Recording and interpretation of vital signs in a private hospital in KwaZulu-Natal

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DEDICATION

I dedicate this study to my late father, Daniel Pieter Steyn, for inspiring me to pursue this degree and for believing in me unconditionally.

DECLARATION

I, Yolanda Bruin, student number 22817875, declare herewith that the dissertation entitled

Recording and interpretation of vital signs in a private hospital in KwaZulu-Natal

is my own work and that all the sources I used are acknowledged in the reference list.

The study was approved by the Institutional Health Research Ethics Committee of the North-West University, by the corporate management responsible for the approval of research studies at the organisation where the research was conducted and the management of the private hospital involved in the study.

The study complies with the research ethical standards of the North-West University (NWU).

I confirm that the study has been language edited in accordance with the requirements and has not been submitted to any other university.

_____

Mrs Y Bruin

November 2017

REFERENCES according to NWU reference guidelines, 2012..
http://library.nwu.ac.za/sites/library.nwu.ac.za/files/files/documents/quoting-sources-a.pdf

DECLARATION OF LANGUAGE EDITING

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I, Mari Grobler, hereby declare that I have language edited the research study with the title:

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for **Yolanda Bruin** for the purpose of submission as a research article.

Changes were suggested in the form of electronic track changes and comments. Implementation was left to the discretion of the author.

Please contact me, should there be any questions concerning the language editing of this study.

Yours sincerely

Mari Grobler
SATI membership no: 1002808

ABSTRACT

Key concepts **Clinical environment, enrolled nurse, enrolled nursing auxiliary, patient deterioration, private hospital, quality care, vital signs**

Within a healthcare context, the traditional role of the nurse involves monitoring vital signs as an essential indicator of physiological deterioration. Enrolled nurses and enrolled nursing auxiliaries are primarily responsible for the measurement of vital signs and play an important role in early recognition of and response to signs of deterioration.

This research explored and described the current theoretical knowledge of the enrolled nurses and enrolled nursing auxiliaries working at a private hospital in KwaZulu-Natal. The researcher further investigated the accuracy of recording and the ability of enrolled nurses and enrolled nursing auxiliaries to correctly interpret the data presented to them during the assessment of vital signs. If nurses are not accurate and effective while recording or interpreting vital signs, it may put patients at risk as appropriate actions are delayed.

The researcher used a quantitative, descriptive research design. All potential respondents meeting the inclusion criteria, were invited to participate in the research study due to the relatively small sample size (N=89). Once ethical clearance had been obtained from the Health Research Ethics Committee of the North-West University, the questionnaire was pre-tested on nurses meeting the inclusion criteria. This was done to identify confusing, ambiguous or difficult questions. Measures were implemented to assure the validity and reliability of the study.

The respondents selected for the study were enrolled nurses and enrolled nursing auxiliaries employed on a permanent or part-time basis at a research hospital. A mediator explained all aspects related to the study to potential respondents. Informed consent was obtained from all respondents.

Data were collected by making use of a questionnaire where questions were selected and formulated by the researcher, with the information in mind contained in the hospital procedural guidelines, related to the assessment and measurement of vital signs. The results obtained from the completed questionnaires showed 68.8% of the respondents were enrolled nursing auxiliaries, 54.7% were aged between 26-35 years, 53.1% had 1-5 years nursing experience and 85.9% were employed on a permanent basis.

The researcher was able to identify gaps in the knowledge of respondents from both categories specifically related to definitions and normal values of each vital sign forming part of the study,

as well as the use of equipment and measurement techniques associated with the effective measurement of vital signs.

Areas, requiring attention and remedial interventions, concern the documentation of vital signs by enrolled nurses and enrolled nursing auxiliaries who participated in the study. The issues identified were that documents are not adequately identified, and especially respiratory rate and oxygen saturation are not correctly documented.

Approximately 50% of the enrolled nurses and enrolled nursing auxiliaries were able to clearly identify and indicate actions and interventions related to abnormalities presented as part of the scenario. By not correctly identifying abnormalities, patients' lives might potentially be at risk.

The recommendations include the introduction of a quality improvement programme specifically targeting the knowledge of enrolled nurses and enrolled nursing auxiliaries together with training on the correct recording techniques that can improve the ability of enrolled nurses and enrolled nursing auxiliaries to timeously recognise and respond to physiological signs of patient deterioration.

OPSOMMING

Sleutelterme **Kliniese omgewing, ingeskrewe verpleegkundige, ingeskrewe verpleeghulp, pasiënt agteruitgang, privaat hospitaal, kwaliteit sorg, vitale tekens**

Binne ’n gesondheidsorgkonteks behels die tradisionele rol van verpleegkundiges die waarneming van vitale tekens as ’n noodsaaklike aanduiding van fisiologiese agteruitgang. Ingeskrewe verpleegkundiges en ingeskrewe verpleeghulpe is hoofsaaklik verantwoordelik vir die meting van vitale tekens en speel ’n belangrike rol in die vroeë erkenning van en reaksie op tekens van agteruitgang.

Hierdie navorsingstudie het die huidige vakkennis van ingeskrewe verpleegkundiges en ingeskrewe verpleeghulpe ondersoek en beskryf wat werksaam is in ’n privaat hospitaal in KwaZulu-Natal. Die navorser het verder ondersoek ingestel na die akkuraatheid van dokumentering en die vermoë van ingeskrewe verpleegkundiges en ingeskrewe verpleeghulpe om die data wat aan hulle voorgelê word, korrek te interpreteer tydens die assessering van vitale tekens. Indien ingeskrewe verpleegkundiges en ingeskrewe verpleeghulp nie akkuraat en effektief abnormale vitale tekens identifiseer en interpreteer nie, kan dit pasiënte se lewens in gevaar stel, aangesien dit gepaste aksies en intervensies vertraag.

Die navorser het gebruik gemaak van ’n kwantitatiewe, beskrywende navorsingsontwerp. As gevolg van die relatief klein steekproef grootte (N=89), is alle potensiële respondente wat aan die insluitingskriteria voldoen het, genooi om aan die navorsingstudie deel te neem. Nadat etiese klaring verkry is vanaf die etiese komitee van Gesondheidswetenskappe van die Noordwes-Universiteit, is die vraelys getoets op verpleegkundiges wat aan die insluitingskriteria voldoen het. Dit is gedoen om verwarrende, dubbelsinnige of moeilik verstaanbare vrae uit te sluit. Maatreëls was toegepas om geldigheid en betroubaarheid van die studie te verseker.

Die respondente wat vir die studie geselekteer was, is ingeskrewe verpleegkundiges en ingeskrewe verpleeghulpe wat permanent of deeltyds by die navorsingshospitaal werksaam was. ’n Bemiddelaar het alle aspekte wat verband gehou het met die studie aan die potensiële respondente verduidelik en ingeligte toestemming is van al die respondente verkry.

Data is ingesamel deur gebruik te maak van ’n vraelys wat deur die navorser saamgestel is, gebaseer op die inligting soos saamgevat in ’n hospitaal se prosedurele riglyne wat verband hou met die assessering en meting van vitale tekens. Die resultate het aangedui dat 68.8% van die respondente ingeskrewe verpleeghulpe was, 54.7% was tussen die ouderdom van 26-35,

53.1% het oor 1-5 jaar verpleegondervinding beskik en 85.9% was permanent in diens van die navorsinghospitaal.

Die navorser kon leemtes identifiseer in die kennis van respondente uit beide kategorieë wat spesifiek verband hou met definisies en normale waardes vir elk van die vitale tekens, wat deel vorm van die studie, asook die gebruik van toerusting en metingstegnieke wat verband hou met die effektiewe meting van vitale tekens.

Areas wat aandag en remediërende intervensies vereis, hou verband met die dokumentasie van vitale tekens deur die ingeskrewe verpleegkundiges en ingeskrewe verpleeghulpe wat aan die studie deelgeneem het. Sommige van die kwessies geïdentifiseer, is dat dokumente nie voldoende geïdentifiseer word nie, en dat veral respirasie sowel as suurstofversadiging nie korrek gedokumenteer word nie.

Ongeveer 50% van die ingeskrewe verpleegkundiges en ingeskrewe verpleeghulpe was daartoe in staat om aksies en intervensies, wat verband hou met die gesimuleerde afwykings, duidelik te identifiseer en korrek aan te dui. Hierdie leemte kan die lewens van pasiënte potensieel in gevaar stel.

Die aanbevelings sluit in die bekendstelling van ’n kwaliteit verbeteringsprogram aan wat spesifiek daarop gerig is om die kennis van ingeskrewe verpleegkundiges en ingeskrewe verpleeghulpe te verbeter, opleiding oor korrekte dokumentering te verskaf sowel as die verbetering van die vermoë van ingeskrewe verpleegkundiges en ingeskrewe verpleeghulpe om betyds op tekens van fisiologiese agteruitgang van pasiënte te reageer.

LIST OF ABBREVIATIONS

ASTM	American Society of Testing and Materials
BP	Blood pressure
COPD	Chronic obstructive pulmonary disease
EN	Enrolled nurse
ENA	Enrolled nursing auxiliary
°C	Degree Celsius
FM	Face Mask
f	Frequency
HREC	Health Research Ethics Committee
INSINQ	The research focus area: Quality in Nursing and Midwifery within the Faculty of Health Sciences of the North-West University
KR-20	Kuder-Richardson 20
n	Actual population
N	Target population
NC	Nasal cannula
NWU	North-West University
PN	Professional nurse
RA	Room Air
SANC	South African Nursing Council
SAQA	South African Qualifications Authority
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization

TABLE OF CONTENTS

ACKNOWLEDGEMENTS ..... **i**

DEDICATION ..... **ii**

DECLARATION ..... **iii**

DECLARATION OF LANGUAGE EDITING ..... **iv**

ABSTRACT ..... **v**

OPSOMMING ..... **vii**

LIST OF ABBREVIATIONS ..... **ix**

CHAPTER 1 OVERVIEW OF THE STUDY **1**

1.1 INTRODUCTION **1**

1.2 BACKGROUND **1**

1.3 PROBLEM STATEMENT **3**

1.4 RESEARCH QUESTIONS **3**

1.5 RESEARCH AIMS AND OBJECTIVES **4**

1.6 RESEARCHER'S ASSUMPTIONS **4**

1.6.1 Theoretical assumptions 5

1.6.1.1 Major concepts underpinning Abdellah's theory of patient centred nursing care 5

1.6.1.1.1 Health 5

1.6.1.1.2 Nursing problems 6

1.6.1.1.3 Problem-solving 6

1.6.1.2 Central theoretical argument 7

1.6.1.3 Conceptual definitions 7

1.6.1.3.1 Vital signs 7

1.6.1.3.2 Patient observation 7

1.6.1.3.3 Enrolled Nurse 8

1.6.1.3.4 Enrolled Nursing Auxiliary 8

1.6.1.3.5 Record keeping 8

1.6.1.3.6 Interpretation 9

1.6.1.3.7 Patient deterioration 9

1.6.1.3.8 Private hospital 9

1.7 RESEARCH DESIGN 9

1.7.1 Design 9

1.7.2 Research method 10

1.7.2.1 Setting 10

1.7.2.2 Population 10

1.7.2.3 Sampling 11

1.7.2.4 Data collection 11

1.7.2.4.1 Selecting and formulating questions for the theoretical knowledge questionnaire 11

1.7.2.4.2 Pre-testing of the questionnaire 13

1.7.2.4.3 Recruitment 14

1.7.2.4.4 Setting 14

1.7.2.4.5 Time frame 15

1.7.2.4.6 Mediator 15

1.7.2.4.7 Confidentiality 16

1.7.2.4.8 Data capturing 16

1.7.2.4.9 Data analysis 17

1.8 RIGOUR 17

1.8.1 Validity 17

1.8.1.1 Internal validity 17

1.8.1.2 External validity 18

1.8.1.2.1 Validity of data collection instruments 18

1.8.2 Reliability 19

1.8.2.1 Reliability of the data collection instruments 19

1.8.2.2 Stability 20

1.8.2.2.1 Internal consistency 20

1.9 ETHICAL CONSIDERATIONS 20

1.9.1 The principle of beneficence 20

1.9.1.1 Risks and precautions 21

1.9.1.2 Prevention of potential discomfort or harm 21

1.9.1.3 Benefits 22

1.9.2 The principle of justice 22

1.9.2.1 Privacy and confidentiality 22

1.9.2.2 Choice 23

1.9.2.3 Fair selection and treatment 23

1.9.3 The principle of respect 23

1.9.3.1 Informed consent 23

1.9.4 Permission 24

1.9.5 Recruitment 24

1.9.6 Incentives and/or the remuneration of respondents 25

1.9.7 Data storage 25

1.10 SIGNIFICANCE OF THE STUDY 25

1.11 CHAPTER LAYOUT 26

1.12 CHAPTER SUMMARY 26

CHAPTER 2 COMPREHENSIVE REVIEW OF LITERATURE 27

2.1 INTRODUCTION 27

2.2 SEARCH STRATEGY 28

2.2.1 Inclusion criteria 28

2.2.2 Exclusion criteria 29

2.3 SOUTH AFRICAN LEGISLATION AND REGULATIONS AFFECTING NURSING PRACTICE OF VITAL SIGNS MONITORING 30

2.4 THE IMPORTANCE OF VITAL SIGNS' ASSESSMENTS IN CLINICAL PRACTICE 32

2.5 WHAT ARE VITAL SIGNS? 33

2.5.1 Blood pressure 35

2.5.1.1 Factors affecting blood pressure 35

2.5.1.2 Accepted normal ranges for blood pressure measurement 36

2.5.1.3 Method of assessment 37

2.5.1.4 Equipment 37

2.5.1.4.1 Cuff selection 37

2.5.1.5 Bodily responses affecting blood pressure 38

2.5.2 Temperature 39

2.5.2.1 Factors affecting body temperature 39

2.5.2.2 Unit of measurement 39
2.5.2.3 Accepted normal ranges 39
2.5.2.4 Assessment of body temperature 40
2.5.2.5 Equipment 40
2.5.2.6 Bodily responses related to body temperature 42
2.5.3 Pulse rate 43
2.5.3.1 Factors affecting pulse rate 43
2.5.3.2 Accepted normal ranges 45
2.5.3.3 Assessment of a pulse rate 45
2.5.3.4 Equipment 46
2.5.3.5 Bodily responses related to pulse rate 46
2.5.4 Respiratory rate 47
2.5.4.1 Factors affecting the respiratory rate of patients 47
2.5.4.2 Method for assessing respiratory rate 48
2.5.4.3 Equipment 48
2.5.4.4 Bodily responses affecting respiratory rate 48
2.5.5 Oxygen saturation 50
2.5.5.1 Factors affecting the oxygen saturation of patients 51
2.5.5.2 Accepted normal ranges of oxygen saturation 51
2.5.5.3 Method of assessment 51
2.6 APPROVED VITAL SIGNS RANGES FOR ADULT PATIENTS 52
2.7 RECORDING OF VITAL SIGNS 53
2.8 THE NEED FOR KNOWLEDGE IN PRACTICE 56

2.9 CLINICAL JUDGEMENT, CRITICAL THINKING AND DECISION-MAKING IN NURSING PRACTICE 57

2.10 CHAPTER SUMMARY 59

CHAPTER 3 RESEARCH DESIGN AND METHOD 60

3.1 INTRODUCTION 60

3.2 RESEARCH DESIGN 60

3.2.1 Quantitative research design 60

3.2.2 Descriptive research design 61

3.3 RESEARCH METHOD 61

3.3.1 Selection of respondents 61

3.3.1.1 Population 61

3.3.1.2 Sampling 62

3.4 INSTRUMENTATION 62

3.4.1 Questionnaire design 63

3.4.1.1 Setting of questions 64

3.4.1.2 Technical layout of the questionnaire 64

3.4.2 Pre-testing of the questionnaire 65

3.4.3 Validity of the data collection instrument 66

3.4.3.1 Content validity 66

3.4.3.2 Face validity 66

3.4.4 Reliability of the data-collection instrument 67

3.4.4.1 Internal consistency of the questionnaire 67

3.5 PERMISSION FROM HOSPITAL A TO CONDUCT RESEARCH 68

3.6 RECRUITMENT OF RESPONDENTS 68

3.7 DATA COLLECTION 68

3.7.1 Setting 69

3.7.2 Time frame 69

3.8 DATA CAPTURING 70

3.9 DATA STORAGE 71

3.10 DATA ANALYSIS 71

3.10.1 Analysis of quantitative data 71

3.10.1.1 Levels of measurement 72

3.10.1.2 Entering the data 72

3.10.1.3 Cleaning the data 72

3.10.1.4 Transforming the data 73

3.10.1.5 Backup copies 73

3.10.2 Descriptive statistics 73

3.10.2.1 Use of graphics and tables 73

3.10.3 Interpretation of quantitative data 73

3.11 CHAPTER SUMMARY 74

CHAPTER 4 RESULTS 75

4.1 INTRODUCTION 75

4.2 QUESTIONNAIRE DEVELOPMENT 75

4.2.1 Results of the self-administered questionnaire 76

4.2.1.1 Demographic data 77

4.2.1.2 Blood pressure 79

4.2.1.3 Body temperature 82

4.2.1.4 Pulse rate 85

4.2.1.5 Respiratory rate and oxygen saturation 88

4.3 THE ACCURACY OF RECORDINGS BY THE ENs AND ENAs WORKING AT HOSPITAL A IN KWAZULU-NATAL. 92

4.4 THE ABILITY OF THE ENs AND ENAs WORKING AT HOSPITAL A IN KWAZULU-NATAL TO ACCURATELY IDENTIFY ABNORMALITIES..... 93

4.5 CHAPTER SUMMARY 94

CHAPTER 5 DISCUSSION OF RESULTS..... 95

5.1 INTRODUCTION 95

5.2 RESULTS..... 95

5.2.1 Demographic data 95

5.2.1.1 Nursing category 95

5.2.1.2 Age..... 96

5.2.1.3 Years of experience..... 97

5.2.1.4 Employment status 97

5.2.2 Blood pressure 98

5.2.3 Body temperature 100

5.2.4 Pulse rate 101

5.2.5 Respiratory rate and oxygen saturation 105

5.3 SUMMARY OF FINDINGS RELATED TO THE KNOWLEDGE OF VITAL SIGNS 108

5.4 THE QUALITY OF DOCUMENTATION COMPLETED BY THE ENs AND ENAs..... 108

5.5 ACCURACY OF THE INTERPRETATION OF VITAL SIGNS 109

5.6 CHAPTER SUMMARY 110

CHAPTER 6 EVALUATION OF THE RESEARCH STUDY, LIMITATIONS AND RECOMMENDATIONS FOR RESEARCH, EDUCATION AND PRACTICE 111

6.1 INTRODUCTION 111

6.2 EVALUATION OF THE STUDY 111

6.2.1 Chapter 1: Overview of the research study 111

6.2.2 Chapter 2: Comprehensive review of literature 111

6.2.3 Chapter 3: Research design and method 112

6.2.4 Chapters 4 and 5: Results and discussion of results 112

6.2.4.1 Demographic data 112

6.2.4.2 What are the theoretical knowledge of ENs and ENAs working at a private hospital in KwaZulu-Natal concerning vital signs? 113

6.2.4.2.1 Blood pressure 113

6.2.4.2.2 Body temperature 114

6.2.4.2.3 Pulse rate 114

6.2.4.2.4 Respiratory rate and oxygen saturation 115

6.2.4.3 How are vital signs findings documented by the ENs and ENAs working at Hospital A, in KwaZulu-Natal? 115

6.2.4.4 Do the ENs and ENAs working at Hospital A in KwaZulu-Natal interpret vital signs data accurately? 116

6.3 LIMITATIONS OF THE RESEARCH STUDY 117

6.4 RECOMMENDATIONS OF THE RESEARCH STUDY 117

6.4.1 Recommendations for practice 117

6.4.2 Recommendations for nursing education 118

6.4.3 Recommendations for nursing research 118

6.5 PERSONAL REFLECTION 118

6.6 CONCLUSION OF THE RESEARCH STUDY 119

REFERENCE LIST 120

LIST OF ANNEXURES

ANNEXURE A1: QUESTIONNAIRE (ENGLISH) 132

ANNEXURE A2: QUESTIONNAIRE (AFRIKAANS) 143

ANNEXURE A3: QUESTIONNAIRE (ISIZULU) 154

ANNEXURE A4: ADULT EARLY WARNING OBSERVATION CHART 165

ANNEXURE A5: IMPLEMENTATION RECORD 166

ANNEXURE B1: INFORMATION BROCHURE (ENGLISH) 167

ANNEXURE B2: INFORMATION BROCHURE (AFRIKAANS) 172

ANNEXURE B3: INFROMATION BROCHURE (ISIZULU) 177

ANNEXURE C: CONFIDENTIALITY UNDERTAKING 182

ANNEXURE D: NON-DISCLOSURE UNDERTAKING 185

ANNEXURE E: ETHICS APPROVAL LETTER 191

ANNEXURE F: FORMAL LETTER REQUESTING PERMISSION TO UNDERTAKE RESEARCH 192

ANNEXURE G: ORGANISATIONAL CONSENT FORM 194

ANNEXURE H: RECORDING AND INTERPRETATION CHECKLIST 195

LIST OF TABLES

Table 2-1: A comparison of the description of regulations of the scope of practice (R2598) relating to vital signs monitoring of individuals who are registered or enrolled under the Nursing Act No 50 of 1978 (SANC, 1978)..... 31

Table 2-2: Ethical considerations related to the monitoring of vital signs (Geyer et al., 2009:380)..... 32

Table 2-3: Factors affecting blood pressure (Baillie, 2014:1661; Brooker & Waugh, 2007:382; Perry et al., 2014:102; Treas & Wilkinson, 2014:433)..... 36

Table 2-4: Cuff size when using an electronic monitor to measure blood pressure (Potter et al., 2016:12; Perry et al., 2014:125)..... 38

Table 2-5: Advantages and disadvantages of using an infrared thermometer (Koutoukidis et al., 2017:403; Perry et al., 2015:101)..... 42

Table 2-6: Bodily responses affecting body temperature (Geyer et al., 2009:380; Waugh & Grant, 2010:461)..... 42

Table 2-7: Factors affecting pulse rate (Brooker & Waugh, 2007:378; Elliot & Coventry, 2012:621; Lawson & Peate, 2009:85; Treas & Wilkinson, 2014:426)..... 44

Table 2-8: Rates, rhythms and the potential causes of abnormalities associated with the respiratory system (Baillie, 2014:154; Beachey, 2013:180, 212; Treas & Wilkinson, 2014:432)..... 49

Table 2-9: Vital signs range for adult patients (Hospital A, 2016:13)..... 52

Table 4-1: Distribution of age, experience and employment status per nursing category..... 77

Table 4-2: Percentage of responses to questions on definitions of blood pressure and adult values and ranges..... 80

Table 4-3: Percentage of responses to the questions on systolic and diastolic blood pressure..... 81

Table 4-4: Percentage of responses to the questions on selecting the correct cuff size during a blood pressure measurement 82

Table 4-5: Responses to questions on the definition of body temperature, hypothermia, rigor and the normal adult ranges for body temperature 83

Table 4-6: Responses to questions on nursing actions to reduce pyrexia 84

Table 4-7: Responses to the questions when using an infrared thermometer to measure body temperature 85

Table 4-8: Responses to questions on the measurement of a pulse rate 86

Table 4-9: Responses to questions on the factors affecting a pulse rate 87

Table 4-10: Responses to questions on aspects of importance during the measurement of a pulse rate 87

Table 4-11: Responses to questions on aspects of importance during the measurement of respiratory rate and oxygen saturation 89

Table 4-12: Responses to the question on criteria to observe for during the measurement of respiratory rate 90

Table 4-13: Responses on measurement times 90

Table 4-14: Actions to prevent changes in the breathing pattern of patients during a measurement of their respiratory rate 91

Table 4-15: Responses on factors affecting respiration 91

Table 4-16: Responses to questions on the measurement of oxygen saturation 91

LIST OF FIGURES

Figure 2-1: Summary of the search strategy for the literature review 29

Figure 2-2: Indications for monitoring vital signs (Koutoukidis et al., 2013:302; Rebeiro et al., 2013:35) 34

Figure 2-3: Phillips SureSigns VS2^{+} vital signs monitor (Phillips, 2011:1-1) 37

Figure 2-4: EeziTemp non-contact infrared thermometer (EeziTemp, 2015:4) 41

Figure 2-5: Measurement technique using an infrared thermometer (EeziTemp, 2015:11) 41

Figure 2-6: Measurement technique for a radial pulse (Kowalak, 2009:15) 46

Figure 2-7: Reusable adult oxygen saturation monitor for Phillips Sure Sign monitors (Phillips, 2017) 52

Figure 2-8: Actions required for vital signs falling in the orange zone (Hospital A, 2016) 54

Figure 2-9: Actions required for vital signs falling in the red zone (Hospital A, 2016) 55

Figure 4-1: Mean percentage achieved for each age group per nursing category 78

Figure 4-2: Mean percentage achieved per category based on years of nursing experience 78

Figure 4-3: Percentage per nursing category based on employment status 79

Figure 4-4: Correct documentation percentage per nursing category 92

Figure 4-5: Percentage of respondents per nursing category 93

Figure 4-6: Additional information recorded per nursing category 93

CHAPTER 1 OVERVIEW OF THE STUDY

1.1 INTRODUCTION

Within a healthcare context, the traditional role of nurses involves the monitoring of the condition of patients during their stay in hospital. This involves the monitoring of vital signs according to the policy or procedure of hospitals. Van Kuiken and Huth (2013:216) describe vital signs as an important physiological indicator of how well the body is functioning at a particular time and include temperature, respiratory rate, heart rate (pulse) and blood pressure (BP). Studies now also include pulse oximetry as a vital sign, which together with respiratory rate, can provide nurses with vital data prior to in-hospital cardiac arrest (Bianchi *et al.*, 2013:37; Bleyer *et al.*, 2011:1387; Elliot & Coventry, 2012:621).

Andersen *et al.* (2016:114) found that 59.4% of the patients forming part of their study presented at least one abnormal vital sign prior to cardiac arrest with 13.4% presenting severely abnormal vital signs. This study further identified that the more abnormal vital signs are present, the higher the mortality rate (Andersen *et al*., 2016:114).

Nurses play, therefore, an important role in the early identification of risks. The accurate interpretation of vital signs and obvious signs of deterioration can be missed if nurses view this task as routine rather than meaningful (Wheatley, 2005:115 &121).

Vital signs are a crucial indicator of changes and deterioration in the condition of patients. Therefore understanding and accurately recording and interpreting vital signs are of the utmost importance.

1.2 BACKGROUND

According to Ansell *et al.* (2015:886), patient safety and care relies on the skills of nurses assessing patients. A fundamental part of this assessment involves vital signs monitoring. A study conducted by Osborne *et al.* (2015:960) indicated that Australian nurses generally collect and report on data related to extended patient deterioration – they follow the hospital policy rather than focusing on the specific needs of patients. Nurses also fail to trust their own intuition and skills. Another study conducted amongst Australian nurses showed that nurses are responsible for the identification of signs of deterioration but are failing to identify and respond to these signs (Considine & Currey, 2014:304).

Ansell e*t al*. (2015:888) found that the measuring of vital signs are increasingly influenced by the use of electronic equipment as noticed in a study done in New Zealand where nurses do

not physically come into contact with patients when performing pulse and BP checks. Without making physical contact, one can miss important information, such as a cold, clammy skin or an irregular pulse. Nurses are also not aware of the limitations of monitoring equipment. These machines are not able to determine the regularity and volume of pulse and respiration measurements (Hogan, 2006:491). Hogan (2006:491) further accentuates that nurses are increasingly dependent on electronic equipment to perform tasks for them and they are unsure when they should perform a task themselves without the support of this equipment. Affective and cognitive skills are, therefore, of critical importance when vital signs are measured.

Burchill *et al.* (2015:254) showed that routine monitoring of vital signs in American hospitals are the norm when in fact, patients should be individually assessed − based on their condition. Wheatley (2005:121) concurs by mentioning that British nurses are checking vital signs merely as a routine task and that vital information can be missed through this practice.

Leonard and Kyriacos (2015:16) state that a delay in response to deterioration in vital signs can severely affect quality care and patient safety. A Finnish study done by Nurmi *et al.* (2005:705) confirm this by showing that 54% of patients suffering cardiac arrest while admitted had abnormal vital signs documented in the 24 hours prior to the incident. This indicates that nurses either did not respond, responded too late or that their interventions were ineffective (Nurmi *et al*., 2005:705). Boulanger and Toughill (2009:10) agree and confirm the statement made by Wheatley (2005:121) that the monitoring of vital signs is becoming a routine task amongst nurses rather than a method to collect vital information, which can influence the progress and safety of patients on a daily basis. This is of great concern as vital signs are one of the earliest indicators of deterioration in the condition of patients.

Each of the aspects of vital signs (BP, pulse, temperature, respiratory rate and oxygen saturation) is a vital indicator of deterioration and requires prompt action once identified (Griffiths *et al.*, 2015:16). Findings from a study done on nurses in the United Kingdom, identified failure of identifying patient deterioration as a complex issue linked to nurses not doing observations, failing to recognise and report abnormalities and not acting once deterioration was observed (National Patient Safety Agency, 2007:6). One of the contributing factors to this phenomenon was identified as a lack of knowledge and the training of how nurses should monitor vital signs was recommended (National Patient Safety Agency, 2007:6).

The ability of nurses to recognise and respond to signs of deterioration is not a simple one and is influenced by a variety of factors, such as knowledge, experience and the competence of nurses performing these tasks (Tait, 2010:35).

1.3 PROBLEM STATEMENT

Data collected through vital signs monitoring should be the most accurate data reflected on patient documents. Changes in vital signs are one of the first indicators of deterioration in patients admitted to hospitals. The South African Nursing Council (SANC) prescribes the monitoring of vital signs within the scope of all categories of nurses registered with the council (SANC, 1984). However, enrolled nurses (ENs) and enrolled nursing auxiliaries (ENAs) are mostly delegated to perform this task. Felton (2012:27) is of the opinion that the measurement of vital signs adds little value if nurses do not understand the significance and importance thereof.

Odell *et al.* (2009:1992) found that the experience and education of nurses influence their process of recognition, recording, reviewing, reporting and responding during vital signs monitoring. Odell *et al.* (2009:1992) then concludes that a need exists to understand the context within which deterioration is detected and reported on − this will facilitate the development of improved education systems.

If nurses do not record or interpret vital signs accurately or effectively, patients are put at risk and appropriate actions are delayed. Currently, no research findings are available on vital signs knowledge, recording and interpretation within a South-African context and specifically, the private sector. It is, therefore, necessary to determine current knowledge and to investigate and describe the accuracy and effectiveness of vital signs recording and interpretation in the private health care in this context. The results of this study can contribute towards nursing education through the identification of a quality deficit in the clinical skills of nurses working in private healthcare facilities.

1.4 RESEARCH QUESTIONS

A problem related to vital signs monitoring was identified in countries, such as Australia, New Zealand, Finland and the United Kingdom (Felton, 2012:27; Odell *et al*., 2009:1992; Tait, 2010:35). A need, therefore, exists to determine the accuracy and effectiveness of patient observation, vital signs knowledge and the recording and interpretation thereof in a South African private healthcare context. The following research questions were asked:

1. Which questions assess the theoretical knowledge, accuracy of recording and the ability to correctly identify abnormal vital signs of ENs and ENAs working at a private hospital in KwaZulu-Natal, South Africa?
2. What is the theoretical knowledge of ENs and ENAs working at a private hospital in KwaZulu-Natal, South Africa, with regard to vital signs, the documentation of vital signs and the interpretation of vital data?
3. Do ENs and ENAs interpret vital signs findings accurately in a private hospital in KwaZulu-Natal, South Africa?
4. How are vital signs findings documented by ENs and ENAs working in a private hospital in KwaZulu-Natal, South Africa?

1.5 RESEARCH AIMS AND OBJECTIVES

The aims of this study were to determine the theoretical knowledge of ENs and ENAs on vital signs, documentation and interpretation and their ability to accurately record and interpret vital signs. The results from this study can provide an opportunity to positively influence nursing research, education and practice. The following objectives were set:

- To select and formulate questions in a questionnaire to assess the theoretical knowledge, the accuracy of recording and the ability to correctly identify abnormal vital signs of ENs and ENAs working at a private hospital in KwaZulu-Natal, South Africa.
- To explore and describe the theoretical knowledge of ENs and ENAs on vital signs, documentation and interpretation at a private hospital in KwaZulu-Natal, South Africa.
- To evaluate and describe the accuracy of the ENs and ENAs documented vital data at a private hospital in KwaZulu-Natal, South Africa.
- To explore and describe if ENs and ENAs accurately interpret vital data during documentation at a private hospital in KwaZulu-Natal, South Africa.

1.6 RESEARCHER'S ASSUMPTIONS

Grove *et al.* (2013:95) describe research assumptions as beliefs and ideas often embedded in the thought processes and behaviour of individuals. Uncovering research assumptions require introspection and a strong knowledge base of the research area and these assumptions can influence the logic of a study (Brink *et al.*, 2012:27). To form an understanding of the assumptions influencing a study, theoretical and methodological assumptions are discussed in the next section.

1.6.1 Theoretical assumptions

Botma *et al.* (2010:187) describe theoretical assumptions as a reflection of the knowledge of researchers concerning existing theoretical or conceptual frameworks, including models, theories, concepts and definitions related to a study. These theoretical assumptions can influence the formulation of a problem statement, aims and objectives of a study.

The nursing theory developed by Faye Glenn Abdellah in 1960 views nurses as essential to the identification of the unique needs of patients (Alligood, 2014:46). Abdellah viewed nursing as an art, which develops the attitudes, intellectual competencies and technical skills of nurses with which they guide patients towards health and well-being (Alligood, 2014:46). One of the 21 problems identified by Abdellah in this theory is the ability to identify the body's physiological response to disease. In this case, physiological changes are presented as abnormal vital signs (Alligood, 2014:47). Within this theory of Abdellah, nurses use their skills of observation and apply knowledge to solve problems related to the needs of patients.

Important aspects related to the theoretical assumptions underpinning this particular study involve the three major concepts supporting Abdellah's theory of patient-centred nursing care, the central theoretical argument and conceptual definitions of the study discussed below.

1.6.1.1 Major concepts underpinning Abdellah's theory of patient centred nursing care

Within the theory of Abdellah, nurses use their problem-solving skills by applying knowledge and skills essential to the accurate identification of physiological changes indicating patient deterioration.

The three major theoretical statements of this theory involve health, nursing problems and problem-solving. Within this approach, nurses use their problem-solving skills to resolve nursing problems related to the health and well-being of patients (Alligood, 2014:46). A description of these concepts follows.

1.6.1.1.1 Health

The researcher views nursing as an art where patients receive care from knowledgeable, skilful individuals. These individuals remain updated by continual training in order to provide up to date, high quality patient care. The researcher supports the definition of health prescribed by the World Health Organization (WHO) as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 2010).

Within this study, preventing patient deterioration through the early identification of physiological changes demonstrated by vital signs, assists nurses to achieve goals aimed at resolving nursing problems in order to restore the health of patients.

1.6.1.1.2 Nursing problems

Abdellah's theory of needs identifies that human behaviour is driven by motivation and assumes that when a need is not met, it negatively impacts on the health and well-being of a patient (Alligood, 2014:46). Abdellah further determines that nursing problems are problems faced by the patient (such as physiological deterioration), requiring nursing care or intervention through nursing assessment and intervention (Kim & Kollak, 2006:20).

The health needs of patients can present as obvious signs of deterioration, such as cyanosis and dyspnoea, or less obvious signs requiring actual assessment, such as hypotension or tachycardia, only identified as part of aspects measured during vital signs' assessments. This study focused on the knowledge of nurses related to the measurement of vital signs, accurate recording and correct identification of signs of patient deterioration during the measurement of vital signs. Early identification of nursing problems can significantly affect patient outcomes.

The measuring of vital signs forms an integral part of the initial patient assessment by providing baseline data and allowing for the identification of actual and potential nursing problems requiring intervention and care during the admission of patients to a hospital.

ENs and ENAs are responsible for the measurement of vital signs and it is expected of them to accurately record the data on the hospital-specific adult early warning observation chart (Annexure A4) and to make use of their existing knowledge of vital signs (including concepts, normal values, important information related to the use of equipment, the document used and the process to follow when abnormalities are identified).

1.6.1.1.3 Problem-solving

The needs theory of Abdellah views problem-solving as a process, whereby patient problems are identified through accurate assessment allowing nurses to formulate appropriate nursing interventions aimed at addressing the needs of the patient (Kim & Kollak, 2006:21).

Within this study, when a problem-solving approach within nursing is followed, nurses are guided by various activities within the nursing practice and develop critical thinking skills as the care provided to patients is based on thorough assessments and an accurate

interpretation of vital data presented to them. The provision of high quality patient care depends on the ability of nurses to identify and solve the individual needs of patients. The needs of patients can be met by the following a problem-solving approach.

1.6.1.2 Central theoretical argument

Determining the knowledge of ENs and ENAs with regard to vital signs concepts, normal values and equipment as well as determining the ability of ENs and ENAs to correctly record and accurately interpret vital data at a private hospital in KwaZulu-Natal, South Africa, were important to the researcher as this information allows for the formulation of additional training guidelines to enhance the abilities of nurses tasked with one of the most vital roles to improve quality patient care.

1.6.1.3 Conceptual definitions

In this research study, the following concepts are defined and applied:

1.6.1.3.1 Vital signs

The *Oxford Dictionary of Nursing* (2008:532) defines vital signs as the signs showing life in a patient and includes measurable body temperature, BP, heart rate and respiratory rate and oxygen saturation. This definition is confirmed by Carter (2008:290) who describes these as important measurements presenting essential information reflecting the current health status of a patient and includes the measurement of BP, respiratory rate, body temperature and heart rate (pulse).

In this study, vital signs refer to the measurement of BP, pulse, respiratory rate, body temperature and oxygen saturation of patients performed by ENs or ENAs while monitoring the well-being of patients admitted to a healthcare facility.

1.6.1.3.2 Patient observation

The *Oxford Dictionary of Nursing* (2008:345) describes patient observation as a systematic data collection process monitoring the condition of patients and includes the monitoring of vital signs. This data collected must be analysed to determine the care required and must be clearly documented to prevent misinterpretations (Oxford Dictionary of Nursing, 2008:345).

For the purpose of this study, patient observation refers to the monitoring, recording and interpretation of the vital signs of patients when they are admitted to the private hospital selected for the study.

1.6.1.3.3 Enrolled Nurse

ENs can be defined as nurses who have completed a practical nursing programme and are licensed by the council to provide routine patient care under the direction of professional nurses (PN) or physicians responsible for care of patients (SANC, 1984).

For this study, ENs are nurses who completed a training programme at an institution recognised by the SANC and who are currently registered with the council working within their scope of practice as set out in Regulation 2598 of the SANC (SANC, 1984).

1.6.1.3.4 Enrolled Nursing Auxiliary

ENAs can be defined as nurses who have completed an appropriate nursing programme and who are currently licensed under the SANC. They are responsible for the meeting of the needs and comforts of patients while working within their scope of practice (SANC, 1984).

For this research study, ENAs are nurses registered with the SANC at the time of the study as enrolled nursing auxiliaries working in their scope of practice set out in Regulation 2598 (SANC, 1984).

1.6.1.3.5 Record keeping

Record keeping is one of the most important responsibilities of nursing and keeping accurate records promotes good nursing practice (Stevens & Pickering, 2010:44). Guidelines for accurate nursing record keeping include legible, factual, comprehensive and current patient information recorded in chronological order using permanent ink signed by nurse practitioners recorded only on original documents (Stevens & Pickering, 2010:45).

The SANC prescribes standards for nursing practice specifying that quality nursing practice is based on timeous, accurate and complete/comprehensive record keeping (SANC, 1998:4). In the Draft Charter for Nursing Practice, the SANC further emphasises the importance of documenting information in a meaningful manner to improve quality care, to record data for assessment and intervention and the reporting of information based on an analysis of available data (SANC, 2004:42).

In this study, record keeping refers to the recording done by ENs and ENAs of the vital signs of patients on the hospital-approved adult early warning observation record (Annexure A4) and the recording of any vital signs related to abnormalities and nursing interventions on the implementation record (Annexure A5).

1.6.1.3.6 Interpretation

Interpretation is defined by the *Free Dictionary* (2017) as the act of demonstrating an understanding or explaining information or data.

In this study, nurses participating in the study were evaluated on their ability to demonstrate and show an understanding by interpreting the vital signs of patients, to identify abnormalities, to document and implement actions when abnormalities are noted.

1.6.1.3.7 Patient deterioration

According to a study done by Lavoie *et al.* (2016:74), patient deterioration is perceived as physiological deterioration, evolving over a period of time presenting specific symptoms with patients worsening towards a critical condition. Within this study, patient deterioration refers to the physical manifestation of deterioration of the condition of patients through changes in their vital signs.

1.6.1.3.8 Private hospital

The *Oxford Online Dictionary* (2016) defines a private hospital as an institution treating only privately paying patients and not funded by the state or a public body. These institutions provide healthcare services in order to generate a profit.

A private hospital in this scenario is a hospital functioning privately without state funding providing medical, surgical, obstetric, neonatal intensive, critical care units, high care units, paediatric, emergency centre, general care and a day clinic for patients with a medical aid or paying cash for services required.

1.7 RESEARCH DESIGN

According to Grove *et al*. (2013:354), a research design maximises a study to possibilities of collecting accurate responses to set objectives and research questions. The design should be appropriate to the purpose selected, feasible with regard to realistic constraints and effective in reducing threats to the design validity (Grove *et al.*, 2013:354).

1.7.1 Design

The research followed a quantitative, descriptive design and was non-experimental in nature with no manipulation of any variables. The research was cross-sectional in nature as data were collected from a specific sample during a week in November 2016. The aim of implementing this design was to formulate a comprehensive description and understanding of the existing knowledge of the ENs and ENAs concerning vital signs, the accuracy of their

recording and their ability to interpret the findings presented to them in a scenario. The respondents were asked to complete a self-administered questionnaire (Annexure A1, A2 & A3) testing their subject matter knowledge of vital signs according to the basic nursing procedures for the assessment of vital signs, the accuracy of their recording using the hospital-specific adult early warning observation chart (Annexure A4) and their ability to correctly identify and record abnormalities presented in a scenario on the implementation record provided (Annexure A5).

