DenDF	Prob>F
F Test	0.0736383	1.8410	1	25	0.1870

### Observation of neurological functions

Figure 4.27 and table 4.39 indicate that the experimental group obtained the same mean scores during the pre- and post-test phases in the procedure *observation of patients' neurological functions*. The experimental group obtained 100% in both the pre-test and post-test and, therefore, could not improve their marks. The control group scored slightly better in the post-test than in the pre-test after exposure to patients in the wards.

**Table 4.39 Neurological functions affective skills**

Group	Pre-test	Post-test
Control	97.0588235	99.0196078
Experimental	100	100



**Figure 4.27 Neurological observations affective skills**

Table 4.40 indicates that the Prob>F is 0.1798 and, therefore, there is no significant proof that the affective skills did improve.

**Table 4.40 Neurological observations affective skills**

Test	Value	Exact	NumDF	DenDF	Prob>F
F Test	0.0730897	1.9003	1	26	0.1798

#### 4.4 CONCLUSION

This chapter discussed the data analysis and interpretation, with the use of graphs, frequency tables and descriptions.

Chapter 5 includes a discussion of the findings, conclusions, recommendations and limitations of the study.

## CHAPTER 5

# DISCUSSION OF FINDINGS, LIMITATIONS, RECOMMENDATIONS AND CONCLUSIONS

### 5.1 INTRODUCTION

Simulation training provides student nurses with the opportunity to develop clinical skills required for nursing practice in a simulated environment, the simulation laboratory. It provides a bridge between theory and practice by providing learning opportunities in a safe environment where students can practise skills they may not be exposed to in the clinical setting, and from a safety perspective, may not be appropriate to practise first-hand on real patients. The aim of clinical simulation is to increase learner confidence in their ability to perform clinical skills in the clinical setting (Pike & O'Donnell 2010:405).

Preparation for clinical practice is a vital component of undergraduate nursing education with simulation laboratories widely adopted as a strategy to support student development of clinical skills (Wellard, Woolf & Gleeson 2007:1). According to these authors there is little empirical evidence about the role of simulation laboratories in students' learning or how it assists in linking theory and practice. Yet in clinical settings, nurse educators often do not have control over the types of experiences a pupil nurse will have or the conditions under which skills can be observed (Rauen 2004:48).

The purpose of this study was to determine whether training through simulation can improve the level of competency of pupil nurses in two selected clinical procedures, namely *administration of oral medication* and *observation of patients' neurological functions*.

This chapter discusses the findings and limitations of the study and proposes recommendations for nursing education and further research.

## **5.2 DISCUSSION OF FINDINGS**

### **5.2.1 Population**

The total population was 43 subjects (N=43).

### **5.2.2 Baseline data of subjects**

Baseline data established in this study included race, gender, age and highest qualification. There were more females than male subjects participating in this study. There were more black subjects than white or coloured subjects. The subjects were predominantly between the ages 19 and 29 years. Most of the subjects only had a matric certificate. Statistical analysis proved that there were no significant differences between the different ages, races and genders with regard to the marks scored during the assessments. The educational level of the subjects did not affect the outcome of the measurements. In this study age, gender, race and highest qualification did not play a significant role in the outcome of the assessment of the clinical competence of second-year pupils in the two procedures: *administration of oral medication* and *observation of patients' neurological functions* (see 4.3.1).

### **5.2.3 Demonstration of clinical procedures**

The researcher observed that the subjects did not use the time allocated to them in the afternoons after demonstrations to practise the procedures that were demonstrated to them (see 4.3.2). They rather used the time to summarise the theoretical content of the work done and worked out some of the theoretical questions applicable to each procedure. As adult learners the subjects have to take ownership of their learning by utilising the time allocated to them to gain experiences necessary for clinical competencies.

## **5.2.4 Competency during the second month in clinical practice**

### ***Oral medication***

During the second month of clinical practice a pre-test was conducted by means of direct observation using an evaluation instrument (check list). Only 22% of the subjects were found not yet competent in the procedure *administration of oral medication* (see 4.3.3.1). Retention of knowledge was observed. The subjects did retain the practical and theoretical knowledge they obtained during the practical block and, therefore, the majority of the subjects (78%) were found competent in the procedure during the pre-test.

