Best practice guidelines for neurodevelopmental supportive care of the preterm infant

By

WELMA LUBBE

Thesis submitted for the degree

DOCTOR OF PHILOSOPHY

OBSTETRICAL AND NEONATAL NURSING SCIENCE

In the

SCHOOL OF NURSING SCIENCE

FACULTY OF HEALTH SCIENCES

NORTH-WEST UNIVERSITY

(POTCHEFSTROOM CAMPUS)

Promotor: Prof HC Klopper

Co-Promotor: Prof SJC van der Walt

December 2009

DECLARATION OF CANDIDATE

I hereby solemnly declare that this thesis, *Best practice guidelines for neurodevelopmental supportive care of the preterm infant*, presents the work carried out by myself and to the best of my knowledge does not contain any materials written by another person except where due reference is made. I declare that all the sources used or quoted in this study are acknowledged in the bibliography; that the study has been approved by the Ethics Committees of both the North-West University and the hospitals, universities and departments of health involved in the study; and that I complied with the ethical standards set by both institutions.

_____

Welma Lubbe

December 2009

ABSTRACT

INTRODUCTION: The survival rate of preterm infants increased over the past few decades, posing a variety of challenges to the preterm infant due to the stark mismatch between the intra-uterine and extra-uterine environment they are prematurely exposed to. Neurodevelopmental Supportive Care (NDSC) is suggested to improve short and long term outcomes of the preterm infant. This method will make the biggest difference and prove most successful in severely challenged settings with little resources.

PROBLEM STATEMENT: The problem in South Africa is that an average of 14.6% of infants are born of low-birth-weight and are at risk for developmental delays, but no Best Practice Guidelines (BPGs) for the NDSC of the preterm infant are available nationally or internationally, and therefore the aim of this study was to develop such BPGs.

PURPOSE AND OBJECTIVES: This aim was achieved through four objectives: (1) To describe the components of NDSC by means of an Integrative Literature Review, (2) To develop a checklist (based on the description of the components) to assess the operationalisation of NDSC, (3) To conduct a situational analysis of the operationalisation of NDCS in public sector hospitals in South Africa (using the checklist, structured observation, key-informant interviews as part of the observation and field notes), and (4) To formulate BPGs for NDSC in the public sector hospitals in South Africa.

METHOD: The research was performed in 3 stages, here discussed in 7 chapters. Stage one aimed to describe the components of NDSC by means of an ILR and stage two comprised a situational analysis of the operationalisation of NDSC in public sector hospitals in South Africa.

RESULTS: The results from stage one and conclusion statements from stage two were synthesised to formulate BPGs in stage three. These BPGs were graded and recommendations for implementation were formulated.

The final chapter of the research discusses the evaluation of the study, identifies limitations and suggests recommendations for nursing practice, education and research.

OPSOMMING

INLEIDING: In die laaste paar dekades het die oorlewing van premature babas verhoog. Dit stel ‘n verskeidenhed uitdagings vir die premature baba as gevolg van die drastiese verskil tussen die intra-uteriene en ekstra-uteriene omgewing waaraan hulle voortydig blootgestel word. Neuro-ontwikkelingstoepaslike sorg (NOTS) is voorgestel om die kort- en langtermyn uitkomste van die premature baba te verbeter. Hierdie metode sal die grootste verskil maak en die meeste sukses lewer in uitdagende omgewings met min hulpbronne.

PROBLEEMSTELLING: Die probleem in Suid-Afrika is dat ongeveer 14.6% van babas gebore word met ‘n lae-geboorte-gewig en hulle word blootgestel aan ontwikkelingsagterstande. Geen Riglyne vir Beste Praktyk (RBP) vir NOTS van die premature baba is internasionaal of plaaslik beskikbaar nie, en daarom is dit die doel van die studie om sulke RBP’S te ontwikkel.

DOEL EN DOELSTELLINGS: Die doel is bereik deur vier doelstellings: (1) Om die komponente van NOTS deur middel van ‘n geïntegreerde literatuuroorsig te bepaal, (2) Om ‘n kontrolelys (gebasseer op die beskrywing van die komponente) te ontwikkeling om die operasionalisering van NOTS te evalueer, (3) Om ‘n situasie analise uit te voer om die operasionalisering van NOTS in publieke sektor hospitale in Suid-Afrika te bepaal (met die gebruik van die kontrolelys, observasie, onderhoude met sleutel informante as deel van die observasie en veldnotas), en (4) Om RBP vir NOTS in die publieke sektor hospitale in Suid-Afrika te formuleer.

METODE: Die navorsing is in 3 stadiums uitgevoer en in 7 hoofstukke bespreek. Die eerste stadium het ten doel gehad om die komponente van NOTS te beskryf deur middel van ‘n geïntegreerde literatuuroorsig en die tweede stadium het die uitvoer van ‘n situasie analise van die operasionalisering van NOTS in die publieke sektor hospitale in Suid-Afrika behels.

RESULTATE: Die resultate van stadium een en die gevolgtrekking stellings van stadium twee is gesintetiseer om RBP’s in stadium drie te formuleer en hierdie riglyne is gegradeer en aanbevelings vir implementasie is geformuleer.

Die finale hoofstuk van die navorsing behels die bespreking van die evaluasie van die studie, beperkinge is geïdentifiseer en aanbevelings gemaak vir verpleegkunde praktyk, -onderwys en –navorsing.

ACKNOWLEDGEMENTS

Preterm infants are little people with unique characteristics and needs. They stepped into my heart with their tiny personalities and shaped the direction of my career. I would like to thank them (and their parents) for providing me with the opportunity to make a difference in their lives.

I want to express my appreciation to my heavenly Father for the opportunity and talent to accomplish this study.

My husband, Johann, provided me with loving support and plenty of motivation to reach my dreams and fulfil my life calling.

Johané, our beautiful little girl, arrived in the final stage of the study and could not yet understand why her mother sometimes had to ask other people to look after her. However, she still smiled whenever I could spend time with her.

My parents were always supportive and shared my dreams and passion for the premmies. Thank you for believing in me.

My promoters, Prof Hester Klopper and Prof Christa van der Walt were a true inspiration and guided me in a process that was new to me. Thank you for treating me as a colleague and not just another student.

Dr Jakkie Bornman and Dr Carin Maree were very supportive and shared professional advice. Thank you so much for your contributions.

A special thanks to Louise Vos for her prompt and continuous help in the library. Without her I would have had a much rougher road.

Petra Gainsford was wonderful and patient with the technical editing and design of schematic presentations and Christien Terblanche made a valuable contribution to the study with the language editing.

A special word of thanks to all the participants in the study. I appreciate their contribution and hope that this work will contribute to improved practice that they can benefit from.

Finally, my appreciation to the National Research Foundation (NRF) and the North-West University for financial support in the form of grants.

INDEX

TABLES

FIGURES

LIST OF ADDENDUMS

LIST OF ACRONYMS

APIB	Assessment of Preterm Infant Behaviour
BES	Best-evidence synthesis
BPG	Best Practice Guideline
CASP	Critical Appraisal Skills Programme
EDD	Expected Date of Delivery
ELBW	Extremely low birth weight
IDLE	Inductive and Deductive Locig Evidence
ILR	Integrative Literature Review
IVH	Intra-ventricular Haemorrhage
KC	Kangaroo Care
KMC	Kangaroo Mother Care
LBW	Low birth weight
MRC	Medical Research Council
NDSC	Neurodevelopmental Supportive Care
NEC	Necrotising Enterocolotis
NICU	Neonatal Intensive Care Unit
NIDCAP	Newborn Individualised Developmental Care Assessment Program
NNS	Non-nutritive sucking
NZGG	New Zealand Guidelines Group
PICOT	Population, Intervention, Comparisons, Outcomes, Time
PPIP	Perinatal Problem Identification Program
RCT	Randomised Control Trials
REM	Rapid Eye Movement
ROP	Retinopathy of Prematurity
SANC	South African Nursing Council
SANITSA	South African Neonate, Infant and Toddler Support Association
SR	Systematic Reviews
VLBW	Very low birth weight
WHO	World Health Organisation

CHAPTER 1
OVERVIEW OF THE STUDY

1.1 INTRODUCTION

The aim of this study is to develop Best Practice Guidelines (BPGs) for Neurodevelopmental Supportive Care (NDSC) of the prematurely born infants in the South African public sector hospitals. The rationale for developing BPGs is to achieve better health outcomes for preterm infants (and their parents), and better value for money than would have been achieved in the absence of guidelines (Shekelle, Woolf, Eccles & Grimshaw, 2000:49).

1.2 BACKGROUND TO THE RESEARCH STUDY

This section provides background on the foetal development and preterm development, behaviour and infancy, history of NDSC and the current status of NDSC in the public sector in South Africa. Figure 1-1 is a schematic presentation of the discussion that will follow.

1.2.1 Uterine Environment	
	1.2.1.1 Foetal development
1.2.2 Preterm infant	
	1.2.2.1 Preterm birth 1.2.2.2 Preterm survival 1.2.2.4 Challenges facing the preterm infant 1.2.2.5 Clinical Challenges to HCP
1.2.3 Value of NDSC	
	1.2.3.1 History ▪ What is NDSC? ▪ Synactive Theory 1.2.3.2 Implementation strategies 1.2.3.3 Effect of implementation strategies
1.2.4 BPGs	

Figure 1-1: Schematic presentation of discussion of the background of the study

1.2.1 INTRA-UTERINE ENVIRONMENT

The intra-uterine environment is now described to explain the optimal environment for fetal development.

1.2.1.1 Foetal development

During a normal fullterm pregnancy, the foetus has the opportunity to develop optimally, as the intra-uterine environment supports the co-regulation process between the parent and the unborn baby (Als, 2001:4). This implies an environment where the foetus can develop in a supportive and well-regulated environment provided by the mother (Als & Gilkerson, 1997:179). The uterus is the optimal environment for development from conception to birth (at 40 weeks gestation), since the foetus receives optimal maternal protection from the external environment, with an ongoing supply of nutrients, continuous temperature control, contained movement pattern, suspension of gravity, muted and regular sensory inputs, physiological support and regulation of chronobiological rhythms (Als & Gilkerson, 1997:179; Van den Berg, 2007:34) and protection from excessive stimulation that may hamper normal intra-uterine development.

During the gestation period all the different body systems develop and become mature enough to enable the baby to survive outside the uterine environment when born at term. From conception onward the foetus is thought to be organising five distinct but interrelated subsystems: autonomic (governing basic physiologic functioning e.g. heart rate, respiratory rate, visceral functions); motor (governing postures and movements); state (governing ranges of consciousness from sleep to wakefulness); attention/interaction (governing the ability to attend to and interact with caregivers); and self-regulatory (governing the ability to maintain balanced, relaxed, and integrated functioning of all four subsystems). These subsystems continually react with and influence each other, thus the term *synactive* (Als, 1982:230,234; Tecklin, 2007:105).

Infants born at term have completed the maturation of these subsystems to the degree that, in general, they are able to demonstrate brief periods of social interaction with a caregiver while maintaining stability in the physiologic, motoric, and state subsystems. They can also utilize strategies to regulate the various subsystems when the environment poses a threat to their stability, for example, when

eye contact with a parent becomes too intense, a term infant may yawn, look away briefly, stretch, tuck her head to her trunk, and bring her hands together before returning the gaze again to a parent's face (Tecklin, 2007:105). This is known as self-regulatory behaviour and means that the newborn adapts her behaviour in order to cope with stimuli from her[1] environment.

In infants born before term the maturation of the five subsystems is interrupted. In addition, babies born before term have lost the uterine support for these subsystems, including containment of the uterine wall and the buoyancy of the amniotic fluid; state supports like diurnal (daytime) cycles of the mother's sleep-wake cycle, and attention/interaction supports such as diminished visual and auditory input (Tecklin, 2007:105,106).

The intra-uterine environment protects the unborn foetus and supports development, but when the baby is born preterm, the protection of the uterus is removed and the infant is required to function outside the uterine environment at a crucial time in her development. In infants born preterm the maturation of each subsystem continues while the infant also negotiates more independent functioning, such as breathing, feeding, eliminating wastes, maintaining postures, and moving against gravity, and while also facing challenges such as enduring bright lighting, harsh noises, frequent handling, and multimodal stimulation (Tecklin, 2007:105,106). The following section discusses the preterm infant and the challenges facing her.

1.2.2 PRETERM INFANT

The survival rates of ever-tinier infants increased over the past decades and this poses new challenges to both the preterm infants and their caregivers (refer to 1.2.2.3. and 1.2.3 for the discussion).

1.2.2.1 Preterm birth

The significance of birth before fullterm lies in the fact that a full-term pregnancy continues until 38 to 42 weeks (280 days) (O'Reilly, 2007 [Online]; ACOG, 2002;

[1] All preterm infants are referred to as her / she for the sake of simplicity. This however, does not exclude male preterm infants

Woods, 1996:17). **A preterm infant** is a baby born before 37 weeks (or 36 completed weeks) of gestation (pregnancy duration calculated as the number of weeks from the first day of the last normal menstrual cycle until the day of birth) is completed (Woods, 1996). Prematurity can be further defined according to birth weight when referring to the maturity of organs. Birth weight of the preterm infant provides an indication of possible risks, challenges, mortality and morbidity rates and health profiles of what can be expected. A low-birth-weight (LBW) infant weighs less than 2 500 grams at birth, very low-birth-weight (VLBW) infant is a LBW infant that weighs less than 1 500 grams at birth (Riordan, 2005:593) and an extremely low-birth-weight (ELBW) infant weighs less that 1 000 grams at birth and is also referred to as a 'micro prem' (Gardner, 2005:451).

According to the Saving Babies report, preterm birth contributes to 50% of neonatal deaths in South Africa (Pattinson, 2005:11). The survival of the preterm infant often requires specialised medical-technical care only available in the neonatal intensive care unit (NICU), (Als & Gilkerson, 1997:179). The extra-uterine environment is not similar to the intra-uterine environment and the infant is continuously exposed to a stressful environment in stark sensory mismatch to the developing nervous system's biological input needs (Perlman, 2007:1342; Als & Gilkerson, 1997:179; Aita & Snider, 2003:223) that will be discussed later in the section 'Challenges facing the preterm infant' (refer to 1.2.2.3).

The extra-uterine environment in the NICU does not support normal growth and development and makes the preterm infant more susceptible to brain injury, since the brain of the foetus quadruples in size between 26 and 40 weeks gestation. Due to this rapid brain growth and other developmental processes; this is the period when the brain is most susceptible to injury and it is therefore a critical period for brain development (WHO, 2005 [Online]; Perlman, 2007:1339; Als & Gilkerson, 1997:179; Volpe, 2001:555; Aita & Snider, 2003:223). The preterm infant's brain is a fragile, immature organ at high risk for haemorrhage and neurological impairment (Lawhon & Melzar, 1998:57). Preterm birth further disrupts the developmental progression of brain structures and affects development of the sensory systems (Van den Berg, 2007:433). Complications resulting from these risks (such as cerebral palsy and learning and behavioural problems) are seen more often due to the global increase in preterm survival (Mahoney & Cohen, 2005:194; Aucott *et al.*, 2002:298).

1.2.2.2 Preterm survival

The increase in the survival rate of preterm infants over the last decade is due to an improvement in perinatal care techniques, technology such as ventilation, medication such as surfactant, and pharmacological advances. These improvements in perinatal care led to a significant decrease in the mortality rate of preterm infants worldwide (Perlman, 2007:1339; Aita & Snider, 2003:223; Goldberg-Hamblin, Singer, Singer & Denney, 2007:163; Lotas & Walden, 1996:681).

However, there has not been a corresponding improvement in the long term developmental outcomes for these surviving very-low-birth-weight (VLBW) infants (Als, 2001:4; Als, 1999:18; NANN, 2000:1; European Science Foundation, 2002-2004; WHO, 1996 [Online]; UCSF Children's Hospital, 2004:67,68; NIH, 2006 [Online]; Perlman, 2007:1339; Goldberg-Hamblin *et al*., 2007:163; Lotas & Walden, 1996:681), since these infants face a variety of challenges due to the intra-uterine environment (needed for optimal foetal development) that has been removed and replaced with the high-technology environment of the NICU. Poor developmental outcome impacts directly on the long term development and functionality during infancy, child- and adulthood. Development and functionality during these life periods impact directly on the social and economical structures of a country, with poor functionality resulting in a socio-economic burden. More babies survive due to technological advances, but their quality of developmental outcome may be a burden to society.

1.2.2.3 Challenges facing the preterm infant

The biggest challenge facing the preterm infant is that of survival, since preterm birth largely contributes to neonatal deaths due to stillbirths and immaturity. The mortality rate is the lowest in metropolitan areas and highest in rural areas (Pattinson, 2005:61,62). This survival challenge has been addressed by implementing neonatal intensive care. However, the preterm infant remains at risk for a range of morbidity related to the immaturity of organ systems and diseases associated with prematurity (Symington & Pinelli, 2006 [Online]) leading to physical and developmental challenges.