1.7.2 Research method

The research method provides a brief explanation of the setting in which the study took place – the population, sampling, data collection, data capturing, data analysis as well as the role of the researcher.

1.7.2.1 Setting

The research study took place at a private hospital with 186 beds situated in KwaZulu-Natal. The organisational policy on research prescribes that the hospital group and the name of the hospital may not be published. The research study refers, therefore, to the hospital as Hospital A. In 2015, the average occupancy of Hospital A was 82% and for 2017 it was 78%. Hospital A aims to meet the needs of the community with a 36-bed general ward, a 42-bed medical ward, a 36-bed surgical ward, a 24-bed obstetric unit, a 12 bed-high care and critical care unit, a 4-bed neonatal intensive care, a 8-bed paediatric unit, a 24-bed day clinic, 4 operation theatres and an emergency centre. The patients admitted to Hospital A are males and females and the majority of the patients are members of a medical aid scheme.

In this setting, the vital signs of all the admitted patients are monitored routinely every four hours unless the condition or treatment of patients specifically indicates more frequent measurements to be done. All vital data measurements in the adult wards are recorded on the adult early warning observation chart (Annexure A4) according to the basic procedure of hospitals on vital signs monitoring.

1.7.2.2 Population

The population selected for the study consisted of all the ENs (N=27) and ENAs (N=47) permanently appointed at Hospital A as well as all the part-time ENs (N=6) and ENAs (N=9) registered with the agency. These specific categories of nurses were selected for the study as they are predominantly responsible for the measurement, recording and interpretation of vital signs at a hospital.

1.7.2.3 Sampling

Brink *et al*. (2012:132) describe sampling as a way of optimising the use of resources in the investigation of an area of interest.

The researcher invited the entire population to participate in the study due to the relatively small size of the population (N=89). Consideration was, however, given to certain inclusion and exclusion criteria.

Inclusion criteria

Inclusion criteria can be described as elements uniquely attributed to members of a population distinguishing certain individuals from others (Brink *et al*., 2012:131). For this study, the respondents selected for inclusion were:

- ENs and ENAs working at Hospital A in the general, medical and surgical wards, day clinic and obstetric departments at the time of the study (permanent and part-time employees).
- Nurses from all age groups.

Exclusion criteria

Brink *et al*. (2012:131) describe exclusion criteria as elements specifically excluding respondents from a study. For this study, the following exclusion criterion was identified:

- Nurses working in wards not using the adult early warning observation chart to record vital data in the critical care unit, high care unit, emergency centre, paediatric and neonatal intensive care unit.

1.7.2.4 Data collection

To accurately measure the knowledge of ENs and ENAs while monitoring vital signs, the researcher selected and formulated questions to test the theoretical knowledge using a questionnaire (Annexure A).

1.7.2.4.1 Selecting and formulating questions for the theoretical knowledge questionnaire

Hospital A forms part of a large private healthcare group and prescribes a comprehensive basic nursing procedure that highlights each step of the assessment of vital signs. The procedure describes step by step the process of measuring vital signs and includes a

description of equipment used, such as an electronic BP monitor and an infrared thermometer as well as the accepted normal values.

When selecting and formulating questions for the questionnaire to evaluate the theoretical applied knowledge of the respondents, the researcher consulted the textbooks used during procedural development. This was done in an attempt to ensure fairness. These textbooks include: Lippincott's *Basic Nursing Procedures* (Kowalak, 2009), *Basic Nursing: Essentials for Practice* (Potter & Perry, 2003), *Thelan's Critical Care Nursing* (Urden *et al.*, 2002) and *Ross and Wilson's Anatomy and Physiology in Health and Illness* (Waugh & Grant, 2003, 2010).

The aim of the questionnaire was to test the theoretical applied knowledge of ENs and ENAs working in general, medical and surgical wards, the day clinic and obstetric department of Hospital A.

A clear title aims at introducing the topic selected for the study and is used to add an element of credibility, as described by Wagner *et al.* (2012:213). The questionnaire provides clear instructions on completion and an example is provided to avoid any confusion.

The questionnaire consists of 41 multiple choice questions and one question on practical application. The multiple-choice questions were formulated in such a way to ensure consistency by providing four potential answers for each question. However, each question accommodates only one correct answer. The questionnaire is divided into seven sections as discussed below:

- *Section one,* consisting of four items, contains questions with regard to relevant demographic data and age, highest qualification obtained, years of experience and employment status are included. No private or confidential information of the respondents were obtained in the questionnaire to ensure anonymity of all the respondents throughout the research study.

- *Section two to six,* consisting of 37 items, focus on questions related to each individual component of the measuring of vital signs, namely BP, body temperature, heart rate (pulse), respiratory rate and oxygen saturation.

- *Section seven* presents a practical scenario. The respondents were requested to complete the attached early warning observation chart (Annexure A4) familiar to them and to record any actions or interventions on the implementation record (Annexure A5). A practical scenario was included to determine their ability to accurately record and

interpret vital signs. Only questions relevant to reaching the aims of this particular study were included. Only closed-ended questions were used. This provided the researcher with more consistent information − potentially easier to analyse statistically (Wagner *et al*., 2012:109).

The formulation of each question is clear and unambiguous, and the questions were asked in a logical order. During the selection and formulation of questions for the questionnaire, it was administered to six PNs permanently employed at different departments from Hospital A. Each of these respondents were also presented with an information brochure (Annexure B1) explaining the aim, purpose and other relevant information pertaining to the study. The researcher was available to answer any questions and address any concerns. Each of the respondents was timed to determine the average duration of completing the questionnaire. It was determined that the questionnaire took approximately 25 – 35 minutes to complete. Feedback was given on the type of questions, format of the questionnaire and difficulty level. The pre-testing was done to identify confusing, ambiguous or difficult to understand questions (Botma *et al.,* 2010:137).

The English questionnaire (Annexure A1) was forwarded to experts (the supervisor, co-supervisor and the statistician) for quality control purposes prior to translating the questionnaire into Afrikaans (Annexure A2) and isiZulu (Annexure A3). The self-administered questionnaire was also presented to a PN with an honours degree in critical care to evaluate the overall suitability for use of this instrument.

1.7.2.4.2 Pre-testing of the questionnaire

According to Botma *et al.* (2010:137), the pre-testing of a questionnaire is important. An untested questionnaire can potentially yield incorrect, irrelevant or unnecessary information (Botma *et al.,* 2010:137).

During the pre-testing of the questionnaire, six of the respondents meeting the set sample criteria for the study were selected to participate. Two of the respondents completed the Afrikaans version of the questionnaire (Annexure A2), two completed the isiZulu version of the questionnaire (Annexure A3) and two completed the English version of the questionnaire (Annexure A1). The respondents selected for pre-testing of the questionnaire met the inclusion criteria set by the researcher. The respondents participating in the pre-testing of the questionnaire were not asked to participate during data collection.

When the researcher obtained ethical clearance from the Health Research Ethics Committee (HREC) of the North-West University (NWU) (Annexure E) and permission to conduct the

study at Hospital A (Annexure G), a pre-test was done on nurses from the hospital meeting the inclusion criteria. A total of six nurses were selected to complete the questionnaire. These nurses identified minor mistakes but stated that they found the questionnaire easy to complete and did not perceive any of the questions as ambiguous.

This allowed for correcting any issues prior to the administration of the questionnaire to the actual intended sample (N=89).

1.7.2.4.3 Recruitment

The researcher made use of a mediator to recruit respondents during the week prior to data collection. This was done to prevent any potential bias or coercion. The respondents could execute their rights to self-determination and act autonomously. Each potential respondent received an information brochure (Annexure B).

The information brochure was made available in English (Annexure B1), Afrikaans (Annexure B2) and isiZulu (Annexure B3) to ensure fairness and to enhance understanding by providing information to potential respondents in their first language. The brochure provided potential respondents with a description of the study, the aims and objectives and clearly explained all ethical issues and considerations. They were provided with the contact information of the mediator and the researcher should any questions or queries arise prior to and during data collection.

The respondents were reminded throughout the research process that they were free to withdraw from the study without any consequence to them at any time. The mediator was available throughout the recruitment process.

1.7.2.4.4 Setting

Data were collected at Hospital A. The researcher obtained permission to make use of the training room. The room comfortably seated 12 respondents at any given time, was quiet, provided sufficient lighting and tables and chairs were available to provide a comfortable environment in which the questionnaire was completed. This setting was selected to accommodate the respondents. Collecting data during their lunch time, while on duty at the hospital where they were employed, reduced any discomfort that could have been caused due to travelling.

1.7.2.4.5 Time frame

No time limit was set for the completion of the questionnaire. This was done to avoid any potential risk of undue pressure. The questionnaire was administered over a four day period beginning on the Sunday evening with the night shift. The next session commenced on the Monday during the day shift, followed by one session on the Wednesday day shift and the final session on the Wednesday during the night shift.

The days selected for data collection ensured that all four shifts were able to participate while they were on duty. This reduced a potential risk of information sharing or time to prepare before answering the questionnaire. The researcher obtained permission from Hospital A to conduct research throughout the day. This allowed for a small number of nurses to leave the ward at any given time to prevent a negative impact on the running of the wards.

The researcher provided tea/coffee and juice with scones, muffins and sandwiches as these nurses participated during their lunch time. By providing snacks, the risk of potential harm to any of the respondents was reduced.

1.7.2.4.6 Mediator

The mediator assisting with data collection is a nurse with previous private hospital experience. She was unemployed at the time of the study and resided in Nelspruit. The mediator is registered with the SANC.

Prior to recruitment and data collection, the researcher explained all aspects related to the study to the mediator. This included the purpose, aim and objectives, the content of the questionnaire and the importance of the study. The method of data collection was explained, and the mediator also completed the self-administered questionnaire herself. This was done to provide her with a clear understanding of the format, type of questions and expected duration.

The mediator was provided with accommodation, meals and transport costs for the duration of the study. She was also reimbursed for her transport costs incurred from Nelspruit to Hospital A and back home.

1.7.2.4.7 Confidentiality

According to Botma *et al.* (2010:17), confidentiality involves the right of respondents to choose what information is shared, refusing to share any information and the right that all information shared is kept confidential by the one obtaining it.

Confidentiality was achieved by not asking any questions containing personal information or details from which the respondents could be identified. The respondents also posted their completed questionnaires in a sealed box with an opening placed at the back of the venue. A sealed box prevented individuals from accessing questionnaires when posted by respondents. In addition, the mediator signed a confidentiality undertaking (Annexure C).

1.7.2.4.8 Data capturing

According to Brink *et al*. (2012:178), quantitative data are best analysed by making use of statistics. The researcher captured the data from the self-administered questionnaire in a MS Excel spreadsheet. The completed self-administered questionnaires provided the researcher with quantitative data necessary to answer the research questions. These quantitative results were coded based on the pre-coding done when questions were selected and formulated as part of the questionnaire. Each question was labelled individually.

The data were checked and cleaned to ensure accurate data capturing. The captured results were compared with the answers provided in the questionnaires until the researcher was satisfied that all the data were correctly captured. During this process, any missing or incorrect data were identified while corrections were made to ensure data accuracy. Once all the data were checked and cleaned, the researcher submitted the data for statistical analysis at the Statistical Consultation Department of the NWU. The data were exported to the statistical software program used for analyses by the NWU, namely the "Statistical Package for Social Sciences" (SPSS). The current version (2015) is officially named IBM SPSS statistics (Elliot & Woodward, 2014:4).

Demographic data were captured as a nominal measurement. This data were collected in an effort to identify similar characteristics by grouping individuals together − differentiating between the ENs and the ENAs participating in the study.

To ensure acceptably clean and error-free data, the researcher ran standard validation checks (frequencies, missing values or range of values) as using incorrect or incomplete data can affect the validity of study results (Wagner *et al*., 2012:176).

1.7.2.4.9 Data analysis

Once the data were captured and checked, the data were interpreted and analysed to allow for relevant conclusions (Wagner *et al*., 2012:176). The collected data were statistically analysed in an attempt to answer the research questions. The researcher used descriptive statistics as well as frequency distributions derived from a large amount of data to describe and summarise the information in a clear, manageable and understandable way − numerically and graphically.

1.8 RIGOUR

Rigour in quantitative research is achieved by looking at each step of the research process in an attempt to reduce mistakes and to identify and eliminate weaknesses to ensure accuracy in results (Botma *et al*., 2010:84).

Accurate data were, therefore, collected throughout the research process and measures were introduced to address threats as soon as any were identified. Two components of rigour were adhered to, namely validity and reliability. By ensuring the reliability and validity of the questionnaire used, the researcher was able to enhance the quality of the research process and the final product.

1.8.1 Validity

The validity of a study is based on whether the conclusions of a study can be justified based on the design used and the interpretation of data (Botma *et al*., 2010:174).

1.8.1.1 Internal validity

Boswell and Cannon (2011:148) state that internal validity relates to data collection, the analysis and interpretation of data as well as the selection of the population and sample. The researcher implemented measures to limit and prevent risks to internal validity. These measures included:

- Biological, physiological and emotional processes of the respondents were monitored to prevent any influences on the data, for example, when the respondents came to the training room to complete a questionnaire during their lunch break or influences related to busy wards, personal problems or a fear of failure. Although none of the potential problems listed above were experienced during the data collection phase, measures were in place to address any issues. In the event of any of these potential aspects occurring, the respondents would have been referred to an independent occupational

health nurse to evaluate their condition and provide support in an effort to resolve the distress. The mediator reminded the respondents that participation was voluntary and that they could withdraw at any time without any consequence.

- The instrument was checked by the supervisor, co-supervisor, subject matter experts and the statistician.
- The instrument was tested during a trial run to identify any errors and to allow for correction prior to the actual research taking place.
- Ethical standards were adhered to during the study as discussed in point 1.9.
- Data collection was supervised, and the researcher ensured that all data were recorded accurately.
- Neutrality was maintained by making use of a mediator to explain aspects of the research study to the respondents – no respondent was influenced by the researcher during recruitment.
- Data were submitted to a statistician from the NWU and SPSS was used to ensure data accuracy.
- Confidentiality and anonymity were maintained throughout the study to protect all the respondents (see 1.9.1). The mediator signed a confidentiality undertaking (Annexure C) and the supervisor and co-supervisor together with the researcher signed a non-disclosure undertaking (Annexure D).

1.8.1.2 External validity

External validity refers to the extent the study findings can be generalised to the selected population and sample (Brink *et al.,* 2012:111). As the entire population was invited to participate in the study, the results can be generalised to this population.

1.8.1.2.1 Validity of data collection instruments

Instrument validity is used to determine if an instrument measures what it should measure (Brink *et al*., 2012:165). The researcher implemented measures to ensure the questionnaire measured the items it intended to measure to interpret results meaningfully. Instrument validity was achieved by testing the instrument during a trial run. The following aspects of the validity of the data collection instrument are discussed next.

- **Content validity**

Content validity refers to the representativeness of all the relevant components of the variables selected (Brink *et al*., 2012:166). If any of the components are not measured, researchers cannot achieve the required results. The researcher aimed to address content

validity by ensuring an even distribution of questions related to each of the elements selected for a knowledge assessment, namely BP, pulse rate, body temperature, respiratory rate and oxygen saturation. The components selected for evaluation were based on the textbooks reviewed during the literature review (Chapter 2).

The self-administered questionnaire was presented to the supervisor, co-supervisor, statistician and a PN with an honours degree in critical care to evaluate the overall suitability of the instrument for use. The instrument was also subjected to a pre-test to ensure clear questions and content relevance.

- **Face validity**

Face validity is the weakest and most obvious form of instrument validity as it is based on the intuition of experts. However, face validity is used to assist researchers in determining clarity of content (Brink *et al*., 2012:166). Face validity was determined by presenting the questionnaire to the supervisor, co-supervisor and statistician. During the trial run, the questionnaire was presented to six PNs, permanently employed at Hospital A. To further test the questionnaire for clarity and consistency, it was administered to six nurses meeting the inclusion criteria and this is further discussed under point 3.4.2.

1.8.2 Reliability

According to Grove *et al*. (2013:355), the reliability of a research instrument refers to the ability of the instrument to consistently measure what it sets out to measure.

The more reliable an instrument, the less random errors will be present in the measurement method. A brief explanation of how reliability within the study was achieved is provided in the next section.

1.8.2.1 Reliability of the data collection instruments

The reliability of an instrument refers to the degree to which the instrument can consistently yield results if tested on the same individual over a period of time or if used by two different researchers (Grove *et al*., 2013:1134). The reliability of the instrument could potentially have been influenced as the same tool was used over a period of time due to transfer amongst the respondents. To address this potential issue, the researcher collected data over as short a period of time (four days) as possible by limiting contact amongst the different groups of respondents. The research was conducted with each day and night shift individually to limit contact amongst the groups.

1.8.2.2 Stability

Stability in research refers to the consistency with which the same attribute is measured repeatedly using the same instrument over a period of time (Grove *et al*., 2013:1158). To test the stability of the instrument, respondents participating in the trial run were given the self-administered questionnaire twice within a two hour period (to limit the chance of preparation).

1.8.2.2.1 Internal consistency

To determine internal consistency, the scale function of SPSS was used. The methods most suited to the measurement of internal consistency is Cronbach's alpha or Kuder-Richardson 20 (KR-20). Both these measurements were used to determine the reliability of the research instrument and estimate the degree to which the measuring instrument was internally consistent (Powers & Knapp, 2011:130).

These measurements were used to ensure the internal consistency of a group of items by measuring how well a set of variables measures a single, one-dimensional latent construct in the questionnaire. The researcher aimed to achieve a desirable value of 0.65 or higher but no less than 0.5 or more than 0.9 as these values may indicate a too narrow or too broad focus (Andrew *et al.*, 2011:202).

The KR-20 method was more appropriate to the study as each question of the questionnaire aims to measure the theoretical knowledge of respondents with only one correct answer to each question. All the remaining options available to respondents for each question are incorrect. This measure of internal consistency measured the average correlation from every possible way to split a test in half (Gravetter & Farzano, 2016:488).

1.9 ETHICAL CONSIDERATIONS

Within research, three broad principles are considered to ensure ethical conduct: beneficence, respect for human dignity and justice (Polit & Beck, 2012:152). Ethics are fundamental to good research and require specific attention to detail to ensure every aspect is given careful consideration (Botma *et al*., 2010:20). The three principles are discussed as applicable to this study.

1.9.1 The principle of beneficence

Within the principle of beneficence, the researcher considered risks and precaution, prevention of potential discomfort or harm as well as potential benefits.

1.9.1.1 Risks and precautions

The principle of beneficence refers to the process of ensuring respondents are not put at risk (Suresh, 2014:49). The well-being of respondents was considered throughout the research process with actions put in place to minimise risks. The risks stemming from research could be physical, physiological or emotional in nature and could have resulted in undue stress affecting respondents negatively. Potential risks were identified prior to data collection.

One stressor identified was that the completion of the self-administered questionnaire could have resulted in stress when the respondents felt as if they had to "write a test". Information brochures (Annexure B) was handed to each potential respondent during recruitment to provide them with important information related to the study prior to data collection. The brochure described the aim and objectives of the study as well as the reason for respondents being selected to participate in the study. Respondents could therefore make an informed decision if they decided to participate.

The mediator, who was available throughout recruitment and data collection phases, could identify any potential signs of stress. An occupational health care nurse working at Hospital A was available to assist if any of the respondents required emotional or physical support during the research process.

Respondents might have experienced emotional distress of having to participate in the study during their off-duty time. This was addressed by obtaining permission from Hospital A to conduct the research during their lunch time, while on day or night duty. This reduced potential stress related to travelling costs, time spent away from home and the need to come to work during their off duty time.

1.9.1.2 Prevention of potential discomfort or harm

This principle of beneficence is further described by Botma *et al.* (2010:20) as the right of respondents to be protected from any harm and discomfort. Doing well above all else was identified by Suresh (2014:49) as one of the most important ethical principles forming part of nursing research.

A potential cause of discomfort or harm could have been due to the fear of possible penalty or unfair treatment should the respondent decide to withdraw from the study. Information was provided at the beginning of the study to explain that there were no risks involved should anyone wish to withdraw from the study (Annexure B). This was reinforced by the mediator throughout the research process.

The mediator reminded respondents that their participation was completely voluntary and that they were free to withdraw from the study at any time. She also ensured that all respondents had something to eat and drink during or after completing the questionnaire as they participated during their lunch time.

Finally, the researcher could be contacted by the respondents or by the mediator at any time during recruitment or data collection to address or clarify any issues or concerns.

1.9.1.3 Benefits

The research study offered no direct benefits to the respondents. It did, however, allow the researcher to identify knowledge gaps. The results from this study will contribute towards nursing research, education and practice by identifying deficits in the theoretical knowledge of ENs and ENAs and the accuracy of their recording as well as their ability to correctly interpret vital data while employed at the research hospital.

As the respondents completed the self-administered questionnaire during their lunch break, the researcher provided them with refreshments (scones, muffins and sandwiches with juice, tea and coffee). This was done to ensure that each respondent had something to eat during their lunch break.

1.9.2 The principle of justice

The principle of justice refers to the right of respondents to the maintenance of privacy and confidentiality, fair selection and treatment as well as the right to choose, throughout the research process (Suresh, 2014:49).

1.9.2.1 Privacy and confidentiality

The right to privacy includes the right to autonomy over personal information, a very important aspect during recruitment (Botma *et al*., 2010:13). The potential respondents were informed during recruitment that any information collected from them will remain confidential. The mediator signed a confidentiality undertaking (Annexure C) prior to becoming involved in the data collection process. The supervisor and co-supervisor together with the researcher signed non-disclosure agreements (Annexure D). The respondents were not required to provide any personal information, such as contact details, on the informed consent form or to divulge any identifying information on the questionnaire. This was made very clear to the potential respondents during recruitment. The respondents posted their own completed questionnaire in the sealed post-split box provided at the back of the room.

The anonymity of Hospital A was maintained by blocking out the name of the hospital from all annexures.

1.9.2.2 Choice

Participation in the study was voluntary with no risks of prejudice. The researcher did not force or coerce anyone to participate in the study. The respondents voluntarily signed the consent form (Annexure B) prior to completing the questionnaire. Respondents only signed the consent form (given to them during recruitment by the mediator) once they fully comprehended all aspects related to the study, just before completing the questionnaire.

Respondents were allowed to withdraw from the study at any time without any prejudicial treatment or consequence to them. All potential and participating respondents were treated with respect, courtesy and tact throughout the research process.

1.9.2.3 Fair selection and treatment

To ensure adherence to the principle of justice, the researcher took all possible steps to ensure a fair selection process. All potential respondents were invited to participate in the study during recruitment due to the relatively small sample size. The respondents were selected to participate based on the inclusion and exclusion criteria as described under sampling (1.7.2.3).

The researcher and the mediator ensured that the venue was set up and prepared on time to respect the respondents and the time they sacrificed to participate in the study.

The final ethical principle was that of respect.

1.9.3 The principle of respect

Suresh (2014:50) describes this principle of respect as the right of respondents to make informed decisions as to whether or not they want to participate in a study.

1.9.3.1 Informed consent

All potential respondents received written information during the week prior to data collection. This information brochure (Annexure B), consisted of all the information relevant to the study (purpose, aim, format of data collection as well as expectations regarding participation). The information brochure was also presented to the six PNs during the trial run to assist during the formulation and selection of questions for the questionnaire as well as during the pre-testing of the questionnaire to ensure that it was comprehensive and clear.

The contact details (contact number and email address) of the researcher was available as part of the brochure for respondents if they wanted to clarify any issues or ask any questions. The brochure clearly stated that participation was voluntary and that the respondents may withdraw from the study at any time without any consequence to them. The informed consent forms were separate from the questionnaire to prevent identification of respondents. The mediator co-signed the consent form directly prior to completion of the questionnaire.

The English information brochure (Annexure B1) was translated into Afrikaans (Annexure B2) and isiZulu (Annexure B3). This was done to enhance understanding through the provision of information in the mother tongue of respondents.

Other ethical considerations included permission, recruitment, incentives and/or remuneration of respondents and finally data storage.

1.9.4 Permission

The researcher requested and obtained ethics approval (Annexure E) for the study from the HREC at the NWU.

A formal letter requesting permission to conduct research (Annexure F) at hospital A was submitted in accordance with the organisational policy on the application for conducting research. The organisational head office discussed the research with the relevant parties of Hospital A and consent was given by the nursing manager employed at Hospital A in writing (Annexure G).

1.9.5 Recruitment

Potential respondents were informed by the mediator that they have been invited to participate in the study and that participation was voluntary. The information brochure (Annexure B) was handed out to each of the potential respondents to provide comprehensive information regarding the study and included information on the purpose of the study, the aim and objectives, the research questions asked by the researcher as well as issues relating to anonymity and confidentiality.

The consent form was included in the brochure given to the potential respondents (Annexure B) and was only signed directly prior to the completion of the questionnaire in the presence of the mediator. The signed consent form was then separated from the information brochure and questionnaire to ensure that the respondents could not be identified. The respondents

were reminded throughout the research process that they were free to withdraw from the study without any consequence to them at any time.

1.9.6 Incentives and/or the remuneration of respondents

The respondents did not receive any incentives or remuneration for participating in the study. As they completed the questionnaire during their lunch time, the respondents received light refreshments, such as sandwiches and tea/coffee/juice, to offer physical comfort and to reduce risks of harm from not having anything to eat or drink during their lunch hour.

After the trial run and pre-testing was completed, it was determined that the questionnaire took approximately 25 - 35 minutes to complete. This allowed for enough time following completion of the questionnaire for the respondents to eat the light refreshments before going back to their departments.

1.9.7 Data storage

All the hard copies of data from the research remained locked away in the office of the researcher following data collection and during the data analysis. Only the researcher had access to this data.

The electronic data were stored on a laptop with password protection and safely kept in a locked cupboard. No personal information of the respondents was captured (numbers represented the respondents). A backup of all the electronic data was made on an external drive stored in a safe at the home of the researcher.

The hard copies were submitted to the research focus area: Quality in Nursing and Midwifery within the Faculty of Health Sciences (INSINQ) of the NWU and will be safely stored for a period of five years from the completion of the study.

All research material will be destroyed after five years in accordance with the NWU policy and regulations on data and record management.

1.10 SIGNIFICANCE OF THE STUDY

Nursing continually strives for acceptance as a true profession with its own unique knowledge base generated from experience and practice. The ability of nurses to perform tasks requires specific skills – especially the measurement of vital signs and this involves cognitive, affective and psychomotor aspects. Nurses performing these procedures, need to possess the necessary knowledge, skills and ability to accurately measure, record and

interpret vital signs. If this is not the case in a South African private health care context, what nurses work so hard to achieve may actually not be reached. Putting the lives of patients in danger is directly in contrast to the oath taken by each nurse. It is, therefore, vital to determine whether there is actually a need within private practice requiring intervention from educators and management in order to provide safe, quality patient care.

1.11 CHAPTER LAYOUT

The research study can be outlined as follows:

Chapter 1: Overview of the research study

Chapter 2: Comprehensive review of literature

Chapter 3: Research design and method

Chapter 4: Results

Chapter 5: Discussion of results

Chapter 6: Evaluation of the research study, limitations and recommendations for research, education and practice

1.12 CHAPTER SUMMARY

This research study followed a quantitative, descriptive design aimed at determining the theoretical knowledge as well as the accuracy of the ENs and ENAs while recording and interpreting vital signs at a private hospital in KwaZulu-Natal. The study aimed to adhere to all applicable ethical principles and was conducted in the private healthcare sector.

It was expected of the respondents to complete a self-administered questionnaire consisting of 41 multiple choice questions together with a scenario aimed at testing their ability to accurately record and interpret vital data presented to them.

Chapter 2 will present the literature review.

CHAPTER 2 COMPREHENSIVE REVIEW OF LITERATURE

2.1 INTRODUCTION

While accompanying nurses responsible for the monitoring of vital signs and as part of a hospital-specific quality improvement programme, the researcher became aware of the fact that although all the necessary information is easily accessible, some of the nurses assumed that they possess the necessary theoretical knowledge and did not refer to the information available to them. This confirmed the need to determine the actual theoretical knowledge of the nurses responsible for monitoring vital signs, their ability to accurately record and correctly interpret vital data presented to them. A study by Mok *et al*. (2015a:213) identified a lack of knowledge as one of the barriers preventing detection of clinical deterioration during patient care.

A comprehensive review of literature was done to gain a better understanding of vital signs, its importance in nursing practice and to determine what research findings are available on monitoring vital signs. The literature review provided information of value during the formulation and selection of questions to form part of the questionnaire (Annexure A), by using the references as starting point, from the standard operating procedural guidelines used by Hospital A (Kowalak, 2009; Potter & Perry, 2003; Urden *et al.*, 2002; Waugh & Grant, 2003). The literature review provided the researcher with definitions of key conceptual definitions important for the study, specifically with regard to vital signs as discussed (see 1.6.1.2) (Baillie, 2014:159; Booysen *et al.*, 2015:248; Brooker & Waugh, 2007:377; Geyer *et al.*, 2009:326; Perry *et al.*, 2016:126; Smeltzer *et al.*, 2010:699; Waugh & Grant, 2010:463), body temperature (Booysen *et al*., 2015:248; Brooker & Waugh, 2007:368; Elliot & Coventry, 2012:621; Geyer *et al*., 2009:326; Kowalak, 2009:12; Perry *et al.*, 2014:67; Potter *et al.*, 2016:488), pulse rate (Booysen *et al*., 2015:252; Brooker & Waugh, 2007:377; Elliot & Coventry, 2012:622; Lawson & Peate, 2009:85; Waugh & Grant, 2010:463), respiratory rate (Booysen *et al*., 2015:255; Perry & Potter, 2011:419; Treas & Wilkinson, 2014:431; Waugh & Grant, 2010:464) and oxygen saturation (Baillie, 2014:168; Yoost & Crawford, 2016:299).

The researcher was further able to confirm the normal organisational vital signs ranges for each component discussed in the study (Baillie, 2014:161; Brooker & Waugh, 2007:368; Carter, 2008:297; Grainger, 2013:48; Mok *et al.*, 2015a:98; Perry & Potter, 2011:45; Perry *et al*., 2014:67; Perry *et al*., 2016:487; Treas & Wilkinson, 2014:416; Yoost & Crawford, 2016:289). The use of equipment (Baillie, 2014:154, 168; Brooker & Waugh, 2007:368; Elliot & Coventry, 2012:622; Geyer *et al*., 2009:326; Kowalak, 2009:15; Lawson & Peate, 2009:87;

Perry & Potter, 2011:419; Perry *et al.,* 2014:125; Phillips, 2011:1-1; Potter *et al*., 2016:12, 126; Treas & Wilkinson, 2014:431, 433, 438; Urden *et al*., 2002:616) and important factors affecting vital signs were also reviewed (Baillie, 2014:154; Brooker & Waugh, 2007:378; Elliot & Coventry, 2012:621; Geyer *et al*., 2009:326; Kowalak, 2009:12; Lawson & Peate, 2009:85; Perry *et al*., 2016:67, 126 & 487; Potter *et al*., 2016:488; Perry & Potter, 2011:419; Treas & Wilkinson, 2014:426; Yoost & Crawford, 2016:299).

Data were collected to determine the importance of monitoring vital signs, the need for clinical knowledge and the significance of accurate recording and interpretation of assessed vital data. A description of the identification and review of literature is discussed next.

2.2 SEARCH STRATEGY

To achieve the objectives of this study, the researcher embarked on a review of literature. To ensure a comprehensive review of literature, the researcher searched for relevant and applicable literature online. The online library and database of the NWU were accessed electronically. Databases and "LibGuides" were selected. A search was conducted focusing on the following key words and concepts relevant to the study:

- Vital sign*; blood pressure; pulse; temperature; respiratory rate; heart rate; oxygen saturation; pulse oximetry; deterioration; physiological deterioration; enrolled nurs*; enrolled nursing auxiliary; nurs*; staff nurse; auxiliary nurs*; knowledge; clinical judgement; critical thinking and reasoning.

The comprehensive search was done with regard to peer-reviewed studies and publications. Articles related to the monitoring and interpretation of vital signs, identification of patient deterioration and the importance of knowledge within healthcare systems were selected. A summary of the search strategy is shown in Figure 2-1. Specific inclusion and exclusion criteria were implemented.

2.2.1 Inclusion criteria

The inclusion criteria were based on a relevance to the study. The researcher selected literature sources:

- Relevant to current nursing practice, education and research.
- Specifically focusing on vital signs and the components of vital signs identified for the study.

- Used as references in the policy and standard operating procedural guidelines on assessment of vital signs from Hospital A to ensure fairness and consistency when selecting and formulating questions for use in the questionnaire.

2.2.2 Exclusion criteria

Literature was excluded based on the following criteria:

- Any literature dated prior to 2006.
- Literature focusing on paediatric, geriatric or specific disease profiles.
- Literature focusing on registered or professional nurses (PN) as their scope of practice and training are more comprehensive than that of ENs and ENAs.
- Literature reviewing the effectiveness of vital signs monitoring in specialised units, such as emergency or psychiatric units, as the frequency and method of monitoring differed from general ward vital signs monitoring.
- Literature in other languages than English.

Although the specific literature used for the design and development of the hospital-specific policy and standard operating procedural guidelines on assessing vital signs were consulted, the researcher also consulted other literature sources as referred to in Figure 2-1.

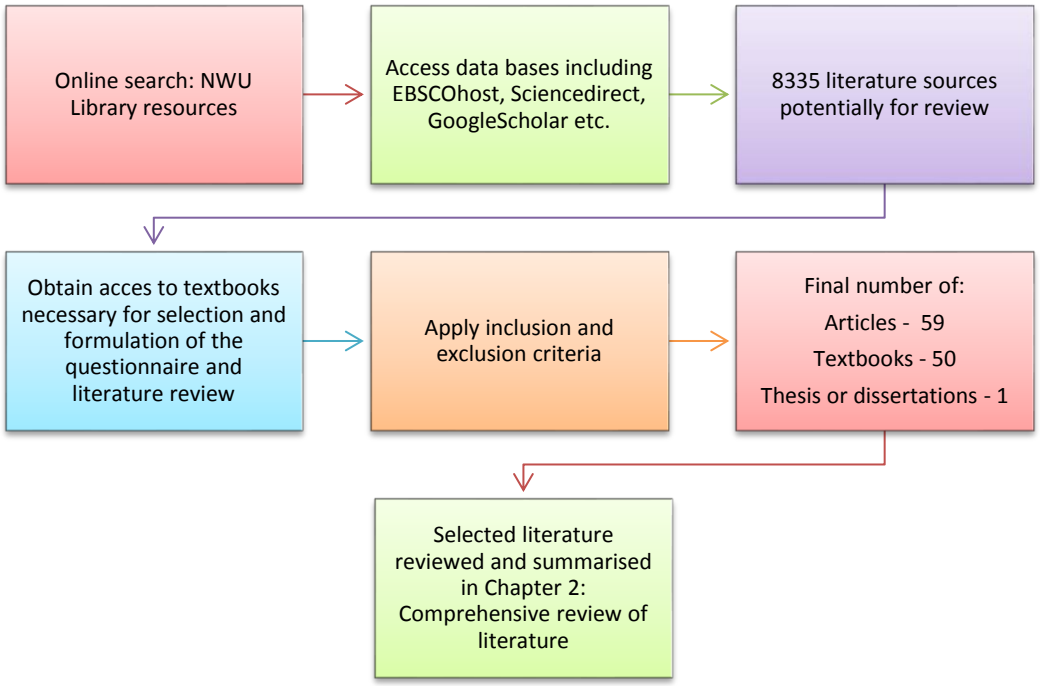

Figure 2-1: Summary of the search strategy for the literature review

Before investigating vital signs and the importance of patient observation, it was important to understand the regulations affecting nursing practice in South Africa − specifically in terms of vital signs monitoring prescribed for each nursing designation. The legislation and regulations affecting nursing practice in terms of vital signs monitoring are discussed in the following section.

2.3 SOUTH AFRICAN LEGISLATION AND REGULATIONS AFFECTING NURSING PRACTICE OF VITAL SIGNS MONITORING

To understand the roles and responsibilities of the various categories of nurses practising in the South African healthcare environment, it was important to firstly look at the governing bodies overseeing nurses and to consider legislation and regulations regulating nursing practice.

The South African Nursing Council (SANC) is an autonomous, financially independent and statutory body operating under the Nursing Act 33 of 2005 (SANC, 2005). The SANC is responsible for the regulation of nursing education and training, monitoring nursing practice and dealing with acts and omissions in terms of their standards.

All practising nurses in South Africa must be registered with the SANC and adhere to the standards set by the council. Individuals who are registered or enrolled at the SANC function under a clearly prescribed scope of practice (SANC, 1984). The regulation was set by the Minister of Health and Welfare on the recommendation of the SANC in terms of Section 45(1)(q) of the Nursing Act 50 of 1978 (SANC, 1984). Responsibilities for vital signs monitoring are prescribed for each category of nurses through the designation of a specific scope of practice reflected in Table 2-1.

All categories of nurses working in South Africa are responsible for the accurate and correct measurement of vital signs and have a responsibility to correctly interpret the data presented to them and to react according to their individual scope of practice. In Hospital A (selected for this study), the ENs and ENAs working in the general, medical and surgical wards, the day clinic and obstetric departments are primarily delegated to perform vital signs monitoring. It is expected of them to accurately and correctly measure, record and interpret abnormalities and to report findings to the PN responsible for patient care.

Table 2-1: A comparison of the description of regulations of the scope of practice (R2598) relating to vital signs monitoring of individuals who are registered or enrolled under the Nursing Act No 50 of 1978 (SANC, 1978).

Chapter 2: The scope of practice of a registered nurse	Chapter 5: The scope of practice of an enrolled nurse	Chapter 6: The scope of practice of an enrolled nursing auxiliary
(c) The treatment and care of and the administration of medicine to a patient, including the monitoring of patient's vital signs and of his reaction to disease conditions, trauma, stress, anxiety, medications and treatment.	(b) Caring for a patient, and executing a nursing care plan for a patient, including the monitoring of vital signs and the observation of reactions to medications and treatment.	(h) The taking of the blood pressure, temperature, pulse and respiration of a patient.

The SANC further prescribes regulations but do not limit the acts or omissions in respect of which the council may take disciplinary steps against a nurse under Section 58(1)(i) of the Nursing Act 33 of 2005 (SANC, 2005).

According to Regulation 767 (updated 1 October 2014 under Chapter two, Section four), the SANC can take disciplinary action if a nurse fails to properly assess, diagnose, treat, care, prescribe, collaborate, refer, coordinate or advocate a patient within the prescribed scope of practice (SANC, 2014).

Chapter 2(5) further identifies the responsibilities of maintaining the health status of a patient under the care of a nurse by (a) assessing the health status of a healthcare user and the responses of the body; (g) monitoring vital parameters, including vital signs of the healthcare user; (h) keeping clear and accurate records of all actions performed on healthcare users (SANC, 2014).

Geyer *et al.* (2009:380) identified, in accordance with the above-mentioned responsibilities, important ethical considerations related to the monitoring of vital signs reflected in Table 2-2:

Table 2-2: Ethical considerations related to the monitoring of vital signs (Geyer *et al.,* 2009:380)

Misconduct	Ethical considerations
Failure to assess vital signs	• Failure to identify changes in condition of patients – changes can be a response to infection. • Misdiagnosis due to an absence of data.
Inaccurate assessment of data – incorrect use of equipment	• Can result in incorrect interventions or treatment plans that adversely affect the health of patients. • Can miss important physiological changes that reflect deterioration.
Dishonesty – estimating respiratory rate	• Incorrect treatment in response to incorrect findings. • Misdiagnosis of serious conditions. • Failure to identify changes in the condition of patients.

Before forming a clear understanding of exactly what vital signs are, one must first determine the importance of vital signs' assessments in clinical practice, specifically in terms of this study.

2.4 THE IMPORTANCE OF VITAL SIGNS' ASSESSMENTS IN CLINICAL PRACTICE

Recognising and acting on clinical deterioration within any healthcare setting are of crucial importance and require knowledge and skills essential in recognising deterioration. Grainger (2013:55) describes the monitoring of body temperature as a routine but essential nursing activity providing essential information together with other clinical observations, such as BP and pulse rate, allowing for the early detection of deterioration.

Assessment of vital signs forms the basis of a nursing process, allowing nurses to identify abnormalities and to determine actual and potential problems which may affect the treatment of patients during their stay in hospital (Brooker & Waugh, 2007:368; Elliot & Coventry, 2012:621; Koutoukidis *et al*., 2013:301; Lawson & Peate, 2009:80; Potter *et al*., 2016:487). A critical part of nursing assessment involves the correct and accurate measurement, recording and interpretation of the vital signs of patients and are most frequently obtained by nurses (Smeltzer *et al*., 2010:66; Rebeiro *et al.*, 2013:487).

The monitoring of vital signs by nurses is crucial, to allow for the identification of any physiological signs of deterioration. Kyriacos *et al.* (2011:326) identified the importance of

nurses recording all the vital signs measured – especially respiratory rate – and the identification of physiological cues indicating patient deterioration in nursing practice.

The ability of nurses to correctly measure, accurately record and to identify abnormal vital signs is essential in the early identification of patient deterioration (Kyriacos *et al*., 2011:326). Mok *et al*. (2015b:91) and Rose and Clarke (2010:11) identified the importance of consistent and accurate documentation of the data reflecting the most reliable information about patients while treated in a hospital. The study by Kyriacos *et al*. (2011:326) further stresses that nurses should clearly communicate any concerns arising from the collected vital data.

Research by Fasolino and Verdin (2015:401) stress that changes in pulse rate and oxygen saturation levels, a clear indication of patient deterioration, were detectable prior to cardiac arrest. Steen (2010:57) and Liu *et al.* (2011:275) further determined that the early detection of patient deterioration can positively affect the outcome and recovery of a patient's condition by preventing organ dysfunction and failure as well as reducing hospital mortality rates.

Storm-Versloot *et al.* (2014:39) suggest that a routine measurement of vital signs of general ward patients is clinically relevant and they recommend further research with regard to this phenomenon.

Continued assessment allows nurses to monitor the condition of patients, determine their progress and identify any changes or unexpected deviations in their condition − ensuring effective nursing care and immediate intervention (Brooker & Waugh, 2007:368; Koutoukidis *et al*., 2013:301; Lawson & Peate, 2009:80; Smeltzer *et al*., 2010:66).