### ***Neurological observations***

The pre-test for *observation of patients' neurological functions* was conducted during the subjects' second month in the clinical practice. Almost half, 44% of the subjects, obtained less than 80% in the pre-test and therefore was not yet competent in the procedure *observation of patients' neurological functions* (see 4.3.4.1). This could be due to the lack of clinical exposure to a patient with a neurological condition this early in the subjects' clinical rotation. The subjects might not have had the opportunity to practise these procedures before the pre-test.

Kolb (1984) in Lisko and O'Dell (2010:106) explain that learning is a process through which knowledge is created by means of transformation of experience (experiential learning); the subjects did not have any previous knowledge or experience in the above-mentioned procedures. The result proves that due to the lack of clinical exposure to the two procedures no new knowledge was gained and learning did not take place.

## **5.2.5 Intervention**

The intervention for the experimental group comprised an opportunity of having a six-hour period to practise the procedures (see 4.3.3.2 and 4.3.4.2). During these six hours the experimental groups, under the supervision of a nurse educator, had time and guidance to practise the two clinical procedures. This was a structured session during which the subjects did not have any time to waste. The nurse educator facilitated the

session and was present the whole time. She observed the role-play and simulation training and gave guidance when needed. Comer (2005) in Wellard et al (2007:2), explains that role-play supports a range of student learning styles within clinical simulation settings and has been reported as a cost-effective method of learning clinical skills when compared to the cost of using technological simulation.

### **5.2.6 Post-test**

A post-test was done on both the experimental and control group at the clinical facility three months after the pre-test.

#### ***Oral medication***

During the post-test 16% of the subjects were not yet competent in the procedure *administration of oral medication*. This was 6% less than for the pre-test. The subjects did improve by gaining better marks in the post-test as compared to the pre-test. However, 4% of the subjects scored between 30-49% in the post-test which means these subjects performed worse in the post-test than in the pre-test (see 4.3.3.3). The subjects of the experimental and control group had time to practise these procedures in the clinical facilities (hospitals) or could be observing the registered nurses while giving out medication. Reinforcement of the procedures due to direct observation could be a contributing factor for the subjects to score better during the post-test. The intervention did not improve competence as there was no significant difference between the scores of the experimental and control groups. No long- term memory or deep learning took place for those (4%) who scored so low during the post-test.

#### ***Neurological observations***

In the procedure *observation of patients' neurological functions* 35% of the subjects were not yet competent. This shows a slight improvement from the pre-test in which more, 44% of the subjects, were not yet competent (see 4.3.4.3). For learning to occur, experiences must be transformed and transformation happens through active external experience or internal reflection of the experience (Lisko & O'Dell 2010:106). The subjects of the experimental and control group were exposed to the clinical setting for a longer period and could have gained experience in the procedure "*observation of*

*patients' neurological functions*". The intervention did not improve competence as there were no significant differences between the scores of the experimental and control groups (see 4.3.4.3).

On reflection, the researcher discovered that the intervention was repetition of knowledge. The subjects did not participate in the active learning exercises. They practised the procedures in simulation, but did not develop critical thinking skills. They repeated the procedure in order to remember the steps. Case studies, for example, could lead to a different outcome to the study. Brandon and All (2010:92), explain that case studies can be used while coaching students as they solve problems, anticipate patient needs, think critically and apply current knowledge.

### **5.2.7 Post-post-test**

A post-post-test was done, on both the experimental and control groups, at the clinical facility nine months after the pre-test.

#### ***Oral medication***

In the procedure *administration of oral medication* 28% of the subjects were not yet competent during the post-post-test. Data from the pre-test showed that 22% of subjects were not competent and data from the post-test showed that 16% of the subjects were not competent. During the post-post-test a greater percentage (28%) of the subjects was not competent (see 4.3.3.4). This implies that short-term memory helped the subjects to improve from the pre-test to the post-test but that knowledge was not internalised and transferred to long-term memory, which could be due to the lack of learning opportunities (learning experiences) to practise the procedure in the clinical facilities, thus no reinforcement of learning through repetition took place. Lisko and O'Dell (2010:106), explain that learning is a continuous process and knowledge is created by transforming experience into existing cognitive frameworks, thus changing the way a person thinks and behaves.