The preterm infant faces survival difficulties because some subsystems (see Table 1-1) have already been activated and function efficiently in-utero, while others

necessary to function extra-uterine have not yet matured and are not yet ready to function (Als *et al.*, 1982:44). Als and Gilkerson (1997:180) further state that the NICU environment has adverse developmental effects resulting from prolonged diffuse sleep states and unattended crying, supine positioning, routine and excessive handling, ambient noise, lack of opportunity for sucking and poorly timed social and caregiving interactions. Morbidity can be categorised into short term and long term morbidity 'symptoms'.

Short term morbidity includes the need for respiratory support, lung conditions (respiratory distress, apnoea), feeding challenges, poor weight gain, and a long stay in the NICU, as well as poor state regulation (Sehgal & Stack, 2006:1009). Long term morbidity may include retinopathy of prematurity (ROP), intra-ventricular haemorrhage (IVH) which may result in later disabilities such as minor neurological injuries, cerebral palsy or learning problems, long term chronic lung disease and sensory impairments (Nair *et al.*, 2003:94; Perlman, 2007:1339; Mphahlele, 2007:40; Aucott *et al.*, 2002:298; Lawhon & Melzar, 1998:56).

Long term complications also include delays in developmental milestones such as rolling over, sitting, crawling, walking and eye-hand coordination. Other developmental complications include postural complications such as cranial moulding, visual acuity and appearance (Kenner & McGrath, 2004:302; Mphahlele, 2007:40). Disabilities that become evident during the school age include poor attention, lower IQ score and behavioural problems (Mahoney & Cohen, 2005:194; Aucott *et al.*, 2002:298).

Therefore, equally important to physical survival is the developmental outcome of the infant. After birth the preterm infant may be cared for in either a high-tech NICU or in some cases in an under-resourced environment that does not support co-regulation. The latter is mostly true for developing countries. The high-tech NICU environment may support the infant with short-term challenges, such as breathing, feeding and illnesses, but may at the same token provide an unsupportive sensory environment challenging the preterm infant's normal development. The unfavourable sensory environment of the traditional high-tech NICU (Paragraph 1.2.4.3) has adverse developmental effects caused by prolonged diffuse sleep states and unattended crying, supine positioning, routine and excessive handling, ambient noise, lack of opportunity for sucking, and poorly timed social and caregiving interactions. This

places the preterm infant at risk for developmental compromise (Als, 2001:4; Nair *et al*., 2003:93; Als & Gilkerson 1997:180). Developmental risks include amongst others, hearing loss, disturbed body rhythm, lack of eye contact, delay in motor development, physiological and behavioural stress and more (refer to 1.2.4.3).

On the other hand the absence of the support of high-tech equipment and resources may also pose risks and challenges to the fragile preterm infant in survival and health. In both situations additional stress is placed on parenting due to compromised bonding as a result of the physical and emotional barriers between the parents and their infant.

1.2.3 CHALLENGES TO THE HEALTH CARE PROFESSIONAL

The preterm infant is not the only one faced with challenges, since preterm birth also creates challenges for the health care professionals responsible for the care of these infants. Health care professionals in both high-tech and low-tech environments are confronted with the challenge to care for the preterm infant using care strategies, techniques or models that aim not only to ensure the infant's survival, but also optimise their developmental course and outcome (Als, 2001:4; Carrier, 2002:27; Als & Gilkerson, 1997:178). Much development took place in the field of clinical care of the preterm infant. This study focussed on the challenge of improvement of developmental outcomes of the preterm infant to ensure quality of life, with as little as possible burden on the society and government.

Assessment and care programmes such as the Newborn Individualized Developmental Care Programme (NIDCAP) (Lawhon & Hedlund, 2008:133-144; Van Den Berg, 2007:437) and Assessment of Preterm Infant Behaviour (APIB) (Als, Lester, Tronick, & Brazelton, 1982:35-63) have been developed internationally to equip health care professionals with the necessary skills and knowledge to provide appropriate NDSC for preterm infants. However, although these are useful programmes that include the training of healthcare professionals to apply behavioural observation and individualized caregiving support of the infant, they do not provide guidelines for implementation within the South African context due to it being designed for use in the developed world (also see Paragraph 4.2). Furthermore, there is a lack of practice guidelines nationally and internationally (primarily USA) and the roles for Developmental Care Teams are not standardised (Ashbaugh, Leick-

Rude & Kilbride, 1999:48). In addition no BPGs are available, making it challenging to implement NDSC within the NICU setting without BPGs.

However, the challenges facing the preterm infant have been addressed in the past by implementing NDSC as a care giving approach when caring for the at-risk newborn. This care approach will now be discussed.

1.2.4 NEURODEVELOPMENTAL SUPPORTIVE CARE (NDSC)

This section provides an overview of NDSC, the implementation strategies, the effect and benefit of these strategies and the benefits of NDSC for the preterm infant.

1.2.4.1 What is NDSC?

NDSC is an approach that uses a range of evidence-based nursing and medical interventions that aim to decrease the stress of the preterm infant in NICU (Nair *et al.*, 2003:94; Starr & Hoye, 1998:33). It comprises providing care for the preterm or ill full-term infant in a manner in which the environment and process of care is adjusted and individualised in response to the infant's level of development, tolerance and communication abilities to enhance optimal neurodevelopmental outcomes (Ashbaugh *et al.*, 1999:48; Sehgal & Stack, 2006:57; Tecklin, 2007:106). Within this approach, interventions are designed to simulate the intra-uterine environment; to promote normal neonatal development (Byers, 2003:176,176) and to enhance the parent-infant relationship (Starr & Hoye, 1998:33).

These strategies, techniques and interventions are applied to the preterm infant during a critical period of development post-birth and is usually provided at least until the preterm infant reaches the date on which she would have been born (due date or EDD – expected date of delivery). The NDSC approach to preterm care views the infant as an active collaborator in her own care in that care are individualised around infant behaviour and aims to reduce the stress of the NICU environment on the preterm infant, to minimise the harmful effects of the extra-uterine environment on the preterm infant and to promote stability and security. This supportive environment is provided by modifying the environment to be most suitable to support and enhance optimal development or continue the foetal developmental trajectory begun in utero and to prevent potential injury.

Researchers have found that NDSC has the potential to improve brain function and structure (Symington & Pinelli 2006 [Online]; Sehgal & Stack, 2006:57; North East Neonatal Benchmarking Group, 2003 [Online], Als & Gilkerson, 1997:180; Aita & Snider, 2003:224; Goldberg-Hamblin *et al.*, 2007:166). This outcome is reached when an environment as similar as possible to the intra-uterine environment is created in which the prematurely born baby can continue to develop optimally after birth.

NOTE

The term Newborn Individualised Developmental Care and Assessment Program (NIDCAP) is often confused with Neurodevelopmental Care. However, NIDCAP is a North American training program in which neonatal nurses reach certification that allows them to observe the behaviours of preterm infants in the NICU. It is a clinical tool that can be used to implement developmental care based on the development of the infant (Aita & Snider, 2003:225). NDSC is the care approach followed when applying NIDCAP, but it can also be applied without NIDCAP.

1.2.4.2 Framework for NDSC – Synactive Theory of Infant Development

NDSC strategies were suggested by experienced clinicians such as Dr Heidelise Als, who in the mid-eighties developed a model known as the Model of the Synactive Organisation of Behavioural Development (Als, S.a [Online]; Als, 1982:229-243) to improve the developmental outcome of preterm infants. She, together with others, developed the evidence-based care practice known as NDSC, based on the Synactive Model, to improve developmental outcomes in preterm infant survivors (Symington & Pinelli, 2006 [Online]).

The Synactive Theory of Infant Development is a theoretical model to understand and assess the individual infant. It focuses on the dynamic, continuous interplay of various subsystems within the infant that follows on each other: the autonomic, motor, state organisational, attentional-interactive and self-regulatory systems (Als, 1982:229; Als, 1992:354). Within this model the infant is in continuous interaction with herself (subsystem interaction) and with the environment (Als, 1982:230; Als *et al.*, 1982:39). This theory is termed *synactive*, since at each stage in the development of the foetus and infant and at each moment of functioning the various subsystems exist side-by-side and are interactive (Als, 1982:230; Als *et al.*,

1982:42,43; Als, 1992:354). Figure 1-2 is the schematic representation of the model "Toward a synactive theory of development: Promise for the assessment of infant individuality." (Als, 1982:134).

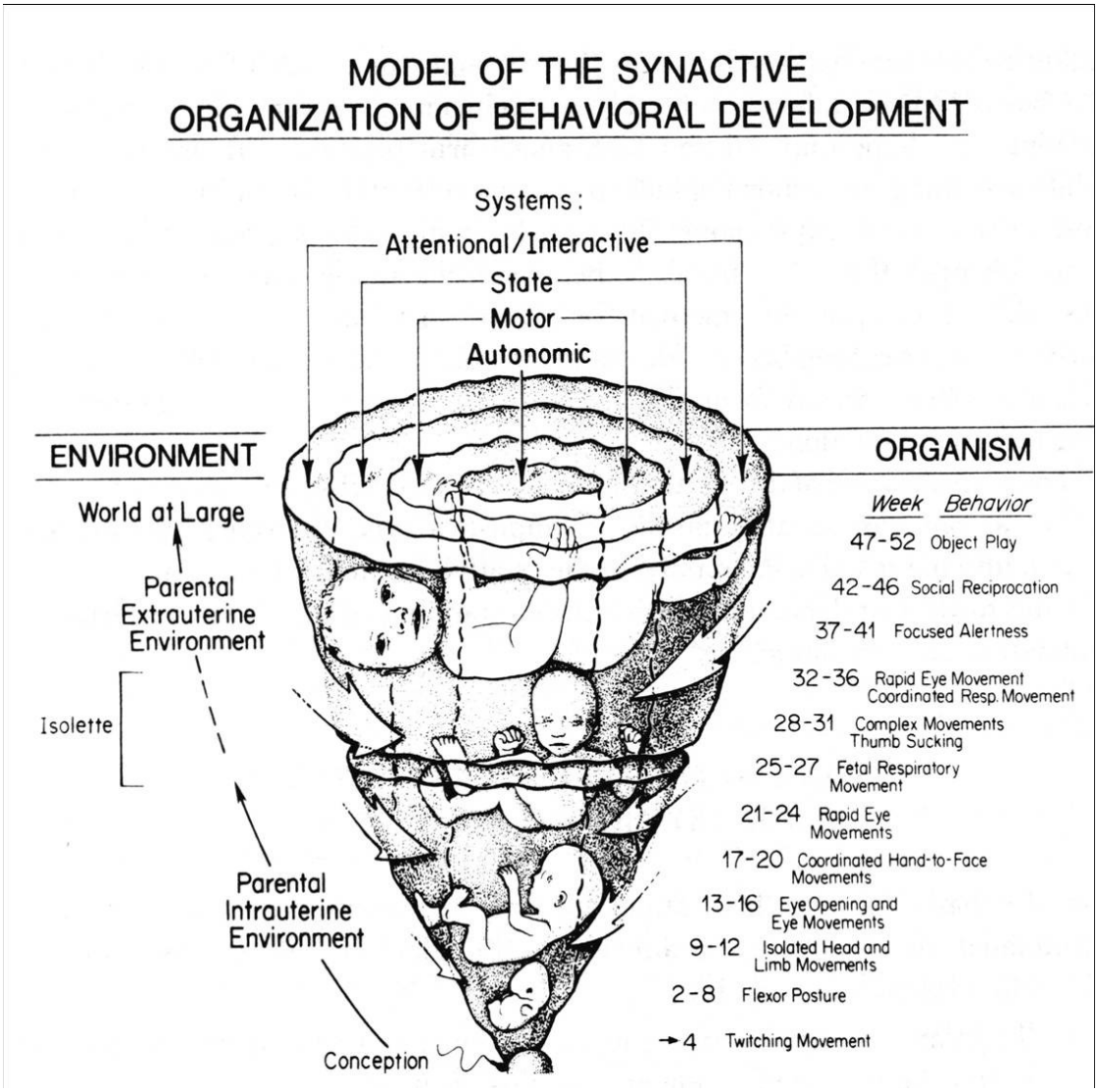

Figure 1-2: Toward a synactive theory of development: Promise for the assessment of infant individuality (Als, 1982), (Reprinted with permission).

Although Als (1982:230) referred to 'organism' in her model, the term preterm infant was used within this research study, since that was in line with the meta-theoretical perspective of the researcher. The subsystems and the observable responses in

each subsystem are outlined in Table 1-1 below and is the conceptualisation of stages of very early behavioural organisation as identified by Als and colleagues (Als *et al.*, 1982:43). A sequential developmental agenda is negotiated in the preterm infant who finds herself prematurely extra-utero in continuous interplay with the extra-uterine environment.

Table 1-1: Infant subsystems and their observable responses

Subsystem	Description	Observable Responses
1. Autonomic	Stabilisation and integration of physiological functions	Respiratory pattern Heart rate Temperature control Colour changes Tremulousness Digestive function Elimination competence Visceral signals such as bowel movements, gagging, hiccupping
2. Motor	The increasingly energized motor system may infringe on the balance of the physiological system	Posture Tone Movements
3. State-organisation	Increasing state differentiation initially can impinge on motoric and even physiological stability	Kind and range of states of consciousness – asleep to aroused Pattern of state transitions exhibited. Change from diffuseness and indeterminateness of state to clear, full range of states.
4. Attention/ interaction	Alert state becomes robust, flexible, accessible and well-differentiated from other states, initially disrupting motor control and physiological balance. Based on in-turning, coming out and reciprocity stages.	Ability to reach alert and attentive state Utilize this state to gather cognitive and social-emotional information from the environment In turn elicit and modify the inputs from the environment
5. Regulatory	Strategies the preterm infant utilise to maintain a balanced, relatively stable and relaxed state of subsystem integration	Observable strategies to maintain balanced, relatively stable and relaxed state of subsystem integration or return to balance and relaxation
(Adapted from Als, 1982:230; Als *et al.*, 1982:43)		

From the synactive model of infant development the clinician would ask: How well differentiated and modulated are the various subsystems given the demands and developmental tasks placed on the infant? What are the thresholds of functioning of the preterm infant beyond which smoothness and balance will become stress coping behaviours? Furthermore, which subsystem is vulnerable at what level of demand and how much or how little does it take in terms of environmental modification to induce the reinstitution of a more balanced integrated state? (Als, 1982:230-231). These questions have been addressed by years of research and programmes have been implemented to assess preterm infant behaviours, train health care professionals in assessment and care strategies and change care practices, and the nursery environment. It is clear that the extra-uterine environment is stressful to the preterm infant and the following section intends to summarise the effects of the environment on the preterm infant.

1.2.4.3 The effect of the extra-uterine environment on the preterm infant

Aspects of care are now discussed under the headings: sound, light, positioning, touch and clustering of activities. This provides an overview of the effects as stated in literature.

(a) The effect of sound and noise in the environment

Loud or sharp sounds can cause physiological changes like tachycardia, tachypnoea, apnoea, oxygen desaturation and sudden increase in mean arterial blood pressure, disturb sleep, startle the infant and may even produce intracranial haemorrhage in a VLBW infant (Nair *et al.*, 2003:93; Perlman, 2007:1343).

(b) *The effect of light in the environment*

Constant light may disturb body rhythm, which disturbs sleep-awake cycles, leading to sleep deprivation. Bright light prevents the infant's eye opening and decreases attention (Nair *et al.*, 2003:93; Perlman, 2007:1344). Early exposure to light influences hearing development (Als, 2006). Sudden increase in light leads to oxygen desaturation and has a damaging effect on the development of the immature visual system (retinal damage). Bright light prolongs REM sleep, which increases physiological instability, apnoea and bradycardia. Finally, bright light delays crawling, walking and fork-feeding (Stromswold & Sheffield, 2004:8).

(c)Effect of inappropriate positioning

A lack of muscle strength and tone in the preterm infant results in the infant taking a positioning over an extended period of time (due to the effect of gravitation) that can lead to abnormal tone with consequent delay in motor development. Developmental appropriate positioning (similar to the intra-uterine position) supports the development of physiological flexion, which helps the small preterm infant to maintain better oxygenation and temperature (Kenner & McGrath, 2004:39; Nair *et al.*, 2003:93).

(e) The effect of inappropriate handling

Handling may lead to physiological and behavioural stress, such as tachycardia, bradycardia, tachypnoea, apnoea, desaturation, colour changes and visceral responses (Nair *et al.*, 2003:93).

The effects discussed above can be grouped within the subsystems explained earlier, and furthermore divided into either stress or coping responses. This information is used when assessing the preterm infant to determine her threshold for stimuli and is according to the Synactive Theory. This has been developed into programs such as NIDCAP and APIB, (as stated in Paragraph 1.2.3), but is not the focus of this study and will therefore not be discussed in more detail. The effects (outcomes) of these interventions are not the aims of this study and were only provided as background information. This research study aims to clearly identify the components of NDCS in order to develop BPGs.