2.5 WHAT ARE VITAL SIGNS?

Mangione (2008:34) describes vital signs as a crucial measurement tool that should be obtained during every important contact or interaction with patients. BP, temperature, respiration and pulse measurements are identified as essential components of vital signs, reflecting the body's ability to regulate temperature, maintain blood flow and oxygenation of tissue (Brooker & Waugh, 2007:368; Elliot & Coventry, 2012:625; Geyer *et al*., 2009:183; Koutoukidis *et al.*, 2013:302; Lawson & Peate, 2009:80; Mangione, 2008:34; Perry *et al*., 2014:66; Smeltzer *et al*., 2010:66). Oxygen saturation is included as an additional vital sign as the function is generally available on an electronic BP monitor and it reflects the ability of cardiac and respiratory systems to maintain adequate oxygenation (Koutoukidis *et al*., 2013:302; Perry *et al*., 2014:66).

Vital signs are further described as a representation of the body's core physiological functions, including circulatory, pulmonary, neurological and endocrine functions, which are automatically regulated by the body and these functions determine how fast a heart beats, the core temperature of individuals and their respiratory rate (Carter, 2008:292; Lawson & Peate, 2009:80; Perry *et al*., 2014:66). These functions provide nurses with a general indication of the current health status of patients by providing a picture of physiological functions within specific physiological parameters (Geyer *et al*., 2009:173).

Perry *et al*. (2014:66) highlight that vital signs are an important indicator of the body's physiological status reflecting its response to physical, environmental and psychological stressors − revealing any sudden changes or changes occurring over a period. Any of these changes may indicate a need for more thorough investigations or nursing therapies and interventions (Perry *et al*., 2014:66). A study by Taylor (2007:87) found that in some instances, when medications are involved, changes in vital signs can be the only indicator of deterioration and it is therefore of crucial importance that nurses responsible for the measurement of vital signs should understand the significance of these signs. This is also supported by Lawson and Peate (2009:82).

Koutoukidis *et al*. (2013:301) identify the measuring of vital signs as part of routine nursing care, requiring nurses to periodically come into contact with patients, allowing for the identification of problems and assessment of the response of patients to treatment and interventions during their stay in hospital. The indications for performing vital signs are reflected in Figure 2-2:

- On admission to a healthcare facility.
- Routine measurement in accordance with hospital specific standing orders, policies and procedures.
- Before, during and after surgical interventions or invasive diagnostic procedures.
- Before, during and after blood transfusions.
- Before, during and after administration of certain medications affecting the cardiovascular system, respiratory rate or temperature control.
- When the general physical condition of patients changes.
- Before, during or after nursing interventions influencing vital signs (mobilisation and exercise).
- When patients report nonspecific symptoms of physical distress, such as chest pain or "feeling funny".

Figure 2-2: Indications for monitoring vital signs (Koutoukidis *et al.,* 2013:302; Rebeiro *et al.*, 2013:35)

It is crucial for nurses to correctly and accurately measure vital signs, understand and interpret the values, communicate findings appropriately and to commence interventions promptly due to the fact that vital signs monitoring provides nurses with a quick and efficient way to monitor the condition of patients, identify problems and evaluate patients' response to interventions (Koutoukidis *et al*., 2013:301-302).

An explanation of each component of vital signs selected for inclusion in the study is provided below. This information formed an integral part of content considered during the selection and formulation of questions forming part of the questionnaire (Annexure A).

2.5.1 Blood pressure

BP is defined as the pressure (or force) exerted by blood against the walls of the arteries during ventricular systole and diastole (Baillie, 2014:159; Booysen *et al*., 2015:256; Brooker & Waugh, 2007:379; Geyer *et al*., 2009:365; Perry *et al*., 2016:102; Smeltzer *et al*., 2010:699; Waugh & Grant, 2010:87).

During left ventricular contraction, blood is pushed into the aorta by producing pressure within the arterial system, which is known as systolic BP (Baillie, 2014:158; Booysen *et al*., 2015:256; Brooker & Waugh, 2007:379; Geyer *et al*., 2009:365; Perry *et al*., 2016:102; Waugh & Grant, 2010:87). Waugh and Grant (2010:464) further define systolic BP as the pressure recorded immediately after ventricular contraction when the pressure is at its highest and the higher of the two measurements is used for a BP recording.

Diastolic pressure occurs when complete cardiac diastole takes place and the heart rests following the ejection of blood resulting in reduced pressure within the arteries (Baillie, 2014:159; Booysen *et al*., 2015:256; Brooker & Waugh, 2007:379; Geyer *et al*., 2009:365; Potter *et al*., 2016:102; Waugh & Grant, 2010:87).

Arterial BP is measured with a sphygmomanometer and is expressed with the systolic pressure above the diastolic pressure.

2.5.1.1 Factors affecting blood pressure

According to Treas and Wilkinson (2014:433), BP regulation is influenced by cardiac function, peripheral vascular resistance and blood volume. BP regulation is a continuous process ensuring an adequate supply of blood to body tissue via perfusion of the capillary beds (Treas & Wilkinson, 2014:433). Several factors affect the BP of patients and are described in Table 2-3:

Table 2-3: Factors affecting blood pressure (Baillie, 2014:1661; Brooker & Waugh, 2007:382; Perry *et al.,* 2014:102; Treas & Wilkinson, 2014:433)

Factors potentially raising blood pressure	Factors potentially lowering blood pressure
Exercise resulting in a more forceful contraction of the ventricles.	Rest.
Emotional stress − anger, fear or excitement.	Emotions, such as grief.
Increased blood volume − during pregnancy.	Active blood loss or shock.
Obesity usually increases BP due to additional vascular supply required for perfusion of a larger body mass.	Weight loss.
Hereditary factors.	Medications that lower BP.
Age (elasticity in arteries decreases, increasing peripheral resistance.	Dehydration.
Pain.	A very rapid heart rate limits the time for ventricular filling, resulting in a decreased stroke volume and decreased cardiac output.
Conditions of the heart vessels.	Damage to the heart (during myocardial infarction or a heart attack).

Other factors identified by Baillie (2014:161), include posture, gravity, medications use, diet, arm support and patient position.

2.5.1.2 Accepted normal ranges for blood pressure measurement

The unit of measurement for BP is millimetres of mercury (mmHg) where the systolic pressure is recorded over the diastolic pressure, for example, 120/80 mmHg (Perry & Potter, 2011:45; Treas & Wilkinson, 2014:433). The normal BP of an adult patient ranges between 100/60 mmHg and 140/90 mmHg (Baillie, 2014:161). A normal BP is believed to be less than 120 to 129 mmHg systolic and less than 80 to 84 mmHg diastolic (Mok *et al*. 2015b:98; Treas & Wilkinson, 2014:433).

2.5.1.3 Method of assessment

When measuring BP, nurses can manually determine BP by making use of a sphygmomanometer or in the case with Hospital A, an electronic monitoring device is used as shown in Figure 2-3. When using an electronic device, it is important that nurses use the monitor according to the manufacturer's guidelines (Lawson & Peate, 2009:87).

2.5.1.4 Equipment

The electronic BP monitor used at Hospital A where the research was conducted, is the Phillips SureSigns VS2+ vital signs monitor (Figure 2-3). This battery-operated monitor can be used to measure BP, pulse rate, oxygen saturation and in some models, temperature as well. The monitor is prescribed for use by healthcare professionals whenever there is a need for monitoring the physiological parameters of patients and is intended for monitoring, recording and alarming of multiple physiological parameters.

When used in vital signs mode, the main screen displays the vital signs measured for the current patient. The values are reflected as a numeric value.

Figure 2-3: Phillips SureSigns VS2^{+} vital signs monitor (Phillips, 2011:1-1)

When using electronic BP monitors, cuff selection is of the utmost importance.

2.5.1.4.1 Cuff selection

Brooker and Waugh (2007:382); Perry and Potter (2011:45) and Treas and Wilkinson (2014:438) accentuate cuff selection when monitoring BP as a critical aspect, which can potentially affect the accuracy of measurement.

A blood pressure cuff normally consists of two parts, namely the cover or sheath and the inflatable inner bladder. Prior to measuring BP, the equipment must be inspected for any damage and cleanness. It is important for the cuff to be the correct size with Brooker and Waugh (2007:382) stating that the bladder of the cuff must encircle at least 75-80% − not more than 100% − of the upper arm. The width must be more than 50% of the length of the upper arm. If the cuff is too big, it can result in an underestimation and too small can potentially result in an overestimation of BP (Brooker & Waugh, 2007:382).

The proper cuff size for the electronic monitoring of BP, according to Potter *et al*. (2016:12) and Perry *et al*. (2014:125), is reflected below in Table 2-4:

Table 2-4: Cuff size when using an electronic monitor to measure blood pressure (Potter *et al.,* 2016:12; Perry *et al.,* 2014:125)

CUFF TYPE	LIMB CIRCUMFERENCE (CM)
Small adult	17-25 cm
Adult	23-33 cm
Large adult	31-40 cm
Thigh	38-50 cm

It is important to note that the patient's position can also affect the BP results therefore a patient should be allowed to sit with the arm at an atrial level after resting for a period of time (Lawson & Peate, 2009:91; Netea *et al.* (2002:398).

2.5.1.5 Bodily responses affecting blood pressure

When patients present a BP reading of below 110/60 mmHg, it is known as hypotension. When BP remains abnormally high for more than three separate readings (>140/90 mmHg), it is known as hypertension (Booysen *et al.*, 2015:259). Hypertension can increase a patient's risk of suffering a heart attack, a stroke, kidney disease, congestive heart failure or even death (Booysen *et al*., 2015:259; Perry *et al*., 2016:102). Booysen *et al*. (2015:259) also identified several possible disease states known to cause high BP, such as type two diabetes, obesity, heart disease, a high salt intake by certain patients, kidney disease, excessive alcohol intake, smoking and pregnancy.

The next aspect of vital signs investigated as part of this study was body temperature.

2.5.2 Temperature

Body temperature is defined as a variation between the heat produced by body processes, such as metabolism and muscular activity, and heat lost through the skin, lungs and body waste (Booysen *et al*., 2015:248; Brooker & Waugh, 2007:368; Elliot & Coventry, 2012:621; Geyer *et al*., 2009:381; Kowalak, 2009:12; Perry *et al*., 2014:67; Potter *et al*., 2016:488).

According to Elliot and Coventry (2012:261) and Potter *et al*. (2016:488), a process known as thermoregulation occurs when physiological and behavioural mechanisms regulate the balance between the heat produced by a body and the heat lost. When a patient's body maintains a stable temperature, it ensures a proper functioning of cells, tissues and organs (Kowalak, 2009:12). Perry *et al*. (2014:67) state that the core temperature of a body is controlled by the hypothalamus and remains within normal ranges, but the skin and body surface temperature fluctuates according to changes in the environment or surroundings.

2.5.2.1 Factors affecting body temperature

Several factors affect body temperature and include age, exercise, hormone levels (the temperature of females is higher that the temperature of males), circadian rhythm, stress, underlying pathophysiological conditions (e.g., septicaemia), environment (exposure to cold in operating theatres) or temperature alterations (Elliot & Coventry, 2012:621; Kowalak, 2009:12; Perry *et al.*, 2014:67; Potter *et al.*, 2016:488).

2.5.2.2 Unit of measurement

Celsius is a metric scale and the unit of measurement for temperature. In South Africa, temperature is recorded as degree (°) Celsius (C). A person's temperature remains relatively constant and vital organs, such as the brain, heart and liver, function best at an optimal temperature of 37°C known as the "set point" (Brooker & Waugh, 2007:368).

2.5.2.3 Accepted normal ranges

Literature does not clearly prescribe normal temperature ranges for adult patients. Body temperature is not the same for every patient and normal ranges depend on the patient and the method of assessment (Carter, 2008:297). Temperature is measured to obtain a representative average of the core body tissues with normal ranges ranging between 36°C and 38°C with an average of 37°C (Perry *et al*., 2014:67).

Brooker and Waugh (2007:368) accept a normal temperature as between 36.5-37.3°C − allowing for a variation of ±0.2°C. Carter (2008:297) describes a core temperature as

relatively constant ranging within 36-38.1°C. Yoost and Crawford (2016:289) accept the normal adult temperature as ranging between 36.5-37.5°C.

It is important to consider that the body temperature of patients differ to some extent (Treas & Wilkinson, 2014:416). Grainger (2013:48) identified a normal body temperature as ranging between 36°C and 37.5°C. The normal vital sign range, for average patients at rest, ranges between 36-37.4°C, according to Mok *et al.* (2015b:98).

2.5.2.4 Assessment of body temperature

Elliot and Coventry (2012:621) state that several methods exist for the measurement of a patient's body temperature and can include an oral, aural, rectal, axillar or groin measurement. When measuring body temperature, it is vital for nurses to consider the type of equipment used (e.g., infrared), calibration requirements, manufacturer prescription for use and selection of the correct anatomical site (Elliot & Coventry, 2012:621). In nursing practice, the body temperature is mostly measured near body surfaces, such as the forehead and axilla (Grainger, 2013:49).

2.5.2.5 Equipment

The infrared thermometer used to measure temperature in the general, medical and surgical wards, the day clinic and obstetric departments of Hospital A is a non-contact forehead infrared thermometer as seen in Figure 2-4.

This infrared thermometer was designed to accurately measure a persons' body temperature regardless of the room temperature at the time of measurement. According to the instruction manual, no hair, perspiration, clothing or cosmetics should obstruct the area on the forehead where the measurement is made. It is important to select "body" mode prior to use to ensure the core body temperature is measured (EeziTemp, 2015:3). The device is intended for use on adults and does not require any contact with patients during measurement.

Figure 2-4: EeziTemp non-contact infrared thermometer (EeziTemp, 2015:4)

The user manual provides clear instructions on how to use the device. It is important to remove any obstructions before using the infra-red beam (EeziTemp, 2015:8). According to the user manual, the device must be held 5-15 cm from the patient's forehead when measuring body temperature, as demonstrated in Figure 2-5. Holding the device at an incorrect distance can result in an incorrect temperature reading (EeziTemp, 2015:12).

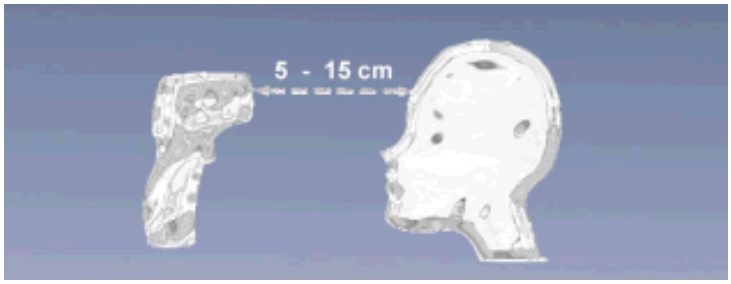

Figure 2-5: Measurement technique using an infrared thermometer (EeziTemp, 2015:11)

The thermometer is said to conform to the standards (American Society of Testing and Materials E1965-98, 2016) set by the American Society of Testing and Materials (ASTM) and according to the user manual, the device has been tested and homologated in accordance with EN60601-1-2:2007 for electromagnetic compatibility.

The advantages and disadvantages of this method of measurement are indicated in Table 2-5:

Table 2-5: Advantages and disadvantages of using an infrared thermometer (Koutoukidis *et al.*, 2017:403; Perry *et al.*, 2015:101)

Advantages	Disadvantages
Ease of access – no repositioning of patients required.	Inaccurate with head coverings, hair on the forehead or excessive makeup.
Rapid measurements – results immediately available.	Affected by skin moisture, such as diaphoresis or sweating.
Patients are not put at risk – comfortable; no exposure of patients.	Accurate temperature measurement cannot be obtained following vigorous physical activity.
No sensor cover required – reduced risk of cross infection or contamination between patients.	If significant changes in surrounding temperature occurs, operator must allow 15 minutes before use to adjust – ensuring reliable measurements.

Bodily responses to changes in body temperature are discussed in the following section.

2.5.2.6 Bodily responses related to body temperature

The body can react to the presence of infection, inflammation, dehydration, brain injury, toxins and medications characterised by an extremely high temperature (Geyer *et al.,* 2009:380). In certain instances (e.g. such as malnutrition, burns and hypothyroidism), bodily responses can result in an extremely low temperature (Geyer *et al*., 2009:386; Waugh & Grant, 2010:461). Bodily responses affecting body temperature are described in Table 2-6:

Table 2-6: Bodily responses affecting body temperature (Geyer *et al.,* 2009:380; Waugh & Grant, 2010:461)

Bodily response	Description
Rigor	A severe febrile reaction of the body to the presence of microbes, toxins or foreign substances in the bloodstream, such as septicaemia, or an incompatible blood transfusion characterised by an extremely high temperature. Presents a rapid increase in body temperature followed by a sudden drop in body temperature to normal or subnormal. Potentially caused by illness, such as flu, incompatibility to a blood transfusion, contaminated intravenous fluid, septicaemia or malaria.
Hypothermia	Reflects an abnormally low core temperature, usually below 35°C. Patients at risk, include:

Bodily response	Description
Hypothermia	• Very young or elderly patients. • Malnutrition or starvation can result in a decreased production of heat. • Burn victims are more likely to lose heat through wounds. • Patients with a decreased metabolic rate – hypothyroidism. • Certain medications, such as beta blockers and muscle relaxants, influence the body's ability to regulate the core temperature. • Alcohol combined with extreme cold can influence thermoregulation (alcohol depresses the central nervous system resulting in peripheral vasodilation – individuals feel warm. When exposed to cold, the body does not respond appropriately, potentially resulting in hypothermia.
Pyrexia	A controlled increase in body temperature. This is the body's defence mechanism against body infections. Temperatures above 38°C.

The next vital sign of importance in the detection of patient deterioration is the pulse rate.

2.5.3 Pulse rate

Booysen *et al*. (2015:252) and Lawson and Peate (2009:85) define a pulse rate as a wave of distension and elongation felt in an artery wall each time the left ventricle ejects blood into the system. Elliot and Coventry (2012:622) and Brooker and Waugh (2007:377) define a pulse rate as a rhythmic expansion of an artery produced by an increased volume of blood pushed into vessels through contraction and relaxation of the heart. The blood is pumped into the aorta continuing further into general circulation (Lawson & Peate, 2009:85). During each contraction, approximately 60-80 millilitres of blood are forced through the already full aorta into the arterial system.

A pulse rate is further defined by Waugh and Grant (2010:463) as the pressure generated by the heart felt along arterial walls where the arteries lie closest to the body surface. The pulse rate determines cardiac output, therefore, if the heart rate increases so does the cardiac output. A pressure wave is transmitted through the arterial system and can be felt at any point where a superficial artery can be pressed gently against a bone (Brooker & Waugh, 2007:377; Perry *et al*., 2014:77).

2.5.3.1 Factors affecting pulse rate

According to Brooker and Waugh (2007:378), Elliot and Coventry (2012:621), Lawson and Peate (2009:85) as well as Treas and Wilkinson (2014:426), pulse rate is influenced by several factors as described in Table 2-7. In addition, Brooker and Waugh (2007:377) include pain as a factor potentially affecting the pulse rate of patients.

Table 2-7: Factors affecting pulse rate (Brooker & Waugh, 2007:378; Elliot & Coventry, 2012:621; Lawson & Peate, 2009:85; Treas & Wilkinson, 2014:426)

Factor	Description
Autonomic nervous system	The most important factor in determining the pulse rate of a patient and reflects the balance between the sympathetic and parasympathetic activity.
Circulating chemicals	An increased pulse rate occurs due to hormones secreted by the adrenal medulla (adrenaline, noradrenaline and thyroxine). Hypoxia and elevated carbon dioxide levels stimulate a pulse rate. Electrolyte imbalances, such as hyperkalaemia, depress cardiac functions resulting in a reduced pulse rate (bradycardia).
Position	A pulse rate is faster when individuals sit upright than when lying down due to blood pooling in veins of the feet and legs, decreasing blood return to the heart, resulting in decreased BP and subsequently an increased pulse rate.
Exercise	When individuals become active, muscles require more blood than when resting. This is achieved by an increasing pulse rate and selective vasodilation. Well-conditioned individuals have a lower pulse rate before and during exercise than other individuals.
Emotional status	When individuals become excited, anxious or during a fearful encounter, the pulse rate increases.
Gender	The pulse rate of females is faster than the pulse rate of males.
Age	Babies and small children have a faster pulse rate than older children and adults.
Temperature	The pulse rate rises and falls with body temperature. This is due to an increase in metabolic rate resulting in the body attempting to compensate for the decrease in BP produced by peripheral vasodilation (fever).
Developmental level	Newborn babies have a rapid pulse rate; this rate stabilises during childhood and gradually slows the older individuals are.
Food	During ingestion of meals, a slight increase in the pulse rate can be measured.
Disease	Diseases, such as heart disease, hyperthyroidism, respiratory disease, and infections, generally result in an increased pulse rate. Hypothyroidism is associated with a decreased pulse rate.
Medications	Certain medications can influence the pulse rate of patients, such as stimulants increasing the pulse rate (epinephrine), cardiotonics (digitalis) and opioids or sedatives decreasing a pulse rate. Certain medications, such as atenolol, can also cause bradycardia.

2.5.3.2 Accepted normal ranges

The normal pulse rate for an adult patient ranges between 60 and 100 beats per minute (Mok *et al*., 2015b:98; Potter *et al*., 2016:487; Treas & Wilkinson, 2014:428; Yoost & Crawford, 2016:102).

2.5.3.3 Assessment of a pulse rate

The number of pulse beats per minute usually represents the heart rate and varies between individuals (Perry *et al*., 2014:77). The heart rate of a patient determines cardiac output. If the heart rate increases, so does the cardiac output.

According to Brooker and Waugh (2007:379), Elliot and Coventry (2012:622), Lawson and Peate (2009:85), Treas and Wilkinson (2014:428) and Waugh and Grant (2010:463), nurse practitioners should observe for the following criteria when measuring a pulse rate:

- The rate at which the heart is beating.
- The rhythm (pattern of intervals between heartbeats) − intervals between beats should be equal. An irregular heartbeat may be indicative of heart disease (disorders affecting electrical conduction).
- Pulse quality − the volume or strength (amplitude) of each beat − and is measured in terms of an absent, weak or thready pulse (barely felt and easily obliterated by pressing with fingers), normal quality (easily palpated, not weak or bounding) and finally bounding or full (easily felt with little pressure, not easily obliterated).

Brooker and Waugh (2007:377) explain that assessing the rate, rhythm and strength when measuring a pulse, provide valuable information with regard to the current health status of patients, response to interventions and treatment as well as sudden changes in condition. Any abnormalities must be reported immediately. Treas and Wilkinson (2014:428) state that an abnormal pulse rate may present as weak, thready, bounding or irregular and these changes should always be further investigated.

A pulse rate is mostly measured by lightly compressing a patient's artery against the underlying bone using the index and middle finger. Kowalak (2009:15) suggests gently pressing the index, middle and ring finger over the radial artery on the inside of the wrist when measuring the radial pulse rate of a patient. This technique is demonstrated in Figure 2-6:

Figure 2-6: Measurement technique for a radial pulse (Kowalak, 2009:15)

When measuring a pulse rate, several pulse points can be selected. The radial pulse rate (a peripheral pulse) is most frequently used due to its ease of access (Brooker & Waugh, 2007:368). During rapid deterioration, it becomes necessary to access the carotid pulse rate as the heart continues to circulate blood to the brain for as long as possible resulting in peripheral pulses weakening while becoming less easily palpable (Lawson & Peate, 2009:86).

Elliot and Coventry (2012:622) suggest that the pulse rate of a patient should be measured for a minimum of 30 seconds as an irregular heartbeat can be missed if measurement takes place over a shorter period.

2.5.3.4 Equipment

During a routine assessment of the pulse rate of patients, nurses require a watch or clock with a second hand or digital display. In some instances, it may be necessary to auscultate using a stethoscope. If a stethoscope is used, it is important to ensure the equipment is clean and well maintained (Treas & Wilkinson, 2014:426).

It is vital for nurses not to rely on the pulse rate indicated by an electronic monitoring system as it does not provide comprehensive information necessary to identify abnormalities requiring prompt intervention (Elliot & Coventry, 2012:622; Lawson & Peate, 2009:98). Nurses should use current knowledge and skills to accurately assess the data of patients as machines can potentially limit time spent with patients and also limit physical contact with nurses missing clinical data (Elliot & Coventry, 2012:622).

2.5.3.5 Bodily responses related to pulse rate

An abnormally slow, rapid or irregular pulse rate may be indicative of the inability of the heart to deliver adequate blood to the body. A weak pulse rate can indicate a low volume of blood ejected against the arterial wall with each contraction and a full bounding pulse rate can

potentially indicate high volumes of blood ejected against the arterial wall with each contraction of the heart (Perry *et al*., 2014:77).

A pulse rate below 60 beats per minute is known as bradycardia (brady = slow and cardia = heart) (Brooker & Waugh, 2007:377; Treas & Wilkinson, 2014:428; Waugh & Grant, 2010:459). Waugh and Grant (2010:464) define tachycardia as an abnormally fast pulse rate. Brooker and Waugh (2007:377) and Treas and Wilkinson (2014:428) describe tachycardia as a pulse rate of more than 100 beats per minute (tachy = rapid). Arrhythmia is an abnormal heart rhythm (Waugh & Grant, 2010:459).

The next component investigated as part of vital signs monitoring is the respiratory rate. According to literature, the respiratory rate is one of the elements of vital signs monitoring most frequently missed or reported incorrectly (Ansell *et al.*, 2015:886; Cretikos *et al.*, 2008:658; Elliot, 2016:2; Flenady *et al.*, 2016:45; Parkes, 2011:12).

2.5.4 Respiratory rate

Respiration refers to the exchange of gasses between body cells and the environment. Two processes are involved, namely breathing and gas exchange (Booysen *et al*., 2015:255; Waugh & Grant, 2010:464). Treas and Wilkinson (2014:431) describe respiratory rate as the number of times an individual breathes − the complete cycle of inhalation and exhalation within one full minute. Perry and Potter (2011:419) state that the accurate assessment of respiration requires recognition of normal thoracic and abdominal movements associated with normal breathing, both active and passive.

2.5.4.1 Factors affecting the respiratory rate of patients

An average normal respiratory rate for an adult patient is 12-20 breaths per minute (Mok *et al.*, 2015b:98; Perry *et al.,* 2016:487). Baillie (2014:154) and Geyer *et al*. (2009:326) identified several factors that can potentially influence the body's function, such as metabolic demand and includes age, gender, increased exercise, stress and fear. Perry *et al*. (2016:487) suggest the monitoring of respiratory rate in instances, such as following the administration of certain medications e.g. opioids (morphine). Irregularities can indicate respiratory disease, such as chronic obstructive pulmonary disease (COPD), asthma and tumours (Perry & Potter, 2011:419; Treas and Wilkinson, 2014:431).

2.5.4.2 Method for assessing respiratory rate

The respiratory rate of patients should be equal between each breath, including a short pause at the end of inspiration and expiration (Baillie, 2014:154). One respiration is equivalent to one complete respiratory cycle (one inspiration and one expiration) (Perry & Potter, 2011:422). Respiration should be counted without patients becoming aware as this may cause altered breathing patterns. This can be achieved by nurses keeping their fingers on the pulse point. Nurses must also observe for rate, depth, pattern and sound (Baillie, 2014:154).

The rhythm is assessed as either regular or irregular. An abnormal breathing pattern, such as Cheyne-Stokes and Biot's breathing, may be indicative of other healthcare problems requiring further assessment (Treas & Wilkinson, 2014:431). Treas and Wilkinson (2014:431) further found that normal breathing should be effortless and when breathing requires a degree of effort (dyspnoea or laboured breathing), it may be uncomfortable for patients resulting in fatigue and fear.

When listening for breathing sounds, nurses must listen for wheezing (a high-pitched sound when air is forced through narrowed respiratory passages) and stridor (a harsh, high-pitched sound due to laryngeal obstruction) (Baillie, 2014:154).

The volume of air moving in and out of the respiratory tract with each breath (tidal volume) must be monitored when observing respiratory depth.

2.5.4.3 Equipment

The only equipment required during the measurement of respiratory rate is a watch with a second hand or digital display and a pen to record the data on the appropriate documents (Perry & Potter, 2011:419).

2.5.4.4 Bodily responses affecting respiratory rate

Several authors identified abnormalities of the respiratory system and include respiratory rate and rhythms as reflected in Table 2-8 (Baillie, 2014:154; Beachey, 2013:180, 212; Treas & Wilkinson, 2014:432).

Table 2-8: Rates, rhythms and the potential causes of abnormalities associated with the respiratory system (Baillie, 2014:154; Beachey, 2013:180, 212; Treas & Wilkinson, 2014:432)

Abnormality	Description	Potential cause
Apnoea	Absence of breathing.	Respiratory arrest.
Biot's respiration	Irregular respirations of variable depth (usually shallow), alternating with periods of apnoea.	Lesions of the pons.
Bradypnoea	Reduced respiratory rate, <10 breaths per minute.	Opioid toxicity, hypercapnia, hypothyroidism, raised intracranial pressure or hypothalamic lesions.
Cheyne-Stokes	Gradual increase in depth or respiration followed by gradual decrease and then a period of apnoea.	Damage to the pons; low cardiac output, such as in congestive cardiac failure, resulting in a delay of blood transit time between lungs and brain.
Dyspnoea	Trouble breathing, requiring use of accessory muscles, such as neck or abdominal muscles. Patients usually breathe through their mouth as this presents less resistance to airflow but can cause drying of mucosa.	Injury (chest wall), pleural effusion, pneumothorax, pulmonary embolism, coronary syndrome, pneumonia, lobar collapse, cardiac tamponade, arrhythmia, acute valvular heart disease, metabolic acidosis, upper airway obstruction, lower airway disease, such as bronchitis, asthma or COPD.
Eupnea	Normal respirations with equal rate and depth, 12-20 breaths/minute.	Normal human respiration.
Hyperventilation	An abnormally low respiratory effort (shallow breathing), associated with a retention of carbon dioxide. Can lead to inadequate gas exchange. If caused by injury, nurses must observe for bilateral chest rise.	Common response to emotional distress, can be due to metabolic acidosis, acute renal failure, lactic acidosis, salicylate and methanol poisoning.
Hypoventilation	An abnormally low respiratory effort (shallow breathing), associated with a retention of carbon dioxide. Can lead to inadequate gas exchange. If caused by injury, nurses must observe for bilateral chest rise.	COPD, central nervous system depression (medications induced), extreme obesity (diaphragmatic movement), neuromuscular disorders, such as spinal cord lesions.

Abnormality	Description	Potential cause
Hypoxia	Inadequate levels of oxygen in tissue.	During ascent to high altitudes, lung damage due to trauma, lung disease, such as COPD, emphysema, bronchitis or pneumonia.
Kussmaul's respirations	Regular but abnormally deep, laboured and increased rate.	Severe metabolic acidosis, such as diabetic ketoacidosis or renal failure.
Orthopnoea	Patients have trouble breathing when in an upright position – requires nursing intervention, patients are positioned in a Fowler's position to reduce discomfort.	Advanced cardiac failure.
Tachypnoea	Rapid, often shallow breathing, >24 breaths per minute.	Chest infection, asthma, pulmonary embolism, choking or cardiac failure.

The respiratory rate of patients is monitored to identify abnormalities, such as tachypnoea, which can indicate atelectasis, a decreased arterial blood oxygen content and increased arterial carbon dioxide levels or acute respiratory distress demonstrated by intermittent breathing, flaring nostrils, external sounds, such as wheezing, and the use of accessory muscles − immediate intervention is needed (Heuer & Scanlan, 2014:65). Additionally, the response of patients to treatment, such as narcotics, can result in bradypnoea that requires accurate assessment (Heuer & Scanlan, 2014:65).

The ability to accurately measure, interpret and act on the respiratory rate of patients requires knowledge of important concepts, factors affecting respiratory rate, abnormalities related to the respiratory system and knowledge of the normal rates integrated with observation and interpretation skills (Baillie, 2014:154). This knowledge enables nurses responsible for the monitoring of the respiratory rate to accurately recognise abnormalities and to identify causes for concern (Baillie, 2014:154).

Together with a respiratory rate, the monitoring of oxygen saturation can provide vital information and aids the identification of patient deterioration.

2.5.5 Oxygen saturation

Oxygen saturation refers to the amount of oxygen attached to the haemoglobin in arterial blood, which is updated at each pulse wave (Baillie, 2014:168; Treas & Wilkinson, 2014:433; Yoost & Crawford, 2016:299). Baillie continues to describe haemoglobin as a molecule

present in the red blood cells of patients responsible for the transportation of gasses – especially oxygen − with approximately 98% of oxygen in the blood attached to haemoglobin molecules and the remaining 2% dissolved in plasma. According to Yoost and Crawford (2016:299), the measurement of oxygen saturation aids nurses in identifying changes in the status of patients. Changes can potentially affect the level of consciousness requiring additional assessment.

2.5.5.1 Factors affecting the oxygen saturation of patients

Perry *et al*. (2016:126) identified a number of factors affecting the oxygen saturation of patients and includes peripheral vascular disease, hypothermia, vasoconstrictors, hypotension, peripheral oedema, patient motion and red-based nail polish. Moreover, Yoost and Crawford (2016:299) identified lung disease, a decreased circulation and hypotension as factors affecting the oxygen saturation of patients.

2.5.5.2 Accepted normal ranges of oxygen saturation

Baillie (2014:168), Mok *et al*. (2015b:98) and Yoost and Crawford (2016:299) prescribe a normal saturation value of 95-100%. A saturation level lower than 90% requires immediate intervention. Perry *et al.* (2016:126) also describe oxygen saturation of lower than 90% a clinical emergency.

2.5.5.3 Method of assessment

Oxygen saturation is monitored by a pulse oximeter (Figure 2-7), which measures arterial oxygen saturation by using an infrared light to detect the oxygen percentage bound to haemoglobin (Geyer *et al*., 2009:326). Urden *et al.* (2018:454); Baillie (2014:168) and Perry *et al.* (2016:126) and Treas and Wilkinson (2014:433) describe pulse oximetry as a continual, non-invasive method. This method allows healthcare practitioners to determine if the oxygenation status of patients requires continual observation.

The probe used to assess the oxygen saturation level of patients contains a microprocessor that is attached to a patient's finger, ear, toe or nose (Urden *et al*., 2018:454). The probe consists of two light-emitting diodes and a photo detector transmitting red and infrared light waves through the pulsating vascular bed to the photo detector on the other side. The light signals are converted into an electric signal, sent to the microprocessor converting the signal into a digital reading.

Figure 2-7: Reusable adult oxygen saturation monitor for Phillips Sure Sign monitors (Phillips, 2017)

This method of measurement is simple, painless and poses limited risk to patients (Perry *et al*., 2016:126).

2.6 APPROVED VITAL SIGNS RANGES FOR ADULT PATIENTS

The standard operating procedural guidelines developed by Hospital A's learning and development department prescribes normal values and requires any deviation to be reported, as indicated in the patient-specific care plan (Hospital A, 2016:13). The prescribed values are reflected in Table 2-9:

Table 2-9: Vital signs range for adult patients (Hospital A, 2016:13)

Temperature	
Adult ranges	36.6°C-37.5°
Pyrexia	>38°C
Hypothermia	<35°C
Pulse rate	
Adult ranges	60-100 beats/minute
Tachycardia	>100 beats/minute
Bradycardia	<60 beats/minute
Respiratory rate	
Adult ranges	12-20/minute
Tachypnoea	>24/minute
Bradypnoea	<10/minute

Blood pressure	
Systolic pressure	110-140 mmHg
Diastolic pressure	60-90 mmHg
Hypotension	Systolic pressure <110 mmHg or within 20 mmHg of baseline
Hypertension	Systolic pressure >140 mmHg Diastolic pressure <90 mmHg
Oxygen saturation	
Adult ranges	90-100%

When the vital signs were assessed by the ENs and ENAs, they should record the data on the "adult early warning observation record" (Annexure A4) used by Hospital A. The record was designed specifically for Hospital A and as the recording of vital signs forms part of their responsibilities a brief description is provided in the next section of how nurses, responsible for vital signs' assessment, are expected to complete the record.

2.7 RECORDING OF VITAL SIGNS

The monitoring and recording of vital signs are important during nursing care by providing valuable information with regard to the physiological status of patients (Aas *et al.*, 2014:334). A study by Aas *et al*. (2014:330) found that in the records of 35% of patients surviving in-hospital cardiac arrests, abnormal vital signs were not identified and in 25% of cases, abnormal vital signs were recorded and reported but no action was taken.

The current research study aimed to investigate the accuracy of recording done by nurses responsible for the monitoring of vital signs and did not investigate the effectiveness of the chart used by Hospital A.

When the adult early warning observation chart was implemented at Hospital A, all nurses working at the hospital attended comprehensive training on the use of the chart. Additionally, nurses are trained on the use of the chart during their orientation period. An algorithm was designed for use, guiding the response of nurses responsible for the recording and interpretation of the chart.

The ability to detect patient deterioration can, therefore, be influenced by how the chart is used (Christofidis *et al.*, 2015:168).

Features of the early warning observation chart (Annexure A4) include a data-recording format (drawn dots rather than written numbers), an integrated colour-based system (the colour in which the vital sign is recorded is expected to elicit a response) and finally, each individual vital sign component is initially recorded with no overlapping − reducing the risk of confusion or misinterpretation.

The early warning observation chart used by Hospital A was specifically designed for use at this hospital group and aims at assisting nurses with the early recognition of a patient's deterioration allowing for early intervention (Hospital A, 2016). The adult early warning observation chart (Annexure A4) has three colour zones, namely white, orange and red. The white zone reflects observations not yet requiring intervention.

Vital signs in the orange zone reflect observations that are not within the ranges, as indicated in Table 2-9. Figure 2-8 reflects the actions required if the vital signs fall within the orange zone.

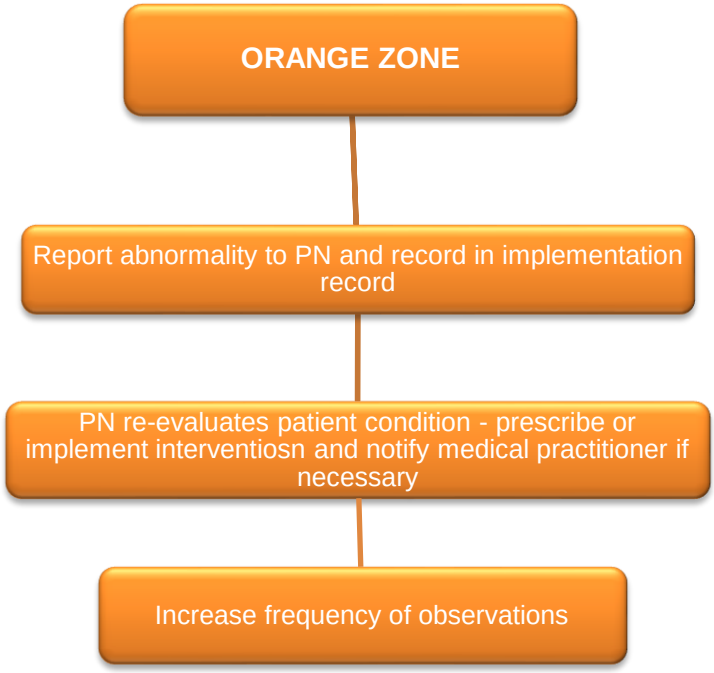

Figure 2-8: Actions required for vital signs falling in the orange zone (Hospital A, 2016)

Vital signs in the red zone are far out of the ranges regarded as safe indicated in Table 2-9 and require immediate intervention. When the vital signs of patients, at a high risk of decompensation, are displayed in the red zone, immediate actions are required, as indicated

in Figure 2-9. It is important to note that reference ranges may be adjusted by attending medical practitioners according to the specific needs of patients (Hospital A, 2016).

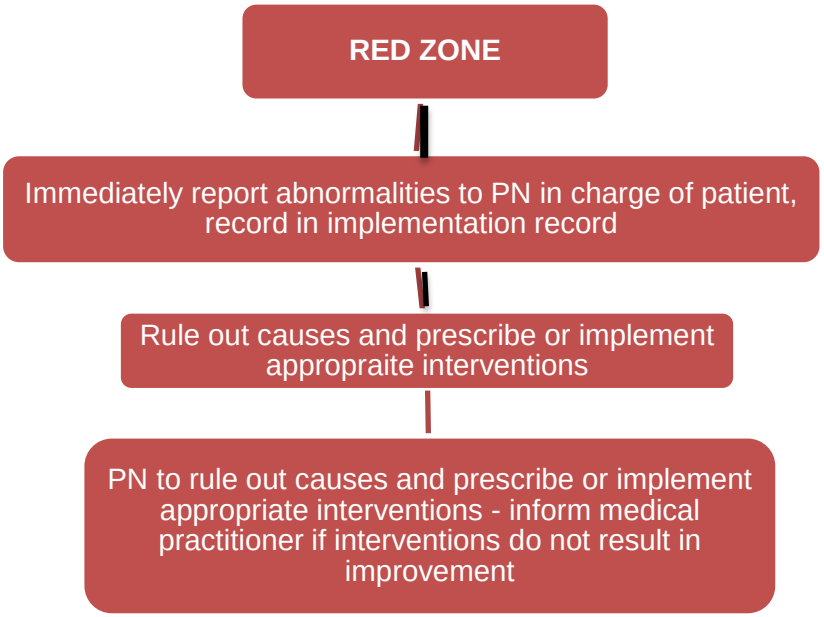

Figure 2-9: Actions required for vital signs falling in the red zone (Hospital A, 2016)

The chart may only be completed in permanent black pen. Vital signs are to be assessed from all admitted patients to collect baseline data. The frequency of a vital signs' assessment is prescribed in the patient-specific care plan but is usually routinely monitored every four hours. A PN has to re-asses the vital signs when alerted to an abnormality by an EN or ENA.

The adult early warning observation chart (Annexure A4) is specifically organised with the respiratory rate first to ensure maximum exposure as respiratory rate is one of the most sensitive indicators of deterioration and is also one of the vital signs most often neglected. The warning system is designed to assess the systolic BP with the colour codes assigned to BP measurement for systolic pressure only.