The significant difference between the mean scores of the experimental group and control group occurred after phase 6, the post-post-test, which was conducted nine months after the pre-test. Here the statistics proved that simulation training did benefit

the experimental group. The experimental group scored better marks in the post-post-test than the control group. This might be because of reflective learning, which took place during the simulation experiences in the simulation laboratory. Wellard et al (2007:2), explain that clinical skills can improve through reflective learning practices. The experimental group received reinforcement of clinical skills by means of repetition during clinical guidance sessions in the simulation laboratory. The control group had to practise the clinical skills in the ward when given the opportunity.

Several statistical tests demonstrate significant differences between the mean scores of the experimental and control group. The nil hypothesis that simulation training will not improve the levels of competency of pupil nurses in the clinical procedure *administration of oral medication* is, therefore, rejected.

### ***Neurological observations***

The interpretation of data from the pre-test showed that 44% of subjects were not competent, and from the post-test it showed that 35% of the subjects were not competent. During the post-post-test 45% of the subjects were not competent; this shows that after the initial improvement, competency declined over time (see 4.3.4.4). This result shows that there was no deep learning that took place due to the lack of learning experiences. There was no proof of integration of theory and practice due to the lack of experiential learning (Lisko & O'Dell 2010:106). The use of scenarios and case studies developed to replicate real-life clinical situations could be valuable during simulation training to improve this result (Kaddoura 2010:506).

Phase 6 refers to the post-post-test of the clinical procedure *observation of patients' neurological functions*. The same outcome was observed, but because the p-value was lower than 0,05, this was not a significant statistical difference and, therefore, the conclusion was that simulation training did not benefit the experimental group to improve their competency level in the procedure *observation of patients' neurological functions*.

In this study there was proof that simulation training can indeed be successfully used as a clinical teaching method, to improve the competency levels of pupil nurses in the procedure *administer oral medication*.

Although the scores of the experimental group were slightly higher than those of the control group in the pre-, post- and post-post-tests for neurological observations, the differences were not found to be significant by various statistical tests, as illustrated in chapter 4. The nil hypothesis that simulation training will not improve the levels of competency of pupil nurses in the clinical procedure, *observation of patients' neurological functions*, cannot be rejected in this case.

## **5.2.8 Findings of data analysis of the different sections of the nursing process in the evaluation instruments**

### **5.2.8.1 Assessment phase**

#### **Administration of oral medication and observation of patients' neurological functions**

The marks of both the control and experimental group declined during the assessment phase of both the procedures *administration of oral medication* and *observation of patients' neurological functions* in the post-test. The experimental group did perform better than the control group in both the pre-test and post-test scores of the procedure *administration of oral medication*; for the procedure *observation of patients' neurological functions* this was true for the post-test scores (see 4.3.5.1).

The reason for the decline in the marks of both groups could be attributed to the fact that the subjects were passive recipients of information during both the theoretical block and clinical demonstration phase. The subjects did not practise the procedure in the time allocated to them during the theoretical or practical block period. Knowledge was not retained. Hoover (1996) (in Brandon and All 2010:90), explain that human learning is constructed and built upon previous knowledge. The authors came to the conclusion that students invent solutions and construct knowledge in the learning process.

### **5.2.8.2 Planning phase**

#### **Administration of oral medication and observation of patients' neurological functions**

The marks of both the control and experimental group declined in the post-test of both procedures. The experimental group's scores declined more than the control group's scores (see 4.3.5.2). This might be because of training in a simulation laboratory where all the equipment is already available for the subjects. The subjects could have become used to having everything ready for the procedure and, therefore, not think critically during the planning phase when they had to perform the procedure in the real clinical setting with a patient. Critical thinking is enhanced when self-confidence and improved problem-solving abilities increase (Childs & Sepples 2006:155). In the simulation laboratory used in this study, all the equipment was ready and therefore no problem-solving abilities were observed.