The intervention strategies and benefits of NDSC are well researched and documented and are discussed in the following section.

1.2.4.4 Principles of NDSC

In 1982 Als suggested strategies based on the synactive approach of development to individualise environmental structuring to maintain maximum development and to reduce developmental defence. Treatment modification was suggested depending on the infant's current sensitivities, but still needs to be tested. The Cochrane Library did a systematic review (Symington & Pinelli, 2006 [Online]) that supported environmental and care strategies that are used as intervention strategies, mostly as

part of the NIDCAP program, but also as individual intervention strategies. These will now be discussed.

Intervention strategies suggested by Als and others therefore include structuring of the physical and social environment with the goal to reduce stress signals and enhance stabilisation signals (Als, 1982:249; Nair *et al*., 2003:94). This entails controlling external stimuli, such as noise, light, positioning, movement, handling, positive touch, protection of sleep states, skin-to-skin care, providing analgesia during stressful procedures, clustering of care, promotion of the understanding of infant behavioural cues, providing private, individualised and personalised infant and family living space and promoting relationship-based caregiving (Als, 1992:359; Symington & Pinelli, 2006 [Online]; Kenner & McGrath, 2004:40,41; Nair *et al*., 2003:93 – 95; Tecklin, 2007:106).

Als suggested that elimination of nearly all stimulation and strict stress precautions may be necessary and appropriate for some infants, depending on the level of sensitivity and fragility of their current subsystem integration. This would include elimination of touch and handling, while assuring maximal postural containment and complete sensory shielding. It is based on each infant's individual threshold for stimulation. Furthermore, infants should be observed over time to prevent routinisation, overloading and eventually developmental delay (Als, 1982:239; Als *et al*., 1982:55-56). Different techniques are described in literature to reach this optimal environment, and these will be discussed.

1.2.4.5 Techniques

Techniques are examples of actions that can be taken to change the environment and care of the preterm infant. The techniques are briefly explained and categorised according to different aspects of care contributing to the components of NDSC the researcher is in search of. What follows is a brief discussion of the techniques (all possible techniques are not mentioned here) to support the development of the preterm infant and the categorisation thereof (Als, 1982:239-240; Aita & Snider, 2003:229-230; Byers, 2003:176,177). Techniques will be discussed in detail in Chapter 3 – ILR Results.

- Direct care giving procedures to the preterm infant can be individually modified and even delayed to reduce stress and increase stability whenever possible (Als,

1982:240). Als suggests positioning the preterm infant in flexion with foot-bracing so that autonomic and motoric stress is minimised. Provide facilitation and rest during processes to allow the preterm infant to return to a relative stable baseline. The caregiver softly encases the head, trunk and extremities of the preterm infant in the incubator or crib in an ongoing fashion. After care or interventions ensure a position in a way that motor arousal and autonomic reactivity are contained and stabilized as much as possible.

- Touch can be very stressful to the preterm infant, however, skin-to-skin care can provide protective and appropriate touch, as well as thermoregulation, as referred to by the World Health Organisation (WHO) as 'essential newborn care' (WHO, 1996 [Online]; Kenner & McGrath, 2004:288-290; Nair *et al.*, 2003:93,94). Benefits of skin-to-skin care are further evident as lower oxygen requirements, less days on respiratory support, and enhanced state organisation improved scores on tools measuring infant development (Perlman, 2007:1344). Kangaroo Mother Care (KMC), (or skin-to-skin care) and parent involvement in infant care also addresses parental stress and contributes to infant-family relationship building (Kenner & McGrath, 2004:36,37; Nair *et al.*, 2003:94).

- Clustering of care activities to be performed within the same time slot, minimises handling and provides the infant longer periods of rest (Symington & Pinelli, 2006 [Online]; Byers, 2003:177).

- Auditory input can be reduced by using felt or weather strips on drawers and doors, decrease ambient conversation and laughter, elimination of radios, and modelling of quiet behaviour for others in the area (Bremmer, Byers & Kiehl, 2003:451,452).

- Individualised visual input is changed by shielding the preterm infant from bright overhead light through a blanket hood over the incubator or crib and the use of stable visual patterning without clutter on the incubator walls to prevent overwhelming in the baby's visual field (Byers, 2003:176,177).

- Olfactory inputs are controlled by eliminating pungent smells whenever possible. A gauze pad with a few drops of the mother's breast milk can be put in the incubator to support bonding by means of smell, breastfeeding success and

counter noxious odours by familial odours (Als, Buehler, Kerr, Feinberg & Gilkerson, 2006:9).

- The environment should be changed with maturation by introducing more stimulation when the preterm infant is changing into a more alert state. Do not interrupt the preterm infant in a sleep state by eliminating or postponing stimuli that prove to be stressful and protect quiet contained time (Byers, 2003:176,177).

- Feeding procedures should not interrupt the preterm infant during deep sleep or the quiet-alert state. Gavage fed preterm infants who are on respirators should be in a flexed position for better hip, knee, shoulder and elbow flexion and containment should be provided along the back and the soles of the feet. A soft graspable cloth or a caregiver's finger in both hands can facilitate sucking and trunk-flexion configuration. Furthermore, a pacifier should be offered to suck on during gavage feeds as soon as the preterm infant is facially relaxed and a period of stabilisation should be provided after feeding (Als, 1982:240; Als *et al.*, 2006:11).

- Oral feeding includes feeding the preterm infant in a state appropriate for feeding, such as quiet-alert. Cradle the infant in the arm and lap about 20cm away from caregivers face and facing away from direct light. Ensure subdued ambient noise and light and talk softly to the preterm infant to encourage alert state. Introduce the nipple while the preterm infant is in a supported tucked (flexor) position allowing resting periods as needed and preventing overstimulation. Burp the preterm infant gently over the shoulder to promote flexion, cuddling and visual alertness (Als, 1982:240,241).

- Time care activities such as diaper changing and cleaning according to the preterm infant's state of transition. Position the preterm infant in a prone or side position. Ensure stabilisation by facilitating flexion and finger holding, sucking if necessary and by aiding postural and autonomic restabilisation after the procedure. Provide calm, soothing talk to the infant only when she can accommodate it (Als, 1982:241; Als *et al.*, 2006:12,13).

- Provide social interaction in keeping with state transitions that does not interrupt the preterm infant during quiet sleep. Once the infant is in the quiet-alert state, social interaction can proceed in a graded fashion. Start from a distance and

gradually increase complexity of interaction depending on the preterm infant's response. Monitor autonomic and motoric stress signals throughout interaction and reduce or terminate stimulation in case of stress. Stabilise and reorganise an aroused and stressed preterm infant before leaving her alone (Als, 1982:241).

- Parent Support: Acknowledge the difficult task of preterm parenting and free parents from feelings of guilt, helplessness, anxiety and fear. Acknowledge parents as an integral part of preterm infant care, both as partner and participant. Assure parents of the significance of the preterm infant's communication and the importance of them responding to these communications. Empower parents in observing the preterm infant and trusting their own observations and finally, support parents into recapturing their preterm infant as theirs, they need to protect and grow trust in the preterm infant's integrity and autonomy (Als, 1982:241, 242; Als *et al.*, 1982:56,57; Als, 1992:359).

The techniques described above provide a supportive and nurturing environment in the NICU that have proven to improve the developmental outcome of the hospitalised neonates (Nair *et al.*, 2003:94; Als, 2001:4; Symington & Pinelli, 2006 [Online]). These outcomes are listed in Table 1-2 and discussed in Chapter 3. It is evident that the research support different interventions, such as the manipulation of the environment and handling related interventions to improve the outcome of the preterm infant (Stromswold & Sheffield, 2004:8; Nair *et al.*, 2003:93; Perlman, 2007:1343).

From the available literature the outcomes of NDSC are stated, but the *components* of NDSC is not clearly stated anywhere and will therefore be explored in Chapter 2 and 3 – ILR, to provide a justified research foundation for BPGs. To further motivate the importance of implementing NDSC, its benefits will now be discussed.

1.2.4.6 Benefits of NDSC

The effects of environmental manipulation and handling interventions as well as suggested interventions have been discussed above. Studies of the effect of NDSC on low-risk preterm infants without medical complications have shown to have both short and long term benefits, as stated in the Table 1-2 below.

Table 1-2: Short and long term benefits of NDSC

<table>
<tr><th>Short term</th><th>Long Term</th></tr>
<tr><td>Medical Benefits
Improved physiological stability.
Improved oxygenation.
Shorter ventilation and weaning from supplemental oxygen.
Better weight gain, height and head circumference.
Improved medical status with fewer complications.
Quicker transition to oral feeding.</td><td rowspan="3">Improved growth and development
Improved neurobehavioral functioning: preterm infants who received NDSC are more relaxed.
Show less uncontrolled extension of the limbs with smoother movements.
Enhanced brain structure (more white matter), which is crucial for learning, thinking and decision making, compared to preterm infants that did not receive NDSC (Cromie, 2004 [Online]).
Better performance outcome indicators at school age as measured by IQ, social competence and behaviour.</td></tr>
<tr><td>Cost effectiveness
Sooner discharge due to quicker progression.
Cost effectiveness due to shorter ospitalisation.</td></tr>
<tr><td>Improved growth and development
Improved neurobehavioural developmental outcomes (vital signs, growth measure, posture, tone, flexion, midline, sleep states, self-regulation and ability to interact) during the hospital stay of the preterm infant.</td></tr>
<tr><td colspan="2">Source: Byers (2003, 178); Tecklin (2007,106); Gardner (2005, 453); Nair et al. (2003, 94); Mahoney and Cohen (2005, 203); Aita and Snider (2003, 228)</td></tr>
</table>

Symington and Pinelli's (2006 [Online]) systematic review of NDSC provides support for the effect of NDSC in neurological enhancement of preterm infants, and in addition, as discussed above, the benefits have proven to justify the need for implementation of a best practice such as NDSC. NDSC became a standard way of

care in many countries, but BPGs are difficult to find and no documented BPGs are available (Als, 1982, 2001; Symington & Pinneli, 2006 [Online]). Therefore the aim of this study is to develop PBGs for NDSC of preterm infants in public hospitals in the South African context.

1.2.5 BEST PRACTICE GUIDELINES (BPGs)

A guideline has a greater potential of compliance than other documents such as protocols, since the guideline is based on systematically developed advisory statements according to validated scientific methodologies (NZGG, 2001:5). Different types of guidelines are available, which will be discussed in Chapter 6. However, for this study the selection fell on BPGs.

A guideline is different from BPGs in that a *guideline* is a practice resource that may or may not have been tested in clinical practice and has no mechanism for ensuring practice implementation (Milkowshi, Blancett & Dominick, 1998:117). *BPGs* are systematically developed statements based on best available evidence to assist practitioners and client decisions with appropriate health care for specific clinical (practice) circumstances (RNAO, 2003a:15,21). Therefore Best Practice Guidelines are more likely to be implemented than a guideline, since BPGs are based on the cooperation effort between practitioners (evidence) and researchers.

Practice development is a continuous process and properly developed guidelines can change clinical practice, the process of health care delivery and may lead to improvements in preterm infant outcome (Grimshaw, Freemantle, Wallace, Russell, Hurwitz, Watt, Long & Sheldon, 1995:60; Fulbrook, 2003:101).

BPGs can be used to influence policies, resource allocation and better delivery systems based on evidence (Grimshaw *et al*., 1995:60; Fulbrook, 2003:101). Therefore BPGs developed in this study intend to provide direction to practicing nurses in all care settings to improve the care of the preterm infant.

1.3 RESEARCH PROBLEM

Internationally NDSC of preterm infants in NICU's has been moving from a theoretically good idea to an evidence-based best practice over the last 10-15 years (Sheldon, 2007 [Online]). Although NDSC has been recognised as an evidence-based practice, no BPGs could be found on NDSC for the preterm infant in South

Africa or internationally (RNAO, 2003b, 2003c, 2003d, [Online]), nor could any guideline development 'in progress' be found.

In South Africa an average of 14.6% of infants are born of LBW (less than 1,500 grams at birth) and are therefore at risk for death and developmental delays (Pattinson, 2000 [Online]; Health Systems Trust, 2006 [Online]). NDSC is an essential practice for the South African low-birth-weight population, especially due to the limited resources. These low-birth-weight infants are reliant on public health care for a long period of time due to risks and long term complications associated with low-birth-weight. This supports the need for implementation of evidence-based practices such as Neurodevelopmental Supportive Care (UNICEF, S.a. [Online]) due to the effect this care approach has on improving the short and long term outcomes of premature neonates, together with significant cost savings.

In a country that experiences low resources, NDSC can potentially have a significant impact on cost saving, better use of resources, delivery of care based on the best available evidence (Grimshaw *et al.*, 1995:60; Fulbrook, 2003:101), improved preterm infant development, and improved parent-infant bonding, but operationalisation of NDSC is not part of standard practice guidelines within the South African hospitals.

The necessity for this kind of care was accentuated by the recommendation from the Paediatric Neonatal Work Group of South Africa and stated in a government document as: "Planning of Neurodevelopmental services to get more attention" (Paediatric Neonatal Work Group, Section 6 & 8.3 [Online]). Als *et al.* (2003:405) and Goldberg-Hamblin *et al.* (2007:167) stated that '*developmental care will make the biggest difference and be most successful in the most challenged settings with little resources'*.

In spite of all the benefits of and recommendations for the application of NDSC (Sheldon, 2007 [Online]), experience has shown that only some interventions that form part of NDSC, as described earlier, are implemented in the public sector hospitals in South Africa. This brings us to the research question.

Based on the introduction and background of the study the following main question arises:

What should best practice guidelines (BPGs) for NDSC in public sector hospitals in South Africa entail?

To answer the main question, answers will be needed for the following research questions:

- What are the components of NDSC?
- What is the present status of the operationalisation of NDSC in public sector hospitals in South Africa?
- How will BPGs for NDSC be formulated?

1.4 RESEARCH AIM AND OBJECTIVES

The main aim of the study is to develop Best Practice Guidelines (BPGs) for NDSC of the preterm infant in the public sector hospitals in South Africa. In order to address this aim the following research objectives are addressed:

Table 1-3: Research objectives

OBJECTIVE 1	To describe the components of NDSC by means of an Integrative Literature Review (ILR).
OBJECTIVE 2	To develop a checklist (based on the description of the components) to assess the operationalisation of NDSC.
OBJECTIVE 3	To conduct a situational analysis of the operationalisation of NDCS in public sector hospitals in South Africa.
OBJECTIVE 4	To formulate BPGs for NDSC in the public sector hospital in South Africa.

1.5 ASSUMPTIONS OF THE RESEARCHER

I conducted this research from a specific point of departure within nursing. This departure point is known as the science philosophy (epistemic interest), which is the assumptions, such as the values, norms and beliefs within nursing that influence the context and research decisions in this study (King & Fawcett, 1997;33,36; Mouton,

2001:138-139; Henning, van Rensburg & Smit, 2005:15). The assumptions are categorised as meta-theoretical, theoretical and methodological assumptions (Botes, 1995b:5).

1.5.1 META-THEORETICAL PERSPECTIVE

The **meta-theoretical perspective** is my personal view of man (human being), society, health and nursing and is not meant to be tested, but is stated to provide the reader of this work with my point of departure (Botes, 1995a:9; Botes, 1995b:5). I view the world and life from a Christian perspective. I believe that God is the creator of all life and Jesus Christ is our saviour. Within the Christian perspective man is body, mind and soul and therefore these three aspects should be viewed as one when looking at the human being (father, mother and preterm infant). It is the responsibility of each Christian to support others in experiencing the presence and fulfilment of God in their lives, especially during a stressful period such as the birth of a preterm infant. God uses me and my knowledge of the health sciences to contribute to the quality of people's lives. He uses me in projects such as this research to show His mercy and love and to grow His Kingdom. Viewing the world from a Christian perspective also requires tolerance towards other religions, beliefs and cultures, and acknowledgement of the importance of faith in a higher power, especially during a stressful time such as the birth of a preterm infant. Within the Christian perspective I also have specific views regarding man, society, health and nursing which influence my assumptions.

View of man (human being): I view the preterm infant as a human being that was born too early and still needs the protection of the uterine environment. Since the foetus forms a unit with her mother, this co-existence should be continued after the birth of a preterm infant and therefore the mother and her preterm infant(s) is seen as a single unit. However, during the pregnancy the father of the unborn baby also becomes more involved with the new being and bonding starts to take place. Therefore the role of the father in the preterm infant is also very important, primarily due to the psychological involvement with the unborn baby, and therefore also with the prematurely born infant. The preterm infant, together with her mother and father is therefore seen as a single co-existing unit within this study.