For an accurate and complete recording, the date, time and post-operative day should be reflected on all patients' charts. Hospital A prescribes the date to be recorded as 01/01/2001. A line should be drawn vertically down the column at midnight to indicate a new date entry. The actual time when the vital signs were assessed should be indicated. The chart assigns abbreviations for oxygen therapy: RA = room air, FM = face mask and NC = nasal cannula.

Once the vital data have been entered, nurses responsible for the measurement must initial to confirm that they did perform the assessment.

When the checklist (Annexure H) for the assessment of recording on the early warning observation chart (Annexure A4) and the implementation record (Annexure A5) was designed (forming part of the questionnaire), the information prescribed in the standard operating procedural guidelines on the assessment of vital signs (Hospital A, 2016) and the comprehensive audit of patient records were considered (Hospital A, 2017:4).

2.8 THE NEED FOR KNOWLEDGE IN PRACTICE

Potter *et al*. (2016:487) identified vital signs together with other assessment measures as a basis for clinical decision-making and problem-solving within nursing practice. The ability to accurately determine the health problems of patients is influenced by knowledge of physiological variables influencing vital signs and understanding their relationship (Potter *et al.*, 2016:487).

The ability to effectively assess vital signs requires specific clinical knowledge about the acceptable ranges and relevant concepts allowing nurses to identify abnormalities, a clear understanding of equipment to ensure accuracy of measurements and specific knowledge of the factors influencing normal values that can potentially cause physiological deterioration (Koutoukidis *et al*., 2013:301).

In her book *Notes On Nursing: What It Is, And What It Is Not* (1860:150), Florence Nightingale wrote that the most important practical lesson one can teach a nurse is:

> *what to observe – how to observe – what symptoms indicate improvement – what the reverse – which are of importance – which are of none – which are the evidence of neglect – and of what kind of neglect*

Florence Nightingale discussed the importance of essential knowledge to observe facts, rather than opinions. She asked how one is able to make decisions if one does not know important facts (characteristics), specifically referring to the fluctuating of a pulse rate − essential knowledge is needed to understand what variations imply (Nightingale, 1860:178). According to Geyer *et al*. (2009:6), Florence Nightingale is viewed as the founder of modern nursing, an individual who realised the importance of educating nurses to allow them to gain the necessary knowledge needed to provide optimal patient care.

Geyer *et al*. (2009:6) describe nursing as a science based on a distinct body of knowledge applied to specific clinical situations where knowledge is continually expanded through nursing research. As a discipline, nursing is characterised as a system with a unique body of knowledge applied to solve problems and meet the specific needs of patients within a specific field (Geyer *et al.,* 2009:11). Additionally, Geyer *et al*. (2009:80) highlight the importance of nursing knowledge with experience allowing nurses to act appropriately within their prescribed scope of practice. Rebeiro *et al*. (2013:35) underline the importance of applying careful techniques and a knowledge of vital signs' monitoring to ensure more accurate findings and interpretations − essential in establishing a baseline during the initial assessment of patients.

Mok *et al*. (2015b:93) state that nurses require clinical knowledge to identify physiological abnormalities indicative of patient deterioration. A combination of both declarative and procedural knowledge is required in practice to perform tasks and procedures (Bekerian & Levey, 2012:113). The ability to correctly and accurately measure vital signs and to interpret and act on data presented to them depends, therefore, on the knowledge of nurses with regard to vital signs at a given time.

Without the necessary knowledge, nurses are not able to correctly and accurately measure and interpret or respond to physiological cues presented during patient deterioration. Endacott *et al.* (2010:2722) are of the opinion that nurses should be trained in combining pathophysiology with patient assessments allowing for trend analyses rather than viewing vital signs in isolation.

From the literature review, as discussed in Chapter 2, it becomes clear that nurses require knowledge on anatomy, physiology and other relevant information to correctly and accurately measure, record, interpret and make decisions as to whether or not to react to signs of deterioration.

The section on the importance of knowledge during the assessment of vital signs is followed by an explanation of the application of clinical judgement in terms of vital signs' assessment.

2.9 CLINICAL JUDGEMENT, CRITICAL THINKING AND DECISION-MAKING IN NURSING PRACTICE

The South African Qualifications Authority (SAQA) prescribes unit standards for both the national certificate leading to registration with the SANC as an ENA and the national diploma in nursing allowing for registration with the SANC as an EN.

According to the SAQA, ENs enrolled with the SANC function within their scope of practice as formulated by the SANC and provide basic nursing care while under the supervision of a registered PN (SAQA, 2015a). ENs are viewed as mid-level nurses working under the supervision of a registered PN and it is expected from them to demonstrate an ability to identify and solve problems and to make decisions by making use of critical thinking (SAQA, 2015a). Alternatively, ENAs are expected to demonstrate effective problem-solving and decision-making skills by applying foundational knowledge of anatomy and physiology during the provision of patient care while under the supervision of a registered PN (SAQA, 2015b).

The ability to think critically is of the utmost importance in education (Hughes, 2014:31). Smeltzer *et al*. (2010:23) describe critical thinking as a systematic, purposeful process requiring reflection and outcome-based thinking founded on a specific body of knowledge where information presented should be analysed. This ability allows ENs and ENAs to practise within their scope of practice (SANC, 1984) allowing for the immediate recognition of abnormalities and enabling them to identify the need to report abnormalities immediately to the PN in charge of patient care (Smeltzer *et al*., 2010:23).

Smeltzer *et al*. (2010:23) identified certain cognitive and mental actions as key components of critical thinking. These actions include collecting information (such as the data collected from a vital signs' assessment); drawing on existing knowledge by analysing the data (determining if the vital signs are within the normal ranges or indicating a change in the condition of patients) and anticipating potential problems that may occur (the physiological deterioration of patients due to bleeding or shock).

Nurses are faced with various situations requiring them to draw from their specific body of knowledge to make decisions affecting the health and well-being of patients on a daily basis (Von Colln-Appling & Giuliano, 2010:107). To accurately interpret data presented to nurses, they require a clear understanding of the anatomy and pathophysiology related to the human body, normal values and a clear understanding of the signs and symptoms of certain conditions to allow for optimal patient care (Von-Colln-Appling & Giuliano, 2010:107). The body of knowledge required for performing basic nursing procedures, such as the assessment of vital signs under supervision in practice and developing the ability of nurses to think critically, is established during initial training (Von Colln-Appling & Giuliano, 2010:107). These skills develop as nurses acquire experience within their scope of practice during a clinical placement (Von Colln-Appling & Giuliano, 2010:107). In their study on decision-making in nursing practice, Johansen and O'Brien (2016:46) concluded that decision-making is a dynamic process requiring knowledge and experience to ensure positive patient outcome.

Finally, Van Graan (2014:217) defines clinical judgment as the process through which nurses reach an appropriate response following an analysis of information collected during the direct observation of patients in a particular clinical context. ENs and ENAs should, therefore, measure the vital data of patients, analyse and interpret the data based on their own experience and knowledge, followed by a period of reflection and reasoning to reach an informed decision on whether the patient data are indicative of patient deterioration requiring a response and intervention.

2.10 CHAPTER SUMMARY

Failure to identify physiological changes due to a patient's deterioration can have a severely negative impact on a patient's outcome. The literature review highlighted the importance of vital signs monitoring within the healthcare environment. The ability to interpret, identify and respond to physiological cues relies on specific knowledge. Without this knowledge, nurses will be unable to address serious health issues (Perry *et al*., 2016:487). Tysinger (2015:74) recommends investigating the barriers, obstacles and reasons for non-compliance and accuracy. Determining the current theoretical knowledge, accuracy of recording and the ability to interpret patient data of ENs and ENAs at Hospital A allowed the researcher the opportunity to identify existing knowledge gaps in order to improve and essentially positively affect a patient's outcome.

CHAPTER 3 RESEARCH DESIGN AND METHOD

3.1 INTRODUCTION

In Chapter 3, the researcher provides a description of the research methodology applied in this research study. The research design is discussed and includes a description of the population and sample selected for the study, the setting in which the data were collected and the process of data collection. The researcher provides information on the process of selecting and formulating questions to be used in the theoretical knowledge questionnaire and the pre-testing of the instrument as well as the validity and reliability of the instrument.

3.2 RESEARCH DESIGN

Grove *et al*. (2013:341) describe a research design as the blueprint of a research study providing control over factors potentially influencing the validity of the study findings. A research design guides the planning and implementation of a study providing the researcher with accurate results (Grove *et al*., 2013:341). Wagner *et al.* (2012:21) view a research design as an architectural blueprint describing how the research will be conducted in terms of the appropriate methodology, data collection methods and the data analysis.

For this research, the researcher selected a quantitative, descriptive design. This design was most suited to provide the results necessary to answer the research questions. A description is provided in the following section on a quantitative, descriptive research design and its benefits for this research study.

3.2.1 Quantitative research design

According to Grove *et al*. (2013:341), a quantitative study design provides the necessary control to increase the probability of the study findings reflecting reality accurately. Botma *et al.* (2010:82) describe quantitative research as a tool needed to generate knowledge for nursing practice, education and management.

The researcher selected a quantitative design to collect numerical data through a self-administered questionnaire aimed at determining the knowledge of ENs and ENAs on vital signs data, their accuracy of recording and their ability to interpret the vital data presented to them in a scenario.

3.2.2 Descriptive research design

A descriptive research design provides researchers with the necessary tools to collect information about characteristics within a particular study area (Grove *et al*., 2013:375). The purpose of a descriptive design is to provide a picture of a phenomenon as it naturally occurs.

A descriptive design was selected by the researcher in an attempt to identify a potential knowledge gap within the current practice of measuring vital signs. Within a descriptive design, no manipulation of variables occurs without treatment or intervention by the researcher. No attempt was made to establish causality among variables (Grove *et al.,* 2013:68).

From personal experience in practice, the practise of performing vital signs monitoring does not result in the early identification of patient deterioration. The researcher undertook the study in an attempt to determine if a knowledge deficit exists on vital signs monitoring amongst ENs and ENAs working in the general, medical and surgical wards, the day clinic and obstetric departments of Hospital A selected for the study.

3.3 RESEARCH METHOD

The research method describes how the investigation was carried out and contains information on the population selected for the study, the sampling frame, the research approach and the data collection technique, a description of the data analysis and the strategies applied to ensure integrity and scientific rigour.

3.3.1 Selection of respondents

Botma *et al*. (2010:123) state that the selection of respondents for a research study is of the utmost importance as incorrect selection can potentially nullify the outcomes of a research study. During the selection of respondents for the study, the researcher considered the purpose of the study, the research questions and objectives set for the study as well as the potential benefits of performing the research. A discussion on the population and sample selected for the research study is presented in the following section.

3.3.1.1 Population

Population is defined as the entire group of respondents meeting the inclusion criteria (Brink *et al.*, 2012:131). For this study, the researcher selected all the ENs and ENAs employed permanently or on a part-time basis at Hospital A at the time of the study. These two

categories of nurses are primarily responsible for monitoring vital data at the hospital. As the researcher was collecting data on the knowledge of vital signs, the accuracy of recording and the ability to interpret the data, all nurses from these two categories meeting the inclusion criteria were selected to participate.

The population (N=89) consisted of permanent ENs (N=27) and permanent ENAs (N=47). Part-time nurses working for an agency were also invited and consisted of ENs (N=6) and ENAs (N=9).

3.3.1.2 Sampling

According to Wagner *et al*. (2012:87), an appropriate sample size is important and should reflect the characteristics of the population to allow for inferences to be made. Wagner *et al*. (2012:88) further suggest that the sample must be as large as possible to reduce sampling errors.

A decision was made together with the statistician from the NWU to invite the entire population (N=89) meeting the set criteria for the study to participate due to the relatively small sample size. The final number of participants was (n=64), consisting of n=20 ENs and n=44 ENAs.

The inclusion criteria set for the research study were as follows:

- ENs and ENAs working at Hospital A in the general, medical and surgical wards, the day clinic and obstetric departments at the time of the study (included permanent and part-time nurses employed by an agency).
- Nurses from all age groups.

These specific departments and wards were selected for the study as nurses working there use the adult early warning observation chart to document vital signs.

The exclusion criterion set for this research study was:

- Nurses working in wards not using the adult early warning observation chart to record vital data and using monitors for the monitoring of vital data (critical care unit, high care unit, emergency centre, paediatric and neonatal intensive care unit).

3.4 INSTRUMENTATION

A questionnaire is defined by Grove *et al*. (2013:717) as a form or document designed to elicit information from the written responses of respondents. A questionnaire was used by

the researcher to determine the current theoretical applied knowledge of the ENs' and ENAs' and their accuracy in the record keeping of vital signs and their ability to interpret vital signs data presented to them (Addendum A). The selection and formulation of questions used for the theoretical knowledge questionnaire is discussed in the following section.

3.4.1 Questionnaire design

The questionnaire (Addendum A) was used to determine the current theoretical applied knowledge of the respondents participating in the research study. The first step taken by the researcher was to determine the type of information desired. The researcher then developed a blueprint identifying essential content to be covered by the questionnaire and this was set at the educational level of the ENs and ENAs selected for the study.

The researcher conducted a comprehensive search of available literature on questionnaires or items that matched the set criteria as discussed in Chapter 2. To the best of the researcher's knowledge, no questionnaire is currently available to test the theoretical knowledge of South African ENs and ENAs working at a private hospital on vital signs monitoring. The hospital selected for the study provide clear procedural guidelines for ENs and ENAs on the monitoring of vital signs by setting specific parameters for normal vital data values, contra-indications and principles required during performance of the procedure.

On employment, new ENs and ENAs (permanent and part-time), receive training on the procedure of vital signs monitoring. During nursing orientation, the procedure is explained and demonstrated to all nurses by clinical facilitators. During their initial orientation period, they are expected to be found competent in measuring, recording and interpreting vital signs of patients.

These guidelines were formulated by members of the training and development department and the sources used were *Lippincott's Nursing Procedures* (Kowalak, 2009); *Basic Nursing: Essentials for Practice* (Potter & Perry, 2003); *Thelan's Critical Care Nursing* (Urden et al., 2002) and *Ross and Wilson's Anatomy and Physiology in Health and Illness* (Waugh & Grant, 2003). Consideration was given to the procedural guidelines for the assessment of vital signs and the assessment tool during the selection and formulation of questions for the questionnaire. These textbooks used by Hospital A during procedural design were also used during the formulation of questions for the questionnaire. This was done to ensure fairness and consistency as the questions contained in the questionnaire must be based on the information available to the respondents during their orientation and training.

3.4.1.1 Setting of questions

Each question set by the researcher consists of two parts: a question and a response. Each question was carefully designed and is expressed clearly. The questions contained in the questionnaire did not allow the respondents to elaborate on responses or ask questions. Questions are presented in a consistent manner with less opportunity for bias. The researcher presented the questionnaire for review to the clinical facilitators working at Hospital A − subject matter experts − as they are responsible for the training and development of ENs and ENAs responsible for the measurement of vital signs. This was done to eliminate potentially vague or ambiguous questions or leading questions with the potential to influence responses.

Each item in the questionnaire has a response set providing parameters within which respondents can answer. The response set is narrow and directive with closed-ended questions. As the researcher was attempting to determine theoretical knowledge of respondents, each question has only one correct response.

During the selection and formulation of questions for use in the questionnaire, it was administered to six professional nurses (PNs) permanently employed in various departments of Hospital A. Each PN was presented with the information brochure and the proposed questionnaire. After completing the questionnaire, the researcher allowed the PNs to ask questions and to provide feedback aimed at clarifying any issues or concerns concerning the content of the questionnaire. The testing of the questionnaire was done to identify any confusing, ambiguous or difficult to understand questions (Johnson, 2015:218).

The proposed questionnaire was also presented to the supervisor, co-supervisor and the statistician for evaluation and feedback on the content of the questionnaire.

3.4.1.2 Technical layout of the questionnaire

The researcher carefully determined the order with each specific aspect of vital signs monitoring grouped together under a clearly identifiable section. The questionnaire consists of a total of 41 questions and one question requiring a practical application based on a scenario provided.

Section one consists of questions collecting demographical data on the professional background of the respondents, their ages, years of experience and their employment status at the time of the study. This section consists of four questions. Section two to six contain questions on each of the individual aspects of vital signs monitoring, namely blood pressure

(BP), body temperature, heart rate (pulse), respiration and oxygen saturation and 37 questions were asked.

Section seven of the questionnaire requires a practical application of the knowledge on vital signs monitoring. It is expected of the respondents to record vital data from a scenario provided. The respondents were asked to document any actions or interventions on the implementation record provided.

Once ethical clearance was obtained from the Health Research Ethics Committee (HREC) of the NWU, Potchefstroom Campus, the researcher performed a pre-test of the questionnaire.

3.4.2 Pre-testing of the questionnaire

Pre-testing of the questionnaire was done prior to the actual data collection with the selected sample in an attempt to determine the clarity of questions, effectiveness of instructions, completeness of response sets, the time required to complete the questionnaire and the success of the instrument as a data collection tool (Grove *et al*., 2013:721).

During the pre-testing of the questionnaire, six of the respondents meeting the set sample criteria for the study were selected to participate. Two of the respondents completed the Afrikaans version of the questionnaire (Annexure A2), two completed the isiZulu version of the questionnaire (Annexure A3) and two completed the English version of the questionnaire (Annexure A1). The respondents selected for pre-testing of the questionnaire met the inclusion criteria set by the researcher. The respondents participating in the pre-testing of the questionnaire were not asked to participate during data collection.

The venue selected for the study was set up in exactly the same manner as for actual data collection. The six respondents were provided with the informed consent leaflet in their preferred language and were asked to sign the informed consent form just prior to completion of the questionnaire. Each of the six respondents was presented with the questionnaire and received clear instructions on how to complete the questionnaire. The respondents were allowed time to ask any questions or clarify any discrepancies.

During pre-testing, the respondents took approximately 25 - 35 minutes to complete the questionnaire. Following the pre-testing of the questionnaire, the researcher asked the respondents for their input. No errors were identified by respondents and they indicated that the questions were not too easy or too difficult and it did measure their knowledge on vital signs. The respondents indicated that none of the questions presented in the questionnaire

were based on information inaccessible to them. The respondents indicated that they were able to complete the questionnaire without distraction.

3.4.3 Validity of the data collection instrument

According to Brink *et al*. (2012:165), instrument validity is a tool used to determine whether the instrument measures what it intends to measure. The researcher had a responsibility to ensure that the instrument measured the items required to generate the necessary results. To ensure validity of the self-administered questionnaire, the researcher tested the instrument during a pre-test. Aspects of validity of the questionnaire are considered in the following section.

3.4.3.1 Content validity

Brink *et al*. (2012:166) describe content validity as the representativeness of all relevant components of the selected variable and if any of the components are not measured, the required results will not be achieved. In an attempt to address content validity, the researcher ensured an even distribution of questions on each of the elements selected for the knowledge assessment, namely BP, pulse rate, body temperature, respiratory rate and oxygen saturation. The elements selected for the evaluation were based on a review of relevant literature, such as the textbooks used by Hospital A when setting procedural guidelines for vital signs' monitoring.

Prior to the administration of the questionnaire during the pre-test, it was presented to the supervisor, co-supervisor, the statistician, two subject matter experts working at Hospital A responsible for the training and assessment of ENs and ENAs and a PN with an honours degree in critical care to evaluate the overall suitability of the instrument for use.

The instrument was further presented to six PNs permanently employed at different departments at Hospital A at the time of the study to review it critically.

3.4.3.2 Face validity

Brink *et al*. (2012:166) view face validity as the weakest yet most obvious form of determining instrument validity, as it is based on the intuition of experts. It is, however, beneficial in assisting researchers to ensure clarity of content. In the research study, face validity was ensured by presenting the questionnaire to the supervisor, co-supervisor, the statistician and two subject matter experts responsible for the training and assessment of ENs and ENAs working at the hospital. The two experts were both permanently employed by

the hospital and were registered with the SANC as PNs. They had experience in critical care, general nursing, surgical nursing and oncology.

The feedback from the experts was positive with minor changes required to one of the questions. The changes were made prior to submitting the questionnaire for ethics approval and translation into Afrikaans and isiZulu for pre-testing.

3.4.4 Reliability of the data-collection instrument

According to Grove *et al*. (2013:355), the reliability of a research instrument refers to the ability of the instrument to consistently measure what it sets out to measure. Grove *et al*. (2013:1134) further state that the reliability of an instrument refers to the degree to which the instrument consistently yields results if it is tested on the same individual over a period of time or if used by two different researchers. The more reliable an instrument, the less random errors will be present in the measurement method.

This research study presented the researcher with a risk of knowledge transfer between the respondents working different shifts and/or preparation from literature prior to data collection. The one group of respondents could have informed the next group of respondents about the content of the questionnaire. This could potentially have influenced the results.

To address this issue, the researcher collected the data over as short a time period (four days) as possible to limit contact between the different groups of respondents. The research was conducted with each shift individually and contact between the different groups was, therefore, limited. A mediator was also present throughout recruitment and data collection to monitor the research process.

3.4.4.1 Internal consistency of the questionnaire

According to Brink *et al*. (2012:170), statistical tests provide measures of internal consistency to instruments used. The test most often used to collect quantitative data when making use of a questionnaire, is Cronbach's alpha coefficients or Kuder-Richardson 20 (KR-20).

Following the pre-testing of the questionnaire, data were entered in a MS Excel spreadsheet and then transferred onto a SPSS data sheet. The data were analysed to determine internal consistency. The internal consistency, following the pre-testing for the knowledge component of the questionnaire, measured 0.741. It was, therefore, not necessary to make any changes to the questionnaire as a score of 0.741 is acceptable in terms of internal consistency (Brink *et al.,* 2012:170).

3.5 PERMISSION FROM HOSPITAL A TO CONDUCT RESEARCH

Prior to commencing the research, the researcher requested permission from Hospital A to collect data from respondents employed by them. In terms of the research policy of Hospital A, the researcher submitted 1) a formal letter (Annexure F) from her supervisor to request permission to conduct the research; 2) a clear description of the data collection process; 3) a letter showing ethical clearance obtained from the HREC (Annexure E); 4) a copy of the Afrikaans (Annexure B2), the English (Annexure B1) and isiZulu (Annexure B3) informed consent brochure stamped by the HREC committee; and lastly, 5) a copy of the Afrikaans (Annexure A2), English (Annexure A1) and isiZulu (Annexure A3) version of the questionnaire.

Head office discussed the proposed research with the nursing manager working at Hospital A where the researcher was planning to collect data. The researcher received confirmation from the head office via an email approving the study and a written letter was received from the nurse manager confirming approval of the study (Annexure G).

3.6 RECRUITMENT OF RESPONDENTS

Before the researcher was able to commence with data collection, respondents were invited to participate in the study during recruitment (Botma *et al*., 2010:13). The researcher was permanently employed at Hospital A during data collection. To ensure fairness to the respondents and to avoid any potential prejudicial or bias treatment or coercion, the researcher was not present during recruitment or data collection.

The researcher made use of a mediator to recruit respondents. The mediator was a female nurse, not employed at Hospital A with no direct link to or relationship with any of the respondents. She was trained by the researcher prior to recruitment and data collection. The informed consent brochure (Annexure B) was explained comprehensively prior to the recruitment of the respondents took place. The researcher adhered to ethical aspects during recruitment as discussed in section 1.9.

3.7 DATA COLLECTION

Data were collected according to the pre-established plan. Careful consideration was given to the type of information needed to answer the research questions, how the data would be collected, who would be responsible for data collection and who would be participating in the study (sample frame), where and when the data would be collected.

The researcher selected to collect quantitative data reflecting the current theoretical knowledge of the ENs and ENAs (permanent and part-time agency) employed at Hospital A in KwaZulu-Natal, the accuracy of their recording and their ability to interpret data presented in a scenario. A questionnaire was used as the data collection instrument. To ensure fairness throughout the process, the researcher was not present during the recruitment process and data collection. A mediator, not employed by Hospital A, was used to recruit the respondents and to collect data. The data were collected on duty during the lunch hour of respondents. Permission to collect the data while the respondents were on duty was first obtained from the nurse manager and the deputy nurse manager prior to any arrangements were made. An explanation of the data collection process follows.

3.7.1 Setting

A research setting refers to the specific place or environment in which data are collected and is determined by the nature of the research questions and the type of data necessary to address these questions (Brink *et al*., 2012:59). As this study required the completion of a self-administered questionnaire by the respondents, a natural setting was selected. A natural setting refers to an uncontrolled, real-life situation or environment where no manipulation takes place or changes are made to the setting to manipulate the outcomes of a study (Brink *et al*., 2012:59).

Data collection took place at Hospital A in KwaZulu-Natal. The hospital has 186 operational beds and four fully operational operating theatres. The hospital has a surgical, medical, general and obstetric ward, a neonatal intensive care unit, a critical care unit, a high care unit, a paediatric unit, an emergency care centre and a day clinic department.

Data were collected in the training room made available on the premises of Hospital A. The room has tables and chairs set up in a classroom style. Each respondent sat at their own table to ensure privacy and to reduce any risk of copying or sharing information. The room was well ventilated and an air conditioner was set at a comfortable temperature.

The room has sufficient light and enough room was available to accommodate ten respondents at a time. The door was closed for the duration of the time it took the respondents to complete the questionnaire to provide a quiet environment.

3.7.2 Time frame

The recruitment of potential respondents commenced during the week prior to data collection. The mediator began the recruitment of potential respondents meeting the sample

criteria on all four shifts providing them with the information leaflet. The mediator was available throughout all shifts (day and night) if the respondents wanted to ask questions pertaining to the study. Not one of the respondents was put under pressure to participate and the respondents were free to refuse participation without any consequences.

The data were collected over four days allowing for all four shifts to complete the questionnaire. The deputy nurse manager selected the Sunday and Wednesday night for the first and third shifts to complete the questionnaire. The mediator set up the venue at 19:00 and was able to start collecting the data at 20:00. The night duty manager allowed staff members to leave the wards for one hour at a time to complete the questionnaire and monitored the wards and ensured that the workload in the ward was not interrupted at any point in time. The dayshift was allowed to complete the questionnaire on the following Monday and the Wednesday to accommodate both dayshifts. The mediator prepared the venue at 11:00 and the respondents were allowed to complete the questionnaire from 12:00-15:00. The respondents were allowed a one-hour lunch break. The researcher prepared light snacks and beverages for the respondents.

Each respondent sat at a separate table with sufficient space. A pen was provided to ensure the ability to complete the questionnaire. The informed consent form was signed once the mediator ensured that all respondents present fully understood the instructions for completing the questionnaire. No time frame was set for the completion of the questionnaire to prevent any undue pressure caused by a pre-set time. The questionnaire took between 25 - 35 minutes to complete (see section 3.4.2). Sufficient time was, therefore, available.

3.8 DATA CAPTURING

All completed questionnaires were posted by the respondents in the sealed box with an opening placed at the back of the room. On the day in between the data collection, the box was locked in the office of the deputy nurse manager. The office remained locked and under constant supervision. The box remained sealed throughout the data collection process. Once all respondents were given an opportunity to complete the questionnaire, the mediator handed the sealed box containing the completed questionnaires to the researcher.

The researcher opened the box in the presence of the mediator. Following a discussion with the statistician, the researcher decided to capture the data herself in a MS Excel spreadsheet. Once all data from the completed questionnaires (sections two to six) had been captured by the researcher, the spreadsheet was forwarded to the statistician at the Statistical Consultation Services of the NWU.

The researcher, together with two subject matter experts were responsible for the assessment of the data collected from the scenario presented in section seven of the questionnaire, making use of a checklist (Annexure H). The data from this analysis were again captured by the researcher in a MS Excel spreadsheet. The data were analysed and interpreted by the researcher.

3.9 DATA STORAGE

The hard copies of the completed informed consent forms and the completed questionnaires were locked away in the researcher's office after the data collection until the data analysis. Only the researcher had access to this data. On completion of the study, all the hard copies of the completed questionnaires, signed consent forms and checklists were handed over to the research focus area, INSINQ, to be kept in storage for a period of five years. All the research material will be destroyed after five years in accordance with the NWU policy and regulations on the management of research data and records.

The questionnaires required no personal information. Each questionnaire was numbered randomly as removed from the box once opened with no names attached to any numbers. A backup of all electronic data was made and saved on a USB drive submitted to INSINQ.

3.10 DATA ANALYSIS

The data collected through the self-administered questionnaire were analysed by the researcher. Careful consideration was given to the methods of exploring and organising the raw data. This was done to give meaning to the collected data. When the data were explored, the researcher was able to obtain an in-depth sense of the data and patterns were identified.

3.10.1 Analysis of quantitative data

Brink *et al*. (2012:177) describe a data analysis as the process of exploring and organising raw data followed by an analysis and interpretation of the data in an attempt to provide meaning to the information collected. When the quantitative data were organised, the researcher was able to identify recurring patterns and this allowed for the identification of missing data. The aspects considered during this process, included the levels of measurement, entering of the data on a spreadsheet, cleaning the data, transforming the data and finally making backup copies. These aspects are discussed in the following sections.

3.10.1.1 Levels of measurement

Nominal data were obtained from the section in which demographic data were requested as part of the self-administered questionnaire (Annexure A). Numbers were assigned to classify the variables into attributes, such as 1 = EN and 2 = ENA. These numbers had no quantitative meaning and the categories were mutually exclusive and exhaustive (Botma *et al.*, 2010:132). Mathematical calculations of this data, included frequency counts, percentages and proportions.

The questions aimed at testing the knowledge of the respondents were dichotomous in nature as each question had only one correct answer – the other three remaining options were incorrect. When the results were, therefore, coded to determine internal consistency, the data were coded as "0" for an incorrect option selected and "1" if the correct option was selected. The options provided for each question were not categorised and were sorted based on a relative ranking of attributes, as found in a Likert scale. The mathematical calculations from this data were used to determine the current knowledge of the ENs and ENAs and also included counts, percentages and proportions.

3.10.1.2 Entering the data

The data collected from the questionnaire were entered in a MS Excel spreadsheet by the researcher. The spreadsheet was prepared based on pre-coding done in the data gathering instrument with variables labelled individually. Each question was labelled and numbered with question one labelled as "Q1" and the forty-first question as "Q41" to ensure ease of identification yet uniqueness. This did, however, present a disadvantage of having to refer to the code list during the data analysis. Once all the data were entered and checked, the original instruments were locked away safely to ensure compliance with anonymity and confidentiality as indicated in the informed consent form presented to the respondents (Botma *et al*., 2010:147).

3.10.1.3 Cleaning the data

To ensure accuracy of data used during the data analysis, the data set was printed and checked against the original documents. Any mistakes or missing data were identified and corrected. As indicated by Botma *et al.* (2010:148), missing data points were identified while cleaning the data. The missing data were checked and corrected if possible to make the data set complete.

3.10.1.4 Transforming the data

When the data from the knowledge section of the questionnaire were analysed, it was necessary to transform the data prior to coding in the spreadsheet. The correct answer for each question was coded as a “1” and the incorrect answer for each question was coded as a “0”. This allowed for the analysis of data as frequency counts, percentages and proportions specifically in terms of knowledge.

3.10.1.5 Backup copies

Once the data were clean and complete, backup copies were made and stored securely in a safe where only the researcher had access to the copies. The printout of the data used for a comparison during the cleaning of the data was also locked away in the same safe.

3.10.2 Descriptive statistics

Simple descriptive statistics were used to describe and summarise the quantitative data collected from the respondents during the data collection (Brink *et al.,* 2012:180). The data were summarised in frequency distributions and allowed for the comparison of data obtained from the ENs and ENAs who participated in the study.

Ratios represent the relative frequency of the set of respondents according to age, years of experience, professional category and employment status at the time of the study. From these results the researcher was able to determine the proportional part of respondents. Additionally, the researcher was able to calculate the arithmetical average as a mean score for the questions related to determining the knowledge of respondents.

3.10.2.1 Use of graphics and tables

Data collected from the self-administered questionnaire are presented in the study as tables and graphics. The tables present the frequency of results obtained from the respondents. The graphics enabled the researcher to effectively relay information collected from the questionnaire (Brink *et al.,* 2012:192). The researcher aimed to present clear, simple and accurate data easily understood by readers. The data are presented as bar charts and pie charts in the study.

3.10.3 Interpretation of quantitative data

During the analysis of the data, the researcher came to realisations when the research questions were answered. The findings of the various questions and sections related to the

study were interpreted in terms of pre-existing literature. This enabled the researcher to reach conclusions based on the findings from the analysed data.

The researcher determined that the findings were not only statistically significant, but also clinically significant as the researcher identified clear knowledge gaps concerning the current knowledge of the ENs and ENAs who participated in the study.

The researcher was able to identify limitations of the study and recommendations are made in Chapter 6 to address issues identified after the analysis of data was completed.

3.11 CHAPTER SUMMARY

In Chapter 3, the researcher provided a description of the research methodology, which included the method and design selected for the study, instrumentation, data collection and the data analysis. In Chapter 4, the researcher describes the results of the research study.

CHAPTER 4 RESULTS

4.1 INTRODUCTION

The main aim of this study was to determine the theoretical applied knowledge of the ENs and ENAs with regard to vital signs and their ability to accurately document and interpret vital signs data. The results from this study will provide opportunities to positively influence nursing education and practice.

The study entailed the development of a questionnaire to assess the theoretical knowledge of the ENs and ENAs working at Hospital A in KwaZulu-Natal, South Africa, on vital signs, the accuracy of their record keeping and the ability of these nurses to correctly interpret the vital data presented to them in a scenario. The study further aimed to explore and describe the findings obtained from the questionnaire to provide recommendations for the correct interpretation and documentation of vital signs and knowledge as well as skills training for all the ENs and ENAs of Hospital A in KwaZulu-Natal.

This chapter reports the results in relation to the objectives (see section 1.5) set for this research study.

4.2 QUESTIONNAIRE DEVELOPMENT

A self-administered questionnaire (Annexure A) was developed consisting of 41 multiple choice questions focusing on basic demographic content (four questions), and the five components of vital signs, namely blood pressure (BP), pulse rate, body temperature, respiratory rate and oxygen saturation (37 questions). Each question has four options to choose from of which only one option is correct. The final section seven of the questionnaire consists of a scenario. The respondents had to demonstrate their ability to record vital signs data, identify abnormalities and accurately record their findings on the adult early warning chart. The respondents also had to record their actions and interventions on the implementation record used during routine observations in the wards. The ENs and ENAs were asked to indicate the action of reporting the abnormality to the PN in charge of patient care. Any additional actions or interventions were also recorded by them. The data from section seven was evaluated using a checklist (Annexure H).

The researcher made use of the scale function to analyse the data for internal consistency. The method used to determine the internal consistency of the questionnaire was KR-20. This method was used to measure reliability on dichotomous results. The questionnaire aimed to measure the theoretical applied knowledge of the respondents. Each correct answer was,

therefore, coded as “1” and each incorrect answer as “0”. The KR-20 method measures all the split-half coefficients that can possibly be derived from various tests. It is used to measure the reliability of a single test performed (Gravetter & Forzano, 2016:488; Kaplan & Saccuzzo, 2009:113; Tavakoli, 2012:314). This KR-20 measured the average correlation from every possible way by splitting a test in half (Gravetter & Farzano, 2016:488; Tavakoli, 2012:314). Values produced, if KR-20 is used, range from 0-1.00. The higher the value, the higher the degree of internal consistency. Using this method on SPSS, a score of 0.688 was achieved. The nine questions that did not contribute towards a score above 0.65 were not included for analysis to ensure reliable measurement.

The completed questionnaires were further analysed by making use of the checklist on recording and interpretation of information (Annexure H) as described in Chapter 3, section 3.8. The information obtained from the checklist was then captured in a MS Excel spreadsheet. The data were coded based on the pre-coding done during the initial planning phase of the questionnaire.

Descriptive statistics were used to describe variables divided into categories (Grove *et al.,* 2013:375). The descriptive data were presented as frequencies and percentages and are displayed as pie charts, bar charts and tables in the study. Results presented as percentages are rounded off to the first decimal point.

4.2.1 Results of the self-administered questionnaire

As demonstrated by the literature review in Chapter 2, the early identification of patient deterioration is vital to nursing practice. To ensure nurses, responsible for the assessment of vital signs, are adequately equipped to accurately record and interpret vital data presented to them, to report abnormalities identified immediately, an assessment of the current knowledge and abilities of the ENs and ENAs was necessary.

In this chapter, the researcher reports on the results of the data captured from the study sample on the current theoretical applied knowledge of the ENs and ENAs working at Hospital A in KwaZulu-Natal. The researcher analysed the data collected from the responses to the self-administered questionnaire and aimed to explore specific variables regarding each of the aspects of vital signs monitoring selected for the study, namely demographic data, BP, body temperature, pulse rate, respiratory rate and oxygen saturation. Each of these variables were individually analysed. For assessment purposes, the responses to questions on respiratory rate and oxygen saturation were analysed together as both sections assessed the respiratory system.

The analysed data are presented in tabular and graph form. The total sample of 64 that participated in the current study, comprised ENs (n=20) and ENAs (n=44). A detailed discussion of all the results presented in the tables and figures follows in Chapter 5.

4.2.1.1 Demographic data

The demographic data were collected from section one. Questions 1-4 of the self-administered questionnaire were analysed individually and presented according to age distribution, nursing category, years of experience and employment status as can be viewed in Table 4-1. The highest number of responses for each criterion is highlighted.

Table 4-1: Distribution of age, experience and employment status per nursing category

CRITERIA	PERCENTAGE DISTRIBUTION PER CATEGORY		
AGE	**EN**	**ENA**	**TOTAL**
18-25	5	11.4	9.4
26-35	50	56.8	54.7
36-40	15	11.4	12.5
>40	30	20.4	23.4
YEARS OF EXPERIENCE			
<1 year	5	22.7	17.2
1-5 years	65	47.7	53.1
6-10 years	10	13.6	12.5
>10 years	20	16	17.2
EMPLOYMENT STATUS			
Permanent	85	86.4	85.9
Part-time (agency)	15	13.6	14.1

During the analysis of the data obtained from the self-administered questionnaire, the researcher was able to determine the mean percentage achieved for each of the age groups from the two nursing categories who participated in the study. These results are presented in Figure 4-1:

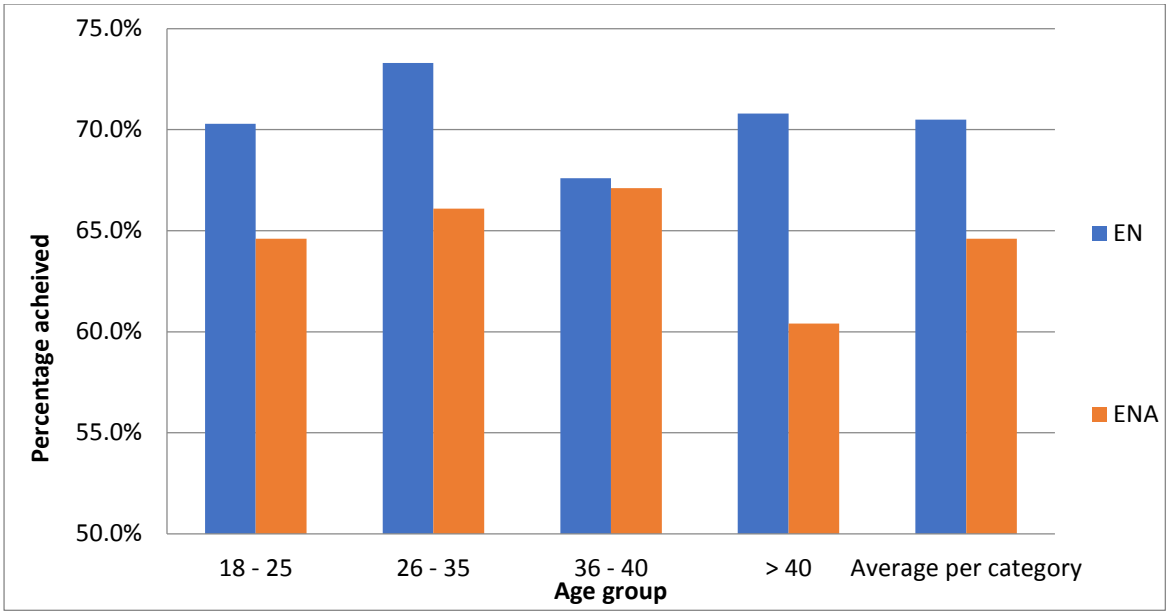

Figure 4-1: Mean percentage achieved for each age group per nursing category

Figure 4-2 shows the mean percentage per nursing category based on the years of nursing experience:

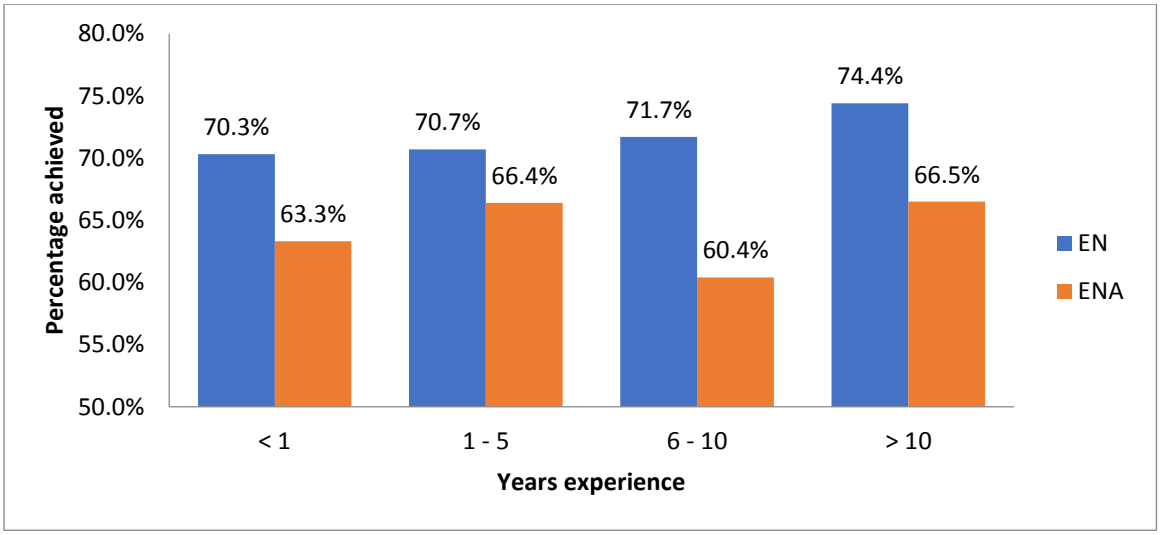

Figure 4-2: Mean percentage achieved per category based on years of nursing experience

Additionally, Figure 4-3 illustrates the mean percentage of the nursing categories who participated in the study based on their employment status at the time of the study:

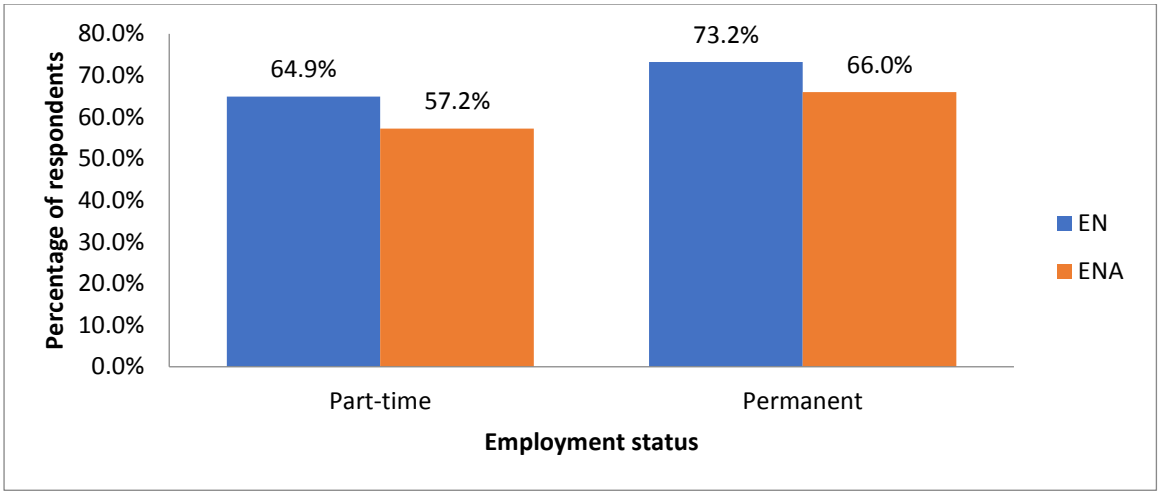

Figure 4-3: Percentage per nursing category based on employment status

The data obtained from each of the vital sign components, such as BP, body temperature, pulse rate, respiratory rate and oxygen saturation are illustrated individually.