### **5.2.8.3 Implementation phase**

#### **Administration of oral medication and observation of patients' neurological functions**

The marks of both the control and experimental group declined in the post-test of both procedures. The scores of the experimental group declined less than the control group's scores in the procedure *administration of oral medication* (see 4.3.5.3). This might be because of experiential learning that took place with the extra exposure of the procedure during clinical simulation training in the simulation laboratory. Learning should be an active process in which students construct new ideas or concepts based upon their current or past knowledge (Brandon & All 2010:90). Clinical simulation training gives subjects the opportunity to reinforce knowledge gained by practising the procedure in simulation. In the procedure *observation of patients' neurological functions*, the opposite of the above results is observed. The scores of the control group declined less than those of the experimental group. The experimental group was practising this procedure in the simulation laboratory on healthy "patients" (fellow pupil nurses) during role-play. They were not exposed to abnormalities that you would find in a patient with a neurological condition. Active learning did not take place due to the lack

of exposure in the clinical setting. Gomez and Gomez (1987) (in Wellard et al 2007:2), conclude that student learning should be within the range of conditions experienced rather than simply focusing on stable and unchanging conditions. These authors also found that students who practised in the patient care setting had higher scores in nursing practice accuracy and confidence.

#### **5.2.8.4 Affective skills**

##### **Administration of oral medication and observation of neurological functions**

The experimental group's affective skills in the procedure *administration of oral medication* decreased while the control group's affective skills increased (see 4.3.5.4). This could be due to the experimental group doing extra clinical training in simulation and not at a patients' bedside. Affective skills are learned and practised at a patient's bedside where the student has to interact with a patient. Kaddoura (2010:507), explains that clinical simulation scenarios can be modified to encourage students to play various roles to learn how to communicate and, therefore, improve their affective skills.

The experimental group obtained 100% in both the pre-test and post-test in the affective skills of the procedure *observation of patients' neurological function* and, therefore, could not improve their marks. This could be due to interaction with a peer acting as a patient (role-play). The control group scored slightly better in the post-test than in the pre-test after exposure to patients in the wards.

### **5.3 LIMITATIONS OF THE STUDY**

Clinical simulation within nursing education is not standardised, so there may be variations in the delivery of clinical simulation in different nursing education institutions. The study was limited to the second-year pupil nurses of a private hospital group's Gauteng learning centre and, thus cannot necessarily be generalised to other nursing training institutions. This research was done on the second-year pupil nurses of 2011 and is, therefore, not representative of all pupil nurses that trained at this institution. Only two procedures were included in this study and thus cannot necessarily be generalised to all the other procedures. The small-scale nature of this study and sample means the results should be interpreted with caution and the researcher does

not suggest that the findings can be generalised to nursing education from this study alone.

## **5.4 RECOMMENDATIONS**

In this study clinical simulation training to improve competency of second-year pupil nurses did not bring valuable results, but the researcher is confident that simulation training can have valuable implications for nursing education and practice, and the recommendations, when implemented, may be used to improve nursing education programmes. Recommendations are proposed pertaining to nursing education and further research.

### **5.4.1 Recommendations for nursing education**

- Nurse educators should adopt and encourage the use of clinical simulation as an orientation teaching strategy during the practical block.
- The procedures must be reinforced immediately after each clinical simulation. It should be compulsory for students to use the simulation laboratory to practice procedures demonstrated to them by demonstrating them back to their peers or nurse educators. Students should be provided with an opportunity in small groups (2-6 students) to practise the skill learned. A mark allocation (%) for simulation laboratory attendance, which will form part of the semester mark, could motivate students to spend more time in the simulation laboratory during the times allocated for simulation laboratory.
- Learning centres and clinical facilities (hospitals) need to provide students with extensive access to simulation practice environments. There is a need for pupil nurses to be facilitated by a nurse educator, mentor or clinical facilitator in order to gain competency in their practical procedures. The implementation of clinical simulation training as a clinical teaching method should be promoted to enhance the competency levels of pupil nurses in their clinical procedures.
- The nurse educators should develop a simulation programme at the learning centre, which will include different simulation teaching strategies including scenarios and case studies to stimulate critical thinking and problem-solving and allocate different dedicated compulsory timeframes for simulation training to take place.

- Current teaching practices in the simulation laboratory should be investigated, including the nurse educator or mentor, learner involvement and learning environment. The reason for this is to evaluate where improvement of the quality of simulation teaching strategies should be addressed and student support strengthened to enhance deep learning.

#### **5.4.2 Recommendations for further research**

- It is recommended that further studies, using similar research with a larger sample, be conducted.
- A qualitative study on students' experience of simulation training can be a valuable study to discover how student nurses benefit from simulation training and what their real needs are in this regard.