View of society: Society is a group of individuals characterised by common interests (Allison, S.a; Farlex, 2003-2008; Philosophy dictionary [Online]; Webster, 2008). In this study society will refer to family and friends that are involved with the preterm infant and her family. Society at large plays a very important role in childbirth and parenting, with specific reference to the role of support. Society may be very helpful, but since they mostly act from personal experience and not from a knowledge base, it may pose a challenge when it comes to parenting. Society should therefore be educated to provide positive support to the affected family.

View of health: I agree with the WHO definition that "The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition." Health is a state of complete physical, mental and social well-being and not merely the absence of disease, while health promotion is the 'process of enabling people to increase control over, and to improve their health' (WHO, 2005:1). Health, or rather a state of well-being, can therefore also be reached within the preterm infant and her parents even while the preterm infant is still in the hospital. Health (of the preterm infant and her parents) within the context of preterm birth is relative and a perception of the parents (Corbin, 2003:266).

View of science: I view a scientist as an individual with a critical and inquisitive mind. A scientist refuses to accept things at face value in her field of specialisation and will also adopt a critical and evaluative stance with regard to her own approaches and methods of work (Mouton & Marais, 1996:153). This fits in with the aim of the study to develop BPGs, which are guidelines based on the best available evidence. A critical process is used to arrive at the results. I agree with Mouton and Marais (1996:156) that science may be defined as that system of concepts, theories, findings, and methods that are accepted by a number of scientists. This view of science is further in line with the epistemological perspective where the aim is not merely to understand the phenomena, but rather to provide a valid and reliable understanding of reality. The goal of scientific research is to discover certain and demonstrable knowledge and this refers to the status of scientific statements. Findings are created within the constructivism paradigm (Guba & Lincoln, 2005:193,195; Mouton & Marais, 1996:8,14,15; Schurink, 2000a:242).

View of nursing: It is my view that nursing is a professional discipline (King & Fawcett, 1997:1) and therefore an independent science where the nurse professional is an independent practitioner. This view is supported by the South African Nursing Council (SANC). Furthermore, nursing includes the prevention of illness, injury and deformity (SANC, 2004:1,4,5,6,7,9,12 – 17; 2005:1,2,6 - 9) and health includes care for the ill, especially within the context of the preterm infant who is in a compromising developmental environment. Since human beings are body, mind and soul, prevention should play a prominent role in all three these aspects and not only on the physical level, as may easily happen when caring for a sick, fragile preterm infant. This study will focus on the preventative and health promotion aspects of nursing.

1.5.2 THEORETICAL PERSPECTIVE

The second category of assumptions of the researcher is the theoretical perspective. Theoretical statements are assumptions that are testable, and provide epistemic findings (knowledge) and provide the framework for epistemic statements in the research (Botes, 1995a:10; Botes, 1995b:5; King & Fawcett, 1997:9). Within the theoretical perspective I position myself within constructivism (embedded in post-modernism) as constructivism derives from the post-modernist approach. The approach towards the research is that of an *appreciative approach*, since the focus will be on the investigation and appreciation of current practices instead of on shortfalls and critique.

Ontology: The qualitative researcher aims to understand local and specific constructed and co-constructed realities that are addressed in the ILR and situational analysis (including interviews) (Guba & Lincoln, 2005:193,195; Schurink, 2000a:242). Due to the variable and personal nature of social constructs, individual constructions are elicited and refined only through interaction between and amongst the researcher and the participants, meaning that the researcher and BPGs are interactively linked. The researcher forms part of the study in that she is the facilitator of the inquiry process (Guba & Lincoln, 1994:111-114). Advocacy and activism are therefore key concepts of the constructivist perspective, since the inquirer takes on the role of both participant and facilitator (Mouton, 1996:113). The researcher will be submerged in data, conduct the interviews and code the data collected.

Methodology: Within constructivism *findings are created* as the investigation proceeds (Guba & Lincoln, 1994:111), which implies a hermeneutic dialectic intention

and methodology, since constructivism aims to explain, understand and interpret truth or reconstruct the constructions (Mouton, 1996:109,111,113,114; Guba & Lincoln, 2005:193; Schurink, 2000a:242).

In order to create findings *consensus from experts and co-construction* plays an important role in constructivism, since constructivism aims to construct realities and is all about understanding and reconstruction. Knowledge consists of those constructions about which there is relative consensus, but is still open to new interpretations as the information improves (Mouton, 1996:113). It is therefore subject to continuous revision (Guba & Lincoln, 1994:111-114). Data will be collected, findings constructed and consensus reached on the findings in order to finally develop BPGs for NDSC.

1.5.3 THEORIES AND DEFINITIONS

The following terminology was used in this thesis and is relevant to the topic of NDSC of the preterm infant.

1.5.3.1 Synactive Theory of Infant Development

The Synactive Theory of Infant Development is a theoretical model to understand and assess the individual infant. It focuses on the dynamic, continuous interplay of various subsystems within the preterm infant: the autonomic, motor, state organisational, attentional-interactive and self-regulatory systems (Als, 1982:229; Als *et al.,* 1982:40, Als, 1992:354). A full discussion of the Synactive Theory of Infant Development is presented in Paragraph 1.2.4.2.

1.5.3.2 Neurodevelopmental Supportive Care (NDSC)

NDSC is a care approach that uses a range of evidence-based nursing and medical interventions that aim to decrease the stress of the preterm infant in NICU (Nair *et al.*, 2003:94). It comprises providing care for the preterm or ill full-term infant in a manner in which the environment and process of care is adjusted and individualised in response to the preterm infant's level of development, tolerance and communication abilities to enhance optimal neurodevelopmental outcomes (Ashbaugh *et al.,* 1999:48; Sehgal & Stack, 2006:57; Tecklin, 2007:106). A detailed description can be found in Paragraph 1.2.4.

1.5.3.3 Neonatal period

The first 4 weeks of life, 1-27 days (Heese & Power, 1992:163)

1.5.3.4 Infancy

First year of life, including the neonatal period (Heese & Power, 1992:163)

1.5.3.5 Preterm infant

It is an infant born at less than 37 weeks gestation, regardless of weight (Riordan, 2005:591; Gardner, 2005:449).

Low-birth-weight (LBW):	An infant whose birth weight is between 1500 and 2500 grams (Riordan, 2005:593; Gardner, 2005:449).
Very-low-birth-weight (VLBW):	A LBW infant whose birth weight is 1500 grams or less (Riordan, 2005:593; Gardner, 2005:449).
Extremely-low-birth-weight (ELBW):	An infant whose birth weight is less than 1000 grams at birth (Gardner, 2005:449).

1.5.3.6 Neonatal Intensive Care Unit (NICU)

Four levels of newborn care are available in South Africa. *Primary healthcare facilities* provides essential standard care such as examination of infants, routine care of the healthy newborn, initiation of breastfeeding within one our of delivery, ongoing breastfeeding support, provision of anti-retrovirals, management of minor problems and follow-up care. This is 24-hour facilities that can in addition provide KMC and phototherapy (Directorate, 2008:6,7). Staff required at primary care facilities include midwives with Perinatal Education Programme (PEP), enrolled nurses and nursing assistants. A medical officer may be available full-time, part-time of visiting (Directorate, 2008: 15).

District (level 1) hospitals provide routine care plus care of the sick infant requiring intravenous therapy, naso-gastric fluids, antibiotics, phototherapy and/or oxygen therapy (ideally including nasal CPAP). Unstable LBW infants that do nod need ventilation as wel as stable LBW infants are cared for in level 1 facilities (Directorate, 2008: 6, 7). Staffing required at level II hospitals include medical officers (full-and

part-time) as well as visiting specialist. Nursing staff include midwives, advanced midwives, nurses with MCWH skills and enrolled nurses and nursing assistants (Directorate, 2008: 15).

High care is provided at *regional (level II) hospitals*. These facilities provide standard inpatient care plus care of the LBW infant that weighs less that 1500 grams, care to infants with severe neonatal jaundice, expecially those requiring exchange transfusion. Infants with moderate to severe respiratory distress are cared for in level II hospitals as well as infants with severe HIE, infants requiring TPN and infants requiring simple neonatal surgical procedures (pre-operative and post-operative care) (Directorate, 2008: 6,7). Staffing at level II hospitals include general paediatricians, paediatric registrars, medical officers and interns. Nursing staff include nurses with advanced training in midwifery and/or neonatal care, enrolled nurses and enrolled nursing assistants (Directorate, 2008: 15).

Intensive or specialised care is provided at *level III and IV (tertiary) hospitals*. Care provided at these facilities is highly specialised services for the sickest and most fragile infants. These facilities provide high care plus the care of neonates requiring assisted ventilation. Sub-specialist care of infants with compicated conditions or infants needing complicated care are also provided at level III and IV facilities (Directorate, 2008: 6,7). Level III units are usually part of teaching hospitals and affiliated with a medical school. At selected level III and IV hospitals extra corporeal membrane oxygenation (ECMO) may be provided as needed (Tecklin, 2007:102). Staffing required at level III and IV hospitals include specialist paediatricians, super-specialists, e.g. neonatologists and neonatal cardiologists. Paediatric registrars in specialist training, medical officers and interns are also staffed at these hospitals. Nursing staff at level III and IV facilities include nurses with advanced training in midwifery and/or neonatal care, midwives, professional nurses, enrolled nurses and enrolled nursing assistants (Directorate, 2008: 15).

1.5.4 METHODOLOGICAL PERSPECTIVE

The third category of assumptions is that of methodological perspective. The methodological assumptions give direction to the methods within the study. Methodology is defined by Mouton and Marais (1996:16) as the logic of the application of scientific methods to the investigation of phenomena. Methodological assumptions have its origin in science-philosophy and direct the research design in

that they influence the decisions the researcher will make regarding the most suitable design to address the research question (Klopper, 2008: 67; Botes, 1995a:10; Botes, 1995b:5; Mouton & Marais, 1996:15). I believe that the right question dictates the right method.

For this study both the *qualitative and quantitative research methodology* is suitable, since I wanted to *explore and describe* NDSC as a phenomenon, and the operationalisation thereof with the *understanding* of the underlying factors of why it is used the way it is. In this study both the qualitative and quantitative research methods will be used to address the different objectives of the study and to understand and explore the phenomenon. The research design will be discussed later (Paragraph 1.6). The specific methods used are also defined within this study.

1.5.4.1 Best Practice Guidelines (BPGs)

BPGs are 'systematically developed statements' based on the best available evidence to assist practitioners with preterm infant decisions about appropriate health care for specific clinical (practice) circumstances (Field & Lohr, 1990, as cited by RNAO, 2003a:21). A detailed description can be found in Paragraph 1.2.5 and Chapter 6.

1.5.4.2 Integrative Literature Review

ILR is related to the SR-method, but not the same, sinc it is an explicit method that allows for simultaneous inclusion and critical summary of quantitative and qualitative as well as experimental and non-experimental research evidence on NDSC of the preterm infant (Wilson, 1999 [Online]; Whittemore and Knafl, 2005:547,548). The ILR method is discussed in detail in Chapter 2. Refer to 2.2.6.

Finally, specific strategies are used to enhance *trustworthiness* within the constructivist perspective (Guba & Lincoln, 1994:111-114). Table 1-5 is a summary of the research study and Table 1-6 a presentation of the objectives and the application of research methods.

1.6 RESEARCH DESIGN

The research design is the plan of how the researcher intends to conduct the study or the structure of the research (Klopper, 2008:68; Babbie & Mouton, 2002:74; De Vos

& Fouche, 2000:81,82). It is the guideline within which the choice of data collection method(s) has to be made and focuses on the end product, namely the kind of study that is planned and the results aimed at. It finally focuses on the logic of research to determine what kind of evidence is required to address the research question adequately. This is followed by the point of departure that involves the research problem or question. This study employs both qualitative and quantitative methods and is explorative, descriptive and contextual in nature.

1.6.1 QUALITATIVE

Mouton and Marais (1996:155,156) defines a qualitative research approach as "those approaches in which the procedures are not as strictly formalized, while the scope is more likely to be undefined, and a more philosophical mode of operation is adopted". The qualitative research approach and analysis involves the collection, integration and synthesis of non-numeric narrative data (Burns & Grove, 2001:56-57). Qualitative research attempts to understand phenomena. It comprises research to understand social and cultural problems, and focuses on interactive processes to collect subjective information that is not structured numerically, but intuitively. It is a holistic design that looks at relationships within systems (the NICU) and is concerned with the immediate, for example, the current state of NDSC in public sector hospitals in South Africa (Denzin & Lincoln, 2003:57; Benetar, *et al.,* 1993:4,5). It furthermore analyses thematic and narrative information.

Concepts were identified from the ILR, but also from field notes from checklists and interviews. This supports the qualitative research approach according to Mouton and Marais (1996:160), since for the qualitative researcher concepts are meaningful words that are analysed in its own right to gain a greater depth of understanding of the concept. The use of the structured observation, field notes and key-informant interviews were part of qualitative methods used to interpret and analyse (understand) the phenomenon.

1.6.2 QUANTITATIVE

The "quantitative approach may be described as an approach to research in the social sciences that is more highly formalized as well as more explicitly controlled, with a range that is more exactly defined, and which, in terms of the methods used, is relatively close to the physical sciences" (Mouton & Marais, 1996:155). The

quantitative approach is applied in stage 1 (ILR), stage 2 (questionnaire construction – see Chapter 4) and stage 3 (structured observation – see Chapter 4).

In addressing objective three, *the situational analysis regarding the operationalisation of NDSC in South African public hospitals*, the researcher aimed to gain new insights into the phenomenon - operationalisation of NDCS in public sector hospitals in South Africa. The aim is exploratory and descriptive and the method of data selection indicated was structured observation of components of NDSC in practice and in the preterm infant files by means of a checklist. The checklist consists of a series of statements. The researcher consequently indicated the relevant items by means of an 'always', 'sometimes', 'never', 'unsure' or 'not applicable' tick box for each item (De Vos, 2000:80,89,124), (see addendum 4.1 Checklist for structured observation).

1.6.3 EXPLORATIVE

Both an explorative and descriptive approach was followed. According to De Vos (2000:214), by using an exploratory approach the researcher will be able to obtain thorough and actual information and gain new insights into the phenomenon – 'Neurodevelopmental Supportive Care in South Africa' – a relatively unknown research area (Mouton & Marais, 1996:43) and explicate the central concepts of NDSC. The exploratory strategy was used to investigate the full nature of the phenomenon, to examine literature on existing NDSC practices, policies and guidelines nationally and internationally, determine the aspects to be included in NDSC BPGs and to provide theoretical validity (Klopper, 2008:66; Babbie & Mouton, 2002:79).

This exploratory research was conducted by reviewing pertinent literature on the phenomena by means of an ILR (see Chapters 2 and 3) as well as exploring the operationalisation of NDSC in South African public sector hospitals as perceived by key-informant participants by means of key-informant interviews (see Chapter 4 and 5), (Mouton & Marais, 1996:44).

1.6.4 DESCRIPTIVE

A descriptive approach was followed since the context of reports and practice was constantly described. This was done using the checklist (addendum 4-1) as well as during interviews (see Chapter 4). Descriptive studies are designed to gain more

information about the characteristics in a particular field and provide a picture of what others are doing in similar situations and therefore describe that which exists as accurately as possible (Burns & Grove, 2001:248; Mouton & Marais, 1996:44). This study emphasised in-depth description of the phenomena. This descriptive study had a contextual interest, since the South African public sector context was described (Mouton & Marais, 1996:43; Klopper, 2008:68).

1.6.5 CONTEXTUAL

This study was contextual due to the interest of the researcher in understanding the events, actions and process (support and barriers to NDSC) rather than just the outcomes and results. The researcher aims to understand the natural setting, but within a specific context of the participants. The researcher does not aim to generalise the findings. This provides a holistic approach to the research (Schurink, 2000b:281; Babbie & Mouton, 2002:272).

The context of this research study is the South African public hospitals. The public sector was selected, since it has the largest number of LBW infants, with the least resources (supporting statistics given later in this section). As stated earlier '*developmental care will make the biggest difference and be most successful in the most challenged settings with little resources' (*Als *et al.,* 2003:405; Goldberg-Hamblin *et al.,* 2007:167).

The South African health sector is a dual sector in that both a large public sector and a smaller, but fast growing private sector of health services are available. Health care varies from the most basic primary health care, offered free of charge by the state, to highly specialised hi-tech health services available in the private sector for those who can afford it (SAb, 2009).

In the public sector all services are available either at no cost or a small cost that is determined on a gliding scale based on monthly income of the patient. The public sector is under-resourced and over-used, while the private sector caters for middle- to high-income earners who are paying members of medical insurance companies (18% of the population), patients who can afford to pay privately for health care services, and foreigners looking for top-quality surgical procedures at relatively affordable prices (SAb, 2009). No statistics are available of the population without medical insurance who actually make use of private services (Gottlich, 2009).