4.2.1.2 Blood pressure

Data from questions (5-11) of the questionnaire tested the knowledge of the ENs and ENAs on the measurement of BP, and is presented as a frequency distribution per nursing category.

In Table 4-2, the frequency (f) of responses to the questions on the definition of BP, hypertension, hypotension and normal adult BP values as per nursing category are presented as a percentage of the respondents per category. The highest response for each question is highlighted.

Table 4-2: Percentage of responses to questions on definitions of blood pressure and adult values and ranges

Blood pressure definition			Normal adult blood pressure ranges			Values associated with hypertension			Values associated with hypotension		
Question option	Percentage		Question option (BP)/mmHg	Percentage		Question option (BP)/mmHg	Percentage		Question option (BP)/mmHg	Percentage	
	EN	ENA		EN	ENA		EN	ENA		EN	ENA
1. The force exerted by the blood against the artery walls when flowing through the body.	40	38.6	1. 90/60-140/90	5	18.2	1. BP of 100/60 or less	0	0	1. BP below 110/60	45	45.5
2. The force exerted by the blood against the vein walls when flowing through the body.	15	15.9	2. 100/60-140/80	10	9.1	2. BP greater than 140/90	50	65.9	2. BP below 90/60	55	52.2
3. The force at which the heart contracts and relaxes.	45	45.5	3. 110/60-140/90	80	68.2	3. BP greater than 110/70	0	2.3	3. BP above 110/60	0	2.3
4. Blood flow in the lungs.	0	0	4. 110/70-130/90	5	4.5	4. BP greater than 180/100	50	31.8	4. BP of 120/80	0	0

The ability of the ENs and ENAs to differentiate between systolic and diastolic BP is presented in Table 4-3. This question was of specific importance as the *adult early warning observation chart* used for recording vital signs data at Hospital A uses a track and trigger system specifically focusing on systolic BP measurements. If the ENs and ENAs were not able to differentiate between systolic and diastolic, it can affect their ability to recognise and respond to patient deterioration. The frequency (f) of responses per category for each question is indicated as a percentage with the highest number of responses per category for each question highlighted.

Table 4-3: Percentage of responses to the questions on systolic and diastolic blood pressure

Systolic blood pressure			**Diastolic blood pressure**		
Question option	**Percentage**		**Question option**	**Percentage**	
	EN	**ENA**		**EN**	**ENA**
1. The lowest point, when a change of sound or disappearance of the sound is noted.	15	27.3	1. The highest point, when the first regular sound is heard.	20	22.7
2. High blood pressure.	0	2.3	2. The lowest point, when a change of sound or disappearance of the sound is noted.	80	68.2
3. Low blood pressure.	5	4.5	3. High blood pressure.	0	6.8
4. The highest point, when the first regular sounds are heard.	80	65.9	4. Low blood pressure.	0	2.3

Brooker and Waugh (2007:382) together with Perry and Potter (2011:45) identified that selecting the incorrect cuff size can potentially influence the accuracy of results when measuring the BP of patients. The frequency (f) of responses to the questions determining the theoretical knowledge of the ENs and ENAs on the importance of selecting the correct cuff size is presented as a percentage in Table 4-4. The highest response per category is highlighted.

Table 4-4: Percentage of responses to the questions on selecting the correct cuff size during a blood pressure measurement

Question option	Percentage	
	EN	ENA
1. Not important as it does not influence accuracy of results.	5	2.3
2. Not important as long as the cuff is applied in the correct position.	0	9
3. Important as the incorrect cuff size could influence accuracy of results.	95	86.4
4. Determined by the age of the patient.	0	2.3

4.2.1.3 Body temperature

The assessment of body temperature is an important factor affecting the ability of nurses to make decisions and Sund-Leander and Grodzinsky (2013:942) highlight the importance of accurate theoretical knowledge and the correct use of equipment during assessments.

The knowledge of the ENs and ENAs on body temperature with regard to the definition of hypothermia, rigor and normal temperature ranges for an adult patient, was tested in this section (questions 12-18). The responses to these questions are indicated in Table 4-5:

Table 4-5: Responses to questions on the definition of body temperature, hypothermia, rigor and the normal adult ranges for body temperature

Temperature definition			Normal temperature for an adult patient (as °C)			Hypothermia (as °C)			Rigor (as °C)		
Question option	Percentage		Question option	Percentage		Question option	Percentage		Question option	Percentage	
	EN	ENA		EN	ENA		EN	ENA		EN	ENA
1. The body's reaction to infection.	15	25	1. 36.7-37	10	20.4	1. A temperature less than 35.	90	81.8	1. A temperature of more than 35.5.	0	6.8
2. The balance between the heat that the body produces and the heat that the body loses.	75	70.5	2. 35-38	5	9.1	2. A temperature less than 37.	0	2.3	2. Body temperature lower closer to the body surface.	15	11.4
3. A severe reaction of the body to the presence of microbes.	0	0	3. 36.6-37.5	80	59.1	3. A temperature of more than 35.5.	5	2.3	3. A severe reaction of the body to the presence of microbes, toxins or foreign substances in the blood stream (e.g., septicaemia).	80	77.3
4. When a patient's skin is warm to touch.	10	4.5	4. 35.5-36.7	5	11.4	4. A temperature ranging between 35.5 -36.5.	5	13.6	4. Patient presents uncontrollable epileptic fits.	5	4.5

The correct nursing actions aimed at reducing pyrexia, include removing of blankets, exposing the skin to air (removal of clothing), at times a tepid sponge and the administering of antipyretic medications, as prescribed by medical practitioners. Ackley and Ladwig (2011:447) together with Ignatavicius and Workman (2016:409) include the administration of antipyretic medications, as prescribed by treating medical practitioners, and performing a sponge bath as nursing interventions aimed at treating pyrexia. The responses to the options to determine if the ENs and ENAs deemed the listed nursing actions as important, are presented in Table 4-6.

Table 4-6: Responses to questions on nursing actions to reduce pyrexia

Question option	Percentage	
	EN	**ENA**
1. Remove blankets, expose the skin to air – remove clothing and administer antipyretic medications as prescribed by the medical practitioner.	15	25
2. Expose the skin to air – remove clothing and administer antipyretic medications as prescribed by the medical practitioner.	0	0
3. Remove blankets and administer antipyretic medications as prescribed by the medical practitioner.	10	9.1
4. Remove blankets, expose the skin to air – remove clothing, give a tepid sponge by wetting with tepid water and allowing it to dry and administer antipyretic medications as prescribed by the medical practitioner.	75	65.9

The responses to the questions aimed at determining the knowledge of the ENs and ENAs related to the use of an infrared thermometer, as used at Hospital A at the time of the study, are presented in Table 4-7 as a percentage with the correct option highlighted in the table:

Table 4-7: Responses to the questions when using an infrared thermometer to measure body temperature

Distance required when using an infrared thermometer			Nursing actions when using an infrared thermometer		
Question option	Percentage		Question option	Percentage	
	EN	ENA		EN	ENA
1. 3-8 cm from the forehead.	5	11.4	1. Push back patient's hair from fore-head; remove glasses; wipe away sweat or makeup from forehead and scan the patient's neck when measuring body temperature.	5	11.4
2. 2-4 cm from the forehead.	80	77.2	2. Push back the patient's hair from forehead and scan the patient's neck when measuring body temperature.	20	29.5
3. Directly against the forehead.	10	2.3	3. Push back the patient's hair from forehead; remove glasses and wipe away sweat or makeup from the forehead.	70	50
4. 10 cm from the forehead.	5	9.1	4. Remove glasses and wipe away sweat or makeup from the forehead.	5	9.1

The next aspect investigated as part of vital signs monitoring is the measurement of the pulse rate of patients.

4.2.1.4 Pulse rate

The factors of importance during the assessment of a pulse rate are discussed by Elliot and Coventry (2012:622) and include the assessment of more than just the rate, the duration of measurement and the importance of not using monitors during the assessment of a pulse rate, but rather using one's knowledge and skills to identify and report abnormalities. The responses to questions 19-29 are outlined in table 4-8.

The responses to the questions aimed at determining the current knowledge of the ENs and ENAs on the definition of a pulse, the normal adult pulse rate, tachycardia, bradycardia, and the consistency of a pulse rate throughout the body as presented in Table 4-8 and the correct answer is highlighted.

Table 4-8: Responses to questions on the measurement of a pulse rate

Pulse definition			Normal adult pulse rate			Consistency of pulse rate throughout the body			Inappropriate pulse points			Tachycardia			A rate of less than 60 beats per minute		
Question option	Percentage		Question option Beats/minute	Percentage		Question option	Percentage		Question option	Percentage		Question option Beats/minute	Percentage		Question option	Percentage	
	EN	ENA		EN	ENA		EN	ENA		EN	ENA		EN	ENA		EN	ENA
1. A skin surface where the veins passes close to the bone.	5	2.3	1. 60-80	35	31.8	1. Always	30	40.9	1. Brachial	0	11.3	1. More than 100	55	56.8	1. Bradypnoea	0	4.5
2. Tension on the heart.	0	0	2. 120-160	0	0	2. Most of the time	40	31.9	2. Apical	60	50	2. More than 90	15	13.7	2. Tachypnoea	5	11.4
3. The rhythmic pulsations which can be felt against the artery walls as the heart contracts and relaxes.	95	95.4	3. 75-100	0	2.3	3. Rarely	15	13.6	3. Orbital	40	36.4	3. More than 60	5	4.5	3. Bradycardia	95	77.3
4. Heart beating faster than 100 beats per minute.	0	2.3	4. 60-100	65	65.9	4. Never	15	13.6	4. Radial	0	2.3	4. More than 120	25	25	4. Tachycardia	0	6.8

The theoretical knowledge of the ENs and ENAs to correctly identify the factors affecting a pulse rate is presented in Table 4-9 and the correct option is highlighted:

Table 4-9: Responses to questions on the factors affecting a pulse rate

Question Option	Percentage	
	EN	ENA
1. Illness, emotions, age and drugs.	80	84.1
2. Illness, emotions and drugs.	15	11.3
3. Emotions and drugs.	0	2.3
4. The above factors do not affect a patient's pulse rate.	5	2.3

The ability of the ENs and ENAs responsible for the measurement of a pulse rate to accurately measure a pulse rate was of importance to the researcher and is presented in Table 4-10 and the correct option is highlighted.

Table 4-10: Responses to questions on aspects of importance during the measurement of a pulse rate

Measurement technique			Measurement time for a regular pulse rate			Assessment criteria when measuring a pulse rate			Measurement time for an irregular pulse rate		
Question option	Percentage		Question option	Percentage		Question option	Percentage		Question option	Percentage	
	EN	ENA		EN	ENA		EN	ENA		EN	ENA
1. An electronic blood pressure device.	10	25	1. Estimate	95	84.1	1. Rate, rhythm, strength and position.	35	34.1	1. Estimate	0	0
2. Your thumbs.	5	4.5	2. At least 30 seconds	0	0	2. Rate, rhythm and strength.	60	52.2	2. At least 30 seconds	5	4.5
3. Tips of 2-3 forefingers.	85	70.5	3. At least 120 seconds	0	6.8	3. Rhythm and position.	5	11.4	3. At least 12 seconds	0	0
4. Observing the patient and then estimating based on years of experience.	0	0	4. A full minute (60 seconds)	5	9.1	4. The above factors do not affect a patient's pulse rate.	0	2.3	4. A full minute (60 seconds)	95	95.5

The next aspect of importance included in the self-administered questionnaire was respiratory rate and oxygen saturation. The results for questions (30-41) determining the current knowledge of the ENs and ENAs are presented in the following section.

4.2.1.5 Respiratory rate and oxygen saturation

During the literature review, the researcher became aware of the fact that respiratory rate is one of the vital signs frequently not measured correctly or just estimated. Boerma *et al.* (2017:1) are of the opinion that hypercapnia, together with tachypnoea and low oxygen saturations, are predictors of patient deterioration. Boerma *et al.* (2017:1) further state that the failure to correctly assess the respiratory rate and oxygen saturation of patients, can result in patients being transferred to a critical care unit in the 24 hours following admission from an emergency centre.

As a lack of knowledge of measurement techniques was identified by Ansell *et al.* (2015:886) influencing the compliance rates of nurses monitoring the respiratory rate of patients, questions aimed at determining the current knowledge of the ENs and ENAs on the measurement of respiratory rate and oxygen saturation were included in a section of the questionnaire.

The responses to questions aimed at determining the current knowledge of the ENs and ENAs who participated in the study are presented in Table 4-11 with the correct option highlighted:

Table 4-11: Responses to questions on aspects of importance during the measurement of respiratory rate and oxygen saturation

Definition of respiration			Normal adult respiratory rate			The bluish colour of the skin when there is insufficient oxygen in the blood			Rapid, often shallow breathing			Difficult breathing, usually when the patient is short of breath			The term used when there is no respiration		
Question option	Percentage		Question option	Percentage		Question option	Percentage		Question option	Percentage		Question option	Percentage		Question option	Percentage	
	EN	ENA	Breaths/min	EN	ENA		EN	ENA		EN	ENA		EN	ENA		EN	ENA
The breathing in and out of carbon monoxide.	5	2.3	At least 25-35	0	2.3	Tachypnoea	0	0	Tachypnoea	65	50	Tachypnoea	10	2.3	Tachypnoea	10	15.9
The breathing in and out of air, which results in gas exchange in the lungs.	80	79.5	At least 32-40	0	0	Dyspnoea	0	9.1	Dyspnoea	15	18.2	Dyspnoea	85	81.8	Dyspnoea	10	9.1
The breathing in and out of oxygen.	15	18.2	At least 12-20	100	97.7	Cyanosis	100	90.9	Cyanosis	0	4.5	Cyanosis	0	4.5	Cyanosis	0	0
Rapid, often shallow breathing.	0	0	At least 35-50	0	0	Apnoea	0	0	Apnoea	20	27.3	Apnoea	5	11.4	Apnoea	80	75

The criterion to use when measuring the respiratory rate of patients was identified by Baillie (2014:154) as listening for breathing sounds. Treas and Wilkinson (2014:431) include effort during breaths adding to the discomfort experienced by patients resulting in fatigue and fear. The responses to determine the knowledge of the ENs and ENAs who participated in the study on the criteria to observe for when measuring a pulse rate are presented in Table 4-12 with the correct option highlighted:

Table 4-12: Responses to the question on criteria to observe for during the measurement of respiratory rate

Question Option	Percentage	
	EN	**ENA**
Rate, rhythm, depth, use of accessory muscles and sounds such as snoring etc.	25	38.7
Rate, rhythm, depth, use of accessory muscles.	20	4.5
Rate, rhythm, depth and sound.	45	47.7
Rate, rhythm and depth only.	10	9.1

The responses to the measurement time when assessing patients with an irregular respiratory rate are presented in Table 4-13 with the correct option highlighted:

Table 4-13: Responses on measurement times

Question Option	Percentage	
	EN	**ENA**
At least 30 seconds	5	2.3
At least 60 seconds	85	90.9
At least 45 seconds	0	2.3
At least 120 seconds	10	4.5

When patients become aware of their respiratory rate being assessed, they change their breathing pattern. It was, therefore, important to ensure that all the ENs and ENAs responsible for the measurement of respiratory rates were aware of this phenomenon. The responses to this question are presented in Table 4-14 with the correct option highlighted:

Table 4-14: Actions to prevent changes in the breathing pattern of patients during a measurement of their respiratory rate

Question Option	Percentage	
	EN	ENA
Inform the patient when respiratory rate will be observed.	0	22.7
Keep fingers on the pulse point and count respiration without the patient's knowledge.	100	75
Estimate the respiration based on patient's appearance.	0	0
Omit checking respiration.	0	2.3

The responses from the ENs and ENAs who participated in the study on the factors affecting respiration are presented as a percentage in Table 4-15 with the correct option highlighted:

Table 4-15: Responses on factors affecting respiration

Question Option	Percentage	
	EN	ENA
Illness or disease, exercise and elevated temperature.	10	22.7
Exercise and elevated temperature.	0	6.8
The above factors do not affect respiration.	0	0
Illness, exercise, age and elevated temperature.	90	70.5

The responses of the ENs and ENAs on the final two questions aimed at determining their knowledge on the measurement of oxygen saturation are presented as a percentage in Table 4-16 and the correct option is highlighted:

Table 4-16: Responses to questions on the measurement of oxygen saturation

Measurement method			Contra-indicated site		
Question option	Percentage		Question option	Percentage	
	EN	ENA		EN	ENA
Venous oximetry	20	29.5	Finger	50	70.5
Pulse oximetry	45	22.7	Ear	5	6.8
Arterial oximetry	5	18.3	Toe	20	2.3
Infrared oximetry	30	29.5	Nose	40	20.4

All the data aimed at answering the question if the ENs and ENAs working at Hospital A in KwaZulu-Natal were knowledgeable regarding the monitoring of vital signs are presented in the provided tables and figures and are discussed comprehensively in Chapter 5.

4.3 THE ACCURACY OF RECORDINGS BY THE ENs AND ENAs WORKING AT HOSPITAL A IN KWAZULU-NATAL.

When evaluating the accuracy of recording-specific items, the importance of these items were identified. These items include the correct identification of documents, legible writing on documents, patient diagnosis recorded on the implementation record, and the chronological order of entries.

The documents completed by the respondents were analysed by three subject matter experts permanently employed at Hospital A at the time of the study. These experts made use of the checklist (Annexure H) during their analysis. The findings from each of the experts were compared and consensus was reached for each of the individual findings.

The results from the data analysis on the documentation of vital data for each nursing category are presented in Figure 4-4:

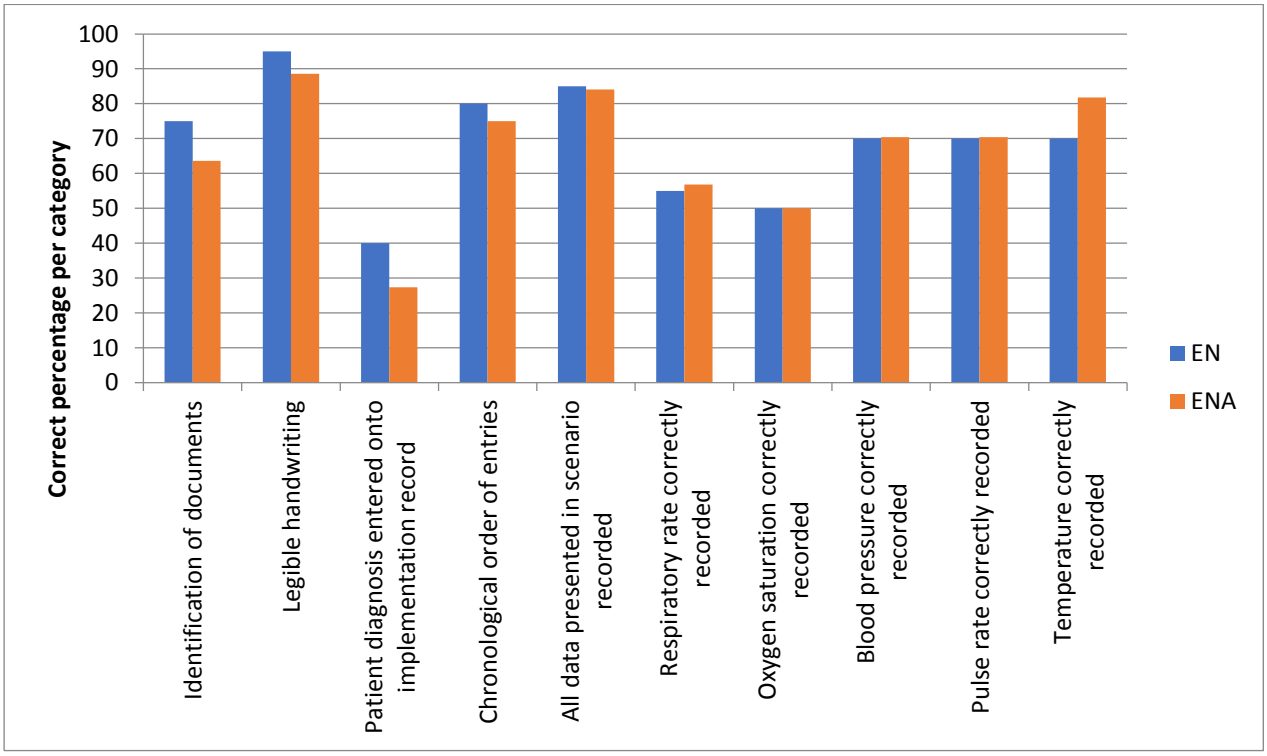

Figure 4-4: Correct documentation percentage per nursing category

4.4 THE ABILITY OF THE ENs AND ENAs WORKING AT HOSPITAL A IN KWAZULU-NATAL TO ACCURATELY IDENTIFY ABNORMALITIES

To determine if the ENs and ENAs who participated in the study were able to identify abnormalities when measuring vital signs data, a scenario was presented to them with patient data in the self-administered questionnaire. The findings from the data analysis following completion of the adult early warning observation chart are presented in Figure 4-5:

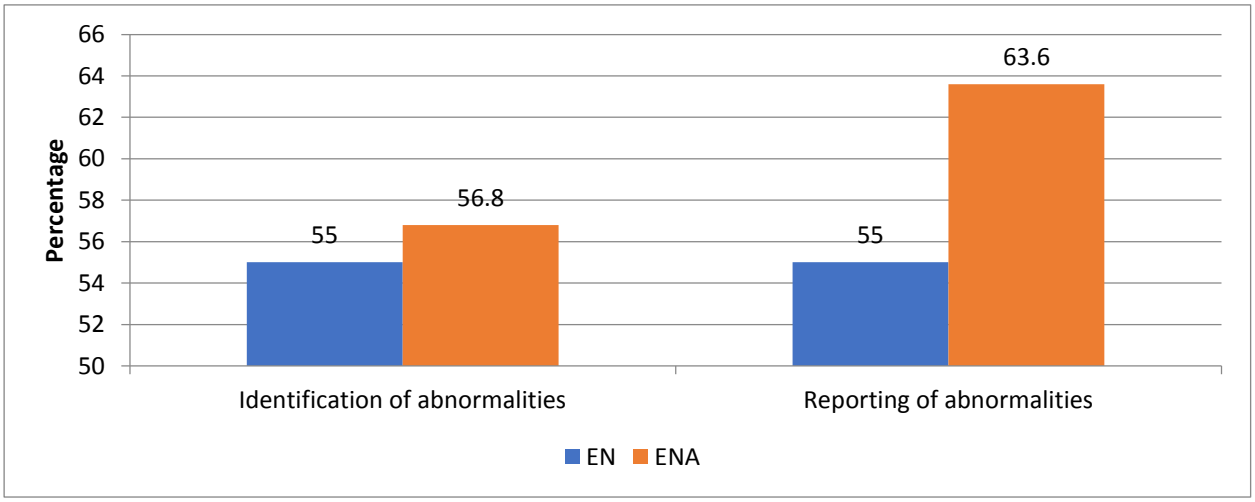

Figure 4-5: Percentage of respondents per nursing category

As some of the respondents indicated additional actions or interventions when they assessed the vital signs provided in the scenario, these responses are presented in Figure 4-6. Additional actions or interventions or actions were not required or expected as part of the study.

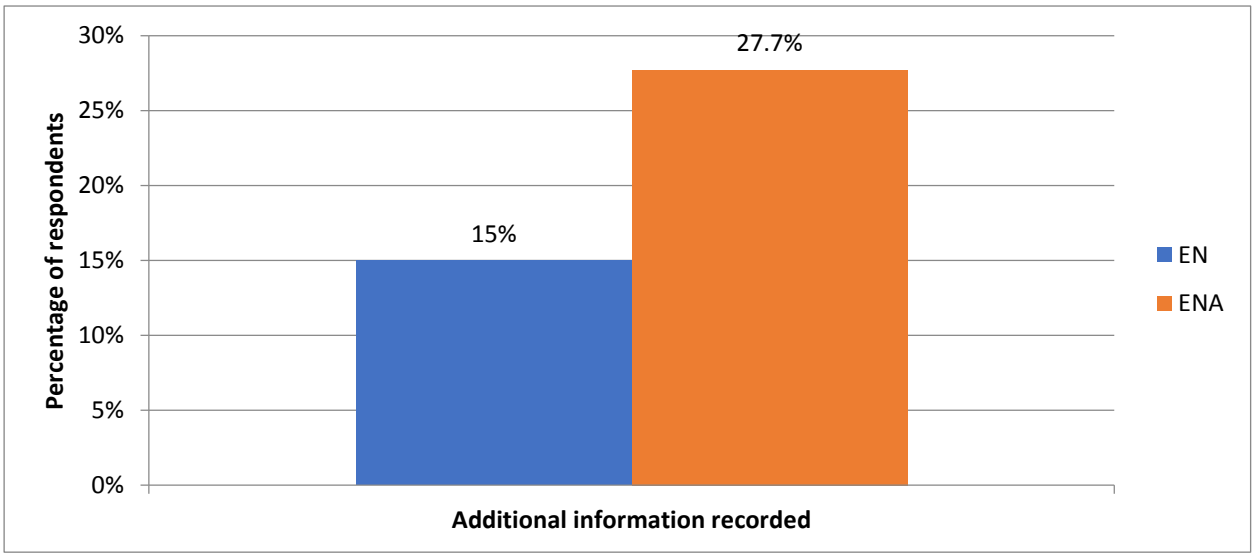

Figure 4-6: Additional information recorded per nursing category

4.5 CHAPTER SUMMARY

This chapter presented the data obtained during the analysis of the responses to the self-administered questionnaire aimed at answering the research objectives as set out in section 1.5.

In Chapter 5, the findings of the study are discussed.

CHAPTER 5 DISCUSSION OF RESULTS

5.1 INTRODUCTION

This chapter provides a detailed discussion of the main results (see Chapter 4) aimed at achieving the objectives of the study.

5.2 RESULTS

The aim of this study was to determine the theoretical applied knowledge of the ENs and ENAs on vital signs, their ability to accurately record vital signs and their interpretation of vital signs data resulting in the identification of abnormalities. To reach this aim, the main objectives of this study were:

- To explore and describe the ENs and ENAs theoretical knowledge on vital signs, documentation and interpretation at Hospital A in KwaZulu-Natal, South Africa.
- To evaluate and describe the accuracy of the ENs and ENAs while recording vital data at Hospital A in KwaZulu-Natal, South Africa.
- To explore and describe if the ENs and ENAs accurately interpret vital data during documentation at Hospital A in KwaZulu-Natal, South Africa.

As demonstrated by the literature review (Chapter 2), the early identification of patient deterioration is crucial to nursing practice. To ensure that nurses, responsible for the assessment of vital signs, are adequately equipped to accurately record and interpret vital data presented to them and to report the abnormalities identified immediately, required evaluation of the current theoretical knowledge and interpretation abilities of the ENs and ENAs to assure quality patient care.

5.2.1 Demographic data

The demographic data collected from the self-administered questionnaire provided information that described specific characteristics of the respondents of importance to the researcher (Connelly, 2013:269).

5.2.1.1 Nursing category

The results from section one, questions 1-4 of the self-administered questionnaire, indicated that 31.2% (n=20) of the respondents were ENs and 68.8% (n=44) were ENAs. A differentiation between the two nursing categories allowed for a comparison between these two groups of respondents, especially in terms of current knowledge, accuracy of recording and the ability of these nurses to correctly interpret the data presented to them. The SANC prescribes clear

guidelines on the roles and responsibilities of ENs and ENAs found in the council's scope of practice (SANC, 1984). The ENs and ENAs were the two categories of nurses primarily responsible for the assessment of vital signs in the general, medical and surgical wards, the day clinic and the obstetric department of Hospital A.

From the findings, the researcher was able to determine that the ENs fared slightly better than the ENAs when completing the self-administered questionnaire (see Figure 4-2). The scores of the ENAs ranged between 43.2% and 89.2% (mean = 64.6%). The lowest percentage achieved was by one of the ENAs, scoring only 37.8%. The highest percentage achieved by one of the ENAs was 89.2% with a mean of 64.9%. The lowest (45.9%) and the highest (94.5%) percentage was achieved by ENs with a mean of 71.5%. The majority of respondents (ENs 65% and ENAs 61.4%) were able to achieve a mean score of between 60% and 80%.

The age, work experience and employment status of the respondents were of importance as the questionnaire provided additional information on experience with regard to responses during patient care. As confirmed by Numminen *et al*. (2013:1411), age and work experience positively influence the clinical competence of practising nurses.

5.2.1.2 Age

From the results presented in Table 4-1, it was evident that the majority of respondents in both the ENs (50%) and ENAs (56.8%) category ranged between 26-35 years of age with 30% ENs and 20.4% ENAs older than 40 years at the time of the study.

The researcher determined that these respondents performed better with a higher mean score of 68.1%. The ENs obtained a mean score of 73.3% − higher than the respondents in the other age groups.

The ENs obtained better results in the knowledge questionnaire with a mean score of 70.5% while the ENAs obtained a mean score of 64.6% (18 – 25 years of age). In the ENAs category, the respondents (36-40 years of age) scored a mean score of 67.1%. The findings from this study are, therefore, not in line with the findings from a study done by Numminen *et al.* (2013:1420) where older nurses performed better than younger, less experienced nurses. In this study, the ENs aged 26-35 years, achieved a higher mean score than the ENs from any of the other age groups.

The ENAs aged 36-40 years achieved a slightly higher mean score than those from the other categories with the ENAs aged over 40 years achieving the lowest mean score. From a study done by Graham and Dufield (2010:44), it is evident that South Africa, as the case in the rest of the world, has a substantial nursing work force aged 40 years and older. However, in this

research study, only 23.4% of the respondents who participated were older than 40 years (see Table 4-1).

The researcher was, therefore, able to conclude that age did not significantly influence the theoretical applied knowledge of practising nurses who participated in this study.

5.2.1.3 Years of experience

From the results presented in Table 4.1, the majority of the ENs (65%) and ENAs (47.7%) indicated 1-5 years of nursing experience working at Hospital A at the time of the study. According to Benner (1982:134), limited nursing experience can influence the ability of nurses to recognise and respond promptly to patient deterioration. Benner (1982:134) describes experience as having a direct influence on the ability of nurses to make decisions in clinical practice. Expert nurses are able to translate experience, preconceived ideas and knowledge into actual practice (see Figure 4-2). The mean for 1-5 years of experience was 68% (ENs = 70.7% and ENAs = 66.4%). The group with >10 years of experience achieved the highest results with a mean score of 69.4% (ENs = 74.4% and ENAs = 66.5%). These results, therefore, support the theory of Benner (1982:134) and Phaneuf (2008:3) that more experienced nurses perform better than less experienced nurses in the theoretical knowledge questionnaire.

5.2.1.4 Employment status

Table 4-1 further demonstrates the distribution of ENs and ENAs with regard to permanent and part-time employment. A study by Aiken *et al.* (2007:338) noted that of the 198 hospitals that participated in their study, 94% of the nurses were employed on a permanent basis which is similar to the findings of this study – 85% of the ENs and 86.4% of the ENAs were permanently employed. In the study by Aiken *et al.* (2007:4), only 6% of the nurses were employed on a part-time basis. In this study, 15% of the ENs and 13.6% of the ENAs were employed on a part-time basis. According to the above-mentioned authors, their findings impacted on the number of adverse events.

Figure 4-3 presents the findings based on the employment status of the ENs and ENAs at the time of the study. Permanently employed ENs achieved higher results (a mean of 73.2%) than the ENs employed on a part-time basis (a mean of 64.9%) employed through an agency. This can be an indication of why a knowledge gap exists regarding the measurement of vital signs. Similarly, permanently employed ENAs achieved a higher result (a mean of 66%) than the ENAs employed on a part-time basis (a mean of 57.2%).

In the above-mentioned study by Aiken *et al*. (2007:5), hospitals with a higher number of part-time nurses showed a higher frequency of adverse events. When the number of part-time

nurses at a hospital was below 5%, a decrease in nosocomial infections was evident. Aiken *et al*. (2007:5) and Page (2008:64) concluded that part-time nurses are not always familiar with the hospitals structure, policies and procedures and can potentially affect the quality of patient care, which appears to have a negative or mixed effect on adverse events, such as nosocomial infections.

5.2.2 Blood pressure

Tanner (2006:205) identified the importance of knowing vital signs information, as the ability of nurses to make clinical decisions is influenced by the knowledge they possess. However, if nurses do not possess the necessary knowledge to compare current cues provided by patient vital data with existing knowledge, they can potentially fail to recognise patient deterioration (Levett-Jones *et al.*, 2010:517).

The responses to questions (5-11) of the questionnaire were used to determine the knowledge of respondents on definitions and values of importance during the assessment of blood pressure (BP) (see Table 4-2). A knowledge gap was identified with regard to both categories of nurses who participated in the study. The researcher was able to determine that a significant number of the ENs and ENAs, who worked at Hospital A in KwaZulu-Natal at the time of the study, did not know the correct definition of BP and they were not able to correctly identify the correct values for hypertension and hypotension, as described in the standard operating procedural guidelines used by Hospital A (Hospital A, 2016:8).

This knowledge deficit was demonstrated by only 40% (n=8) of the ENs and 38.6% (n=17) of the ENAs from a total of 39.1% (n=25) respondents who correctly *defined BP*. The option accepted as the definition of BP is the “force exerted by the blood against the artery walls when flowing through the body” evident in numerous literature sources (Baillie, 2014:159; Booysen *et al.*, 2015:256; Perry *et al.*, 2016:102).

Furthermore, only 50% (n=10) of the ENs and 65.9% (n=29) of the ENAs from a total of 60.9% (n=39) of the respondents knew that the hospital guidelines (Hospital A, 2016:13) describe *hypertension* as “BP above 140/90 mmHg”. These values are confirmed by Booysen *et al*. (2015:259).

Similar to the results on hypertension, only 45% (n=9) of the ENs and 45.5% (n=20) of the ENAs from a total of 45.3% (n=29) respondents knew that the prescribed values for *hypotension* are identified in the standard operating procedural guidelines (Hospital A, 2016:13) as “a systolic BP below 110 mmHg”. This value is confirmed by Eastridge *et al.* (2007:296).

The basic nursing procedure regarding vital signs identifies the *normal BP ranges* for an adult patient as “between 110-140 mmHg systolic BP and 60-90 mmHg diastolic BP” (Hospital A, 2016:13). The majority of the ENs knew the correct *BP ranges*, as indicated by the results − 80% (n=16) of the ENs selected the correct option. However, only 68.2% (n=30) of the ENAs knew what the *normal BP ranges* for an adult patient were − an overall 71.9% (n=46) of the respondents. Tanner (2006:205) identified the importance of knowing vital signs information, as the ability of nurses to make clinical decisions, is influenced by the knowledge they possess. However, if nurses do not possess the necessary knowledge to compare current cues provided by patient vital data with existing knowledge, they can potentially fail to recognise patient deterioration (Levett-Jones *et al.*, 2010:517).

As Hospital A makes use of a track and trigger system with regard to the *adult early warning observation chart* used to record vital data, it was important to determine if the ENs and ENAs were able to differentiate between systolic and diastolic BP. The chart is colour coded to trigger a response if an abnormal systolic pressure, falling outside of the prescribed ranges is recorded in either the orange or red zones, as described in Chapter 2, section 2.6. The ENs identified the correct *definition for both systolic and diastolic BP* significantly better than the ENAs with 80% (n=16) of the ENs selecting the correct definition for both systolic and diastolic BP. However, only 65.9% (n=29) of the ENAs knew that *systolic pressure* was the maximum pressure and only 68.2% (n=30) knew that *diastolic* was the minimum pressure. These results are of concern to the researcher as it can influence the ability of the ENs, and especially of the ENAs, to recognise abnormalities related to the measurement of BP.

The question on the importance of selecting the *correct cuff size* was well answered by both the ENs and the ENAs. Seckel (2016:e14) highlights the importance of the correct cuff size when measuring BP. If a cuff is used that is too small, it can result in an overestimated BP, and if a cuff is used that is too wide, the BP can be underestimated. A significantly high proportion, 95% (n=19) of the ENs and 86.4% (n=38) of the ENAs, understood the importance of selecting the correct cuff size. Although both the categories demonstrated fair knowledge when answering this question, it would be beneficial to include this knowledge in any training intervention to ensure that all the ENs and ENAs responsible for the measurement of BP are aware of the importance of selecting the correct cuff size. This knowledge can positively contribute towards the provision of high quality patient care at Hospital A.

From these findings, it is evident that a knowledge gap on BP measurement exists with regard to the ENs and ENAs working at Hospital A in KwaZulu-Natal.

5.2.3 Body temperature

The assessment of body temperature is described by Sund-Leander and Grodzinsky (2013:942) as an important factor affecting the decisions made by nurses and these decisions are affected by knowledge. The findings from the section of the questionnaire that tested the knowledge of the respondents concerning the assessment of body temperature were carefully analysed and important findings were made (questions 12-17).

The majority of nurses (both the ENs and ENAs) were able to correctly define *body temperature* as "the balance between the heat that the body produces and the heat that the body loses*"* (see Table 4-5)*.* This definition is confirmed by numerous literature sources, such as Booysen *et al.* (2015:248); Brooker and Waugh (2007:368); Elliot and Coventry (2012:621); Geyer *et al.* (2009:381); Kowalak (2009:12); Perry *et al.* (2015:77); and Potter *et al.* (2016:488). This correct option was selected by 75% (n=15) of the ENs and 70.5% (n=31) of the ENAs forming a combined 71.9% (n=46) of the respondents. This finding, therefore, indicates that the majority of the respondents had the necessary knowledge to answer the question correctly.

There was a significant difference in the knowledge of the ENs and the ENAs when asked about the *normal adult value*s for body temperature as seen in Table 4-5. Hospital A accepts the normal adult ranges for body temperature as 36.6-37.5°C (Hospital A, 2016:8). As many as 80% (n=16) of the ENs identified the correct option but only 59.1% (n=26) of the ENAs selected the correct option. This result indicates that a high number of the ENAs would be able to recognise and respond to abnormalities before actually necessary, potentially resulting in wasted time and resources to address perceived abnormalities. Alternatively, the majority of the respondents correctly identified the option to describe *hypothermia* (see Table 4-5). *Hypothermia* is accepted by Geyer *et al*. (2009:386) and Waugh and Grant, (2010:461) as "a temperature of less than 35°C". This knowledge was demonstrated by 90% (n=18) of the ENs and 81.8% (n=36) of the ENAs as a combined group of 84.4% (n=54) respondents who selected the correct option.

The question that tested the knowledge of respondents regarding the description of *rigor* (seen in Table 4-5) were relatively well answered by the majority of both categories of nurses. Geyer *et al.* (2009:380) and Waugh and Grant (2010:461) define *rigor* as a severe reaction of the body to the presence of microbes, toxins or foreign substances in the blood stream (septicaemia) – accepted as the correct option in the self-administered questionnaire presented to the respondents. An overall 80% (n=16) of the ENs and 77.3% (n=34) of the ENAs selected the correct option when answering the question with regard to the accurate assessment of patients during the measurement of vital signs.

Although the majority of respondents selected the correct option when asked to identify the *action required to reduce pyrexia*, 15% (n=3) of the ENs and 25% (n=11) of the ENAs as a combined group of 21.9% (n=14) respondents did not include *giving a tepid sponge bath* as an appropriate action to reduce pyrexia (see Table 4-6). A study by Sreekanth and Sharif (2015:213) showed that combining a tepid sponge bath with antipyretic medications shortened the duration and severity of the body temperature of patients by up to 1°C for every 20 minutes. Additionally, Ackley and Ladwig (2011:447) together with Ignatavicius and Workman (2016:409) include the administration of antipyretic medications as per the medical practitioner's prescription together with a tepid sponge bath as effective nursing interventions to reduce pyrexia.

The remaining two questions aimed at determining the current knowledge of the ENs and ENAs on the *use of the infrared thermometer* used at Hospital A where the data were collected, presented findings summarised in Table 4-7. When asked about the *correct distance from the forehead to maintain when measuring the temperature*, only 5% (n=1) of the ENs and 11.4% (n=5) of the ENAs selected the option indicating the correct distance. The procedural guideline (Hospital A, 2016:7) on the distance to maintain prescribes 3-8 cm as the appropriate distance to ensure an accurate result.