#### **5.5 CONCLUSION**

This chapter discussed the conclusions and limitations of the study and made recommendations arising from the findings for nursing education and further research.

The study attempted to evaluate if simulation training could improve the clinical competency levels of the second-year pupil nurses. The study found that clinical training in simulation did improve the competency levels of the experimental group in the *procedure administration of oral medication*, but simulation training did not improve the clinical competence levels of experimental group in the *procedure observation of patients' neurological functions*.

The study identifies the potential of clinical simulation training as clinical teaching method in nursing education.

In conclusion, the researcher could not come to a definite conclusion about simulation training. This subject should be investigated again with more procedures and a bigger group as well as over a longer time period.

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**UNIVERSITY OF SOUTH AFRICA**  
**Health Studies Higher Degrees Committee**  
**(HSHDC)**  
**College of Human Sciences**  
**ETHICAL CLEARANCE CERTIFICATE**

Date of meeting: 24 March 2011

Project No: 4081-305-3

Project Title: Competence of second year pupil nurses after clinical training in simulation.

Researcher: Elizabeth Maria Powell

Degree: Master of Arts in Health Studies

Code: DIS702M

Supervisor: Prof E Potgieter

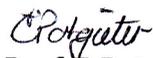
Qualification: D Litt et Phil

Joint Supervisor: -

**DECISION OF COMMITTEE**

Approved

Conditionally Approved



**Prof E Potgieter**

**RESEARCH COORDINATOR**



**Prof MC Bezuidenhout**

**ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES**

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

 Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

**Powell, Elize**

**From:** van Zyl, Ann **Sent:** Wed 2011/04/20 07:26 AM  
**To:** Powell, Elize  
**Cc:** Stroh, Avril  
**Subject:** FW: Meestersgraad - Powell  
**Attachments:**  Non-Clinical Research & Presentation Data.xlsx(22KB)

Elize, ek gee toestemming. Kan jy asb die spread sheet (aangeheg) voltooi en aan my stuur, asb. Die 'non-clinical research' gedeelte moet voltooi word, asb.

Sterkte! Ek dink aan jou!

Groete

**Ann van Zyl**

**Manager: Nursing Education**

*Medi-Clinic Offices*

*Tijgerpark 1, Willie van Schoor Avenue, Bellville, 7530*

*PO Box 5228, Tyger Valley, 7536*

*Tel No: +27 21 9436000*

*Fax No: +27 866813188*

[www.mediclinic.co.za](http://www.mediclinic.co.za)

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**From:** Jordaan, Estelle  
**Sent:** 19 April 2011 04:25 PM  
**To:** Powell, Elize  
**Cc:** van Zyl, Ann  
**Subject:** RE: Meestersgraad - Powell



VEREENIGING  
MEDI-CLINIC  
Privaat hospitaal

Medi-Clinic Beperk • Reg No 1969/009218/06

H/v Hofmeyerlaan & Joubertstraat, Vereeniging 1939 • T +27 16 440 5000 • F +27 16 440 5005  
Posbus 760, Vereeniging 1930 • www.vereenigingmc.co.za

## ANNEXURE B

### LETTER OF PERMISSION – VEREENIGING MEDI-CLINIC

To whom it may concern:

Madam

I am currently doing my Master's Degree in Nursing Education. My research topic is,  
**“Competence of second year pupil nurses after training in simulation.”**

I request permission to conduct my research at your hospital. This letter also serves to inform you that all the data gathered from the second year pupil nurses will be used solely for research purposes and that the anonymity of all is guaranteed.

I trust that you will kindly grant me the consent in conducting my research.

Thanking you

Yours truly  
(Mrs) E.M. Powell  
Nurse Educator

Approved.  
H. van der Merwe  
21/4/11

M. J. van der Merwe  
21-04-2011

VEREENIGING MEDI-CLINIC  
COR. JOUBERT ST. & HOFMEYER AVE.  
P.O. BOX 760, VEREENIGING 1930  
Tel: (016)440-5000 Fax: (016)440-5005