In South African there is no single database that provides data on the number of registered neonatal intensive care units or NICU beds registered to the public sector and the private sector respectively. Some data is available for the public sector provided by the Medical Research Council. However, this data is not comprehensive. In the public sector a project is currently running to determine this data, but it is not completed or available yet. According to the Medpages website (www.medpages.co.za) there are 53 public hospitals with NICU's and 98 NICU's in the private sector. However, it is important to note that the number of hospitals do not represent the number of patients, beds or levels of care. For example there are a total of 675 neonatal beds in the private sector, of which some hospitals have one bed and the largest unit has 22 beds ranging between intensive care and ward care (growing preterm infants). In the public sector some newborn units have as much as 30 beds. More detail on this data is provided in Chapter 4 – Structured observation, when the sampling is discussed. Four different levels of care are available in South Africa as defined in Paragraph 1.5.3.6, and the hospitals are also classified according to care levels. However, these care levels are used in the public sector, but not in the private sector (Jordaan, 2009) and will be discussed in more detail in Chapter 4.

South Africa has nine provinces that each has either or all of Community Health Centres, district, regional and tertiary hospitals. Community centres and district hospitals render level 1 care, regional hospitals level 2 and tertiary hospitals level 3. These are usually also academic hospitals and link to a tertiary institution. The only data available for these hospitals are in the Saving Babies Report, which is a report of the Perinatal Problem Identification Program (PPIP) funded by the Medical Research Council (MRC). As not all hospitals in South Africa at this point in time participate, the profile is incomplete and does not provide an accurate picture of perinatal statistics (Pattinson, 2005 [Online]). Table 1-4 provides a summary of the data that is available from the Saving Babies Report and Statistics South Africa on the distribution of hospitals and their statistics.

Three provinces were purposively selected namely the Gauteng, Northern Cape and Free State. Gauteng is the most densely populated province with 9.6 million people (20.2% of total population) occupying only 1.4% of the country's land area. Northern Cape is a typical representation of a province that does not have a level three hospital, but needs to provide most of the level three services at the academic level two hospital (SAa, 2009). The Free State is a typical example of the majority of

provinces with regard to the distribution and responsibility of hospitals according to the level of care provided, since the tertiary (level 3) academic hospital is the reference hospital for the province.

Table 1-4: Distribution of hospitals, population, and births per province

Province	PPIP Sites[2]	Community Health centres	District Hospitals (L1)	Regional (L2)	Tertiary (L3)	Population	Total births	Births >500g	Births >1000g
Eastern Cape (Oct 04-March 06)	-	37	65		3	6.436.763 (13.5%)*	38,615	38,615	38,269
Free State (Jul 03-Dec 06)	-	30	25	4	1	2,706,775 (5.2%)*	158,253	-	13.6-17.7%
Gauteng	-	22 Hospitals	-	-	-	8,837,178 (21.5%)*	44,278	-	16.3%
KwaZulu-Natal (Oct 03-Mar 06)**	29	-	-	-	-	9,426.017 (20.8%)*	59,495	-	58,921
Limpopo (Jan 05-Aug 06)	15	-	35 (9)	7 (3)	1 (1)	5,273,642 (rural)	50,371	-	13.8%
Mpumalanga	25	26 hospitals	22	3	1	3,122,990 (rural)	65,000pa	-	-
Northern Cape (2006)**	9	-	-	-	-	822,727 (2.2%*)	20,990pa	-	21.4%
North West (Apr 05 – Mar 06)	13	20 hospitals		10	3	3,669,329 (7.0%*)	70,186	-	12.4%
Western Cape (Oct 03 – Mar 06)	-	-	-	-	-	4,524,335 (10.8%*)	166,261	18.1%	-
Total for SA	**-**	**-**	**-**	**-**	**-**	**44,819,770 (2001)**	**-**	**-**	**-**

* Data from Pattinson, 2005:107-148; Statistics South Africa (2008:3,11; 2001)
- no data available
** PIPP sites identified, but no data available on the level of care provided at each site

Table 1-5 provides a summary of the research study and is followed by Table 1-6: Presentation of the objectives and their applicable research method.

[2] PPIP (Perinatal Problem Identification Program) sites are the sites that submitted data for the Saving Babies 2003-2005 Report (Pattinson, 2005). It may be fewer sites than the actual hospitals, but it is the only data available

Table 1-5: Summary of the research study

CHAPTER REF	STAGE	DESCRIPTION	STAGE REF
	RESEARCH PROBLEM	No documented BPGs for Neurodevelopmental Supportive Care (NDSC) for the preterm infant are available, and in addition; Only certain aspects of NDSC are implemented in the public sector in South Africa.	
	RESEARCH QUESTION	What should best practice guidelines (BPGs) for NDSC in public sector hospitals in South Africa entail?	
	AIM	To develop BPGs for NDSC in the public sector in SA	
Chapter 2 & 3	**QUESTION 1**	What are the components of NDSC?	*Stage 1*
	OBJECTIVE 1	To describe the components of NDSC by means of ILR	
Chapter 4 & 5	**QUESTION 2**	What is the present status of the operationalisation of NDSC in public sector hospitals in South Africa?	*Stage 2*
	OBJECTIVE 2	To develop a checklist (based on the description of the components) to assess the operationalisation of NDSC	
	OBJECTIVE 3	To conduct a situational analysis of the operationalisation of NDCS in public sector hospitals in South Africa (using the checklist, structured observation, key-interviews as part of the observation, and field notes)	
Chapter 6	**QUESTION 3**	What should BPGs for NDSC in the public sector hospitals in South Africa include?	*Stage 3*
	OBJECTIVE 4	To formulate BPGs for NDSC in public sector hospitals in South Africa	
	NATURE OF RESEARCH DESIGN	Qualitative and Quantitative Explorative, Descriptive and Contextual	

Table 1-6: Presentation of the objectives and their applicable research method

OBJECTIVES	DATA COLLECTION	POPULATION (P) AND SAMPLE (S)	DATA ANALYSIS
1: *To describe the components of NDSC*	ILR	(P) Available national and international literature (S) Purposive – Inclusion criteria: Keyword search – best practice guidelines, neurodevelopmental supportive care, developmental care, developmental supportive care, developmental care policies, developmental care protocol	Critical appraisal and data extraction of literature using Johnss Hopkins Evidence Appraisal Instruments
2: *To develop a checklist (based on the description of the components) to assess the operationalisation of NDSC*	Integrating and synthesising results of objective one	(P) Conclusions from results of objective 1 (S) All inclusive (N=16)	Deductive and inductive logic
3: *To conduct a situational analysis of the operationalisation of NDCS in public sector hospitals in South Africa*	Checklist – structured observation	(P) Public hospitals with NICU's in South Africa (N=53) (S) Selection - Academic hospitals in Free State, Gauteng, Northern Cape provinces (n=3)	Coding of checklist by statistician
	(Key informants) Interviews	(P) Registered Nurses of selected hospitals – Unit managers or shift leaders (N=11) (S) Purposive sample (n=4)	Open coding of interviews using Tesch's approach Field notes
4: *To formulate BPGs for NDSC in public sector hospitals in South Africa*	Integration and synthesis of results (Objective 1-3)	All conclusion statements from objectives 1 – 3	Inductive and deductive logic reasoning (IDLE-method™), (Klopper, 2010), integrating synthesising by conclusion statement to BPGs

1.7 RESEARCH METHOD

This section provides a broad overview of the research method followed in this study. The research was designed in three stages that achieved the four study objectives (stage 3 address both objectives 2 and 3). The findings from stage 1 and 2 provided evidence for the formulation of BPGs in stage 3.

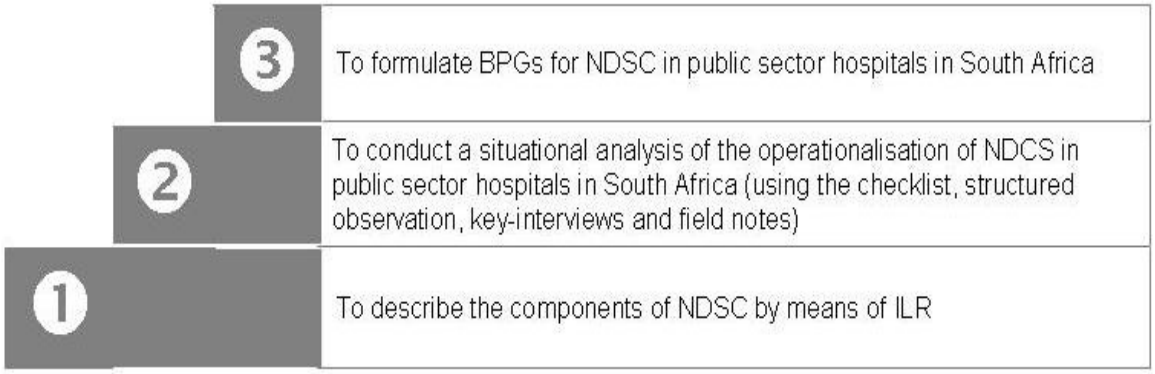

Figure 1-3: Schematic presentation of the stages followed in this study

An overview of each objective is now provided, indicating the population, sample, data gathering and data analysis. The methods followed during each stage in order to address each objective respectively are discussed in more detail in the separate chapters dealing with each objective. It is summarised in Table 1-6.

1.7.1 OBJECTIVE 1: TO DESCRIBE THE COMPONENTS OF NDSC BY MEANS OF AN INTEGRATIVE LITERATURE REVIEW

The population for stage 1 was all available national and international literature, and the sample is purposive. Inclusion criteria set for the sampling was done by means of a keyword search: *best practice guidelines, neurodevelopmental supportive care, developmental care, developmental care policies* and *developmental care protocol*. Data analysis was done by means of critical appraisal, using the Johns Hopkins Evidence Appraisal Instrument (Newhouse, Dearholt, Poe, Pugh & White, 2007:198, 206-211). The selection and appraisal process is well documented (see Chapter 3) to ensure a good audit trail, and a second reviewer confirmed the inclusion and exclusion of literature. A consensus meeting was held to decide on literature

regarding which discrepancies developed (results are discussed in Chapter 3). Refer to Table 1-6 for a summary of the method applied.

1.7.2 OBJECTIVE 2: TO DEVELOP A CHECKLIST (BASED ON THE DESCRIPTION OF THE COMPONENTS) TO ASSESS THE OPERATIONALISATION OF NDSC

The second stage of the research was concerned with assessing the operationalisation of NDSC in public sector hospitals in South Africa. Two objectives were set to address the process of operationalisation: Objective 2: To develop a checklist (based on the description of the components) to assess the operationalisation of NDSC, and objective 3: To conduct a situational analysis of the operationalisation of NDSC in public sector hospitals in South Africa. Findings of the ILR formed the basis of the second stage in the research. Reconstruction of findings of stage 1 was done through a co-operative effort by the researcher and a team of experts. Three experts were purposively selected, two based on their expertise regarding different components of NDSC, and/or checklist development and one a statistician. Consensus discussion and content validation refined the data for the development of the checklist. The population for stage 2 was the conclusion statements from the results of objective one and the sample is an all-inclusive sample. Items for the checklist were derived from the Conclusion Statements (objective 1) through deductive and inductive logic. Refer to Table 1-6 for a summary of the method applied.

1.7.3 OBJECTIVE 3: TO CONDUCT A SITUATIONAL ANALYSIS OF THE OPERATIONALISATION OF NDSC IN PUBLIC SECTOR HOSPITALS IN SOUTH AFRICA

Situational analysis is a strategy to generate information about individuals, groups and/or organisations with the aim to describe and explore the current status of NDSC in public hospitals. The checklist (objective 2) was used to observe the extent to which principles of NDSC were implemented in the selected neonatal units. This stage was important since it provided a detailed description to understand the context for which the BPGs were developed. It also helped the researcher to understand the behaviour, intend to implement NDSC, relationships and/or interests in the selected units regarding NDSC (RNAO, 2002:26).

The unit of analysis is incidents of care that reflect the extent to which principles of NDSC is implemented. In South Africa 53 neonatal units were available in the public sector as research sites for this study (see 1.6.5 Contextual and Chapter 4 for a clarification of the population). These units provide different levels of care ranging from levels one to four (as described in Paragraph 1.5.3.6). Therefore one hospital may provide different levels of care in the different units (i.e hospital X may have a NICU, high care and KMC unit). Statistics regarding the number of registered beds for each level was not readily available and the information had to be gathered for the sampling process. Different regions and hospitals were not always willing to support the researcher in providing this information due to lack of time and staff, and therefore this data is still limited.

Academic public sector hospitals with NICU's were targeted as they are linked to a university and are responsible for the care of the highest volume of the sickest infants in the region. Academic hospitals are also the referral hospitals for each region and they are responsible for hospitals providing a lower level of care in their region (for example level 1 or 2), including protocol and guideline development, implementation and training.

1.7.3.1 Structured observation

Data collection for stage 2 was done by means of structured observation guided by the checklist developed in objective 2. Preterm infant files, key-informant staff members, or parents were consulted if information could not be gathered from the observation. The method of structured observation is now briefly discussed, but is discussed in detail in Chapter 4.

Permission to access the information in the files was gained according to the Promotion of Access to Information Act, No 2 of 2000 (SA, 2000).

- Institutional consent was obtained from the hospital CEO's and the nature of the situational analysis and the checklist explained (addendum 1-4 to 1-8).
- No files were removed from the hospital premises.
- In the case of retrospective audit of patient records, patient consent (in this case proxy consent from the parents) are not needed as no personal information is required.

- The identity of the hospital is protected by using a coding system for participating hospitals.
- The checklists are stored in a safe place in the School of Nursing Science and only the researcher has access to the raw data.
- All information by which a preterm infant, the hospital or any of their staff could be recognised, were hided in the report.

Data analysis for this objective was done using descriptive statistics with the help of a statistician of the Statistical Department of the North-West University. Refer to Table 1-6 for a summary of the method applied.

To address objective 3 the structured observation was followed by interviews with key-informants.

1.7.3.2 Key-informant interviews

Semi-structured interviews were selected to gather more information for the situational analysis to determine the current status of NDSC in the public sector hospitals in South Africa. The key-informant interviews are discussed in detail in Chapter 4 and 5.

Interviews with key-informants provided an insider perspective of the operationalisation of NDSC in selected settings. The target population and sample included the most senior registered nurses of NICU's at the selected hospitals. Key-informant participants, individuals who provide useful insights into the population and can steer the researcher to information (Creswell, 1998:60), were purposively selected on the basis of their knowledge and experience of the implementation of NDSC. Should a unit manager not be available for interviewing, she was asked to indicate a suitable person to be included in the sample. Individual interviews with key-informants were used to obtain an in-depth understanding of the operationalisation of NDSC in public hospitals in South Africa.

An interview schedule was used to guide the interviews (see addendum 4-5), consisting of three core questions given in Figure 1-4:

▪ What do you understand under Neurodevelopmental Supportive Care?
▪ Tell me what helped your unit to implement NDSC.
▪ Tell me about those factors you experienced as barriers to implement NDSC in your unit.

Figure 1-4: Questions for the interview schedule

The interviews were held in a private place with minimal disturbances, and at a time suitable for the participants. Permission was obtained to audiotape the interviews. Field notes were also taken during the interviews.

The interviews were transcribed verbatim and analysed using open coding following Tesch's approach to ensure confirmability (refer to addendum 4-6 and Chapter 4), (Creswell, 2003:191-197; Creswell, 1998:57,131). This approach is discussed in detail in Chapter 4 and 5.

An analysis protocol was used for independent coding and consensus has been reached on the analysis. Peer reviewing (independent coder) of the findings assisted in preventing bias or misinterpretation of the nature of barriers and supporting factors as perceived by the participants. This coding process is discussed in detail in Chapters 4 and 5 – Interviews. Refer to Table 1-6 for a summary of the method applied. The results from the structured observation and key-informant interviews together with recorded field notes were combined to reach objective 3.

1.7.4 OBJECTIVE 4: TO FORMULATE BPGS FOR NDSC IN THE PUBLIC SECTOR HOSPITALS IN SOUTH AFRICA

The purpose of developing BPGs for NDSC of the preterm infant in the South African context was to improve the short and long term developmental outcomes of the preterm infant and her family, to assist practitioners in applying the best available research evidence to clinical decisions, to promote the responsible focus of health care resources and to reduce cost (RNAO, 2003 [Online]; Martinez, s.a.). In addition, gaps in the availability of evidence-based practice were highlighted. BPGs in this context should be realistic and feasible in a resource constrained environment with both low-level trained and specialised staff.

The evidence collected in the previous stages (ILR and situational analysis and interviews) was used as a basis for the BPGs, integrated and contextualised in the form of conclusion statements. These statements were then translated as BPGs by using the IDLE-method™ (Klopper, 2010), (the method is discussed in Chapter 6). The systematically developed statements of best practice will assist practitioners in the operationalisation of NDSC.