Although 70% (n=14) of the ENs identified the appropriate *nursing actions required when using an infrared thermometer*, only 50% (n=22) of the ENAs identified the correct actions. During the analysis of the data, Hospital A investigated more appropriate methods to measure body temperature. A decision was made to introduce an axillary thermometer with disposable probes to reduce any chances of cross infection or contamination during measurement. Although this is a positive initiative, it is important to ensure comprehensive training during rollout of new equipment. The incorrect use of equipment can influence results and potentially impact on the health and well-being of patients (Powell-Cope *et al.*, 2008:8).

The results discussed in this section, indicate that although the ENs and ENAs generally had appropriate levels of knowledge related to the measurement of body temperature, areas of concern were identified that require interventions to ensure optimal care for all patients admitted to Hospital A.

5.2.4 Pulse rate

The accurate measurement of a pulse rate is important. Perry *et al.* (2014:77) state that the heart rate of patients determines cardiac output − changes in the cardiac output of patients occur when the pulse rate is affected. When formulating questions to test the knowledge of the

ENs and ENAs, the researcher again referred to the basic nursing procedure of the assessment of vital signs that is available in every nursing unit at Hospital A (Hospital A, 2016).

The data from the responses to questions 18-28 of the questionnaire were analysed and interpreted to determine the knowledge of the ENs and the ENAs who participated in the study on the measurement of a pulse rate. The respondents of the study demonstrated some knowledge when answering the questions on the measurement of a pulse rate (Table 4-8).

When answering the question testing the knowledge of respondents on the *definition of a pulse rate*, a significant 95% (n=19) of the ENs and 95.4% (n=42) of the ENAs as a combined group total of 95.3% (n=61) of respondents correctly answered the question. These responses indicate excellent knowledge when defining a pulse rate.

A *normal adult pulse rate* was correctly identified by the majority of both categories but 35% (n=7) of the ENs and 31.8% (n=14) of the ENAs as a combined group of 32.8% (n=21) respondents accepted 60-80 beats per minute as a normal pulse rate. This can result in the recognition of an “abnormal” pulse rate when the pulse rate is above 80 beats per minute. As a pulse rate of 80 – 100 beats per minute is accepted as normal, reporting it as abnormal, could result in an early intervention, which is in fact not warranted, and which could potentially have a negative impact on the patient’s outcome.

According to Eckman (2008:29), it is generally expected that the pulse rate remains the same everywhere in the body. It is, however, important to note that due to certain factors, such as decreased cardiac output, a variance can be observed as a result of the inability of the heart to eject sufficient blood into the peripheral circulation during cardiac contraction (Eckman, 2008:29). Perry and Potter (2011:5) and Eckman (2008:29) emphasise that a pulse rate deficit is determined by auscultating the apical rate while palpating the radial rate and comparing the two results. A pulse rate can, therefore, differ when comparing the radial with the apical rate due to the diminished peripheral circulation as a result of decreased cardiac output. The accepted answer for the question *if the pulse rate is the same everywhere in the body* was “always”, rather than “most of the time”. If a deficit is observed, it would, therefore, require further investigation to determine the cause.

With a variance in the pulse rate from one site to another indicating changes in the condition of patients, such as a decreased cardiac output, it is of concern that only 30% (n=6) of the ENs and 40.9% (n=18) of the ENAs selected this option − demonstrating a clear gap in their knowledge that can potentially affect their ability to identify a significant change in the condition of patients.

The next question posed to the respondents aimed to identify which pulse point can be deemed inappropriate by the ENs and ENAs. Perry *et al.* (2016:102) describe the apical pulse as the most accurate non-invasive measurement of a heart rate. Rosdahl and Kowalski (2008:519) concur that the apical pulse is the most accurate pulse point lying between the 4th and 5th left intercostal space. No literature was found that identifies “orbital” as an acceptable pulse point during the measurement of a pulse rate.

“Orbital” as an *inappropriate pulse point* was only selected by 40% (n=8) of the ENs and 36.4% (n=16) of the ENAs. The majority of respondents felt that “apical” was an incorrect pulse point (EN=60%; ENA=50%). With the apical pulse point identified by Perry *et al.* (2016:102) and Rosdahl and Kowalski (2008:519) as the most accurate pulse point, this response rate is of concern and requires attention.

One of the most significant findings from the questions on measuring a pulse rate was that only 55% (n=11) of the ENs and 56.8% (n=25) ENAs could identify that a pulse rate of more than 100 beats per minute was known as tachycardia. The need to assess the rate, rhythm and strength of a pulse rate was correctly identified by 60% (n=12) of the ENs and 50% (n=22) of the ENAs who completed the questionnaire. This response indicates a knowledge gap existing for both categories on measuring of a pulse rate.

When the data were analysed with regard to the responses on which pulse rate the ENs and ENAs associated with *tachycardia*, a deficit in knowledge was identified. Of the ENs, only 55% (n=11) and 56.8% (n=25) of the ENAs were able to identify a pulse rate of more than 100 beats per minute as *tachycardia*. Tachycardia − a pulse rate of more than 100 beats per minute − is defined by Brooker and Waugh (2007:377) and Treas and Wilkinson (2014:428). With nurses selecting a pulse rate of more than 120 beats per minute (option 4) as tachycardia, it can result in a delayed response to patient deterioration.

Bradycardia is described by Lewis (2013:72) as a pulse rate of less than 60 beats per minute. This was correctly identified by 95% (n=19) of the ENs and 77.3% of the ENAs. Although the majority of ENs were able to correctly identify a pulse rate of less than 60 beats per minute as *bradycardia* (De Wit *et al.*, 2016:434; Melin e*t al.*, 2016:198), it is important to note that only 77.3% (n=34) of the ENAs knew that this was correct with 11.4% selecting “tachypnoea” from the options. As highlighted by Massey *et al.* (2017:17), the use of appropriate medical terms, such as bradycardia, in clinical practice has a positive impact on the ability of nurses to recognise and respond to patient deterioration. It is, therefore, important to ensure that all nurses potentially exposed to these terms are properly trained and educated about the correct meaning of terms.

Table 4-9 presents the responses of the ENs and ENAs with regard to the question focusing on *factors affecting the pulse rate* of patients. Pathology, such as obstructive pulmonary disease, pneumonia, heart failure, age, medications and emotions (stress), are identified by Alexis (2010:320) as factors affecting the pulse rate of patients. The question was well answered with 80% (n=16) of the ENs and 84.1% (n=37) of the ENAs as a total group of 82.8% (n=53) respondents selecting the correct option concerning the potential factors affecting the pulse rate of patients. These responses indicate adequate levels of knowledge associated with factors affecting a pulse rate.

The responses to the questions on aspects of importance during the measurement of a pulse rate as presented in Table 4-10. The researcher was able to determine that there was a difference in the knowledge of ENs and ENAs with regard to the *measurement technique* associated with measuring a pulse rate. The correct technique for the measuring a pulse rate was correctly selected as “using the tips of 2-3 forefingers” by 85% (n=17) of the ENs and 70.5% (n=31) of the ENAs. An area of concern is that 25% (n=11) of the ENAs felt that it was appropriate to use an electronic monitoring device to measure a pulse rate (option 1). According to Elliot and Coventry (2012:622) and Lawson and Peate (2009:98), this can result in failure to recognise vital information obtained through a manual assessment.

The question testing the knowledge of the ENs and ENAs pertaining to the *measurement time of a regular* as well as *an irregular pulse rate* was well answered by both categories who participated in the study. Measuring a regular pulse rate for 30 seconds was correctly selected by 95% (n=19) of the ENs and 84.1% (n=37) of the ENAs as a total group of 87.5% (n=56) respondents. The measurement time for an irregular pulse rate was correctly identified as 60 seconds by 95% (n=19) of the ENs and 95.5% (n=42) of the ENAs as a total group of 95.3% (n=61) respondents – an indication of adequate knowledge to ensure a proper assessment during the measurement of a pulse rate.

The *assessment criteria of importance when measuring a pulse rate*, were correctly identified by 60% (n=12) of the ENs and 52.2% (n=23) of the ENAs. This response rate indicates that almost half of the respondents did not identify rate, rhythm and strength as the correct criteria to assess when measuring a pulse rate − demonstrating a clear gap in their knowledge. These assessment criteria are identified as important by Kowalak (2009:16) and Lawson and Peate (2009:85) as these assessment criteria can be indicative of underlying conditions, such as atrial fibrillation and respiratory diseases requiring a prompt response and intervention. Accurate assessments depend on a complete assessment requiring the necessary knowledge on what to assess and observe for.

From the above findings, it is, therefore, clear that a knowledge gap exists on the normal pulse rate of an adult patient, the consistency of a pulse rate throughout the body, inappropriate pulse points, the values associated with tachycardia and the assessment criteria of importance during the measurement of a pulse rate. Moreover, the ENAs also displayed a deficit in their knowledge concerning the values associated with bradycardia and the correct measurement technique associated with the measurement of a pulse rate.

These areas of concern identified during the analysis of the data, require attention and appropriate interventions, as discussed in Chapter 6, to ensure provision of quality care for all patients admitted to Hospital A.

5.2.5 Respiratory rate and oxygen saturation

The importance of accurate measurements of respiratory rate and oxygen saturation as part of the assessment of vital signs is discussed by Boerma *et al.* (2017:1). From the analysis of the data collected through the self-administered questionnaire (questions 29-40), certain gaps in the knowledge of respondents were identified. However, certain questions were relatively well answered − demonstrating sufficient knowledge associated with the accurate measurement of respiratory rate and oxygen saturation (Table 4-11).

In a study by Boerma *et al.* (2017:1), a conclusion was reached that hypercapnia together with tachypnoea and low oxygen saturation are predictors of patient deterioration resulting in a transfer to a critical care unit in the 24 hours following admission from an emergency centre. This study further highlighted the importance of accurate measurements of respiratory rate and oxygen saturation as part of a vital signs' assessment to identify patient deterioration and to put preventative measures in place to reduce the need for transfer to critical care units. A study by Ansell *et al.* (2015:886) further identified a lack of knowledge concerning measurement techniques influencing the compliance rates of nurses monitoring respiratory rates.

Respiration was well defined by 80% (n=16) of the ENs and 79.5% (n=35) of the ENAs. The respondents correctly selected "the breathing in and out of air, which results in gas exchange in the lungs", confirmed by numerous literature sources (Booysen *et al*., 2015:255; Waugh & Grant, 2010:464). Although adequate knowledge was demonstrated by both the categories, it would be in the interest of Hospital A to include this information in any training interventions resulting from this study for improved patient care.

The respondents from both categories showed excellent knowledge when 100% (n=20) of the ENs and 97.7% (n=43) of the ENAs correctly selected 12-20 breaths per minute as the *normal respiratory rate for an adult patient*. This rate is accepted as normal for adult patients by Mok *et al.* (2015b:98) and Perry *et al*. (2016:487).

This level of knowledge was again demonstrated by the respondents when the question on *defining cyanosis* was correctly answered by 100% (n=20) of the ENs and 90.9% (n=40) of the ENAs. The respondents correctly identified cyanosis as a bluish discoloration. The presence of cyanosis can be indicative of heart disease and a decreased oxygen saturation requiring an immediate response and intervention (Kyavar *et al.*, 2014:37).

A deficit in the knowledge of the ENs and the ENAs was identified concerning the definition of *tachypnoea*. Only 65% (n=13) of the ENs and 50% (n=22) of the ENAs associated "rapid, often shallow breathing" as tachypnoea. Tachypnoea is associated with chest infection, asthma, pulmonary embolism, choking and heart failure − it is, therefore, imperative that it should be identified rapidly to reduce distress to patients (Baillie, 2014:154).

The question focusing on *dyspnoea* was also well answered with 85% (n=17) of the ENs and 81.8% (n=36) of the ENAs selecting dyspnoea as the most appropriate term for "difficult breathing, usually when a patient is short of breath*".* Dyspnoea potentially results from injuries to the chest wall, pleural effusion, pneumothorax, pneumonia, arrhythmia and heart disease and it is, therefore, crucial for nurses to be able to identify this condition as soon as possible (Geyer *et al.,* 2009:340).

The "absence of respiration" to describe *apnoea* was correctly identified by 80% (n=16) of the ENs and 75% (n=33) of the ENAs, indicating an appropriate level of knowledge. This definition confirmed by Baillie (2014:154) can be due to respiratory arrest. Although an appropriate level of knowledge was demonstrated by both the categories, it will be beneficial to include this information in any training intervention to enhance the level of knowledge of those responsible for the assessment of vital signs.

When asked to identify all *criteria to observe when checking the respiratory rate*, a serious gap in knowledge was identified. Only 25% (n=5) of the ENs and 38.7% (n=17) of the ENAs were able to identify all criteria to observe. The importance of including all the criteria was important to the researcher, as this demonstrated comprehensive assessments were performed. The need to observe for rate, rhythm and depth, the use of accessory muscles and sounds, such as snoring, were identified by Treas and Wilkinson (2014:431) as important when the breathing of patients requires a certain degree of effort − it can contribute to the discomfort of patients, resulting in fatigue and fear. Additionally, listening for breathing sounds was also identified as important by Baillie (2014:154).

The *appropriate measurement time when assessing an irregular respiratory rate* was well answered by both categories with 85% (n=17) of the ENs and 90.9% (n=40) of the ENAs selecting "at least 60 seconds" as an appropriate level of knowledge related to the

measurement of a respiratory rate and oxygen saturation. Measuring an irregular respiratory rate for at least 60 seconds is highlighted by Heuer and Scanlan (2014:66).

Keeping fingers on the pulse point while counting the respiratory rate to ensure that patients do not become aware of being observed is viewed as important. It prevents patients from changing their respiratory pattern that can prevent an accurate assessment (Baillie, 2014:154; Heuer & Scanlan, 2014:66). The question was well answered by 100% (n=20) of the ENs but only by 75% (n=33) of the ENAs. Although this is a good response rate, it is important to ensure that the remaining 25% (n=11) of ENAs understand the importance of this action during assessments of a respiratory rate to ensure accurate results.

The *factors affecting respiration* were identified by 90% (n=18) of the ENs. The majority of the respondents were equipped in correctly identifying illness and disease, age, exercise and an elevated temperature as some of the factors associated with changes in the respiratory rate of patients (Baillie, 2014:154; Geyer *et al*., 2009:326; Perry *et al*., 2016:487). Although 70.5% (n=31) of the ENAs were able to correctly identify the factors affecting respiratory rate, the remaining 29.5% (n=13) of the ENAs did not. This can potentially affect the efficient assessment of the respiratory rate of patients resulting in the unnecessary implementation of interventions.

The final two questions focused on oxygen saturation and from the responses of the respondents the researcher identified a significant gap in the knowledge of both categories that participated in the study. Only 45% (n=9) of the ENs and 22.7% (n=10) of ENAs correctly identified “pulse oximetry” as the *measurement method* used at Hospital A. The use of pulse oximetry as a method to measure oxygen saturation is described by Geyer *et al*. (2009:326). Moreover, a total of 50% (n=10) of the ENs and 70.5% (n=31) of the ENAs associated the finger as a *site contra-indicated with the measurement of oxygen saturation*. This is, however, the site most frequently used during the measurement of oxygen saturation. Only 40% (n=6) of the ENs and 20.4% (n=9) of the ENAs knew that the nose is the site contra-indicated during a measurement of oxygen saturation when using pulse oximetry.

From this analysis, the researcher was able to determine that the majority of respondents displayed adequate knowledge with regard to definitions, such as respiration, cyanosis, apnoea and dyspnoea, and the normal values associated with the respiratory rate of adult patients. It was, however, noted that a knowledge gap exists for both of the categories concerning the concept tachypnoea and the criteria to observe when assessing the respiratory rate of patients. In addition, a knowledge gap was identified with regard to the ENAs measuring respiratory rate and the technique used and should be addressed when interventions are developed.

The researcher was able to identify a gap in the equipment associated with the measurement of oxygen saturation from the data analysis performed on the questions related to oxygen saturation.

5.3 SUMMARY OF FINDINGS RELATED TO THE KNOWLEDGE OF VITAL SIGNS

The overall findings from the self-administered questionnaire to determine current theoretical applied knowledge of the ENs and ENAs indicated a gap in areas, such as normal values, definitions and important terms associated with the measurement of vital signs, which can potentially influence the ability of these nurses to correctly identify patient deterioration and concerns regarding the use of equipment for BP measurements and the infrared thermometer.

5.4 THE QUALITY OF DOCUMENTATION COMPLETED BY THE ENs AND ENAs

The results from the analysis are presented in Figure 4-4. Hospital A prescribes specific guidelines for all the nurses regarding documentation (Hospital A, 2016). These guidelines include that all documents should be identified with at least the name, surname, date of birth, department admitted to and the admitting medical practitioner of the patient. When the documents were analysed, 75% (n=15) of the ENs and 63.6% (n=28) of ENAs correctly identified the adult early warning observation chart and implementation record. These findings identified a deficit in the skills of the ENs and the ENAs – when documents are incomplete, it is viewed as a quality failure.

The next aspect considered during the analysis of the documents that formed part of the self-administered questionnaire, was legibility on all the documents. When the documents were analysed, the experts identified that the handwriting was legible for 95% (n=19) of the ENs and 88.6% (n=39) of the ENAs of a total of 92% (n=58) of the documents completed by the respondents. Illegible handwriting can potentially affect the ability of the nurses when they have to reread their own writing or the writing of others – difficulties can result in a delay concerning the recognition of abnormalities (Prideaux, 2011:1452).

The inclusion of a patient's diagnosis on the implementation record was done by only 40% (n=8) of the ENs and 27.3% (n=12) of the ENAs as a combined group of 31.3% (n=20) respondent documents. It is possible that the respondents felt the recording of a diagnosis is the responsibility of the professional nurse (PN), but this requires further investigation.

Entries on the documents were in chronological order when the results were analysed. 80% (n=16) of the ENs and 75% (n=33) of the ENAs as a total group of 76.6% (n=49) of respondents recorded all the data presented in the scenario. When this point was analysed, no consideration was given to the accuracy of recording information – only if all the data presented were indeed

recorded. These findings demonstrate that the majority of respondents knew how to record all the data in chronological order, which is in line with the policy of Hospital A (Hospital A, 2016).

The recording of each vital data component was individually analysed for accuracy. An important finding was that respiratory rate was only correctly recorded by 56.3% (n=36) of the respondents who completed the documents. This total consisted of 55% (n=11) ENs and 56.8% (n=25) ENAs. This finding is significant as it indicates a significant gap in the knowledge and skills of the ENs and ENAs responsible for the recording of findings on the observation chart. This can have a serious impact on the early recognition of and the response to patient deterioration, specifically related to the respiratory system.

Similarly, oxygen saturation was only recorded correctly by 50% (n=32) of the respondents consisting of 50% (n=10) ENs and 50% (n=22) ENAs. This can impact the ability of the nurses, responsible for the assessment and measurement of vital signs, to recognise and react to signs of patient deterioration.

BP, pulse rate and body temperature were found to be accurately recorded by 70% (n=14) of the ENs who participated in the study. Similarly, 70.4% (n=31) of the ENAs accurately recorded BP and pulse rate presented as part of the scenario. Of the ENAs, 81.8% (n=36) were able to accurately record the temperatures presented to them, which is significantly higher than the result obtained by the ENs. Although these results are much higher than the results obtained for oxygen saturation and respiratory rate, the results still indicate a deficit in the knowledge and skills of the ENs and ENAs responsible for the recording of vital data.

From the study findings described in the above section, the researcher determined that the accuracy of recording data by the ENs and ENAs at Hospital A requires attention. Specific attention should be given to the recording of the respiratory rate and oxygen saturation although the other three elements can also be significantly improved.

5.5 ACCURACY OF THE INTERPRETATION OF VITAL SIGNS

To determine if the ENs and ENAs who participated in the study were able to identify all the abnormalities presented to them as part of the study, the documents were again presented to the subject matter experts. During the analysis, the experts found that only 55% (n=11) of the ENs and 56.8% (n=25) of the ENAs correctly identified all the abnormalities. An overall total of 56.3% (n=36) of the respondents correctly identified the abnormalities correctly. Additionally, only 55% (n=11) of the ENs and 63.6% (n=28) of the ENAs recorded all the abnormalities presented to them and the actions and interventions that followed on the implementation record.

Although not a requirement, the subject matter experts identified that 15% (n=3) of the ENs and 27.3% (n=12) of the ENAs recorded additional information, such as adding blankets for the comfort of patients, administering oxygen or commencing intravenous therapy and medications.

By not identifying abnormalities, patient deterioration can be misidentified and patients are put at risk. If abnormalities are not reported, responses and the implementation of actions are delayed, such as the administration of oxygen and medications to reduce symptoms – prompt responses and the correct implementation of actions can potentially save the lives of patients.

5.6 CHAPTER SUMMARY

This chapter presents a detailed discussion on the findings of the results. The importance of the timely recognition of physiological changes that potentially signify patient deterioration was comprehensively described in this chapter. From the findings of this study, the researcher concludes that a need exists to improve the knowledge of nurses concerning vital signs as well as their skills concerning the recording of vital signs data on the early warning observation chart used at Hospital A.

CHAPTER 6 EVALUATION OF THE RESEARCH STUDY, LIMITATIONS AND RECOMMENDATIONS FOR RESEARCH, EDUCATION AND PRACTICE

6.1 INTRODUCTION

This chapter provides an evaluation of the research study, the limitations of the study and recommendations for nursing research, education and practice. It further presents the personal reflection and the conclusion of this study.

6.2 EVALUATION OF THE STUDY

In this section, each chapter is separately evaluated.

6.2.1 Chapter 1: Overview of the research study

In Chapter 1, an overview of the research study is presented, including an introduction and background to familiarise the reader with the problem statement. The overall aim of this research study was to determine the current theoretical applied knowledge of the ENs and ENAs working at Hospital A in KwaZulu-Natal on vital signs. In order to reach the aim, the researcher set out to answer the research questions as discussed in Chapter 1, point 1.4. The ethical considerations and universal standards for validity and reliability for this research study were also discussed in point 1.8.

6.2.2 Chapter 2: Comprehensive review of literature

In Chapter 2, the researcher undertook a comprehensive review of available literature on vital signs and the measurement, recording and interpretation thereof. The researcher provided an overview of the search strategy and an investigation into South African legislation and regulations that affect nursing practice related to vital signs monitoring.

Each individual aspect related to the measurement of vital signs was discussed, namely body temperature, pulse rate, BP, respiratory rate and oxygen saturation. Special consideration was given to factors affecting each of these vital signs, namely the unit of measurement, accepted normal values for an adult patient, measurement techniques, equipment used during measurements and bodily responses related to each individual vital sign.

The researcher proceeded to review literature related to the documentation of vital signs and presented the approved normal ranges for each vital sign used by Hospital A. Finally, the researcher reviewed literature to determine the importance of vital signs' assessments in clinical

practice, the need for knowledge, clinical judgement, critical thinking and decision-making in nursing.

6.2.3 Chapter 3: Research design and method

In Chapter 3, an in-depth discussion of the research methodology was provided. The research design was discussed − a quantitative, descriptive design was used (Botma *et al.*, 2010:82; Grove *et al.*, 2013:341; Wagner *et al.*, 2012:21). The researcher discussed the method of data collection, data capturing, storage of the data and finally the data analysis used to achieve the following objectives:

Objective 1: To select and formulate questions in a questionnaire to assess the theoretical knowledge, the accuracy of recording and the ability to correctly identify abnormal vital signs of the ENs and ENAs working at Hospital A in KwaZulu-Natal.

Objective 2: To explore and describe the theoretical knowledge of ENs and ENAs on vital signs, recording and interpreting at a private hospital in KwaZulu-Natal.

Objective 3: To evaluate and describe the accuracy of the ENs and ENAs recording vital data at a private hospital in KwaZulu-Natal.

Objective 4: To explore and describe if the ENs and ENAs accurately interpreted vital data during documentation at a private hospital in KwaZulu-Natal.

6.2.4 Chapters 4 and 5: Results and discussion of results

In Chapters 4 and 5, the researcher presented the results and each of the aspects related to vital signs, included in the questionnaire, was discussed individually. The first part of the self-administered questionnaire aimed at ensuring that the correct sample participated in the study and also assisted in determining the demographics of the respondents.

6.2.4.1 Demographic data

In section one of the questionnaire that focused on the demographic data of respondents, the researcher determined that 68.8% of the respondents were ENAs and the remaining 31.2% were ENs. This finding is in line with the current mix of skills available at Hospital A. Hospital A has significantly fewer ENs employed in the medical, surgical and general wards and day clinic. Although the ENs performed better than the ENAs in the knowledge component of the questionnaire, the difference was not significant.

Hospital A has a relatively young workforce − 54.7% of the respondents were between 26-35 years of age at the time of the study. When analysing the results of the questionnaire, it was noted that age did not significantly influence the results from either of the two categories.

The research showed that the ENs and ENAs with more nursing experience, performed better by achieving a higher score than participants with less years of experience. Experienced nurses perform, therefore, better than those with less experience.

A significant 85.9% of the respondents were employed on a permanent basis at the time of this research study and 14.1% of the respondents were employed on a part-time basis. The review of literature indicates that hospitals with a higher number of part-time nurses have a higher number of adverse events impacting on the quality of patient care (Aiken *et al.*, 2007:5). Aiken *et al.* (2007:5) and Page (2008:2) attributed this phenomenon to part-time nurses not being as familiar with the policies and procedures of a hospital that can result in an increase of adverse events occurring. It is, therefore, possible that these ENs and ENAs require additional intervention to familiarise themselves with the policies and procedures of Hospital A to ensure high quality patient care.

To meet the objectives of the study, the researcher aimed to answer the following three questions:

6.2.4.2 What are the theoretical knowledge of ENs and ENAs working at a private hospital in KwaZulu-Natal concerning vital signs?

From the results, the researcher identified a significant gap in some aspects of the current theoretical knowledge of the ENs and ENAs who participated in the study. The conclusion of each of the aspects analysed is presented separately.

6.2.4.2.1 Blood pressure

The respondents from both the categories found it difficult to define BP. Both the ENs and ENAs demonstrated a gap in their knowledge with regard to the normal BP values of an adult patient, the values associated with hypotension and the values associated with hypertension.

A significant number of the respondents were not able to correctly distinguish between systolic and diastolic BP. This is of concern as Hospital A makes use of a systolic track and trigger system. If the nurses are unable to differentiate between systolic and diastolic BP, it can potentially result in a failure to identify abnormalities resulting in a delay in response and this can have a negative impact on patient care.

The importance of the use of a correct cuff size, when measuring BP, was well understood by the respondents from both categories.

6.2.4.2.2 Body temperature

Questions on defining body temperature and identifying the correct ranges associated with hypothermia and rigor were well answered by the respondents who participated in the study.

However, a difference in the knowledge of the ENs and ENAs was noted when asked to identify the normal values associated with an adult body's temperature. The majority of the ENs correctly identified the approved ranges used by Hospital A but a significantly lower number of ENAs was able to correctly identify the ranges used to determine an adult body temperature.

The actions required to reduce pyrexia must be reiterated through training interventions, especially the inclusion of a tepid sponge bath and the administration of antipyretic medications.

The knowledge of respondents on how to use an infrared thermometer presented a significant gap in both the categories. Hospital A is now making use of an oral thermometer that makes use of disposable probes. No recommendations are, therefore, made concerning the use of an infrared thermometer – recommendations are presented to address the use of new equipment at Hospital A.

6.2.4.2.3 Pulse rate

The measurement time of a regular and an irregular pulse rate and the ranges associated with bradycardia, were well answered by the majority of respondents from both the categories. However, 77.3% of the ENAs answered the question on a pulse rate associated with bradycardia correctly. Ninety-five percent of the ENs selected the correct option − demonstrating a slight deficit in the knowledge of the ENAs in terms of these ranges.

A significant number of the ENAs (25%) felt it was appropriate to use an electronic BP device to measure a pulse rate. A significant number of the respondents (ENs = 15%; ENAs = 29.5%) selected the incorrect option, which indicates a gap in their knowledge related to the measurement of a pulse rate. This can result in failure to identify important changes in the condition of patients.

Other areas where a clear knowledge deficit was identified were in the questions related to the consistency of a pulse rate throughout the body, the selection of an inappropriate pulse point, the rate associated with tachycardia; and the assessment criteria of importance during the measurement of a pulse rate. With both categories demonstrating a significant gap in their

knowledge with regard to the ranges of a pulse rate associated with tachycardia and not knowing which criteria to assess, recommendations are needed to address this issue.

6.2.4.2.4 Respiratory rate and oxygen saturation

A higher percentage, although not significant, of the ENs were able to correctly identify definitions associated with respiratory rate and oxygen saturation − demonstrating higher levels of knowledge than the ENAs.

When asked to define tachypnoea, a deficit in knowledge was identified in both the categories. A higher percentage of the ENs selected the correct option and only 50% of the ENAs were able to select the correct option.

When the knowledge of respondents was determined, according to the criteria that should be observed for a respiratory rate, a significant gap in the knowledge of both the categories was found, especially with regard to the ENs. When the respiratory rate of patients is determined, it is important for patients not to be aware of a measurement taking place to prevent changes to their breathing pattern. Only 25% of the ENAs indicated that changes to the breathing pattern of patients is of importance, and that it can result in inaccurate respiratory rates measured. The measurement of oxygen saturation demonstrated a clear knowledge gap existing in both the categories who participated in the study. It is, however, important to note that it was possible that the respondents did not fully understand the question and selected, therefore, the incorrect option to answer the question.

The overall findings following the analysis and interpretation of the results from the self-administered questionnaire to determine the current theoretical knowledge of the ENs and ENAs show a clear deficit in their knowledge related to the measurement of vital signs. Specific areas of concern are that the nurses do not know what the normal ranges of vital signs are, they experience difficulty with determining important aspects related to the measurement of various aspects regarding vital signs monitoring, and a clear knowledge deficit was found in the use of equipment associated with the measurement of vital signs.

6.2.4.3 How are vital signs findings documented by the ENs and ENAs working at Hospital A, in KwaZulu-Natal?

After the documents had been analysed as part of the self-administered questionnaire, the researcher evaluated how vital signs are documented by the ENs and ENAs working at Hospital A, in KwaZulu-Natal.

The findings from the data analysis indicated that documents were not always correctly identified − fewer ENAs than ENs correctly identified documents. The majority of the respondents' writing was legible. Very few of the respondents who participated in the study included the patient diagnosis on the implementation record – potentially expecting the professional nurse (PN) to enter this crucial information.

Although the majority of respondents did make entries chronologically, slightly more ENs than ENAs were able to do this.

When analysing the individual aspects, it was noted that BP and the pulse rate were entered correctly by the majority of respondents from both the categories. It was, however, important to note that a significant 29.6% of the ENs and the ENAs did not enter the data correctly, which can potentially result in failure to recognise abnormalities. More of the ENAs were able to accurately record the results for body temperature.

The recordings of oxygen saturation and respiratory rate by the two categories who participated in the study, allowed for the identification of a large deficit in the accuracy of recording these two aspects. Only 50% of the respondents from both the categories correctly recorded oxygen saturation. Just over half of the respondents accurately recorded the respiratory rate provided in the scenario. This is a significant finding that clearly indicates a clear gap in the ability of the ENs and ENAs to record vital signs accurately. This deficit requires serious and significant actions and interventions to improve the skills of these nurses allowing for improved patient care.

6.2.4.4 Do the ENs and ENAs working at Hospital A in KwaZulu-Natal interpret vital signs data accurately?

Following the analysis of the data by the theoretical knowledge experts, the researcher was able to make certain conclusions. From the findings, the researcher was able to determine that the ENs and the ENAs do not accurately interpret vital signs. Approximately 50% of the respondents were able to identify all the abnormalities presented to them in the scenario. Moreover, the findings also indicated that a significant number of the ENs and the ENAs did not indicate that abnormalities must be reported to the PN in charge of patient care.

The ENs and ENAs working at Hospital A, in KwaZulu-Natal did not interpret vital signs findings accurately. When abnormalities are not identified, patient deterioration can be misidentified and patients potentially put at risk. When abnormalities are promptly reported, immediate responses and the implementation of actions, such as the administration of oxygen and medications to patients to reduce symptoms, can potentially save the lives of patients.

6.3 LIMITATIONS OF THE RESEARCH STUDY

The limitations of the research study relate to the contextual aspects of the research setting. The findings of the study cannot be generalised to other private hospitals and are only applicable to this specific research site due to the relatively small sample size (n=64). It is, however, important to note that the response rate of the ENs and ENAs who participated in the research study did not influence the reliability of the study findings.

The questions were formulated based on the specific basic nursing procedures and values prescribed by Hospital A as part of their vital signs guidelines. The results can, therefore, not be generalised to other private hospital groups or facilities.

The research study was conducted at only one private hospital. It is possible that other hospitals are using different training methods, assessment techniques and equipment, which can influence the results at these institutions if the questionnaire was adjusted to be administered.

6.4 RECOMMENDATIONS OF THE RESEARCH STUDY

The research findings highlighted a definite knowledge gap concerning the measurement of vital signs, the recording of vital signs on the adult early warning observation chart and the implementation record, and the identification of abnormalities.

The recommendations for research, education and practice are provided below.

6.4.1 Recommendations for practice

- An increased awareness of quality improvement initiatives and collaboration should be created by presenting these findings and suggestions to the management of Hospital A for quality improvement.
- A written report of the findings will be given to the head office of Hospital A.
- Following the introduction of quality improvement initiatives, the knowledge and skills of the ENs and ENAs at Hospital A can be assessed on the measurement of vital signs to determine if the initiatives, recommended by the research findings, had a positive impact on patient care.
- Encourage health professionals (clinical facilitators and students) to take action and participate in the development of a policy on quality improvement initiatives to standardise procedural guidelines in the private hospital group.

6.4.2 Recommendations for nursing education

- The introduction of a quality improvement programme targeting the training of ENs and ENAs with regard to the correct recording and interpreting of vital signs can improve the ability of ENs and ENAs to identify signs of patient deterioration.
- The researcher suggests intense training as part of the induction programme of Hospital A in two phases:
    - Phase 1: Improving the knowledge of the ENs and ENAs by focusing specifically on the definitions associated with BP, pulse rate, body temperature, respiratory rate and oxygen saturation; normal values for the aspects associated with vital signs, and important aspects associated with the measurement techniques and equipment used to measure vital signs.
    - Phase 2: Focusing on the correct recording of vital signs on the adult early warning observation chart. Specific attention should be given to the recording of a respiratory rate, a pulse rate, body temperature, BP and oxygen saturation and the importance of recognising abnormalities, using the correct documentation and reporting abnormalities to the PN in charge.

6.4.3 Recommendations for nursing research

- The self-administered questionnaire can be refined and adjusted according to protocol and can be used at other private hospitals of the hospital group to allow for a generalisation of results. This can potentially contribute towards the early identification of patient deterioration and improve patients' outcomes.
- A need exists to further investigate the correct identification and reporting of abnormalities by ENs and ENAs.
- Further research studies can analyse actual patient documents during an audit in the departments selected for this research study.
- The findings will be presented at a nursing education conference and will also be used for the publishing of an article in an accredited journal.

6.5 PERSONAL REFLECTION

While completing this research study, I was continually encouraged to engage in this challenging and inspirational research experience. I was challenged on a daily basis to improve the quality of my work as clinical facilitator at Hospital A, to look for meaning and to reach the objectives of the research study.

I was blessed with this opportunity. It allowed me to identify gaps in the current practice of assessing and measuring vital signs and assisted me in making recommendations aimed at enhancing the quality of care provided to patients admitted to Hospital A.

My passion for nursing education is today even more dedicated, and I hope that this research study contributes towards the early recognition of and responding to physiological signs of patient deterioration, hopefully saving the lives of those entrusted to the care of nurses.

6.6 CONCLUSION OF THE RESEARCH STUDY

This chapter presented a reflection by the researcher on the objectives of this study. Each objective was individually evaluated and discussed.

The importance of prompt recognition of physiological changes, potentially signifying patient deterioration, has been well described. From the findings of this study, it is concluded that a need exists to improve the knowledge of nurses with regard to vital signs and to enhance their skills concerning the recording of data on the adult early warning observation chart used by the hospital. The researcher further presented recommendations for nursing research, education and practice in this regard. Ensuring optimal knowledge of vital signs and the accurate recording of the data, the ability of nurses to identify patient deterioration can be improved and this can significantly affect patient outcomes.

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SANC ***see*** South African Nursing Council.

SAQA ***see*** South African Qualifications Authority.

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ANNEXURES

ANNEXURE A1: QUESTIONNAIRE (ENGLISH)

INFORMATION

I appreciate your time taken to participate in this research study. All information given by you will be held in strict confidence. The information provided will only be used for this study.

Completion of this questionnaire will provide me with valuable information on your current knowledge on vital signs, as well as vital signs recording and interpretation.

INSTRUCTIONS

- Each question has only one correct answer
- Please select the correct/most appropriate answer
- Indicate your answer by marking with a cross in the box selected by you as correct

Example:

Q1: Gender

X	Male	2	Female

- The questionnaire consists of 7 sections and 50 questions. Please complete all sections and questions.
- Section 7 covers recording and interpretation of vital signs based on the scenario provided. Please complete the early warning observation chart and the implementation record provided.
- It will take approximately 30 minutes of your time but no time limit is set.
- Once you have completed the questionnaire please place it in the envelope provided and post it in the post-split box provided at the back of the room.
- Please feel free to clarify any issues or ask the mediator any questions you may have.

Thank you for your participation in this study.

SECTION 1: DEMOGRAPHIC DATA

Q1 Age

1	18 – 25	2	26 – 35	3	36 – 40	4	> 40

Q2 Years of experience

1	< 1	2	1 – 5	3	6 – 10	4	> 10

Q3 Employment status

1	Permanent	2	Agency

Q4 Highest level of education

1	EN	2	ENA

SECTION 2: BLOOD PRESSURE MONITORING

Q5 Blood pressure is

1	The force exerted by the blood against the artery walls when flowing through the body
2	The force exerted by the blood against the vein walls when flowing through the body
3	The force at which the heart contracts and relaxes
4	Blood flow in the lungs

Q6 Systolic blood pressure is

1	The lowest point, when a change of sound or disappearance of the sound is noted
2	High blood pressure
3	Low blood pressure
4	The highest point, when the first regular sounds are heard

Q7 Diastolic blood pressure is

1	The highest point, when the first regular sounds are heard
2	The lowest point, when a change of sound or disappearance of the sound is noted
3	High blood pressure
4	Low blood pressure

Q8 The normal blood pressure for an adult patient ranges between

1	90/60 – 140/90mmHg
2	100/60 – 140/80mmHg
3	110/60 – 140/90mmHg
4	110/70 – 130/90mmHg

Q9 Hypertension is defined as

1	Blood pressure of 100/60mmHg or less
2	Blood pressure greater than 140/90mmHg
3	Blood pressure greater than 110/70mmHg
4	Blood pressure greater than 180/100mmHg

Q10 Hypotension is defined as

1	Blood pressure below 110/60mmHg
2	Blood pressure below 90/60mmHg
3	Blood pressure above 110/60mmHg
4	Blood pressure of 120/80mmHg

Q11 Selecting the correct cuff size when monitoring blood pressure is:

1	Not important as it does not influence accuracy of results
2	Not important as long as the cuff is applied in the correct position
3	Important as the incorrect cuff size could influence accuracy of results
4	Determined by the age of the patient

SECTION 3: TEMPERATURE

Q12 Temperature can be defined as

1	The bodies reaction to infection
2	The balance between the heat that the body produces and the heat that the body loses
3	A severe reaction of the body to the presence of microbes
4	When a patient's skin is warm to touch

Q13 A normal temperature for an adult patient is

1	36.7 - 37°C
2	35 - 38°C
3	36.6 – 37.5°C
4	35.5 – 36.7°C

Q14 Hypothermia is defined as

1	A temperature of less than 35°C
2	A temperature of less than 37°C
3	A temperature of more than 35.5°
4	A temperature ranging between 35.5 – 36.5°C

Q15 Rigor is defined as

1	A temperature of more than 35.5°C
2	Body temperature lower closer to the body surface
3	A severe reaction of the body to the presence of microbes, toxins or foreign substances in the blood stream e.g. septicaemia
4	Patients with uncontrollable epileptic fits

Q16 Nursing actions to reduce pyrexia includes

i. Remove blankets
ii. Expose the skin to air – remove clothing
iii. Give a tepid sponge by wetting with tepid water and allowing it to dry
iv. Administer antipyretic medications as prescribed by the medical practitioner

1	i, ii and iv
2	ii and iv
3	i and iv
4	i, ii, iii and iv

Q17 When using the infrared thermometer hold the thermometer at what distance from the forehead?