Hospitaalbestuurder: L. Lambrechts

Direkteure: WH Aucamp, AJ Joubert, NS Matlala, KHS Pretorius, B Valodia

Maatskappysekretaris: TA Lockyer

\*\*\* Hersien 12 Augustus 2008 R161 \*\*\*





**POTCHEFSTROOM  
MEDI-CLINIC**  
Private hospital

Potchefstroom Medi-Clinic (Pty) Ltd • Reg. No. 1985/004441/07

66 Meyer Street, Potchefstroom 2520 • T +27 18 293 7000 • F +27 18 297 6225  
PO Box 19901, Noordbrug 2522 • www.potchefstroommc.co.za

**ANNEXURE B**

**LETTER OF PERMISSION – POTCHEFSTROOM MEDI-CLINIC**

To whom it may concern:

Madam

I am currently doing my Master's Degree in Nursing Education. My research topic is,  
**“Competence of second year pupil nurses after training in simulation.”**

I request permission to conduct my research at your hospital. This letter also serves to inform you that all the data gathered from the second year pupil nurses will be used solely for research purposes and that the anonymity of all is guaranteed.

I trust that you will kindly grant me the consent in conducting my research.

Thanking you

Yours truly  
(Mrs) E.M. Powell  
Nurse Educator

**POTCHEFSTROOM MEDI-CLINIC**

POSBUS 19901  
NOORDBRUG 2522  
TEL NO: (018) 2937000  
FAKS NO: (018) 297 6225

Permission granted

12/4/11

Hospital Manager: B.J. van Aswegen

Directors: H.C. du Toit, M.J. Eybers, W.C. Kruger, B.J. van Aswegen,  
S. Veldsman, Dr A. Vermooten, Dr A.G.N. Vorster

Company Secretary: H.K. Gerber

\*\*\* Revised 30 July 2010 M2537 \*\*\*



Medi-Clinic Limited • Reg. No. 1969/009218/06

Barney Molokwane Street, Trichardt, 2300 • T +27 17 638 8000 • F +27 17 638 0798  
PO Box 579, Trichardt 2300 • www.highveldmc.co.za

8 APRIL 2011

Sandton Learning Centre Medi-Clinic

Dear Mrs EM Powell,

**RE: LETTER OF PERMISSION – HIGHVELD MEDI-CLINIC**

RESEARCH TOPIC:

“Competence of second year pupil nurses after training in simulation”

It is my pleasure to inform you that permission is granted for the evaluation of Highveld Medi-Clinic's PEN 2 students.

May I take this opportunity to wish you success with your research.

Yours faithfully,

**MS CHARMAINE EVERTON**  
**NURSING MANAGER**

Hospital Manager: WS Schoonbee

Directors: WH Aucamp, AJ Joubert, Dr NS Matala, KHS Pretorius, B Valodia

Company Secretary: TA Lockyer

\*\*\* Revised 2 September 2010 M2519 \*\*\*





**SANDTON MEDI-CLINIC**  
*Private hospital*

11/04/11

**Dear Elize Powell**

Permission is hereby granted to conduct your research at Sandton Medi-Clinic.  
Research referring to "Competence of second year pupil nurses after Clinical  
Training in Simulation.

Regards,

  
\_\_\_\_\_  
**Mrs M Lanz**



**MORNINGSIDE  
MEDI-CLINIC**

Private hospital

Medi-Clinic Limited • Reg. No. 1969/009218/06

Cnr Rivonia & Hill Roads, Morningside 2057 • T +27 11 282 5000 • F +27 11 783 9100  
Private Bag X6, Bryanston 2021 • www.morningsidemc.co.za

**ANNEXURE B**

**LETTER OF PERMISSION – MORNINGSIDE MEDI-CLINIC**

To whom it may concern:

Madam

I am currently doing my Master's Degree in Nursing Education. My research topic is,  
**“Competence of second year pupil nurses after training in simulation.”**

I request permission to conduct my research at your hospital. This letter also serves to inform you that all the data gathered from the second year pupil nurses will be used solely for research purposes and that the anonymity of all is guaranteed.

I trust that you will kindly grant me the consent in conducting my research.