Validation, contextualisation and implementation of the BPGs do not fall within the scope of this research, and will be followed up in postdoctoral research.

1.8 RIGOUR

Rigour in research refers to the establishment of confidence in the truth (credibility) of the findings of the study and the criteria by which this credibility was established (Lincoln & Guba, 1985:290). Trustworthiness of qualitative research was established by using four strategies, namely credibility, transferability, dependability and confirmability (Krefting, 1991:1). However, the checklist design and use for data gathering utilised quantitative methods and therefore the validity and reliability of this instrument was also important in ensuring rigour. Table 1-7 provides a summary of the criteria, preventative actions and application in this research to ensure rigour. However, specific issues of rigour as related to each objective will be discussed throughout the thesis.

Table 1-7: Criteria, preventative actions and application in this research to ensure rigour

Criteria	Description	Preventative actions	Application in this research
Credibility	Credibility establishes how confident the researcher is regarding the truth of the findings. Credibility criteria involve establishing that the results of qualitative research are credible or believable from the perspective of the participant, researcher or reader of the research (Creswell, 2003:195; Denzin & Lincoln, 2003:69; Miles & Huberman, 1994:278,279; Trochim, 2006 [Online]).	Prolonged engagement (Klopper & Knobloch, 2009:5)	Researcher worked in the field of NDSC for the past eight years. Built a trust relationship with key-informants. Researcher presents training in NDSC on national and international levels. President of SANITSA. Act as consultant for various universities. Runs a web page for parents with preterm infants.
		Persistent observation (Klopper & Knobloch, 2009:5)	In objective 1 research studies and specific types of documents were reviewed consisting of evidence on different levels such as the opinions of respected authorities, based on clinical experience and the use of descriptive studies or reports of expert committees (RNAO, 2003a:14; NHMRC, 2000:xvii). The levels of evidence of data were further described (refer to Chapter 3 & 6), (Lincoln & Guba, 1985:301,304). Observation was done at different times and days (objective 3).

Criteria	Description	Preventative actions	Application in this research
		Triangulation (Klopper & Knobloch, 2009:5)	Data sources: Different *data sources* were used such as journals, studies, policies and guideline documents. Methods of data collection: Triangulation of the *methods of data collection* included the use of interviews, observations and field notes. Investigator triangulation: The researcher employed *investigator triangulation* when using the expert opinions of different professions, as well as independent reviewers in different stages of the study. *Methodological triangulation* entails the use of multiple methods to study a single problem, indicating the multiple stages followed in the study and including ILR, structured observation as well as interviews and field notes.
		Thick description	Context-rich and meaningful descriptions of NDSC (components and operationalisation) are provided throughout the study (Miles & Huberman, 1994:279). The presented data links well to the categories of prior theories / categories identified previously by other authors (i.e. see 1.2.4.2 - Synactive Theory of Infant Development by Als). The findings were internally coherent and the concepts of NDSC were systematically related. Negative evidence was sought for and none were found. Evidence only suggested intervention with positive or no adverse effect. The latter implied no positive or negative effect to support the application of such interventions, since the interventions do not result in harm. The interventions are safe for use (see Chapter 4 - Data interpretation & Synthesis).
		Peer review	Meetings with the study leaders, doctoral seminars and doctoral committee meetings. During this process bias was explored, and methods, ethical matters and others were questioned (Klopper & Knobloch, 2009:5). Peer review contributed to develop the next steps in the methodological design and finally provided the opportunity for catharsis – clearing the mind of emotions and feelings that may be clouding good judgement (Lincoln & Guba, 1985:308).

Criteria	Description	Preventative actions	Application in this research
Reflexivity			Bias was explained with onset of the research and as it evolves and the research perspective was not ignored. Believes and values were made explicit as stated in 1.5 – Assumptions of the researcher.
Transferability	Transferability refers to the extent to which the process can be applied in other contexts or with other respondents (Miles & Huberman, 1994:279; Schurink, Schurink, Poggenpoel, 2000:331,349; Klopper & Knobloch, 2009:7).		This study did not intent to generalise findings, but a detailed and thick description of data was provided (Babbie & Mouton, 2002:274) to enable the reader to decide to what extent his or her context is similar or different and whether the findings of this study may be applicable – bottom line, to decide to what extent the BPGs might be appropriate in their settings. The obligation for demonstrating transferability therefore rests on those who wish to apply it to the receiving context (the reader of the study), but the researcher enhanced transferability by thoroughly describing the research context and the assumptions that were central to the research (Trochim, 2006 [Online]). The potential for transferability was ensured by means of a thick description of methods, processes and results throughout the study (Miles & Huberman, 1994:279; Klopper & Knobloch, 2009:7). Some examples include full description of the populations and samples used in the study. Purposive sampling was used for all stages of the study as summarised in the sections indicated below. The findings were congruent with the prior theory 'Synactive Theory of Infant Development' as described in 1.2.4.2.

Criteria	Description	Preven-tative actions	Application in this research
Confir-mability	Confirmability is the criterion of neutrality (Poggenpoel, 2000:350) and refers to the degree to which the findings of an inquiry are determined by participants and could be confirmed by others and are not of the bias influenced by the researcher, other motivations and perspectives (Miles & Huberman, 1994:278; Schurink *et al*., 2000:331).		Confirmability was achieved when *credibility and transferability* of these findings to other settings were established.
		Audit trail	An audit trail implies a systematic collection of material and documents that allow an independent auditor to come to a conclusion about the data, implying that the methods and procedures followed in the study are described explicitly and in detail. A data audit can be conducted after the study to examine the data collection process and procedures of analyses, and to judge the potential for bias. Conclusion statements provided evidence (Klopper, 2010). Personal assumptions, biases and values were stated explicitly (see 1.5 – Assumptions of the researcher). The raw data was retained and will be stored for a period of 5 years at the School of Nursing Science and be available for secondary analysis (Miles & Huberman, 1994:278; Trochim, 2006 [Online]).
			The researcher chose to state her meta-theoretical perspectives explicitly (see Paragraph 1.5.1). The researcher immersed into the data through data collection until saturation. Independent coders analysed the data and consensus discussion clarified differences (Poggenpoel, 2000:345-346).

Criteria	Description	Preven-tative actions	Application in this research
		Peer examination	*Peer examination* of the findings was done through peer review of the data findings.
		Triangulation	Triangulation of data took place as explained (Klopper & Knobloch, 2009:5).
Dependa-bility	Dependability determines to what extent the process of the study was consistent and the findings of a particular inquiry can be repeated if the inquiry was replicated with the same participants in the same context. The researcher endeavours to provide her audience with evidence that if the study was to be repeated with the same or similar respondents in a similar context, its findings would be similar (Miles & Huberman, 1994:278; Schurink *et al*., 2000:331,350; Klopper & Knobloch, 2009:9).	Thick description	A thick description of the context is provided through in-depth description of the research context to allow sufficient information to evaluate contextual similarity (Klopper & Knobloch, 2009:8), (see 1.6.5 Contextual)
		Clear research question	The research question is stated clearly and the features of the study design are congruent with it (see 1.3 Research problem)
		Researcher's role	The researcher's role and status within the site as well as paradigms are explicitly described (see 1.5 Assumptions of the Researcher)
		Data collection	Data was collected across the full range of appropriate settings and respondents as suggested by the research question (see 1.7 Research method)

Criteria	Description	Preventa-tive actions	Application in this research
		Independent reviewers	Coding checks were made by using independent reviewers for stages 1 and 2, and they showed adequate agreement (see Chapters 3 - 5)
		Peer review	Peer review were constantly in place by confirming the research process and findings and employing the inputs of study promotors, independent reviewers, a statistician and experts in the field of research, the subject of NDSC and knowledge of the public hospital sector in South Africa (see Chapters 2 - 5)
Reliability	Content reliability of the checklist instrument was also important, since it indicates to which extent independent administrations of the same instrument will provide similar results if used in comparable conditions. It is therefore concerned with how well the instrument measures the operationalisation of NDSC (De Vos & Fouche, 2000:85,86).		The statistician of the NWU confirmed that the statements or questions included in the instrument are actually measuring the components identified from the ILR. The qualitative research (interviews and observation) in this study was sensitive to the time and place it was performed and therefore not consistent over time, therefore reliability was proven through peer review, member checking and triangulation as discussed earlier.
Validity	Validity is an important aspect of rigour regarding the checklist designed and used in this study. Validity of the checklist as an instrument means that it is 'measuring what it is supposed to measure'. In this section two aspects were considered namely whether the instrument actually measured the concept in question, and whether the concept was measured accurately (De Vos & Fouche, 2000:83; Klopper & Knobloch, 2009:6).	Content validity refers to the representative-ness and adequacy of the items included in the instrument.	Content validity of the checklist was ensured by using a statistician to ensure that the questions included in the instrument actually represented the categories and subcategories identified during the ILR. An independent reviewer and expert in the subject field also indicated that this is indeed the case (Klopper & Knobloch, 2009:6; De Vos & Fouche, 2000:84).

Criteria	Description	Preventative actions	Application in this research
	Internal threats include using inadequate procedures such as changing the instrument during the research.	Pilot checklist Interview guide	The checklist was piloted first and then used in the study by a single researcher (Klopper & Knobloch, 2009:6). The same applied during the interviews and an interview guide was used.
	External validity is concerned with the extend to which findings can be generalised and *threats* may arise when generalising to other groups not under study.	Saturation of data and audit trail	It was stated that the aim of this study is not to generalise findings to other populations, but to constantly provide a thick description of the research process and the data.
	Construct *validity* refers to determining the degree to which an instrument successfully measures a theoretical construct. Construct validity is therefore concerned with the meaning of the instrument, that is what it is measuring and how and why it operates the way it does.	Concept clarification	*Construct validity threats* may occur when the researcher use inadequate definitions and measures of variables. For this reason all concepts were clearly defined by means of the data gathered from the ILR (see Chapter 3) and an independent reviewer, content expert, as well as a statistician were used to validate the content of the final checklist (Creswell, 2003:171). Strategies to control threats to reliability and validity as well as to trustworthiness are discussed in detail in Chapter 4 (checklist construction) and Chapters 5 and 6 (structured observation using the checklist).
		Theoretical validity	This was done by means of *conceptualisation* – the process of describing the key concepts in the research, as well as the grounding and integration of research within the accepted nursing body of knowledge (Botes, 1995a;11-12; Klopper & Knobloch, 2009:4). Definitions were provided earlier in this chapter (see 1.5.3 Theories and definitions). However, conceptualisation was refined after the ILR (see Chapter 3).

1.9 ETHICS

The researcher is committed to ethical research and this study aims to comply with ethical standards and provides research results that will be published after completion of the study.

Ethical considerations included obtaining permission for the research. Ethical clearance was obtained from the Ethics Committee of the North-West University (NWU-0030-08-A1), (see addendum 1-1). Institutional consent was obtained from the different hospitals, universities and Departments of Health (ETOVS no: 159/08 [see addendum 1-3], Free State Province Department of Health: reference no 13/2, Universitas Academic Hospital: see signed addendum 1-4, Kimberley Hospital Complex [addendum 1-5], Coronation Hospital [addendum 1-6], Steve Biko Academic Hospital [addendum 1-7], University of Pretoria [addendum 1-8]).

It was stated clearly in the letter for institutional consent that the researcher will not be involved in direct preterm infant care and will immediately report any need for emergency care that might arise while she is present.

The researcher acted honestly. No results were disguised and all contributors were acknowledged.

JUSTICE means the equal distribution of risks and benefits between communities. The research respected the ethics of justice, fairness and objectivity in respecting the dignity of people involved in the research, and did not expose participants to intentions and motives not directly attached to the research projects, its methodology and objectives (Babbie & Mouton, 2002:528; Benetar *et al.*, 1993:1,5,6).

AUTONOMY of all persons involved in the study was respected. Parents are the rightful decision makers for preterm infants. Health care professionals should always be honest towards the parents so that they can make informed decisions (Van Der Westhuizen, 2007). Due to the constructive nature of the study, confidentiality and anonymity may become problematic (Guba & Lincoln, 1994:115; Mouton, 1996:157). For this reason key-informant interviews have been selected and the researcher tried to establish the best possible interpersonal relationship with the participants (Mouton, 1996:157).

During the structured observations selected aspects of care of the preterm infants were observed. Although there were NO direct contact with the preterm infants or the parents, observation of change in the condition of the preterm infant that implies emergency intervention, unethical behaviour of staff and dangerous and unprofessional practice, may pose an ethical dilemma to the researcher. As a professional nurse the researcher cannot ignore this and intended to immediately report it to the person in charge. However, such a situation did not occur.

Finally, the researcher will share the research results with all the role players in the study. The research results will be further distributed by means of journal articles, congress papers and workshops. By implementing the BPGs, the communities as a whole benefit from the study.

1.10 OUTLINE

The thesis consists of the following sections:

Chapter 1 Overview of the study

Chapter 2 Integrative Literature Review: Research method

Chapter 3 Integrative Literature Review: Realisation of esults

Chapter 4 Situational analysis of the operationalisation of NDCS: Research method

Chapter 5 Situational analysis: Results

Chapter 6 Formulation of Best Practice Guidelines for NDSC of preterm infants in public sector hospitals in South Africa

Chapter 7 Evaluation of the study, limitations and recommendation for practice, education and research

1.11 SUMMARY

The survival rate of preterm infants increased over the last decades, but their developmental outcomes do not correspond. NDSC has been identified as a care intervention to address this problem, and care programmes have been developed by expert professionals such as Dr Heidelise Als (Als, 1982; Als *et al.*, 1982, 1992).

NDSC is also applicable to the South African context due to the short and long term benefits of these interventions on the developmental outcomes of preterm infants. There is a great need for NDSC in South Africa. This need was supported by the Paediatric Neonatal Workgroup (Paediatric Neonatal Work Group, Section 6 & 8.3 [Online]) and the WHO (1996 [Online]). NDSC principles have been developed, tested and mostly implemented in first world contexts, but have never been applied and tested in the context of a developing country such as the South African context. This is in sharp contrast with the view of Als *et al.* (2003:405) that 'developmental care will make the biggest difference and be most successful in the most challenged settings'. The question is therefore not whether NDSC should be implemented in South Africa, but rather how it should be done. BPGs are a first step in the direction of successful implementation in South Africa in an organised and systematic manner.

Literature discusses different concepts of NDSC as well as training in NDSC, but no BPGs for the implementation of NDSC are available on a national or international level. This brings us to Chapter 2 of this study – Integrative Literature Review: Research method.

CHAPTER 2
INTEGRATIVE LITERATURE REVIEW: RESEARCH METHOD

2.1 INTRODUCTION

In Chapter 2 the Integrative Literature Review (ILR) research method are discussed.

2.1.1 ORIENTATION TO THE STUDY AS A WHOLE

A scoping review of the literature on NDSC was performed to *explore* NDSC components and develop an initial impression of the body of literature (Dixon-Woods, Agarwal, Young, Jones, & Sutton, 2004:23). During this exploration it was determined that no written BPGs regarding NDSC were available nationally or internationally.

In this chapter stage one of the research study will be discussed to address objective one (1) of the study. The objective was to describe the components of NDSC by means of an ILR. This chapter in particular presents the methodological options when doing an ILR to motivate the use of the ILR as method.

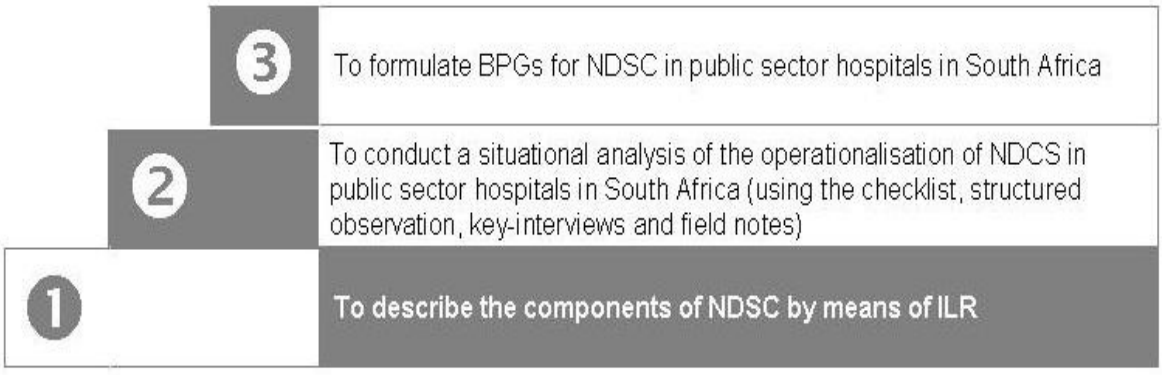

Figure 2-1: Schematic presentation of the stages to be followed in this study indicating stage one

2.1.2 AIM OF STAGE ONE

The aim of stage ONE of the research study is to identify, critically appraise, explore and synthesise the evidence on NDSC to form a theoretical framework for the study. Results of studies that were found to meet the criteria of high methodological quality

research and potential applicability were extracted, described; and after thematic analysis of the findings the results were synthesised according to the main themes that arose, namely – components[3] of NDSC. The results will be discussed in more detail in Chapter 3.