1	3 – 8 cm from the forehead
2	2 – 4 cm from the forehead
3	Directly against the forehead
4	10 cm from the forehead

Q18 To ensure accurate results when using an infrared thermometer, the nurse should

i. Push back the patient's hair from forehead
ii. Remove glasses
iii. Wipe away sweat or makeup from the forehead
iv. Scan the patients neck when measuring a body temperature

1	i, ii, iii and iv
2	i and iv
3	i, ii and iii
4	ii and iii only

SECTION 4: HEART RATE (PULSE)

Q19 Pulse is defined as

1	A skin surface where the veins passes close to the bone
2	Tension on the heart
3	The rhythmic pulsations which can be felt against the artery walls as the heart contracts and relaxes
4	Heart beating faster than 100 beats per minute

Q20 The normal pulse rate for an adult patient is

1	60 – 80 beats per minute
2	120 -160 beats per minute
3	75 – 100 beats per minute
4	60 -100 beats per minute

Q21 The pulse rate is the same everywhere in the body

1	Always
2	Most of the time
3	Rarely
4	Never

Q22 The following is NOT an appropriate palpable pulse point

1	Brachial
2	Apical
3	Orbital
4	Radial

Q23 The pulse rate of a patient can be affected by the following:

i. Illness
ii. Emotions
iii. Age
iv. Drugs

1	i, ii, ii and iv
2	i, ii, and iv
3	ii and iv
4	The above factors do not affect a patient's pulse rate

Q24 Tachycardia is a pulse rate of

1	More than 100 beats per minute
2	More than 90 beats per minute
3	More than 60 beats per minute
4	More than 120 beats per minute

Q25 A rate of less than 60 beats per minute can be defined as

1	Bradypnoea
2	Tachypnoea
3	Bradycardia
4	Tachycardia

Q26 It is acceptable to measure pulse using

1	An electronic blood pressure device
2	Your thumbs
3	Tips of 2 – 3 forefingers
4	Observing the patient and then estimating based on years of experience

Q27 When measuring pulse rate, the nurse should count the pulse rate for

1	30 seconds
2	25 seconds
3	10 seconds
4	120 seconds

Q28 The following needs to be assessed when measuring a pulse

i. Rate
ii. Rhythm
iii. Strength
iv. Position

1	i, ii, iii and iv
2	i, ii and iii
3	i, iii, iv
4	The above aspects are not assessed when measuring a pulse

Q29 If the pulse rate is irregular, the nurse should count the pulse rate for

1	Estimate
2	At least 30 seconds
3	At least 120 seconds
4	A full minute (60 seconds)

SECTION 5: RESPIRATORY RATE

Q30 Respiration is defined as

1	The breathing in and out of carbon monoxide
2	The breathing in and out of air, which results in gas exchange in the lungs
3	The breathing in and out of oxygen
4	Rapid, often shallow breathing

Q31 The normal respiration for an adult patient is

1	At least 25 – 35 breaths per minute
2	At least 32 – 40 breaths per minute
3	At least 12 – 20 breaths per minute
4	At least 35 – 50 breaths per minute

Q32 The bluish colour of the skin when there is insufficient oxygen in the blood is known as

1	Tachypnoea
2	Dyspnoea
3	Cyanosis
4	Apnoea

Q33 Rapid, often shallow breathing is defined as

1	Tachypnoea
2	Dyspnoea
3	Cyanosis
4	Apnoea

Q34 Difficult breathing, usually when the patient is short of breath is defined as

1	Tachypnoea
2	Dyspnoea
3	Cyanosis
4	Apnoea

Q35 The term used when there is no respiration is

1	Tachypnoea
2	Dyspnoea
3	Cyanosis
4	Apnoea

Q36 When observing respiration, the nurse should check the

1	Rate, rhythm, depth, use of accessory muscles and sounds such as snoring etc.
2	Rate, rhythm, depth, use of accessory muscles
3	Rate, rhythm, depth and sound
4	Rate, rhythm and depth only

Q37 If the respiration is irregular the nurse should count the breath for

1	At least 30 seconds
2	At least 60 seconds
3	At least 45 seconds
4	At least 120 seconds

Q38 As the patient changes breathing rate and rhythm of respiration when becoming aware of being assessed the nurse should

1	Inform the patient when respiratory rate will be observed
2	Keep fingers on the pulse point and count respiration without the patient knowledge
3	Estimate the respiration based on patient's appearance
4	Omit checking respiration

Q39 Factors affecting respiration includes

i. Illness or disease
ii. Exercise
iii. Age
iv Elevated temperature

1	i, ii and iv
2	ii and iv
3	The above factors do not affect respiration
4	i, ii, iii and iv

SECTION 6: OXYGEN SATURATION

Q40 The method used to measure oxygen saturation is known as

1	Venous oximetry
2	Pulse oximetry
3	Arterial oximetry
4	Infrared oximetry

Q41 Which site is contra-indicated for the measurement of oxygen saturation?

1	Finger
2	Ear
3	Toe
4	Nose

SECTION 7: RECORDING AND INTERPRETATION

- Please read the scenario provided carefully.
- Familiarised yourself with the content.
- Complete the adult early warning observation and implementation record.
- Document all information provided.
- Indicate any additional actions or interventions you would take based on the scenario provided.

Mr X, a 78-year-old male patient, is admitted into your ward for Dr Watson. He is presenting with abdominal pain. The pain started at 04:00 this morning and became progressively worse throughout the day. He is feeling nauseas and has vomited once. His vital signs on admission at 14:00 are:

BP	129/75mmHg
Pulse	78
Temperature	37.5°C
Respiration	22
Oxygen saturation	94% on room air

Following investigations and consultation with the surgeon the patient is scheduled for surgery at 18.00 Patient is prepared and his vital signs at 17:30 are:

BP	140/90mmHg
Pulse	84
Temperature	37.3°C
Respiration	20
Oxygen saturation	95% on room air

The patient returns to the ward following surgery at 01:00. His vital signs are monitored on return to the ward and are as follows:

BP	145/95mmHg
Pulse	98
Temperature	35.5°C
Respiration	22
Oxygen saturation	92% on oxygen via face mask from theatre

As per policy the vital signs are repeated within 30 minutes:

BP	96/48mmHg
Pulse	118
Respiration	28
Temperature	36°C
Oxygen saturation	90% on oxygen via face mask

After 15 minutes the vital signs are repeated and are:

BP	90/50mmHg
Pulse	115
Respiration	30
Temperature	35.8°C
Oxygen saturation	80% on oxygen via face mask

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ANNEXURE A2: QUESTIONNAIRE (AFRIKAANS)

INLIGTING

Baie dankie dat U die tyd geneem het om deel te neem aan hierdie navorsing studie. Alle inligting wat deur jou verskaf word sal streng konfidensieel hanteer word. Die inligting verskaf sal slegs vir hierdie studie gebruik word.

Die inligting verkry vanaf die voltooide vraelys sal my van waardevolle inligting verskaf oor jou huidige kennis van vitale data, sowel as die dokumentering en interpretasie van vitale data.

INSTRUKSIES

- Elke vraag het slegs een korrekte antwoord
- Kies asseblief die korrekte/mees toepaslike antwoord
- Dui jou keuse aan deur ’n kruisie in die toepaslike boks te trek soos in die voorbeeld hieronder

Voorbeeld:

Q1: Geslag

X	Manlik	2	Vroulik

- Die vraelys bestaan uit 7 afdelings en 50 vrae. Voltooi asseblief al die afdelings en antwoord asseblief al die vrae
- Afdeling 7 handel oor die dokumentering en interpretasie van vitale tekens gebaseer op die scenario voorsien. Voltooi asseblief die “Adult early warning observation chart” en die “implementation record” voorsien.
- Die vraelys behoort ongeveer 30 minute van jou tyd te neem maar daar is geen tyd limiet gestel vir voltooing nie
- Wanneer jy die vraelys voltooi het, plaas dit in die koevert voorsien en pos dit in die geseëlde boks aan die agterkant van die vertrek
- Neem asseblief die vrymoedigheid om enige probleme op te klaar of vra die bemiddelaar enige vrae wat u mag hê

Dankie vir U deelname aan hierdie studie

AFDELING 1: DEMOGRAFIESE DATA

Q1 Ouderdom

1	18 – 25	2	26 – 35	3	36 – 40	4	> 40

Q2 Jare ondervinding

1	< 1	2	1 – 5	3	6 – 10	4	> 10

Q3 Werkstatus

1	Permanent	2	Agentskap

Q4 Hoogste vlak van opleiding

1	EN	2	ENA

AFDELING 2: BLOEDDRUK MONITERING

Q5 Bloeddruk is

1	Die druk wat die bloed uitoefen teen die arterie wand wanneer die bloed deur die liggaam vloei
2	Die druk wat die bloed teen die aar wand uitoefen wanneer die bloed deur die liggaam vloei
3	Die druk waarteen die hart saamtrek en ontspan
4	Bloed vloei deur die longe

Q6 Sistoliese bloeddruk is

1	Die laagste punt, wanneer ’n verandering van klank gehoor word of wanneer die klank verdwyn
2	Hoë bloeddruk
3	Lae bloeddruk
4	Die hoogste punt, wanneer die eerste gereelde klank gehoor word

Q7 Diastoliese bloeddruk is

1	Die hoogste punt, wanneer die eerste gereelde klank gehoor word
2	Die laagste punt, wanneer ’n verandering van klank gehoor word of wanneer die klank verdwyn
3	Hoë bloeddruk
4	Lae bloeddruk

Q8 Die normale bloeddruk van ’n volwasse pasiënt wissel tussen

1	90/60 – 140/90mmHg
2	100/60 – 140/80mmHg
3	110/60 – 140/90mmHg
4	110/70 – 130/90mmHg

Q9 Hipertensie word gedefinieer as

1	’n Bloeddruk van 100/60mmHg of minder
2	’n Bloeddruk hoër as 140/90mmHg
3	’n Bloeddruk hoër as 110/70mmHg
4	’n Bloeddruk hoër as 180/100mmHg

Q10 Hipotensie word gedefinieer as

1	’n Bloeddruk laer as110/60mmHg
2	’n Bloeddruk laer as 90/60mmHg
3	’n Bloeddruk hoër as110/60mmHg
4	’n Bloeddruk van 20/80mmHg

Q11 Die keuse van die korrekte band grootte wanneer bloeddruk gemeet word is:

1	Nie belangrik nie omdat dit nie die akkuraatheid van die resultate beïnvloed nie
2	Nie belangrik nie solank as wat die band op die korrekte posisie geplaas word
3	Belangrik omdat die verkeerde grootte band die akkuraatheid van die resultate kan beïnvloed
4	Bepaal deur die ouderdom van die pasiënt

AFDELING 3: TEMPERATUUR

Q12 Temperatuur kan gedefinieer word as

1	Die liggaam se reaksie op infeksie
2	Die balans tussen die hitte wat die liggaam produseer en die hitte wat die liggaam verloor
3	’n Ernstige reaksie van die liggaam op die teenwoordigheid van mikrobes
4	Wanneer ’n pasiënt se vel warm is as jy daaraan vat

Q13 ’n Normale temperatuur vir ’n volwasse pasiënt is

1	36.7 - 37°C
2	35 - 38°C
3	36.6 – 37.5°C
4	35.5 – 36.7°C

Q14 Hipotermie word gedefinieer as

1	’n Temperatuur laer as 35°C
2	’n Temperatuur laer as 37°C
3	’n Temperatuur van meer as 35.5°
4	’n Temperatuur tussen 35.5 – 36.5°C

Q15 Rigor word gedefinieer as

1	’n Temperatuur van meer as 35.5°C
2	Liggaam temperatuur laer nader aan die liggaam oppervlak
3	’n Ernstige reaksie van die liggaam op die teenwoordigheid van mikrobes, gifstowwe of vreemde stowwe in die bloedstroom bv. septisemie
4	’n Pasiënt met onbeheerbare epileptiese aanvalle

Q16 Verpleeg aksies om pireksie te verlaag sluit die volgende in

v. Verwyder komberse
vi. Stel die vel aan lug bloot – verwyder klere
vii. Gee ’n louwarm spons bad, laat die vel droog word
viii. Dien koorswerende medikasie toe soos voorgeskryf deur die dokter

1	i, ii en iv
2	ii en iv
3	i en iv
4	i, ii, iii en iv

Q17 Hoe ver moet die termometer van die voorkop af gehou word wanneer ’n infrarooi termometer gebruik word?

1	3 – 8 cm vanaf die voorkop
2	2 – 4 cm vanaf die voorkop
3	Direk teen die voorkop
4	10 cm vanaf die voorkop

Q18 Om akkurate resultate te verseker wanneer ’n verpleegster ’n infrarooi termometer gebruik moet watter van die volgende gedoen word?

v. Stoot die pasiënt se hare weg van die voorkop af
vi. Verwyder die pasiënt se brille
vii. Verwyder enige sweet of grimering van die voorkop af
viii. Skandeer die pasiënt se nek wanneer die temperatuur geneem word

1	i, ii, iii en iv
2	i en iv
3	i, ii en iii
4	Slegs ii en iii

AFDELING 4: HARTKLOP (POLS)

Q19 Pols word gedefinieer as

1	’n Liggaamsoppervlak waar die are naby die been verby beweeg
2	Druk op die hart
3	Die ritmiese polsing wat gevoel word teen die arterie wand wanneer die hart saamtrek en ontspan
4	’n Hartklop vinniger as 100 slae per minuut

Q20 Die normale pols vir ’n volwasse pasiënt is

1	60 – 80 slae per minuut
2	120 -160 slae per minuut
3	75 – 100 slae per minuut
4	60 -100 slae per minuut

Q21 Die polsslag is dieselfde oral oor die liggaam

1	Altyd
2	Meeste van die tyd
3	Selde
4	Nooit

Q22 Die volgende is NOOIT ’n aanvaarbare palpeerbare pols punt nie

1	Bragiaal
2	Apikaal
3	Orbitaal
4	Radiaal

Q23 Die pasiënt se polsslag kan deur die volgende beïnvloed word:

v. Siekte
vi. Emosies
vii. Ouderdom
viii. Medikasie

1	i, ii, ii en iv
2	i, ii, en iv
3	ii en iv
4	Die bogenoemde faktore beïnvloed nie ’n pasiënt se polsslag nie

Q24 Tagikardie is ’n polsslag van

1	Meer as 100 slae per minuut
2	Meer as 90 slae per minuut
3	Meer as 60 slae per minuut
4	Meer as 120 slae per minuut

Q25 ’n Polsslag van minder as 60 slae per minuut kan gedefinieer word as

1	Bradypnoea
2	Tachypnoea
3	Bradikardie
4	Tagikardie

Q26 Dit is aanvaarbaar om ‘n polsslag te meet met

1	’n Elektroniese bloeddruk apparaat
2	Jou duime
3	Die punte van 2 – 3 voorvingers
4	Observeer die pasiënt en raai gebaseer op jou jare van ondervinding

Q27 Wanneer ’n polsslag gemeet word moet die verpleegster die polsslag tel vir

1	30 sekondes
2	25 sekondes
3	10 sekondes
4	120 sekondes

Q28 Die volgende moet geëvalueer word wanneer ’n polsslag gemeet word

i. Spoed
ii. Ritme
iii. Sterkte
iv. Posisie

1	i, ii, iii en iv
2	i, ii en iii
3	i, iii, en iv
4	Die bogenoemde aspekte word nie geëvalueer wanneer polsslag gemeet word nie

Q29 As die polsslag onreëlmatig is moet die verpleegster die polsslag vir hoe lank tel?

1	Skat die polsslag
2	Ten minste 30 sekondes
3	Ten minste 120 sekondes
4	’n Volle minuut (60 sekondes)

AFDELING 5:ASEMHALING TEMPO

Q30 Asemhaling word gedefinieer as

1	Die in en uitaseming van koolstofmonoksied
2	Die in en uitaseming van lug, wat lei tot gaswisseling in die longe
3	Die in en uitaseming van suurstof
4	Vinnige, dikwels vlak asemhaling

Q31 Die normale asemhaling vir ’n volwasse pasiënt is

1	Ten minste 25 – 35 asemhalings per minuut
2	Ten minste 32 – 40 asemhalings per minuut
3	Ten minste 12 – 20 asemhalings per minuut
4	Ten minste 35 – 50 asemhalings per minuut

Q32 Die blou verkleuring van die vel wanneer onvoldoende suurstof in die bloed voorkom staan bekend as

1	Tachypnoea
2	Dyspnoea
3	Sianose
4	Apnee

Q33 Vinnige, dikwels vlak asemhaling staan bekend as

1	Tachypnoea
2	Dyspnoea
3	Sianose
4	Apnee

Q34 Moeilike asemhaling, gewoonlik wanneer die pasiënt kortasem is staan bekend as

1	Tachypnoea
2	Dyspnoea
3	Sianose
4	Apnee

Q35 Die term wanneer geen asemhaling teenwoordig is

1	Tachypnoea
2	Dyspnoea
3	Sianose
4	Apnee

Q36 Wanneer die verpleegster asemhaling monitor moet sy/hy observeer vir die volgende

1	Tempo, ritme, diepte, die gebruik van bykomstige spiere en klanke soos snork ens.
2	Tempo, ritme, diepte en die gebruik van bykomstige spiere
3	Tempo, ritme, diepte en klank
4	Slegs tempo, ritme en diepte

Q37 As die asemhaling ongereeld is moet die verpleegster die asemhaling tel vir

1	Ten minste 30 sekondes
2	Ten minste 60 sekondes
3	Ten minste 45 sekondes
4	Ten minste 120 sekondes

Q38 Omdat pasiënte hulle asemhaling patroon verander wanneer hulle bewus word daarvan dat die verpleegster hulle asemhaling monitor moet sy/hy

1	Die pasiënt in kennis stel wanneer die asemhaling gemonitor word
2	Die vingers op die pols punt hou terwyl die asemhaling gemeet word sonder dat die pasiënt daarvan bewus is
3	Skat die asemhaling gebaseer op die pasiënt se voorkoms
4	Moenie die asemhaling monitor nie

Q39 Faktore wat asemhaling beïnvloed sluit in:

i. Siekte
ii. Oefening
iii. Ouderdom
iv. Hoë temperatuur

1	i, ii en iv
2	ii en iv
3	Die bogenoemde faktore beïnvloed nie asemhaling nie
4	i, ii, iii en iv

AFDELING 6: SUURSTOFSATURASIE

Q40 Die metode waarmee suurstof saturasie gemeet word staan bekend as

1	Veneuse oksimetrie
2	Pols oksimetrie
3	Arteriële oksimetrie
4	Infrarooi oksimetrie

Q41 Watter area is teen aangedui vir suurstof saturasie meting?

1	Vinger
2	Oor
3	Toon
4	Neus

AFDELING 7: REKORDERING EN INTERPRETASIE

- Lees die scenario voorsien aandagtig deur
- Raak vertroud met die inhoud
- Voltooi die aangehegte “Adult early warning observation” rekord asook die implementasie rekord
- Rekordeer al die inligting in die scenario voorsien
- Dui al jou addisionele aksies en intervensies aan.

Mnr X is ’n 78 jarige manlike pasiënt wat vandag in jou eenheid opgeneem word deur Dr. Watson met abdominale pyn. Die pyn het om 04:00 vanoggend begin en progressief vererger deur die loop van die dag. Hy dui aan dat hy naar voel en een keer vandag gebraak het. Sy vitale data met opname om 14:00 is:

BP	129/75mmHg
Pols	78 slae per minuut
Temperatuur	37.5°C
Asemhaling	22
Suurstof saturasie	94% op kamer lug

Na afloop van verskeie ondersoeke en konsultasie met die chirurg word die pasiënt geskeduleer vir chirurgie om 18:00. Die pasiënt word voorberei vir teater en sy vitale data om 17:30 is:

BP	140/90mmHg
Pols	84 slae per minuut
Temperatuur	37.3°C
Asemhaling	20
Suurstof saturasie	95% op kamer lug

Die pasiënt word om 01:00 terugontvang in die eenheid na afloop van die chirurgie. Sy vitale data op sy terugkeer is as volg:

BP	145/95mmHg
Pols	98 slae per minuut
Temperatuur	35.5°C
Asemhaling	22
Suurstof saturasie	92% op suurstof via 40% suurstof masker vanaf teater

Soos per die beleid word die vitale data na 30 minute herhaal:

BP	96/48mmHg
Pols	118 slae per minuut
Temperatuur	36°C
Asemhaling	28
Suurstof saturasie	90% op suurstof via 40% suurstof masker

Na 15 minute word die vitale data herhaal en is as volg:

BP	90/50mmHg
Pols	115 slae per minuut
Temperatuur	35.8°C
Asemhaling	30
Suurstof saturasie	80% op suurstof via 40% suurstof masker

ANNEXURE A3: QUESTIONNAIRE (ISIZULU)

IMININGWANE

Ngiyabonga kankhulu ngesikhathi sakho osichithile ukubamba iqhaza kulolucwaningo. Yonke imininingwane kanye nezimpendulo zakho zizogcinwa ziyimfihlo. Imininingwane oyinikile izosetshenziswa kulolucwaningo kuphela.

Ngokugwalisa nokuphendula loluhlu-mibuzo uzobe unginika imininingwane ebalulekile ngolwazi onalo malungana nokuqosha kanye nokutolika izinkomba ezibalulekile.

IMIYALO

- Umubuzo ngamunye unempendulo eyodwa
- Ngicela ukhethe impendulo esondele kakhulu noma ekuyiyona ngqo
- Bonisa impendulo yakho ngokufaka uphawu – x ebhokisini elinempendulo okuyiyona

Isibonakaliso:

Q1: Ubulili

X	Owesulisa	2	Owesifazane

- Loluhlu-mbuzo luhlukaniswe izigaba eziyisikhombisa futhi linemibuzo engamashumi amahlanu. Ngicela uphendule zonke izigaba kanye nayo yonke imibuzo.
- Isigaba sesikhombisa sibhekise ekuqosheni kanye nokutolika izinkomba ezibalulekile kubhekiswe kusigameko esisizayo. Ngicela ugcwalise ifomu okubhalwa kuyo izinkomba ezibalulekile kunye nefomu oyinikiwe okubhalwa kuyo isimo sempilo yesiguli.
- Konke lokhu kuzothatha isikhathi esilinganiselwa kwimizuzu engamashumi amathathu, kodwa asikho isikhathi esibekiwe.
- Uma usuqedile ukuphendula loluhlu – mibuzo ngicela ulithathe ulifake emvilaphini le engikunike yona, bese uyifaka ebhokisini elinembobo yokufaka elibekwe laphaya emuva kulo leligumbi
- Ngicela ukhululeke ngokubuza, noma ukucela incazelo noma ubuze umsizi ozobe3 ekhona uma unemibuzo noma udinga ukucaciselwa

Ngibonga kakhulu ukuthi ubambe iqhaza kulolucwaningo

INGXENYE 1: IMININGWANE NGOKOMKHAKHA

Q1: Iminyaka

1	18 – 25	2	26 - 35	3	36 – 40	4	> 40

Q2: Iminyaka yolwazi

1	< 1	2	1 - 5	3	6 – 10	4	> 10

Q3: Isimo ngokomsebenzi

1	Uqashwe ngokugcwele	2	Ubambe okwesikhashana

Q4: Izinga eliphakeme lemfundo

1	EN	2	ENA

INGXENYE 2: UKUHLOLA UMFUTHO WEGAZI

Q5 Umfutho wegazi

1	Amandla igazi eligijima ngawo emithanjeni nasemzimben
2	Amandla igazi eligijima ngawo emithanjeni emincane emzimbeni
3	Amandla endlela inhliziyo efinyela neluleka ngayo
4	ukugijima kwegazi emaphashini

Q6 Umfutho wegazi obizwa isistoli yi?

1	Izinga eliphansi, lokushintsha komsindo nokunyamalala komsindo
2	Umfutho wezazi ophakeme
3	Umfutho wegazi owehlile
4	Izinga liphezulu lomsindo wukugula wejwayela

Q7 Umfutho wegazi obizwa nge diyastoli yi?

1	Izinga liphezulu lomsindo wukugula wejwayela
2	Izinga eliphansi, lokushintsha komsindo nokunyamalala komsindo
3	Umfutho wezazi ophakeme
4	Umfutho wegazi owehlile

Q8 Umfutho wegazi ovamile emuntwini omdala uphakathi kwa:

1	90/60 – 140/90mmHg
2	100/60 – 140/80mmHg
3	110/60 – 140/90mmHg
4	110/70 – 130/90mmHg

Q9 Umfutho wegazi ophezulu uchazwa ngokuthi:

1	Umfutho wegazi ongango noma ongaphansi kuka 100/60mmHg
2	Umfutho wegazi engaphezu kuka 140/90mmHg
3	Umfutho wegazi ongaphezu kuka 110/70mmHg
4	Umfutho wegazi ongaphezu kuka 180/100mmHg

Q10 Umfutho wegazi ophansi uchezwa ngokuthi

1	Umfutho wegazi ongango 100/60mmHg noma ngaphansi
2	Umfutho wegazi ongaphansi kuka 90/60mmhg
3	Umfutho wegazi ongaphezu kuka 110/60mmHg
4	Umfutho wegazi ongango 120/80mmHg

Q11 Ukukhetha isimfonyo esiwusayizi olungile uma ukala umfutho wegazi kubaluleke ngoba::

1	Usayizi okungewona uzokunika imiphumela okungeyona
2	Usayizi wesa mfonyo awubalulekile ifuthi awuyishintshi imiphumela
3	Umfutho wegazi, ungawukala noma ngamuphi usayizi wesimfonyo
4	Isibhedlela sinosayizi wesamfonyo owodwa kuphela

INGXENYE 3: IZINGA LOKUSHISA

Q12 Izinga lokushisa lingachazwa kanje:

1	Ibhalansi phakathi kokushisa okukhiqizwa umzimba nokushisa okukhishwa umzimba
2	Ukwesabela komzimba ukutheleka izifo
3	Ukwesabela kakhulu komzimba ubukhona bamagawane
4	Uma isikhumba sesiguli sibanda uma usithinta

Q13 Izinga lokushisa oluvamile emuntwini osekhulile yileli:

1	36.7 - 37°C
2	35 - 38°C
3	36.6 – 37.5°C
4	35.5 – 36.7°C

Q14 Uma ungenwe amakhaza kakhulu emzimbeni

1	Izinga lokushisa lisuke lingaphansi kuka 35°C
2	Izinga lokushisa lisuke lingaphansi kuka 37°C
3	Izinga lokushisa lisuke lingaphezu kuka 35.5°
4	Izinga lokushisa lisuke liphakathi kuka 35.5 – 36.5°C

Q15 Ukuqhaqhazela komzimba uma kwenyuke izinga lokushisa kuchazwa kanje

1	Izinga lokushisa elingaphezu kuka 35.5°C
2	Izinga lokushisa elehlile nelicishe lilingane nokushisa komzimba
3	Ukwesabela komzimba okunzima ngenxa yokubakhona kwamagciwane,ubuthi noma izinto ezivela ngaphandle egazini e.g. Ubuthi egazini
4	Iziguli ezinesifo sokuwa esinzima

Q16 Izinyathelo ezingathathwa onesi ukwehlisa lokushisa

ix. Susa izingubo
x. Vumela isikhumba sishaywe umoya – Khumula izimpahla zokugqoka
xi. Cwilisa indwangu emanzini abandayo bese uyivoma umanzise umzimba wonke uphinde uwuvumele wome.
xii. Nika imithi eyehlisa ukushisa njengokubhala kukadokotela

1	i, ii no iv
2	ii kanye iv
3	i kanye iv
4	i, ii, iii no iv

Q17 Uma usebenzisa ithuluzi lokukala izinga lokushisa leli elimise okwesibhamu kumele ulibambele

1	3 – 8 wamasentimitha kusuka esiphongweni
2	2 – 4 wamasentimitha kusukela ebunzini
3	Ngokuqondile ebunzini
4	10 wamasentimitha kusukela ebunzini

Q18 Ukuqiniseka ukuthi uthola imiphumela ekuyiyona uma usebenzisa loluhlobo olusasibhamu ukukala izinga lokushisa kufanela

ix. Uziqhelise izinwele esiphongweni sesiguli
x. Uziqhelise izibuko
xi. Usule umjuluko noma isitaputapu eiphongweni
xii. Hambisa amehlo entanyeni uma ukala izinga lokushisa

1	i, ii, iii no iv
2	i kanye iv
3	i, ii no iii
4	ii kanye iii

XENYE 4: UKUSHAYA KWENHLIZIYO

Q19 Ukushaya kwenhliziyo kungachazwa njenge

1	Indawo esesikhunjeni lapho imithambo igudla ithambo
2	Ukushuba kwesimo senhliziyo
3	Ukushaya ngamandla kwenhliziyo okuzwakala kudonga lwemithambo ngesikhathi inhliziyo yemfinyela iphinde izelule
4	Ukushaya kwenhliziyo okwedlula u 100 ngomzuzu owodwa

Q20 Ukushaya kwenhliziyo okuvamile emuntwini omdala

1	Ukushaya kayi 60 – 80 ngomzuzu owodwa
2	Ukushaya kayi 120 -160 ngomzuzu owodwa
3	Ukushaya kayi 75 – 100 ngomzuzu owodwa
4	Ukushaya kayi 60 -100 ngomzuzu owodwa

Q21 Ukushaya kwenhliziyo kuyalingana emzimbeni wonke

1	Iqiniso
2	Amanga
3	Ngesinye isikhathi
4	Akwenzeki

Q22 Lokhu okulandelayo akuyona indawo evamile yokukala ukushaya kwenhliziyo

1	Ngenhla kwendololwane
2	Ngasenhliziyweni
3	Ngasemehlweni
4	Esihlakaleni

Q23 Ukushaya kwenhliziyo yesiguli kungashintshwa yilokhu okulandelayo

ix. Ukugula
x. Ukuphazamiseka emoyeni
xi. Iminyaka yobudala
xii. Imithi

1	i, ii, iii no iv
2	I, ii no iv
3	Ii kanye iv
4	Ayikho empendulo kulokhu okubhalwe ngaphezulu

Q24 Ukushaya kwenhliziyo ngamandla kusuke kusho

1	Ukushaya okungaphezu kuka 100 ngomzuzu owodwa
2	Ukushaya okungaphezu kuka 90 ngomzuzu owodwa
3	Ukushaya okungaphezu kuka 60 ngomzuzu owodwa
4	Ukushaya okungaphezu kuka 120 ngomzuzu owodwa

Q25 Ukushaya kwenhliziyo okungaphansi kuka 60 ngomzuzu owodwa kungachazwa njenge

1	Ukukhathala kwenhliziyo
2	Iphika
3	Ukukhathala kwenhliziyo
4	Ukushaya ngamandla kwenhliziyo

Q26 Kuvumelekile ukukala ukushaya kwenhliziyo uma usebenzisa

1	Isamfonyo sokukala umfutho wegazi sikagesi
2	Izithupha zakho
3	Amacuphe eminwe emibili noma emithathu
4	Ukuqagela noma ukubuka ngamehlo

Q27 Uma ekala ukushaya kwenhliziyo,unesi kufanele abale isikhathi esingaka

1	Imizuzwana engu 30
2	Imizuzwana engu 25
3	Imizuzwana engu 10
4	Imizuzwana engu 120

Q28 Lokhu okulandelayo nako kunga hlolwa ngesikhathi ukala ukushaya kwenhliziyo

i. Izinga
ii. Isigqi
iii. Umsindo
iv. Isikhundla

1	i, ii, iii kanye iv
2	i, ii kanye iii
3	i, iii kanye iv
4	Ayikho impendulo kulokhu okubhalwe ngaphezulu

Q29 Uma kunokushaya kwenhliziyo okungajwayelekile unesi kufanele abale isikhathi esingaka

1	Aqagele
2	Imizuzwana engu 30
3	Okungenani imizuzwana engu 120
4	Umzuzu owodwa ogcwele

INGXENYE 5: IZINGA LOKUPHEFUMULA

Q30 Izinga lokuphefumula lingachazwa njenge

1	Ukudonsa nokukhipha umoya ongcolile
2	Ukudonsa nokukhipha umoya, okubangela ukushintshana komoya emaphashini
3	Ukudonsa nokukhipha i-oksijini
4	Iphika

Q31 Izinga lokuphefumula elivamile emuntwini omdala

1	Okungenani u 25 – 35 ngomzuzu owodwa
2	Okungenani 32 – 40 ngomzuzu owodwa
3	Okungenani 12 – 20 ngomzuzu owodwa
4	Okungenani 35-50 ngomzuzu owodwa

Q32 Ukushintsha kwesikhumba sibe luhlazana uma ushodelwa i-oksijini emzimbeni kubizwa

1	Iphika
2	Ukucinana
3	Ukushodelwa umoya
4	Ukuvaleka ukuphefumula

Q33 Ukuphefumulela phezulu ngamandla kubizwa

1	Iphika
2	Ukucinana
3	Ukushodelwa umoya
4	Ukuvaleka ukuphefumula

Q34 Ukuphefumula kanzima engathi uyavaleka kubizwa

1	Iphika
2	Ukucinana
3	Ukushodelwa umoya
4	Ukuvaleka ukuphefumula

Q35 Igama elisentshenziswa uma ukuphefumula sekuvaleke unomphelo

1	Iphika
2	Ukucinana
3	Ukushodelwa umoya
4	Ukuvaleka ukuphefumula

Q36 Uma unesi ehlola izinga lokuphefumula kufanele abheke nalokhu

1	Izinga, isigqi, ukujula, ukusebenzisa izikhwepha kanye nemisindo yokuhona,emanzi noma eklebhulayo.
2	Izinga, isigqi, ukujula, , ukusebenzisa izikhwepha
3	Izinga, isigqi, ukujula, kanye nomsindo
4	Izinga, isigqi, ukujula kuphela

Q37 Uma izinga lokuphefumula lingajwayelekile unesi kufanele abale isikhathi esingu

1	Okungenani 30 wesibili
2	Imizuzwana okungenani 60
3	Okungenani 45 imizuzwana
4	Okungenani 120 yesibili

Q38 Uma isiguli sazi ukuthi unesi uhlola izinga lokuphefumula izinga nesigqi kuyashintsha ngakho ke kufanele

1	Usitshele isiguli uma usubala izinga lokuphefumula
2	Ugcine amacuphe eminwe esihlakaleni
3	Uqagele
4	Ungalibali izinga lokuphefumula

Q39 Izimbangele zenza indlela ophefumela ngayo ishintshe yilezi

v. Ukugula noma isifo
vi. Ukuzivocavoca
vii. Ubudala
viii. Izinga lokushisa eliphakeme

1	i, ii kanye iv
2	ii no iv
3	Akukho kulokhu okungenhla
4	i, ii, iii kanye iv

INGXENYE 6: I-IKSIJINI EJIKELEZA EMZIMBENI

Q40 Indlela esetshenziswa ukukala i-oksijini ejikeleza emzimbeni yaziwa nge:

1	Ukukala i-oksijini ngemithambo yegazi
2	Ukukala i-oksijini ngokushaya kwenhliziyo
3	Ukukala i-oksijini ngokushaya kwenhliziyo
4	Ukukala i-oksihini ngokukagesi

Q41 Yisiphi isiqu somzimba ongavunyelwe ukukala inani le- i-oksijini kuso:

1	Umunwe
2	Indlebe
3	Ubhonsi
4	ikhala

ISIGABA 7: UKUQOSHWA NOKUTOLIKWA

- Ngicela ufunde isigameko osinikiwe ngokucophelela
- Zijwayeze ngokuqukethwe
- Gewalisa ishadi elikuxwayisa ngezinkomba ezibalulekile kanye nerekhodi lokuqaliswa kokunakekelwa
- Bhala yonke imininingwane oyinikiwe
- Khombisa izenzo ozithathile

uMnumzane X oyisiguli sesilisa ongeniswe ewadini ngaphansi kuka Dokotela Watsone, ephethwe izinhlungu zesisu. Izinhlungu ziqale ngo 04:00 ekuseni zaqhubeka zaba buhlungu kakhulu ngokuqhubeka kosuku. Uthi unobucanucanu benhliziyo kanti uhlanze kanye vo. Izinkomba ezibalulekile ezithathwe ngesikhathi efika ngo 14:00 yilezi:

Umfutho wegazi	129/75mmHg
Ukushaya kwenhliziyo	78
Izinga lokushisa	37.5°C
Izinga lokuphefumula	22
Inani le-oksijini elijikeleza egazini	

Emuva kokucwaninga nokuthintana no dokotela obehlinza lesiguli, isiguli sibese sihlelelwa ukuyohlinzwa ngo 18:00. Isiguli sesikulungele ukuyohlinza, kanti izinkomba ezibalulekile ngo 17:30 bezithi:

Umfutho wegazi	140/90mmHg
Ukushaya kwenhliziyo	84
Izinga lokushisa	37.3°C
Izinga lokuphefumula	20
Inani le-oksijini ejikeleza egazini ingu 95-phesenti uma eziphefumulela	

Lesiguli sibuye ewadini ngo 01:00 emva kokuhlinzwa. Emveni kokufika ewadini izinkomba ezibalulekile eziqoshiwe yilezi:

Umfutho wegazi	145/95mmHg
Ukushaya kwenhliziyo	98
Izinga lokushisa	35.5°C
Izinga lokuphefumula	22
Inani le-oksijini uma afake isifonyo ebuya naso-ethiyetha	92%

Njengenqubomgomo izinkomba ezibalulekile ziphinde zaqoshwa emuva kwe-mizuzu engamashumi amathathu, zaba nje:

Umfutho wegazi	96/48mmHg
Ukushaya kwenhliziyo	118
Izinga lokushisa	36°C
Izinga lokuphefumula	28

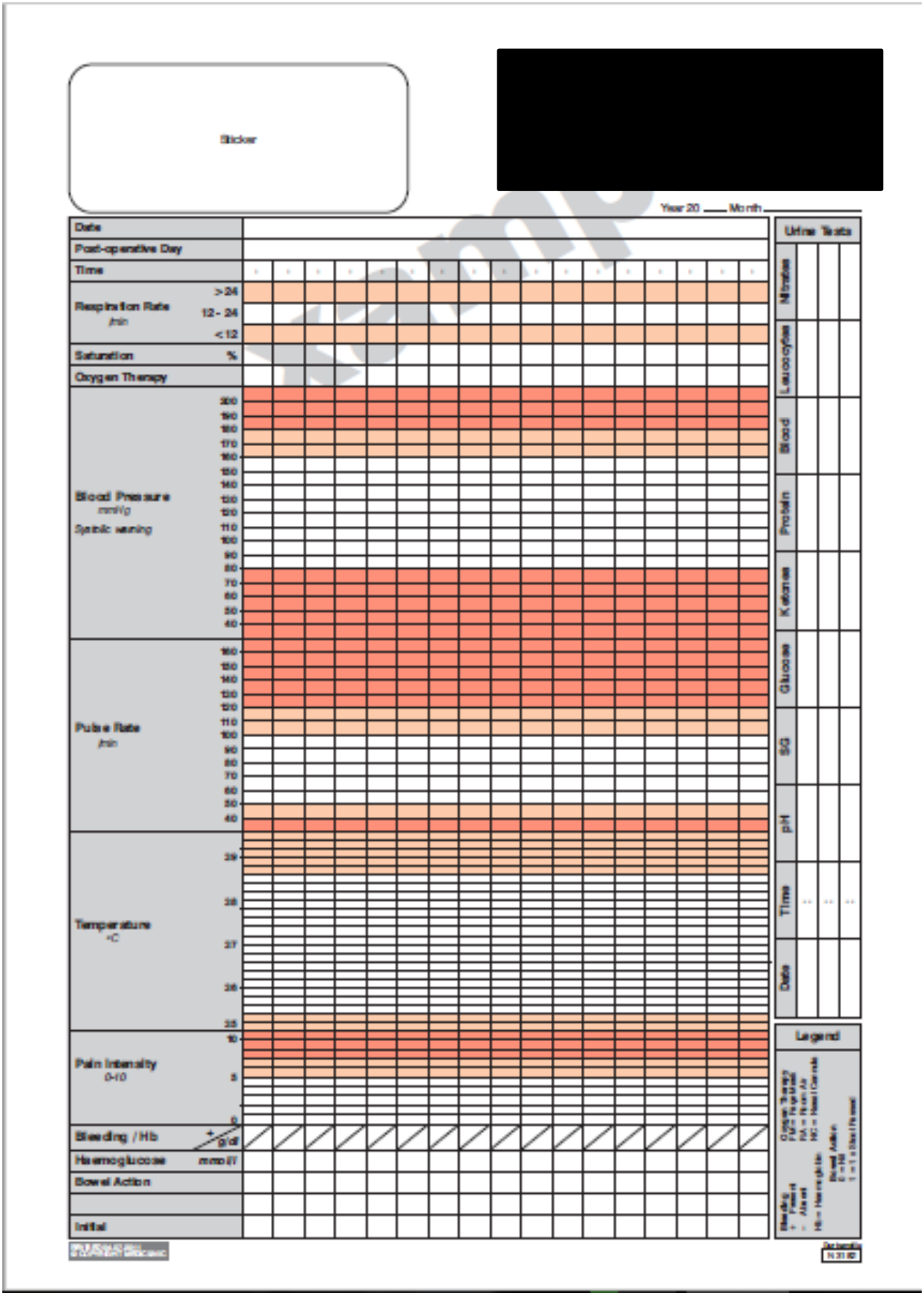
Inani le-oksihini ejikeleza egazini 90 phesenti uma efake isifonyo sasebuswenie

Emuva kwemizuzu eyishumi ziphinde zaqoshwa izinkomba ezibalulekile zaba nje:

Umfutho wegazi	90/50mmHg
Ukushaya kwenhliziyo	115
Izinga lokushisa	35.8°C
Izinga lokuphefumula	30

Inani le-oksihini ejikeleza egazini 80 phesenti uma efake isifonyo sasebusweni

ANNEXURE A4: ADULT EARLY WARNING OBSERVATION CHART



ANNEXURE A5: IMPLEMENTATION RECORD

Sticker

[redacted]

IMPLEMENTATION RECORD

DATE	TIME	PROBLEM/ACTION	PATIENT INTERVENTIONS & PROGRESS	SIGNATURE/INITIAL
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	:			
DIAGNOSIS/PROCEDURE				

Example

[redacted]

PAGE

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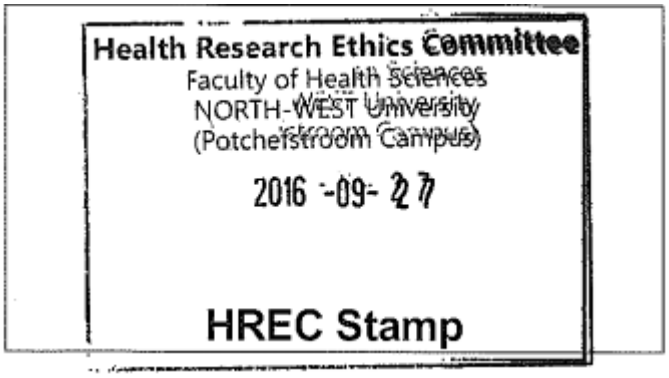
ANNEXURE B1: INFORMATION BROCHURE (ENGLISH)

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS



PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM FOR NON-CLINICAL RESEARCH

TITLE OF THE RESEARCH PROJECT:

Recording and interpretation of vital signs in a private hospital in KwaZulu-Natal

REFERENCE NUMBERS:

PRINCIPAL INVESTIGATOR:
Yolanda Bruin

ADDRESS:

P O Box 9613
Newcastle
2940

CONTACT NUMBER: 084 437 0822

You are being invited to take part in a research project that forms part of my master's degree dissertation. Please take some time to read the information presented here, which will explain the details of this project. Please ask any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University (*NWU* 00084-16-A1)** and will be conducted according to the ethical guidelines and principles of the international

Declaration of Helsinki and the ethical guidelines of the National Health Research Ethics Council. It might be necessary for the research ethics committee members or relevant authorities to inspect the research records.