Thanking you

Yours truly  
(Mrs) E.M. Powell  
Nurse Educator



Hospital Manager: WJ Erasmus

Directors: WH Aucamp, AJ Joubert, NS Matlala, KHS Pretorius, B Valodia

Company Secretary: TA Lockyer

Revised 1 August 2008 M2529



6 JAN VAN RIEBEECK BLVD  
VANDERBIJLPARK  
1911

PRIVATE BAG X020  
VANDERBIJLPARK  
1900

T +27 16 950 8000  
F +27 16 950 8011  
ETHICS LINE 0800 005 316

www.mediclinic.co.za

**ANNEXURE B**

**LETTER OF PERMISSION – EMFULENI MEDI-CLINIC**

To whom it may concern:

Madam

I am currently doing my Master's Degree in Nursing Education. My research topic is,  
**“Competence of second year pupil nurses after training in simulation.”**

I request permission to conduct my research at your hospital. This letter also serves to inform you that all the data gathered from the second year pupil nurses will be used solely for research purposes and that the anonymity of all is guaranteed.

I trust that you will kindly grant me the consent in conducting my research.

Thanking you



Yours truly

(Mrs) E.M. Powell

Nurse Educator

APPROVED:

  
.....  
MS JS OOSTHUIZEN  
NURSING MANAGER

**EMFULENI MEDI-CLINIC**  
PRIVAATSAK X020  
VANDERBIJLPARK  
1900

21/04/2011  
.....  
DATE

ANNEXURE B

Wits University  
Donald Gordon  
Medical Centre



Patient-centred. Independent. Academic.



LETTER OF PERMISSION – WITS DONALD GORDON MEDICAL CENTRE

To whom it may concern:

Madam

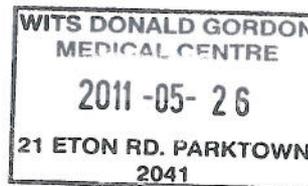
I am currently doing my Master's Degree in Nursing Education. My research topic is, "**Competence of second year pupil nurses after training in simulation.**"

I request permission to conduct my research at your hospital. This letter also serves to inform you that all the data gathered from the second year pupil nurses will be used solely for research purposes and that the anonymity of all is guaranteed.

I trust that you will kindly grant me the consent in conducting my research.

Thanking you

Yours truly  
(Mrs) E.M. Powell  
Nurse Educator



**LETTER OF INFORMATION – PUPIL NURSES**

Dear Second year Pupil Nurse,

I am currently completing my Master's Degree in Nursing Education.

I am planning a research project that will take place over one year. The aim is to find methods to improve education to benefit all pupil nurses. I will be investigating which teaching strategies would enhance student learning in order to improve nursing education.

This study involves no physical risks to you as pupil nurses. As a group, you will be involved in my research study and by the end of the study all of you will have been exposed to the various teaching strategies I plan to use to ensure that none of you will be disadvantaged in any way. You will not be paid to participate in this study, but as a group, you may all benefit as a result of the extra attention to teaching methods that may be more beneficial to enhance student learning.

The research results will be announced to everyone after the study has been completed.

If any one of you has a serious objection to be included in the study, you are free to discuss your concerns with me, I will not coerce you into a study of which you do not want to be part of, you have a right to be excluded and will not be penalised in any way.

I shall appreciate your willingness to be part of the study.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'E.M. Powell', with a stylized flourish at the end.

(Mrs) E.M. Powell

## ANNEXURE D

Dear Colleagues

Thank you for agreeing to assist me with my research study.

The topic of the study is: **Clinical competence of final year Pupil Enrolled Nurses after training in simulation.**

Population: Second year PEN students

Sample: All the PEN February 2011 and August 2011 second year students.

My experimental group will be the Sandton and Vereeniging students. The rest of the groups will be in the control group.

The subjects will all receive demonstrations in the procedures: *administration of oral medication and observation of patients' neurological functions*, two weeks before the commencement of their second year of study during the practical block.

There will be a pre-test, post-post and post-post-test. I will give you the evaluation tools we are going to need in this process.

The experimental group must practice the above mentioned procedures in the simulation laboratory with every GPL day. The post-test will be done in each hospital after three months of the pre-test and the post-post-test will be done nine months after the pre-test.

Contact me if you have any questions.