2.1.3 DEFINITION OF INTEGRATIVE LITERATURE REVIEW

ILR is the method used to explore and synthesise research evidence and will be discussed in this chapter.

Integrative literature (research) review is a scientific inquiry of primary qualitative and quantitative research studies with the aim to summarise accumulated knowledge and synthesise results from past empirical as well as theoretical literature. It allows for simultaneous inclusion of quantitative and qualitative data from both experimental and non-experimental studies in order to more fully understand a phenomenon. In addition, integrative reviews incorporate a wide range of purposes: to define concepts, to review theories, to review evidence, and to analyse methodological issues of a particular topic.

Studies are critically appraised with regard to methodological quality in order to reach higher analytic goals, generalise findings from these studies and bring about maximum new information (Sandelowski, Docherty, Emden, 1997:367; Whittemore & Knafl, 2005:546-548; Cooper, 1982b:291-292).

2.1.4 DEFINITION OF THE PROCESS OF INTEGRATIVE LITERATURE REVIEW

Whittemore and Knafl (2005:546,547) stated that the proliferation of all types of literature reviews during the past decade has contributed to more systematic and rigorous methods. However, these review methods still tend to over-emphasise the randomised clinical trial. However, the integrative review method allows for the inclusion of diverse methodologies (including experimental and non-experimental research).

[3] The term components will refer to themes, categories or topics in this study and will be used as synonym for these terms

Since the integrative review draws on various approaches, the process followed in the ILR are explicitly described to minimise the risk for bias, inaccuracy and lack of rigour (Whittemore & Knafl, 2005:547,548; Cooper, 1982a:abstract – 7; Cooper, 1982b:291). The method followed in this study involves five steps that are similar to that of primary research (Shelby & Vaske, 2008:99-108; Whittemore & Knafl, 2005:548). The review process consists of (1) review question, (2) search strategy, (3) critical appraisal, (4) data analysis and synthesis (result discussion of the critical appraisal) and finally, (5) conclusion statements. This will be discussed in more detail later in the chapter.

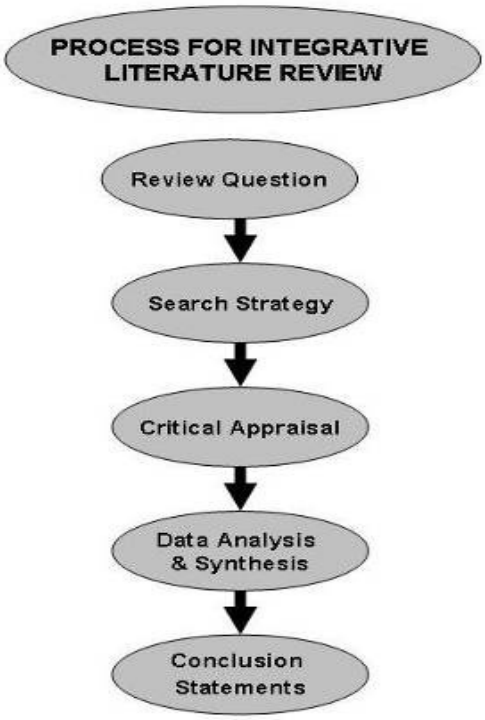

Figure 2-2: Schematic presentation of the steps followed in the ILR process

2.2 THE INTEGRATIVE LITERATURE REVIEW AS METHOD OF CHOICE

The aim of this section of the research study is to identify the components of NDSC and to describe the best available evidence in this regard. As a fair amount of

research have been done on NDSC, the most suitable method to follow seemed to be one of critical appraisal of relevant literature and synthesising past research results and non-research[4] literature (as defined in the Johns Hopkins appraisal instrument by Newhouse *et al.,* 2007). A single study can rarely provide a generalisable and definite answer to a research question in the social sciences. Results can be influenced by sampling technique and the characteristics of the sample, and may be restricted by economic constraints (Suri, 2000:49; Whittemore & Knafl, 2005:547). A combination of results from several primary studies may therefore provide a comprehensive investigation of an area, such as NDSC. Non-research literature provided descriptive and contextual explanations of the concepts of NDSC that the researcher was looking for.

Different methods of conducting reviews of health care literature have been used to synthesise the available best research evidence (Whittemore & Knafl, 2005:547). These methods focus on the review and synthesis of different types of studies and documents and include both quantitative and qualitative studies. The researcher intended to explore and describe the components of NDSC as described in these studies, which included intervention, its effect as well as the context in which it has been applied.

According to Suri (2000:50) the methodology of research synthesis is crucial, since it plays an important role in translation and dissemination of knowledge and in shaping further research and practice and should thus be rigorously applied. Therefore the following section intends to argue different methodological options (see Figure 2.3), such as systematic review, meta-analysis, traditional narrative reviews, meta-ethnography, qualitative meta-analysis, qualitative meta-synthesis and ILR review in order to motivate the decision to use an ILR method for this study. These options can be grouped in four groups: (1) synthesis of primary quantitative results, (2) summary methods of primary quantitative results, (3) synthesis of primary qualitative results and (4) summary methods of primary qualitative results. A summary focuses

[4] Non-research evidence is defined as expert opinions, systematic reviews, clinical practice guidelines, organisational (QI, financial data) and expert opinions, case studies and literature review (Newhouse, et al, 2007: 198; 206-211),

on summarising topical, thematic or survey data, while a synthesis focuses on interpreting, integrating and explaining of a phenomenon.

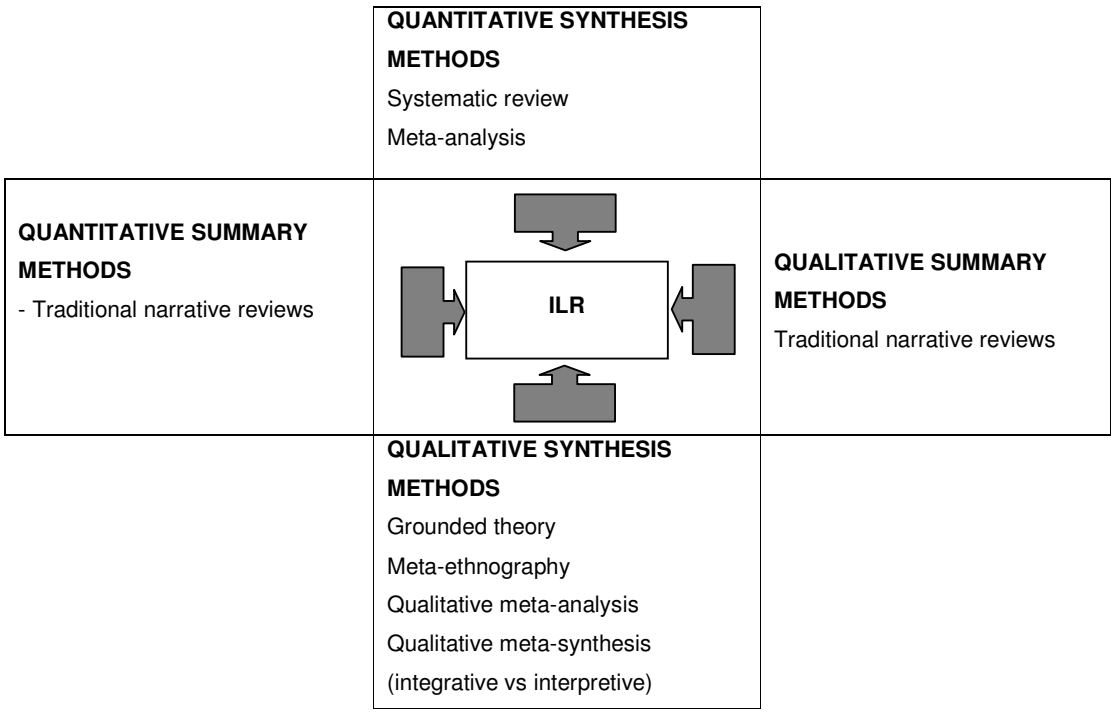

Figure 2-3: Data summary and synthesis methods available for use in reviews

Both summary and synthesis of quantitative and qualitative primary data are important for inclusion in this study and therefore the different methods are now briefly discussed.

2.2.1 QUANTITATIVE SYNTHESIS METHODS

The quantitative synthesis methods include the systematic review and meta-analysis that will now be discussed.

2.2.1.1 The Systematic Review

Traditionally quantitative research was regarded as 'the best' research, especially experimental studies and randomised clinical trials and this data can easily be pooled for systematic review. However, systematic reviews are not the appropriate methods for this study as NDSC is best researched using both quantitative and qualitative studies due to the nature of NDSC interventions.

A SR is a review of specific research literature guided by a clearly formulated review question that uses comprehensive and systematic search procedures and explicit, transparent methods to identify, select, appraise and synthesise all of the relevant research evidence in order to answer a specific clinical question (Allan, Badenoch, Bexon, Carlsson, Dearness, Mihailova, West, S.a; Dixon-Woods *et al.*, 2004:12; Forbes & Griffith, 2002:144; Whittemore & Knafl, 2005:547). Cochrane in 1979 further defined SR as a "critical summary [organised] by specialty or subspecialty, adopted periodically, of all relevant randomised controlled trials" which, according to the Joanna Briggs Institute for Evidence Based Nursing and Midwifery (JBIEBNM, 2001:3) provides a summary of the best available research evidence that is known about an intervention, but also a summary of further research needed. Table 2-1 provides a summary of the unique characteristics of the SR

Table 2-1: Summary of unique characteristics of the SR

EXPERT DEFINITION	DEFINITION	UNIQUE CHARACTERISTICS / ATTRIBUTES
Cochrane Library ([Online])	"A systematic review identifies an intervention for a specific disease or other problem in health care, and determines whether or not this intervention works. To do this authors locate, appraise and synthesize evidence from as many relevant scientific studies as possible. They summarize conclusions about effectiveness, and provide a unique collation of the known evidence on a given topic, so that others can easily review the primary studies for any intervention. Systematic reviews differ from other types of review in that they adhere to a strict design in order to make them more comprehensive, thus minimizing the chance of bias, and ensuring their reliability. Rather than reflecting the views of the authors, or being based on a partial selection of the literature, (as is the case with many articles and reviews that are not explicitly systematic), they contain all known references to trials on a particular intervention and a comprehensive summary of the available evidence. The reviews are therefore also valuable sources of information for those receiving care, as well as for decision makers and researchers"	▪ Identify intervention for disease ▪ Determine the effectiveness of the intervention ▪ Summarise evidence ▪ Strict design ensure reliability ▪ Contain all known references on trials

EXPERT DEFINITION	DEFINITION	UNIQUE CHARACTERISTICS / ATTRIBUTES
Whittemore & Knafl, 2005:547	"Systematic reviews are research reviews that combine the evidence of multiple studies regarding a specific clinical problem to inform clinical practice and are the method of choice for evidence-based practice initiatives. Systematic reviews require a well-specified clinical question, explicit methods, and a comprehensive search for relevant primary studies. Systematic reviews often include the statistical methods of meta-analysis if primary studies meet the assumptions required for meta-analyses."	▪ Combine multiple studies with a specific clinical problem ▪ Well specified clinical question ▪ Explicit methods ▪ Comprehensive search for relevant primary studies ▪ Statistical methods of meta-analysis of primary studies
Dixon-Woods *et al*., 2004:v, 6, 12	Explicit, transparent and systematic selection, appraisal and synthesis of quantitative studies, which focus exclusively on clinically defined outcomes rather than on those that might be most important to patients.	▪ Explicit, transparent and systematic selection, appraisal and synthesis ▪ Quantitative studies ▪ Clinically defined outcomes
Sandelowski, Voils, Barroso & Lee, 2008:454	Systematic review is typically viewed in the health sciences as the most objective—that is, rigorous, transparent, and reproducible—method for summarising the results of research.	▪ Objective review ▪ Rigorous, transparent and reproducible ▪ Summarise research results
Russell, 2005 [Online]	"carefully synthesized research evidence designed to answer focused clinical questions...also known as evidence summaries and integrative reviews"	▪ Answer focused clinical question ▪ Synthesises research evidence
JBIEBNM, 2001:2	Systematic reviews are summaries of all past research on a topic of interest. They utilise the same principles and rigour that is expected of primary research, are systematic in their approach and use methods that are pre-planned and documented in a systematic review protocol.	▪ Summaries of past research on topic ▪ Same principles than primary research ▪ Systematic approach ▪ Pre-planned and documented method

EXPERT DEFINITION	DEFINITION	UNIQUE CHARACTERISTICS / ATTRIBUTES
Forbes & Griffiths, 2002:144	In systematic reviews, questions need to be very explicit, identifying a particular population, intervention or group of interventions for comparison, and types of outcomes. Systematic reviews can be used to answer many types of empirical questions. The systematic review is explicit about the types of methods to be considered and will generally select RCTs on the assumption that large well designed RCTs provide the strongest evidence. It further follows a very explicit search strategy or protocol, which are often subject to external review.	▪ Explicit questions identifying particular populations, interventions and outcomes ▪ Explicit quantitative methods (RCT) ▪ Explicit search strategy subject to external review
CONCLUSION Systematic review combines the evidence from past primary research studies that addresses a specific clinical problem and therefore requires a well specified clinical question. The systematic review uses explicit, transparent, comprehensive and systematic search and appraisal methods and synthesis of quantitative studies, guided by a strict protocol. The systematic review is reproducible, subject to external review and focuses exclusively on clinically defined outcomes.		

SRs collect and analyse data from the included studies of high methodological quality, which lead to greater precision in estimates of how much benefit (or harm) we can get from an intervention. Although SRs work with quantitative data it allows the clinician and/or researcher a way to confirm qualitative findings, such as whether an intervention is beneficial, but also promotes greater accuracy in how we quantify benefits (how much benefit we can expect from a treatment). It should also include all high quality research, regardless of whether it agrees with the review hypothesis (Allan *et al.*, s.a; Forbes & Griffith, 2002:144). When evaluating the effectiveness of an intervention, the randomised controlled trial (RCT), is considered the gold standard for SR (JBIEBNM 2001:3). It further provides the most reliable evidence where human error is minimised by having a team of people undertake each activity of the review process (JBIEBNM, 2001:2, 5) to ensure consensus in the findings. The use of a review team contributes to the rigour of systematic reviews.

According to the Critical Appraisal Skills Programme (CASP) (Allan *et al.*, s.a) the aims of SRs are to (1) reduce the volume of research for the practitioner, (2) increase

the power of research, (3) increase precision of estimates, (4) explain inconsistencies and conflicts and (5) to better reflect the 'real world'. Furthermore, the high accuracy and quality increase precision of estimates through critical summary of RCTs and the use of an independent reviewer minimises human error.

It is clear that SRs provide valuable evidence. However, since it over-emphasises the RCTs, and other forms of evidence are categorised as of lesser quality by means of a hierarchy of research evidence, important information may be lost (Whittemore & Knafl, 2005:547). Other problems include bias in favour of the intervention or a procedure under investigation induced by weak methods in the primary studies and selective publication (Forbes & Griffiths, 2002:142) and it has a low focus on the effect of context.

The researcher decided not to use the SR method to synthesise data, but rather to appraise selected SRs previously performed by other researchers to draw on high methodological quality evidence. SRs appraised for this study summarise all the past RCT research on NDSC. However, important other studies might have been missed and therefore add to the detribute of gaining a full understanding of NDSC. Therefore, since findings from qualitative research were also regarded as important for inclusion in this study, especially for a deeper understanding of the phenomena and contextualisation of results and the possibilities of synthesis of this data, these methods will also be discussed later. SRs may further contain a method known as *meta-analysis*, which will now be discussed.

2.2.1.2 Meta-analysis

Meta-analysis refers to a statistical technique for combining evidence from multiple primary quantitative studies with similar designs, hypotheses and data (Shelby & Vaske; 2008:96; Whittemore & Knafl, 2005:547). It is the statistical process of combining and analysing all of the results of the individual studies with high methodological quality into one overall measure of effectiveness of an intervention. These studies need to address the same question, use a similar population, administer the intervention in a similar manner and measure the same outcomes (Allan *et al.*, S.a, Forbes & Griffiths, 2002:1440; JBIEBNM, 2001:4, 5; Whittemore & Knafl, 2005:547). Glass (1976:3) furthers this definition as the practice of secondary analysis and in his own words: 'Meta-analysis refers to the analysis of analyses' which implies the pooling of similar data. Since meta-analysis is a statistical

technique used within systematic reviews, it was only appraised as part of the appraisal of SRs included in this review.