- **What is this research study all about?**

  This study will be conducted at your hospital. You will be asked to complete a self-administered questionnaire aimed at testing theoretical knowledge. It will consist of 50 multiple choice questions and a practical scenario. A quantitative, descriptive design will be implemented in an attempt to answer the research question and reach the aim of the study. The study is aimed at identifying the current knowledge of enrolled nurses and enrolled nursing auxiliaries on vital data monitoring, recording and interpretation.

- **Why have you been invited to participate?**

  You have been invited to participate because you are responsible for monitoring vital sings in the wards you work in and testing your knowledge and record keeping and interpretation of vital data will greatly contribute towards understanding vital signs monitoring in the hospital.

- **What will your responsibilities be?**

  You will be expected to complete a self-administered questionnaire consisting of 50 multiple choice questions and a scenario. There will be no time limit set for completion of the test. The test will be completed in the conference room at your hospital during your lunchtime during your on-duty time. You will not be asked to divulge any private information during the test.

- **Will you benefit from taking part in this research?**

  Although you will not benefit directly from participating in the study, the results generated from the study will contribute towards identifying knowledge gaps and problems with regards to completion of documents and interpretation of vital data. The aim will be to improve current practices and enhance knowledge to enable you to monitor vital data to detect signs of early deterioration.

- **Are there risks involved in your taking part in this research?**

  There are no foreseeable risks in this study. The self-administered questionnaire will however take time. The researcher will make any and all attempts to ensure that the test is completed at a time convenient to you. You will not be asked to divulge any private or confidential information and you will not be identifiable from the completed test hereby maintaining your anonymity.

- **What will happen in the unlikely event of some form of discomfort occurring as a direct result of your taking part in this research study?**

  Should you experience any form of discomfort during any part of the study the INCON sister will be available to assist you. You will be provided with the researchers contact details and the mediator will be on hand to ask any questions. You may withdraw at any point during the study without any consequence to you.

- **Who will have access to the data?**

  No names of participants will be made public at any point during the study. The questionnaire was designed in such a way as to ensure you will not be recognised through completion of the questionnaire. The completed questionnaires will be kept in a safe for safekeeping with only the researcher having access. The data from the questionnaires will be captured by the researcher. A statistician from the NWU statistical department will assist the researcher in analysing and interpreting the data collected from the questionnaire. Additionally, the researcher and the researcher's supervisors will be the only people with access to the information.

What will happen with the data/samples?

Once collected the data will be captured by the researcher and interpreted and analysed together with the statistician. No private or confidential information will accompany the data from the completed questionnaires.

Will you be paid to take part in this study and are there any costs involved?

No, you will not receive any financial incentives for participating in the study, but snacks and tea will be provided to you as you will be completing the questionnaires during your lunch hour.

Is there anything else that you should know or do?

- You can contact Yolanda Bruin should you have any questions or further queries regarding the study
- You can contact Mrs Carolien van Zyl at the Health Research Ethics Committee on 018 299 2089 or via email at carolien.vanzyl@nwu.ac.za should you have any concerns or complaints you wish to address.
- You will be provided with a copy of this information and consent form for your own records

How will you know about the findings?

The researcher will share the findings with you via a power point presentation during feedback sessions at the hospital and all results will be will be presented as part of a final research dissertation.

Declaration by participant

By signing below, I ……..……. agree to take part in a research study titled: “Recording and interpretation of vital signs in a private hospital in KwaZulu-Natal”.

I declare that:

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

Signed at (*place*) .....…..…….. on (*date*) ……...…….. 20....

....
Signature of participant **Signature of witness**

Declaration by person obtaining consent

I *(name)* ……..…… declare that:

- I explained the information in this document to ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) .....…..…….. on (*date*) ……...…….. 20....

....
Signature of person obtaining consent **Signature of witness**

Declaration by researcher

I *(name)* ……..…… declare that:

- I explained the information in this document to ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

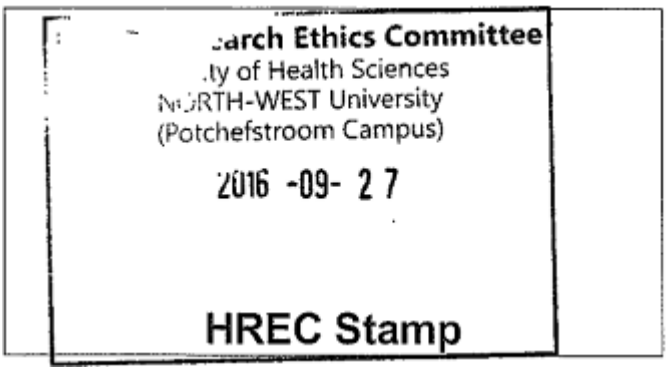
Signed at (*place*) .....….....…….. on (*date*) ……...…….. 20....

....

Signature of researcher **Signature of witness**

ANNEXURE B2: INFORMATION BROCHURE (AFRIKAANS)

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS



DEELNEMER INLIGTINGSTUK EN TOESTEMMINGVORM VIR NIE-KLINIESE NAVORSING

TITEL VAN DIE NAVORSINGSPROJEK:

Recording and interpretation of vital signs in a private hospital in KwaZulu-Natal

VERWYSINGSNOMMER:

HOOFNAVORSER:
Yolanda Bruin

ADRES:

Posbus 9613
Newcastle
2940

KONTAK NOMMER: 084 437 0822

U word hiermee uitgenooi om deel te neem aan 'n navorsingsprojek wat deel uitmaak van my Meestersgraad navorsing. Neem asseblief tyd om die inligting wat hier volg aandagtig deur te lees. Hieronder word al die besonderhede van hierdie projek verduidelik. Voel vry om enige vrae oor enige gedeelte van hierdie projek wat jy nie ten volle verstaan nie te vra. Dit is baie belangrik dat jy heeltemal tevrede is dat jy duidelik verstaan wat hierdie navorsing behels en hoe jy betrokke kan wees. Ook, jou deelname is **heeltemal vrywillig** en jy is vry om te weier om deel te neem. As jy nee sê, sal dit jou glad nie op enige wyse negatief affekteer nie. Jy is vry om enige tyd te onttrek van die studie, selfs al het jy aangedui dat jy sal deelneem.

Hierdie studie is goedgekeur deur die **Health Research Ethics Committee van die Fakulteit van Gesondheid Wetenskappe aan die Noord-Wes Universiteit (*NWU* 00084-16-A1)** en sal uitgevoer word in lyn met die etiese riglyne en waardes van die

internasionale Verklaring van Helsinki en die etiese riglyne van die Nasionale Gesondheid Navorsing Etiek Raad. Dit mag moontlik nodig wees dat die navorsing etiek komitee lede of ander betrokke owerhede die navorsingsrekords moet inspekteer.

- **Waaroor handel die navorsing?**

  Hierdie studie is gemik daarop om te bepaal wat jou huidige kennis ten opsigte van vitale data is asook om te kyk na die akkuraatheid van die rekordering en interpretasie van vitale data.

- **Hoekom word jy genooi om deel te neem?**

  Die studie is spesifiek gemik op die individue wat verantwoordelik is daarvoor om vitale data te monitor in die hospitaal waar jy werk. Om jou huidige kennis en vaardigheid ten opsigte van vitale data monitering te toets sal van groot waarde wees om die huidige vitale data monitering kennis en vaardigheid in die hospitaal te bepaal.

- **Wat sal jou verantwoordelikheid wees?**

  Daar sal van jou verwag word om 'n vraelys te voltooi wat uit 50 veelvuldige vrae bestaan asook 'n praktiese scenario. Die toets sal onderneem word in die konferensie saal by jou hospitaal gedurende jou etenstyd terwyl jy aan diens is. Daar sal nie van jou verwag word om enige konfidensiële of privaat inligting te voorsien nie.

- **Sal jy enige voordeel trek uit hierdie navorsing?**

  Alhoewel daar geen direkte voordele vir jou is nie sal die resultate van hierdie studie my toelaat om enige leemtes in die huidige kennis te identifiseer asook enige probleme ten opsigte van dokumentering en interpretering van vitale data. Die doel van hierdie studie is om die nodige kennis te genereer sodat die huidige praktyk en kennis rondom vitale data monitering kan verbeter.

- **Is daar enige risiko's verbonde daaraan om deel te neem aan die navorsing?**

  Die navorser voorsien geen risiko's verbonde aan hierdie studie nie. Die vraelys sal wel van jou tyd neem om te voltooi. Die navorser sal enige moontlike aksies in plek sit om te verseker dat jy die toets kan voltooi wanneer dit vir jou geleë is. Jy sal glad nie enige konfidensiële of privaat inligting hoef te verskaf nie om jou anonimiteit te verseker.

- **Wat sal gebeur in die onwaarskynlike geval dat jy enige vorm van ongemak ervaar as gevolg van jou deelname aan hierdie studie?**

  Indien jy enige vorm van ongemak ervaar gedurende jou deelname aan hierdie studie sal die INCON verpleegkundige beskikbaar wees om jou te help. Die navorser se kontak besonderhede is ook op hierdie dokument beskikbaar indien jy haar wil kontak om enige vrae te vra of vir uitklaring van enige aspekte rakende die studie. Jy kan enige tyd gedurende die studie onttrek sonder enige nagevolge vir jou.

- **Wie sal toegang tot hierdie data hê?**

  Geen deelnemer aan hierdie studie se naam sal bekend gemaak of gepubliseer word gedurende hierdie studie nie. Die vraelys is saamgestel op so 'n wyse dat jy nie geïdentifiseer kan word nie. Die voltooide vraelys sal deur jouself in die geseëlde boks beskikbaar in die konferensie kamer geplaas word. Die voltooide vraelyste sal vir veiligheid in 'n kluis gestoor word met slegs die navorser wat toegang hiertoe het. Die data wat ingesamel word deur die navorsing sal deur 'n datavaslegger van die NWU vasgelê sal word. 'n Statistikus sal die navorser bystaan om die inligting te analiseer en te interpreteer. Die navorser en die toesighouer sal die enigste ander persone wees met toegang tot die data. Al hierdie individue sal 'n konfidensialiteit onderneming onderteken.

Wat sal met die data gebeur?

Die data wat ingesamel word deur die navorsing sal deur die datavaslegger vasgelê word en deur die statistikus geanaliseer en geïnterpreteer word. Geen privaat of konfidensiële inligting sal bekend gemaak word nie. Die data sal deel uitmaak van die bevindings in die dissertasie.

Sal jy enige geld ontvang as jy deelneem aan hierdie studie en is daar enige kostes betrokke?

Nee, jy sal geen geld ontvang as jy deelneem aan hierdie studie nie. Omdat jy gedurende jou etenstyd gaan deelneem aan die studie sal ligte versnaperings asook tee voorsien word aan alle deelnemers.

Is daar enige iets anders wat jy moet weet of doen?

- Jy kan Yolanda Bruin ten enige tyd kontak as jy enige vrae het gedurende die studie
- Jy kan vir Me Carolien van Zyl by die *Health Research Ethics Committee* kontak op 018 299 2089 of via epos by carolien.vanzyl@nwu.ac.za indien jy enige vrae of bekommernisse het wat jy wil bespreek
- Jy sal 'n afskrif van hierdie inligting sowel as die ingeligte toestemming vorm ontvang vir jou eie rekords.

Hoe sal jy in kennis gestel word van die bevindinge?

Die navorser sal 'n omvattende voorlegging saamstel om al die bevindings aan jou weer te gee tydens 'n geskeduleerde terugvoer sessie by die hospitaal sodra die finale navorsingsdissertasie voltooi is.

Verklaring deur deelnemer

Deur hieronder te teken, stem ek ……..……. in om deel te neem aan die navorsing getiteld: Recording and interpretation of vital signs in a private hospital in KwaZulu-Natal.

Ek verklaar dat:

- Ek het hierdie inligting en toestemming vorm aandagtig deur gelees en dit is geskryf in ’n taal wat ek kan lees, skryf en wat ek vlot en gemaklik in is.
- Ek het voldoende geleentheid ontvang om vrae aan sowel die persoon verantwoordelik om hierdie toestemming te kry en die navorser te stel en enige vrae is genoegsaam beantwoord
- Ek verstaan dat my deelname aan hierdie studie geheel en al **vrywillig** is en dat ek nie onder enige druk is om deel te neem nie
- Ek is vry om te onttrek van die studie ter enige tyd en sal nie gepenaliseer of te nagekom word op enige manier nie
- Die navorser kan my ter enige tyd vra om die studie te verlaat as sy voel dat dit in my beste belang is, of as ek nie die studie plan volg nie, as ek daartoe toestemming verleen

Geteken te (*plek*) .....…..…….. op (*datum*) ……...…….. 20....

....
Handtekening van deelnemer **Handtekening van getuie**

➢ **Verklaring deur persoon wat toestemming verkry**

Ek *(naam)* ……..…… verklaar hiermee dat:

- Ek die inligting in hierdie dokument weergegee verduidelik het aan ……..
- Ek het hom/haar aangemoedig om vrae te vra en voldoende tyd toegelaat om die vrae te beantwoord
- Ek is tevrede daarmee dat hy/sy alle aspekte van hierdie navorsing volledig verstaan, soos hierbo bespreek
- Ek het/het nie van ’n vertaler gebruik gemaak/nie

Geteken te *(plek)* .....…..…….. op (*datum*) ……...…….. 20....

....
.....
Handtekening van persoon wat toestemming **Handtekening van getuie**

verkry

- **Verklaring deur navorser**

Ek *(naam)* ……..…… verklaar dat:

- Ek die inligting in hierdie dokument verduidelik het aan ……..
- Ek het hom/haar aangemoedig om enige vrae te vra asook voldoende tyd toegelaat om vrae te beantwoord
- Ek is tevrede dat hy/sy alle aspekte van die navorsingstudie voldoende verstaan, soos hierbo verskaf
- Ek het/het nie van ’n vertaler gebruik gemaak/nie

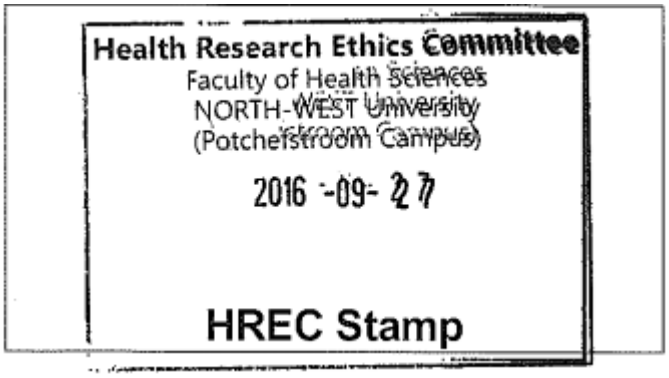
Geteken te *(plek)* .....…..…….. op (*datum*) ……...…….. 20....

....

Handtekening van navorser **Handtekening van getuie**

ANNEXURE B3: INFROMATION BROCHURE (ISIZULU)

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS



IPHEPHA LEMININGWANE KANYE NEMVUMO YOKUBAMBA IQHAZA KUCWANINGO

ISIHLOKO SOCWANINGO:

Ukurekhoda nokutolikwa kwemininingwane ekolekiwe esibhedlela esiyi Private KwaZulu-Natal

INOMBOLO:

UMHOLI WOCWANINGO:
Yolanda Bruin

IKHELI:

P O Box 9613
Newcastle
2940

INOMBOLO YOCINGO: 084 437 0822

Uyamenywa ukuba uzibandakanye kucwaningo oluyingxenye yezifundo zeziqu ze Masters. Ngicela uthathe isikhathi sakho ufunde yonke imininingwane nencazelo ngalolucwaningo. Ungabuza imibuzo noma ngayiphi ingxenye ongayiqondisisi kulocwaningo. Kubalulekile ukuthi ugculiseke futhi uqonde inhloso yalolucwaningo nokuthi ubandanyeka kanjani. Ukubamba iqhaza kuphuma kuwena, futhi unemvumo yokuthi wale uma ungazimisele. Ukwala ukuba yingxenye yalolu cwaningo akusho ukuthi uzojezwisa, kanjalo uvunyelwe ukuyeka ukuba yingxenye yalo noma nini na.

Lolucwaningo, luvunyelwe yikomidi lomkhakha wezempilo enyuvesi yase **North-West University (*NWU* 00084-16-A1)**. Luzohanjiswa ngokomthetho kanye menigomo ye-International Declaration of Helsinki kanye ne national health Research Ethics.

Amalunga ekomidi lemithetho sivivinyo ayayicwaninga imininingwane kanye nama rekhodi alesifundo uma kunesidingo.

- **Luphathelene nani lolucwaningo?**

  Lesifundo sizophenya esibhedlela osebenza kuso. Uzocelwa ukuba ugcwalise ifomu elinemibuzo elizobe lihlola ulwazi lwakho. Lizobe linemibuzo engu-50 (amashumi amahlanu), kunoluhlu okhetha kulo kanye nesigameko esiwusizo. Izindlela thize ezimbalwa zizosetshenziswa ukuchaza kanye no-kuzama ukuphendula imibizo ephathelene nalolucwaningo. Lolucwaningo lenziwa ukuze kuhlonzwe ulwazi luka stafu-nesi kanye nonesi abangabancedisi, ekuqoshweni, kanye nasekutolikweni kwezimpawu ezibalulekile.

- **Kungani umenywe ukuba ubambe iqhaza?**

  Umenywe ngoba kungumsebenzi wakho ukukala kanye nokuqosha izimpawu ezibalulekile kuwo wonke ama-wadi osebenza kuwo, ukuze sihlole ulwazi lwakho, indlela oqosha ngayo, kanye nendlela otolika ngayo, kuba nesandla ekuqondeni indlela yokuqapha izimpawu ezibalulekile

- **Ngeyiphi indima yakho kulolucwaningo?**

  Ulindeleke ukuba uphendule imibuzo engu-50 (amashumi amahlanu) kanye nesigameko esibekiwe. Asikho isikhathi esinqunyiwe zokufeza isivivinyo. Isivivinyo sizobe sibhalelwa endlini-yenkomfa esibhedlela osebenza kuso ngesikhathi sekhefu ngelanga oyobe usebenza ngalo. Akekho ozokwenxusa ukuba uveze imininingwane eyimfihlo yakho ngesikhathi sesivinvinyo.

- **Uzozuza yini, ngokuba yingxenye yocwaningo?**

  Akukho ozokuzuza ngqo, kodwa imiphumela yalolucwaningo izobanesandla ekuvezeni izinkomba kanye nezikhala ezikhona, kunye nezinkinga ezibhekene nokugcwaliswa kwamaphepha kanye nokutolika izinkomba ezibalulekile. Inhloso ukwenyusa izinga kanye nokwengeza ulwazi ukuze sikwazi ukuqapha izinkomba ezibalulekile ngeyona ndlela, sizosheshe sibone izimpawu zokuwohloka.

- **Ingabe kungangibeka engozini yini, ukabe yingxenye yalolucwancingo?**

  Akukho ngozi ebonakalayo kulesifundo. Loluhlu lwemibuzo ozobe uziphendulela yona ithatha isikhathi nokho. Umvivinyi waloluchwaningo uzoqiniseka ukuthi lemibuzo uyiphendula ngesikhathi esivumelana nawe Asoze ucelwe ukuba uveze imininingwane eyimfihlo yakho, futhi ayikho imininingwane ezoveza ukuthi uphendule imibuzo noma ube yingxenye yalesivivinyo.

- **Kuzokwezekani uma ngabe ngeshwa, ungabe usazizwa kahle emveni kokuba yingxenye yalolucwaningo?**

  Uma kungenzeka ungazizwa kahle maphakathi noma emuva kokubamba iqhaza kulesifundo, kukhona umhlengikazi wase INCON ongakunceda. Kanti futhi uyonikwa nemininingwane yomcwaningi kanye nalabo abamiswe ukuba bakuncede. Ungabuza imibuzo uma unayo. Uvunyelwe ukuthi uhoxe noma kunini futhi awuzukujeziswa ngalokho.

- **Ngubani ongafinyelela kulemininingwane?**

  Amagama abantu abathethe ingxenye kulolucwaningo angeke avezwe noma amemezelwe.Loluhlu-lwemibuzo belenziwe ngendlela eqinisekisa ukuthi akunamkhondo, futhi imininingwane izokhiyelwa. Umunikazi wesivivinyo kuphela onemvumo yoku bona le – minininingwane, yonke izogcinwa e-NWU. Lomnikazi walesifundo uzosayina isithembiso sokukhipha imfihlo ngaphambi kokufinyelela kulemininingwane. Usozibalo wase NWU uzosiza lomcwaningi ukuhlaziya nokuhumusha yonke imininingwane eqoshwe kuloluhlu – mibuzo. Ukwengeza, umcwaningi nabaphathi bakhe, yibo kuphela abanelungelo lokufinyelela kule minininingwane.

Kuzokwenzekani ngalemininingwane?

Uma isiqoqiwe, izohlaziywa bese ihunyushwa uSozibalo. Akunazimfihlo ezizobe zivezwe ngeminingwane eqoqiwe.

Uzokhokhelwa yini ngokuzimbandakanya kulesi-sivivinyo?

Cha, awuzukubhadalwa ngokuba yingxenye yalolucwaningo, kodwa-ke itiye nokokwehlisa kuzobe kukhona kwazise uzobe uphendula uhlu-mibuzo ngesikhathi sekhefu lakho.

Kukhona yini okunye okumele ukwazi noma okumele ukwenze?

- Uma unemibuzo ungathintana no-Yolanda Bruin, noma
- Ungathintana no Nkosikazi Carolien van Zyl, osebenza e-Health Research Ethics Committee kulenombolo 018 299 2089 noma nge-email ethi carolien.vanzyl@nwu.ac.za uma kukhona ongakutholisisi kahle.
- Uzonikwa ikhophi enalemininingwane kanye nefomu yemvume oyisayinileyo, ukuze uzigcinele.

Uzokwazi kanjani ngemiphumela?

Umcwaningi uzokwazisa ngemiphumela yocwaningo esebenzisa uhlobo lokubonisa okuthiwa i-power point uma eselethe izimpendulo esibhedlela osebenza kuso. Yonke imiphumela iyobe iyingxenye yocwaningo.

Isimemezelo semvumo sobambe iqhaza

Ngokusayina langezansi, mina ……..……. ngiyavuma ukubamba iqhaza kucwaningo olubizwa nge: ”Ukuqosha nokutolika izimpawu ezubalulekile”

Ngiyavuma ukuthi:

- Ngifunde yonke imininingwane kanye nesivulwane njengoba ibhalwe ngolwimi lwami engilizwayo
- Nginikiwe ithuba lokubuza imibuzo, yilowo obengicela imvume kanye nakumcwaningi uqobo lwakhe. Yonke imibuzo yami iphendulwe ngokugculisayo
- Ngiyaqonda ukuthi ukubamba iqhaza kulolucwaningo kuphuma kuwena, futhi akekho ongicindezelile ukuba ngibambe iqhaza
- Ngingazikhethela ukuyeka ukuba yingxenye yalolucwaningo noma kunini, futhi angeke ngijeziswe noma ngikhokhiswe ngandlela thize.
- Kungenzeka ngicelwe ukuba ngishiye noma ngiyeke ukuba yingxenye yalolu – cwaningo lungakafezwa, uma ngabe umcwaningi ubona ukuthi ngizozuza ngalokhu, noma ebona ukuthi angilandeli imigomo yalolucwaningo njengesivumelweno

Isayinwe e *(indawo*) .....…..…….. nge (usuku) ……...……20....

....
Isiginesha yobambe iqhaza **Isiginesha kafakazi**

Isimemezelo esisuka kothatha imvume

Mina *(Igama)* ……..…… ngimemezela futhi nginazisa ukuthi:

- Ngimuchazele u …….. ngemininingwane ekule – dokhumenti
- Ngimkhuthazile ukuba abuze imibizo, ngathatha isikhathi esanele ukuyiphendula imibuzo
- Nganelisekile ukuthi uyaqonda ngokujulile yonke imininingwane yalocwaningo, njengoba ichazwe ngenhla
- Azange kube nesidingo sokusebenzisa utolika.

Isayinwe *(indawo)* .....…..…….. nge (usuku) ……...……. 20....

....
Isiginesha yalowo ofumana imvume **Isiginesha kafakazi**

Isimemezelo esisuka kumcwaningi

Mina *(igama)* ……..…… ngimemezela/nginazisa ukuthi:

- Ngiyichazile imininingwane ekule – dokhumenti ku ……..
- Ngimkhuthazile ukuba abuze imibuzo, ngathatha usikhathi esanele ukuyiphendula imibuzo
- Nganelisekile ukuthi uyaqonda ngokujulile yonke imininingwane yalocwaningo, njengoba ichazwe ngenhla
- Azange kube nesidingo sokusebenzisa utolika

Isayinwe *(indawo)* .....…..…….. ngo (usuku) ……...…….. 20....

....

Isiginesha yomcwaningi **Isiginesha kafakazi**

ANNEXURE C: CONFIDENTIALITY UNDERTAKING

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

CONFIDENTIALITY UNDERTAKING

entered into between

I, the undersigned

Prof / Dr / Mr / Ms Liesbeth van Staden

Identity Number 730300 0067 081

Address 42 Kay Fitzpatrick Ave Potpark

hereby undertake in favor of the **NORTH-WEST UNIVERSITY**, a public higher education institution established in terms of the Higher Education Act No. 101 of 1997

Address: Office of the Institutional Registrar, Building C1, 53 Borchard Street, Potchefstroom, 2520

(hereinafter the "NWU")

1 Interpretation and definitions

1.1 In this undertaking, unless inconsistent with, or otherwise indicated by the context

1.1.1 "Confidential Information" shall include all information that is confidential in its nature or marked as confidential and shall include any existing and new information returned by me after the Commencement Date, including but not be limited to its interpretation to, research data, information concerning research participants, all secret knowledge, technical information and specifications, manufacturing techniques, designs, diagrams, instruction manuals, blueprints, electronic artwork, samples, devices, demonstrations, formulae, know-how, intellectual property, information concerning materials, marketing and business information generally, financial information that may include remuneration detail, pay slips, information relating to human capital and employment contract, employment conditions, budgets, income and expenditures and other materials of whatever description in which the NWU has an interest in being kept confidential, and

1.1.2 "Commencement Date" means the date of signature of this undertaking by myself

1.2 The headings of clauses are inserted for convenience only and shall not affect the interpretation of this undertaking

2 Preamble

2.1 In performing certain duties requested by the NWU, I will have access to certain Confidential information provided by the NWU in order to perform the said duties and I agree that it must be kept confidential

2.2 The NWU has agreed to disclose certain of this Confidential Information and other information to me subject to me agreeing to the terms of confidentiality set out herein

3 Title to the Confidential Information

I hereby acknowledge that all right, title and interest in and to the Confidential Information vests in the NWU and that I will have no claim of any nature in and to the Confidential Information.

4 Period of confidentiality

The provisions of this undertaking shall begin on the Commencement Date and remain in force indefinitely

5 Non-disclosure and undertakings

I undertake

5.1 to maintain the confidentiality of any Confidential Information to which I shall be allowed access by the NWU, whether before or after the Commencement Date of this undertaking. I will not divulge or permit to be divulged to any person any aspect of such Confidential Information otherwise than may be allowed in terms of this undertaking

5.2 to take all such steps as may be necessary to prevent the Confidential Information falling into the hands of an unauthorised third party

5.3 not to make use of any of the Confidential Information in the development, manufacture, marketing and/or sale of any goods

5.4 not to use any research data for publication purposes

5.5 not to use or disclose or attempt to use or disclose the Confidential Information for any purpose other than performing research purposes only and includes questionnaires, interviews with participants, data gathering, data analysis and personal information of participants/research subjects

5.6 not to take or attempt to use the Confidential Information in any manner which will cause or be likely to cause injury or loss to a research participant or the NWU, and

5.7 that all documentation furnished to me by the NWU pursuant to this undertaking will remain the property of the NWU and upon the request of the NWU will be returned to the NWU. I shall not make copies of any such documentation without the prior written consent of the NWU

6 Exception

The above undertakings by myself shall not apply to Confidential Information which I am compelled to disclose in terms of a court order

7 Jurisdiction

This undertaking shall be governed by South African law be subject to the jurisdiction of South African courts in respect of any dispute flowing from this undertaking.

8 Whole agreement

8.1 This document constitutes the whole of this undertaking to the exclusion of all else

8.2 No amendment, alteration, addition, variation or consensual cancellation of this undertaking will be valid unless in writing and signed by me and the NWU

Dated at Potchefstroom this 28 October 2016

Witnesses

1

2

(Signatures of witnesses)

(Signature)

ANNEXURE D: NON-DISCLOSURE UNDERTAKING

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOMKAMPUS

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

NON DISCLOSURE UNDERTAKING

ENTERED INTO BETWEEN

NORTH-WEST UNIVERSITY a public higher education institution and a juristic person, regulated by and established in terms of the Higher Education Act No. 101 of 1997 and represented herein by Dr Belinda Scrooby, ID number 730911 0023 089, 12335746 Student/personal number as co- research supervisor duly authorised thereto. (Hereinafter referred to as **NWU.**)

AND

Yolanda Bruin Full names 7612130085082 ID number

22817875 Student number

(Hereinafter "the **post graduate student**").

In favour of

[redacted]

WHEREAS the research study **"Recording and interpretation of vital signs at a private hospital in KwaZulu-Natal, South Africa: A cross-sectional study"** will be conducted [redacted] in the KwaZulu-Natal Province by the postgraduate student from the NWU, Potchefstroom Campus.

(Hereinafter referred to as [redacted]:

AND WHEREAS

- The member of the personnel of the Faculty of Health Sciences at the NWU will be involved in research activities related to [redacted] and
- The post-graduate student of the Faculty of Health Sciences at the NWU will be involved in research activities related to [redacted]

1

AND WHEREAS the member of the personnel/post-graduate student of the Faculty of Health Sciences at the NWU shall during the course of the research study be privy to sensitive and confidential information, which information may be made available to the post-graduate student/member of the personnel of the Faculty of Health Sciences verbally or in writing, in respect to [redacted]

AND WHEREAS NWU requires the member of the personnel/post-graduate student of the Faculty of Health Sciences at the NWU to treat all such information as sensitive and confidential and not to disclose same in any manner than under the provisions of this agreement.

NOW THEREFORE THE PARTIES AGREE AS FOLLOWS:

1. The NWU and post graduate student or member of personnel of the Faculty of Health Sciences, undertakes to maintain the confidentiality of any and all confidential information relating to the study conducted at [redacted] to which the NWU, post graduate student or member of personnel of the Faculty of Health Sciences should be allowed access during the course of the research study, whether before or after date of this undertaking and whether divulged verbally or in writing. The NWU and post graduate student or member of personnel of the Faculty of Health Sciences will not divulge or permit to be divulged to any third party and aspect of such confidential information.
2. This undertaking shall remain in force for the entire period of the post graduate student or member of personnel of the Faculty of Health Sciences studies/employment of the member of the personnel of the Faculty of Health Sciences and indefinitely thereafter.
3. The NWU and the post graduate student or member of personnel of the Faculty of Health Sciences acknowledges that all right, title and interest in and to the confidential information vests **Mediclinic Newcastle** and the patients of [redacted]
4. The NWU and the post graduate student or member of personnel of the Faculty of Health Sciences shall take all such steps as may be reasonably necessary to prevent the information falling into the hands of an unauthorised third party.
5. The NWU and the post graduate student or member of personnel of the Faculty of Health Sciences shall not use or attempt to use the confidential information in any manner which will cause or be likely to cause injury or loss to [redacted]
6. Any information relating to [redacted] in material form of a confidential nature which comes into the possession of the NWU, the post graduate student or member of personnel of the Faculty of Health Sciences at the NWU, shall be deemed to form part of the confidential information of [redacted] and patients of [redacted] and shall not be copied, reproduced, published or circulated by the NWU, save for the purpose of academic qualifications and dissertation/academic publications. In the event of any academic publication, the articles will not

contain any personal information or data of [redacted] or patients of [redacted]

7. [redacted], the NWU and the post graduate student or member of personnel of the School of Nursing Science -Faculty of Health Sciences shall use reasonable endeavours to solve any dispute that will arise in connection to this undertaking by mutual arrangement. Any disputes between the Parties arising under or relating to this undertaking shall be referred to the Dean of the Faculty of Law of NWU for resolution, who will attempt to resolve the matter amicably and promptly. The parties confirm that any decision by the Dean of the Faculty of Law, NWU shall be final and binding on the parties.

SIGNED AT Potchefstroom THIS 16 th DAY OF May 2018

WITNESSES:

1. _____

_____

POST GRADUATE STUDENT/MEMBER OF

[redacted]

2. _____

_____

CO - RESEARCH SUPERVISOR

NORTH-WEST UNIVERSITY

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOMKAMPUS

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

NON DISCLOSURE UNDERTAKING

ENTERED INTO BETWEEN

NORTH-WEST UNIVERSITY a public higher education institution and a juristic person, regulated by and established in terms of the Higher Education Act No. 101 of 1997 and represented herein by Dr AC van Graan, 621025 0024 089 ID number, 10197869 personal number as research supervisor duly authorised thereto. (Hereinafter referred to as **NWU.**)

AND

Yolanda Brum Full names 7612180085082 ID number

22817876 Student/Personal number

(Hereinafter "the **post graduate student**").

In favour of

[redacted]

WHEREAS the research study "**Recording and interpretation of vital signs at a private hospital in KwaZulu-Natal, South Africa: A cross-sectional study**" will be conducted at [redacted], in the KwaZulu-Natal Province by the postgraduate student from the NWU, Potchefstroom Campus.

(Hereinafter referred to as [redacted]

AND WHEREAS

- The member of the personnel of the Faculty of Health Sciences at the NWU will be involved in research activities related to [redacted] and
- The post-graduate student of the Faculty of Health Sciences at the NWU will be involved in research activities related to [redacted]

D.M. NFC

AND WHEREAS the member of the personnel/post-graduate student of the Faculty of Health Sciences at the NWU shall during the course of the research study be privy to sensitive and confidential information, which information may be made available to the post-graduate student/member of the personnel of the Faculty of Health Sciences verbally or in writing, in respect to [redacted].

AND WHEREAS NWU requires the member of the personnel/post-graduate student of the Faculty of Health Sciences at the NWU to treat all such information as sensitive and confidential and not to disclose same in any manner then under the provisions of this agreement.

NOW THEREFORE THE PARTIES AGREE AS FOLLOWS:

1. The NWU and post graduate student or member of personnel of the Faculty of Health Sciences, undertakes to maintain the confidentiality of any and all confidential information relating to the study conducted at [redacted] to which the NWU, post graduate student or member of personnel of the Faculty of Health Sciences should be allowed access during the course of the research study, whether before or after date of this undertaking and whether divulged verbally or in writing. The NWU and post graduate student or member of personnel of the Faculty of Health Sciences will not divulge or permit to be divulged to any third party and aspect of such confidential information.
2. This undertaking shall remain in force for the entire period of the post graduate student or member of personnel of the Faculty of Health Sciences studies/employment of the member of the personnel of the Faculty of Health Sciences and indefinitely thereafter.
3. The NWU and the post graduate student or member of personnel of the Faculty of Health Sciences acknowledges that all right, title and interest in and to the confidential information vests **Mediclinic Newcastle** and the patients of [redacted].
4. The NWU and the post graduate student or member of personnel of the Faculty of Health Sciences shall take all such steps as may be reasonably necessary to prevent the information falling into the hands of an unauthorised third party.
5. The NWU and the post graduate student or member of personnel of the Faculty of Health Sciences shall not use or attempt to use the confidential information in any manner which will cause or be likely to cause injury or loss to [redacted]
6. Any information relating to [redacted] in material form of a confidential nature which comes into the possession of the NWU, the post graduate student or member of personnel of the Faculty of Health Sciences at the NWU, shall be deemed to form part of the confidential information of [redacted] and patients of [redacted] and shall not be copied, reproduced, published or circulated by the NWU, save for the purpose of academic qualifications and dissertation/academic publications. In the event of any academic publication, the articles will not

Q.M. MS

contain any personal information or data of [redacted] or patients of [redacted]

7. [redacted] the NWU and the post graduate student or member of personnal of the School of Nursing Science -Faculty of Health Sciences shall use reasonable endeavours to solve any dispute that will arise in connection to this undertaking by mutual arrangement. Any disputes between the Parties arising under or relating to this undertaking shall be referred to the Dean of the Faculty of Law of NWU for resolution, who will attempt to resolve the matter amicably and promptly. The parties confirm that any decision by the Dean of the Faculty of Law, NWU shall be final and binding on the parties.

SIGNED AT Potchefstroom THIS 16th DAY OF May 2016

WITNESSES:

1. _____

_____

POST GRADUATE STUDENT/MEMBER OF [redacted]

2. _____

_____

RESEARCH SUPERVISOR

NORTH-WEST UNIVERSITY

ANNEXURE E: ETHICS APPROVAL LETTER

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom,
South Africa, 2520

Tel: (018) 299-4900
Fake: (018) 299-4910
Web: http://www.nwu.ac.za

Institutional Research Ethics Regulatory Committee

Tel: +27 18 299 4849
Email: Ethics@nwu.ac.za

ETHICS APPROVAL CERTIFICATE OF STUDY

Based on approval by **Health Research Ethics Committee (HREC)** on **28/09/2016** after being reviewed at the meeting held on **11/08/2016**, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby **approves** your study as indicated below. This implies that the NWU-IRERC grants its permission that provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: **Recording and interpretation of vital signs at a private hospital in KwaZulu-Natal.**

Study Leader/Supervisor: Dr AC van Graan
Student: Y Bruin

Ethics number: N W U - 0 0 0 8 4 - 1 6 - A 1

Application Type: Single study
Commencement date: 2016-09-28 Risk: Medium

Continuation of the study is dependent on receipt of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation up to a maximum period of three years.

Special conditions of the approval (if applicable):

- Translation of the informed consent document to the languages applicable to the study participants should be submitted to the HREC (if applicable).
- Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the HREC. Ethics approval is required BEFORE approval can be obtained from these authorities.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The study leader (principle investigator) must report in the prescribed format to the NWU-IRERC via HREC:*
  - *annually (or as otherwise requested) on the monitoring of the study, and upon completion of the study*
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.*
- *Annually a number of studies may be randomly selected for an external audit.*
- *The approval applies strictly to the proposal as stipulated in the application form. Would any changes to the proposal be deemed necessary during the course of the study, the study leader must apply for approval of these amendments at the HREC, prior to implementation. Would there be deviated from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the study may be started.*
- *In the interest of ethical responsibility the NWU-IRERC and HREC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the study;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the study are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the HREC or that information has been false or misrepresented,*
    - *the required amendments, annual (or otherwise stipulated) report and reporting of adverse events or incidents was not done in a timely manner and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *HREC can be contacted for further information or any report templates via Ethics-HREC-Apply@nwu.ac.za or 018 299 1206.*

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the IRERC or HREC for any further enquiries or requests for assistance.

Yours sincerely

Prof LA Du Plessis

Digitally signed by Prof LA Du Plessis
Date: 2016.10.13 10:37:22 +02'00'

Prof Linda du Plessis
Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)

ANNEXURE F: FORMAL LETTER REQUESTING PERMISSION TO UNDERTAKE RESEARCH

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOMKAMPUS

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

30 September 2016

RE: APPLICATION FOR PERMISSION TO UNDERTAKE RESEARCH AT [redacted]

Dear Me Ann van Zyl

Hereby the school of Nursing Science confirm that Yolanda Bruin is a student of the North-West University, Potchefstroom Campus, currently completing a Master of Nursing degree and respectfully request permission to undertake research at [redacted]. The research title is "Recording and interpretation of vital signs in a private hospital in KwaZulu-Natal".

The researcher undertakes to ensure the anonymity of the hospital and to adhere to all the principles of research ethics, throughout the research process as per the attached non-disclosure agreement.

The study was approved by the Health Research Ethics Committee at the North-West University, Potchefstroom Campus (Ethics number: **NWU-00084-16-S1**).

The researcher requests permission to invite all permanent and temporary appointed enrolled nurses and auxiliary nurses working at [redacted] to complete a knowledge assessment questionnaire measuring their current knowledge on vital signs monitoring, interpretation and recording. Due to the relatively small population size, all nurses meeting the criteria will be invited to complete the questionnaire on duty time during their lunch hour. Attached are copies of the self-administered questionnaire that will be used during data collection.

The data collection process is explained in the attached document "data collection" where the process of data collection of the study is explained.

We would appreciate it if you could consider the request for conducting the research as to grant permission in writing to the student.

Yours faithfully

Dr A.C van Graan
Research supervisor
School of Nursing Sciences
North-West University, Potchefstroom Campus
Tel: +27 (0)18 299 1960
Email: anneke.vangraan@nwu.ac.za

Ms Y. Bruin (22817875)
Clinical Facilitator
[redacted]

ANNEXURE G: ORGANISATIONAL CONSENT FORM

[redacted]

19 October 2016

Yolanda Bruin
P O Box 9613
[redacted]

Dear Sr Bruin

RE: PERMISSION TO UNDERTAKE RESEARCH AT [redacted]

Your request to undertake research at [redacted], as confirmed by [redacted] Corporate Office, is granted.

Wishing you all the best with the research and the completion of your Master of Nursing degree.

Yours faithfully

.....
Yvonne Combrinck
Nursing Manager

[redacted]

ANNEXURE H: RECORDING AND INTERPRETATION CHECKLIST

SECTION 7: RECORDING AND INTERPRETATION

CRITERIA	YES	NO
Were the documents identified with at least: ▪ The patient name ▪ Age ▪ Admitting doctor		
Is the handwriting on the documents legible		
ADULT EARLY WARNING OBSERVATION CHART		
Were all the data provided in the scenario correctly recorded?		
Were the respiratory rates provided in the scenario correctly recorded?		
Were the oxygen saturations provided in the scenario correctly recorded?		
Were the blood pressure readings provide in the scenario correctly recorded?		
Were the pulse rates provided in the scenario correctly recorded?		
Were the temperature readings provided in the scenario correctly recorded?		
IMPLEMENTATION RECORD		
Is the patient diagnosis recorded?		
Were the abnormalities identified by the nurse and recorded?		
Is there proof that the abnormalities was reported the professional nurse in charge of the patient?		
Are the recorded vital sign entries chronological?		
Were any additional actions related to vital signs recorded on the Implementation record?		