Kind regards



Elize Powell  
Nurse educator

<b>Administer Oral Medicines</b>					
	Control group		Experimental group	Unit:	Date:
Percentage:	%	Competent		Not yet Competent	

Specific Outcomes	Assessment Method
1. Assessment	1. Direct observation
2. Planning	2. Direct observation
3. Implementation	3. Direct observation
4. Evaluation and Record keeping	4. Direct observation

- **1 = 1 mark per item**
- **0 = Not done**
- **\* = Critical Point – 25% will be deducted from final mark for each critical point according to the policy.**

Score	Mark	N/A	Comment
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## PSYCHOMOTOR SKILLS

### Specific Outcome 1: Assessment

1. Patient identified
2. Prescription chart checked
3. Patient care plan checked
4. Heart rate/blood pressure assessed
5. Mims/package insert checked
6. Pain assessed

* 1			
1			
1			
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1			

### Specific Outcome 2: Planning

1. Trolley cleaned
2. Hands washed
3. Correct requirements assembled
4. Procedure explained
5. Verbal consent obtained
6. Bedpan/ Urinal offered

1			
1			
1			
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### Specific Outcome 3 & 4: Implementation & Documentation

1. Trolley positioned at bed and unlocked
2. Hands washed
3. Patient identified – name band checked:
  - Name
  - Folder number
  - doctor
4. Prescription chart checked:
  - patient name and number
  - diagnosis
  - allergies
  - medication and dosage
  - time and route of administration
5. Medication checked with prescription chart:
  - patient name and folder number
  - medicine
  - route

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* 1			

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1			
1			



Observation of Neurological Function					
	Control group		Experimental group	Unit:	Date:
Percentage:	%	Competent		Not yet Competent	

Specific Outcomes	Assessment Method
1. Assessment	1. Direct observation
2. Planning	2. Direct observation
3. Implementation	3. Direct observation
4. Evaluation and Record keeping	4. Direct observation

- **1 = 1 mark per item**
- **0 = not done**
- **\* = Critical Point – 25% will be deducted from final mark for each critical point according to the policy.**

## PSYCHOMOTOR SKILLS

### Specific Outcome 1: Assessment

1. Prescription chart checked
2. Patient care plan checked
3. Indication for neurological assessment identified
4. Contra-indications for certain painful stimuli identified

Score	Mark	NA	Comment
1			
1			
1			
1			

### Specific Outcome 2: Planning

1. Privacy ensured
2. Hands washed
3. Required equipment assembled

1			
1			
1			

### Specific Outcome 3 & 4: Implementation

1. Patient approached without speaking in order to assess *best eye opening response*.
2. Stimulus appropriately evaluated if no spontaneous eye opening on approaching the patient
3. Appropriate questions used to determine the patient's *best verbal response*
4. The conscious patient only now identified (also to verify responses to questions regarding orientation)
5. Best motor response determined in a conscious patient by asking the patient to obey a simple command
6. In the conscious patient, motor strength in the arms assessed by asking the patient to do the following:
  - "make a muscle"
  - "push me away"
  - "squeeze my fingers hard"
  - "extend your arms in front of you"
7. In the conscious patient, motor strength in the legs assessed by asking the patient to do all of the following:
  - "wiggle your toes"
  - "pull your toes up"
  - "step on the petrol"
8. All four limbs tested
9. Light in the room dimmed if possible
10. Pupil size assessed before shining a torch into the eye

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11. Pupil shape assessed
12. Pupil reaction to light assessed by using a bright, narrow beam torch
13. Temperature, blood pressure, pulse rate, respiratory rate and Pattern assessed
14. Patient positioned comfortably
15. Cotsides in position/bed low
16. Bell/locker within reach
17. Health education given (if conscious)
18. Hands washed

Score	Mark		Comment
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1			

**Specific Outcome 5: Evaluation & Record Keeping**

1. Glasgow Coma Scale correctly evaluated and recorded
2. Motor strength correctly evaluated and recorded
3. Pupillary response correctly evaluated and recorded
4. Vital signs correctly evaluated and recorded
5. Recording done scientifically
6. Changes from the previously recorded observations observed
7. Abnormalities reported and acted upon
8. Time utilized economically

1			
1			
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**AFFECTIVE SKILLS**

1. Comprehensive approach with regard to the patient's basic needs:
  - *Physical Needs (e.g. pain, discomfort)*
  - *Psychological Needs (e.g. emotions, dignity, culture)*
2. Effective verbal and non-verbal communication:
  - *Friendly and courteous*
  - *Reassuring*
  - *Professional*
  - *Approachable*

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<b>44</b>			