(a) Motivation to include results from meta-analysis into the review

The first meta-analysis performed by Karl Pearson in 1904 was an attempt to overcome the problem of reduced statistical power in studies with small sample sizes (Shelby & Vaske, 2008:96). The use of meta-analysis as a quantitative research technique became increasingly popular since Gene Glass introduced the SR at the annual convention of the American Education Research Association in 1976 (Shelby & Vaske 2008:96) and became popular in die medical sciences since the 1980's.

Suri (2000:51) and Neill (2006 [Online]) recommend that meta-analysis be used to obtain insight into:

- Direction of the overall effectiveness of interventions (e.g., positioning, cluster care),
- Quantification of the effect by showing the relative impact of independent variables (e.g., the effect of different types of therapy), and
- Identification of the strength of relationships between variables.

A meta-analysis includes all the quantitative data relevant to the research question and is in principle free from subjectivity. Selection and exclusion criteria are explicitly stated and meta-analysis can provide a general conclusive answer to a clinical question. This method can also deal with a large number of empirical studies. Furthermore, meta-analysis goes beyond literature review, since in the latter the results from various studies are discussed, compared and perhaps tabulated, whereas with a meta-analysis the results of individual studies are synthesised into a new result (Berman & Parker, 2002 [Online]). The results of individual studies are synthesised into a new result and meta-analysis direct overall effectiveness of interventions, quantifies the effect of intervention – showing the effect of independent variables. Finally it identifies the strength of relationships between variables. Therefore, the use of data from meta-analysis (as used in SRs) was very helpful and powerful in providing the researcher with the components of NDSC as identified from previous research studies.

However, NDSC has also been described as consisting of a number of interventions that are differently operationalised, and for this situation a single meta-analysis does not exist. That is, the same interventions were not described, explored or investigated in any one of the available studies. Meta-analyses of individual interventions such as KMC are available, which shed light on specific individual interventions, rather than NDSC as a single concept.

Meta-analyses are prone to over-generalising findings, may include results from methodologically poor studies, be biased in favour of published research, give more weight to studies with multiple results and ignore studies for which the effect size cannot be computed. Potential errors may result from combining studies with different methodologies, sampling designs and variable measurements. The most concerning fact within the social research framework, is that qualitative studies are excluded from such research syntheses (Suri, 2000:50; Shelby & Vaske, 2008:105, 106). Table 2-2 outlines the strengths and weaknesses of meta-analysis.

Table 2-2: Strengths and weaknesses of meta-analysis

Strengths of meta-analysis	Weaknesses of meta-analysis
▪ Imposes a discipline on the process of summarising research findings ▪ Represents findings more differentiated and sophisticated than conventional reviews ▪ Capable of finding relationships across studies that are obscured in other review methods ▪ Protects against over-interpreting differences across studies ▪ Can handle a large number of studies, which would overwhelm traditional methods to review ▪ Adjustment for sample size and study quality can be included in analysis ▪ Provides a rigorous methodology for quantitative research synthesis ▪ Rigorous approach encourages the researcher to become intimate with the data, create focussed hypotheses and identify moderator variables	▪ Requires a good deal of effort and expertise ▪ Comparability of studies is often in the 'eye of the beholder' (comparing apples and oranges). Population, or methods may seem similar, but measure different outcomes that are still compared ▪ Most meta-analyses include 'blemished' studies ▪ Selection bias posses a continual threat, since published results are favoured, more weight are given to studies with multiple results and studies for which the effect size cannot be computed may be ignored ▪ Exclude negative and null finding studies that are not found or findings that were not reported ▪ Analysis of differences between studies are fundamentally correlational
Source: Wilson, 1999 [Online]; Whittemore & Knafl, 2005:547; Shelby & Vaske, 2008:105	

Meta-analysis may be a very valuable method to derive statistical conclusions from multiple studies. However, it poses the risk of excluding smaller studies and qualitative studies that would provide context for the phenomenon researched. To prevent this risk of excluding studies the method of meta-analysis were not employed as a method to synthesise data in this study. Other past research did employ the method of meta-analysis and provided valuable data which the researcher used in this review. The implication is that studies such as SRs on the topic of NDSC (which employed the method of meta-analysis) were included in the review, but not the method of meta-analysis in isolation.

The contribution of including meta-analysis (used as a technique used within SRs) was to determine components and strengths of NDSC from randomised trials. The researcher attempted to deal with the weaknesses of meta-analysis which imply weakness in the data from SRs by employing complementing methods of synthesis to ensure the inclusion of data from qualitative research. The increasing use of meta-analyses has also led to increasing expectations for rigour in the process and procedures. Rigour for meta-analysis will not be discussed here, but further discussion of the rigour of the research study is seen in Paragraph 2.2.6.

2.2.2 QUALITATIVE SUMMARY METHODS

A variety of options are available for combining qualitative primary data and synthesising the results into a new theory or framework (Whittemore & Knafl, 2005:547). Some methods identified in literature included, amongst other things traditional narrative reviews, thematic analysis, grounded theory, meta-ethnography, meta-study, meta-summary, content analysis, case survey, and others (Dixon-Woods *et al.*, 2004:14, 23; Whittemore & Knafl, 2005:547). A short overview of some of these methods will now follow to support the argument of selecting ILR as the applicable method for this study, starting with the qualitative summary methods and followed by qualitative synthesis methods.

2.2.2.1 Traditional Narrative Reviews

Traditional narrative reviews may be the most frequently used method to summarise data from qualitative and quantitative studies. It is usually used in the traditional literature review. Traditionally, narrative reviews were used for information selection and assembly, and summary of narrative reports of individual (qualitative and

quantitative) research findings for review with an introduction that contains a brief literature review (Suri, 2000:50; Froese, Gantz & Henry, 1998:102; Dixon-Woods *et al*., 2004:12). According to Forbes and Griffith (2002:145) these reviews follow an inductive mode of inquiry and focus on the process as much as the outcomes. Narrative review uses a flexible methodology and is more descriptive, but only provides a brief literature review and is therefore superficial and leaves room for subjectivity. Suri (2000:50) states that traditional narrative reviews are often inconclusive, ignore unpublished research and may therefore introduce publication bias and misrepresentation of the literature as a result of the bias. With this method equal weight is given to studies with different sample and effect sizes, resulting in misleading conclusions. Finally, these methods often fail to identify the study characteristics (Suri, 2000:50).

The traditional narrative review method did not match the aim and objectives of this part of the study, since it cannot provide a critical synthesis of the components of NDSC, but only a summary of the available literature. It could identify the components of NDSC, but not the nature and strength of evidence. Therefore qualitative meta-synthesis methods were explored as a possible methodological option; starting with grounded theory to determine if this would be a suitable route to follow in this research study.

2.2.3 QUALITATIVE SYNTHESIS METHODS

Sandelowski and Barroso (2003:227) define qualitative metasynthesis as “a form of systematic review or integration of qualitative research findings in a target domain that are themselves interpretive syntheses of data, including phenomenologies, ethnographies, grounded theories, and other integrated and coherent descriptions of explanations of phenomena”. Qualitative metasynthesis is therefore also referred to as qualitative meta-data-analysis, qualitative meta-analysis, and meta-ethnography.

SRs and meta-analyses exclude qualitative data and underestimate the effect of context. Qualitative meta-summary summarises data gathered in previous studies and does not contribute to new information. Dixon-Woods *et al.* (2004:5) emphasise the value of qualitative synthesis to integrate and explain phenomena and may be of value to this study. These include:

- Complementing the findings and interpretation of quantitative systematic reviews

- Identifying differences between interventions in apparently similar studies or between the contexts within which interventions are delivered
- Illuminating the impact of contextual factors
- Integrating, synthesising and organising research results into coherent patterns that can be more easily evaluated for application to clinical practice
- Generating operational models that can be tested or applied to practice
- Specifying/developing concepts to clarify the phenomenon of NDSC in operational terms, that is, what are the concepts of NDSC and how can it be defined?
- Consolidating widely scattered literature on a defined topic
- Generating bibliographies for use as reference of research in particular areas to be used by other researchers
- Identification of gaps where further research is required, i.e. hypothesis generation (Russell, 2005 [Online])
- Validating and assessing the empirical support for theories, and
- Identifying significant domains or attributes to enable the development of prototype instruments or scales.

Different types of qualitative synthesis are now discussed.

2.2.3.1 Grounded theory

Grounded theory as method can also be used to synthesise qualitative data. The method of grounded theory is concerned with generalising explanations for social phenomena within qualitative research. It involves the identification of patterns in the data and relationships between these patterns. Analysis guides the sampling, and theoretical saturation determines the point at which sampling is adequate (Dixon-Woods *et al.*, 2004:15). Multiple studies are used to move towards a higher, more abstract level of interpretation and theory-building. The aim of this research study is not theory development and therefore grounded theory was not the synthesis method of choice.

2.2.3.2 Meta-ethnography

Meta-ethnography is a set of techniques for synthesising qualitative studies and involves three major strategies. The first is known as (i) reciprocal translational analysis. The key concepts in each study are identified and an attempt is made to translate concepts with different names but similar meanings into a concept that is most adequate (Dixon-Woods *et al.*, 2004:17). ii) Refutational synthesis involves the identification of key concepts in each study, after which contradictions are characterised. The 'refutations' are examined and an attempt is made to explain them. (iii) Lines-of-argument-synthesis involves building a general interpretation grounded in the findings of the separate studies. This is discussed in more detail in 3.1.4.2.

Meta-ethnography can potentially deal with quantitative data by treating it as a theme (Dixon-Woods *et al.,* 2004:18). Some issues regarding meta-ethnography include the problem of determining the order in which papers should be synthesised, as well as issues about searching for qualitative research and the use of an appraisal tool. However, it does provide guidance with regard to analysis and synthesis. Meta-ethnography was not used as the exclusive method of synthesis in this research study, although one of the strategies of the method, the reciprocal translational analysis strategy, has been employed as a technique when dealing with the synthesis of qualitative studies in cases where the concept of NDSC was poorly conceptualised. The next meta-synthesis technique was qualitative meta-analysis.

2.2.3.3 Qualitative meta-analysis

Qualitative meta-analysis is defined as aggregating a group of studies for the purpose of discovering the essential elements and translating the results into an end product that transforms the original results into a new conceptualisation (Dixon-Woods *et al.*, 2004:19). The focus of qualitative meta-analysis is stated by Dixon-Woods *et al.* (2004:20) as (1) theory building where the aim is to develop formal theory through the exploitation of data from diverse sources, (2) theory explication, which would further elaborate abstract concepts, and (3) theoretical development where the synthesis of findings is thickly descriptive and comprehensive. This method of data aggregation is debatable, since as Dixon-Woods *et al.* (2004:20) also argues that meta-analysis refers to a very specific form of *quantitative* synthesis involving a family of quantitative synthesis methods as opposed to *qualitative.*

Qualitative meta-analysis furthermore does not provide any set of techniques to undertake the analysis, compromising auditability of the research results. It could also not be proven as a suitable method to data synthesis for this study, since there seemed to be discrepancies regarding the application of the term in literature. In addition this method seems unable to address the aim of this part of the study, namely to identify the aggregating studies to build the concept of NDSC.

However, qualitative meta-synthesis, seemed like a possible suitable synthesis technique, but on its own not suitable to address the objective of identifying the and describing the components of NDSC.

2.2.3.4 Qualitative meta-synthesis

'Meta-synthesis' is a term used generically to describe the synthesis of primary qualitative studies and may include all or many of the methods already described above (Dixon-Woods *et al.*, 2004:20; Sandelowski & Barroso, 2003:227). Through a rigorous description and translation process, meta-synthesis tells a new comprehensive story (Aagaard & Hall 2008:33). It further identifies commonalities and metaphors across contexts and cultures. Meta-synthesis provides generalisability with stronger power for evidence-based practice (Aagaard & Hall, 2008:33).

Dixon-Woods *et al.* (2004:20) explain the process of qualitative meta-synthesis with reference to other authors in the field, as involving six phases known as:

- Parameters are set for inclusion criteria in relation to the study question
- Studies are located that meet these inclusion criteria
- Text is read and re-read. The findings of studies are standardised via common codes, outlines and reporting formats, with attention given to the details of the individual accounts. Studies are therefore appraised to evaluate scientific adequacy
- Studies are then clustered, homogeneity across studies determined and initial assumptions made about the relationships between studies
- Data is merged across studies to identify common themes, and reciprocal translational analysis follows, and finally

- Translations are synthesised and the clustered themes are refined describing themes by means of a narrative synthesis.

Dixon-Woods *et al.* (2004:20) describe the use of meta-synthesis as a process that is based on a combination of methods derived from meta-ethnography as well as other methods of qualitative synthesis. This description of meta-synthesis offers useful guidance for conducting synthesis of qualitative data, since it emphasises preserving an audit trail on the decision-making about inclusion. The processes appear to be based on primary research methods and are suitable for use in this research study (Dixon-Woods *et al.*, 2004:21). The limitations of meta-synthesis, according to Aagaard and Hall (2008:e33), include the loss of rich descriptions that validate and illuminate categories, domains, and themes in the original studies.

Suri (2000:52) states that "qualitative researchers argue that synthesis of qualitative research should be interpretive rather than aggregative. While preserving the integrity and holism of individual studies, inductive and interpretive techniques should be used to sufficiently summarise the findings of individual studies into a product of practical value". Dixon-Woods *et al.* (2004:11-12) also differentiate between traditional narrative reviews as being either interpretive or integrative. The choice for this study fell on a combination of the integrative and interpretive synthesis. The terms 'interpretive' and 'integrative' will now be explained.

(a) Integrative vs interpretive synthesis

i Integrative reviews

Integrative reviews involve techniques such as meta-analyses and require basic comparability between phenomena in order to aggregate data for analysis. Integrative reviews are regarded primarily suitable for synthesising quantitative studies (Dixon-Woods *et al.*, 2004:11). The inclusion of quantitative studies was important for this research (refence is made to quantitative studies within this discussion of qualitative methods for the sake of comparing integrative with interpretive synthesis). Since integrative and interpretive synthesis are not completely distinct the following paragraph offers an explanation of interpretive synthesis.

ii Interpretive synthesis

Interpretive reviews see synthesis as involving both induction and interpretation and are concerned with anticipating what might be involved in analogous situations, and understanding connections and interactions between things. Interpretive reviews are suitable for synthesis of interpretive studies (Dixon-Woods *et al.*, 2004:11). The purpose of an interpretive synthesis of qualitative research is not to generate predictive theories, but to facilitate a fuller understanding of the phenomenon, context or culture under consideration (Suri, 2000:53). Dixon-Woods *et al.* (2004:11-12) argues that the primary concern of interpretive synthesis is the development of concepts and theories that integrate those concepts. Therefore, specifying concepts in advance is avoided in interpretive synthesis. The analysis is conceptual in process and output, and the product is theory, not data aggregation (Dixon-Woods *et al.*, 2004:12). Within interpretive synthesis the criteria for inclusion of individual studies should be based on conceptual consideration rather than only methodological considerations (Suri, 2000:53). Interpretive techniques involve the quantification of qualitative data with the emphasis on achieving a systematic integration of the data. Interpretive synthesis fits in with the aim of this part of the study – to identify the components of NDSC. However, it excludes quantitative research studies.

Dixon-Woods *et al.* (2004:12) offer valid arguments that interpretive and integrative forms of synthesis are not completely distinct, since they share areas of overlap. Although some forms of synthesis can be characterised as being primarily interpretive or integrative, this study includes elements of both. Using data from narrative summary, meta-synthesis and meta-study to identify and refine the concepts of NDSC, the study leans towards the interpretive end of the spectrum for data analysis techniques, while data-analysis techniques such as meta-analysis is used within the systematic reviews, and the content analysis leans more towards the integrative end of the spectrum. Since both the qualitative and quantitative methods explained exclude some data, an alternative was proposed in the form of best-evidence synthesis.

2.2.3.5 Best-evidence synthesis

Slavin (1986:5) (and older reference, however still applicable) proposes 'an alternative to both meta-analytic and traditional reviews'. The method, 'best-evidence synthesis' as defined by Slavin (1986:5) combines the quantification of effect sizes

and systematic study selection procedures of quantitative syntheses with the attention to individual studies and methodology typical of the best narrative reviews. Best-evidence syntheses focus on the 'best evidence' in a field, the studies highest in internal and external validity, using well-specified and defended priori inclusion criteria, and use effect size data as an adjunct to a full discussion of the literature being reviewed.

Best-evidence synthesis (BES) draws on the strengths of both traditional narrative reviews and meta-analyses (as used in systematic reviews) in that statistical analysis and rigour of meta-analysis (quantitative findings) is supplemented with the flexibility of traditional narrative reviews and a rich literature review that explains any discrepancies observed. It summarises the results that cannot be quantified. The 'best-evidence synthesis' method was furthermore proposed by Slavin (1986:10) to overcome the limitations mentioned for traditional narrative review and meta-analysis. The problem of bias within the BES method is addressed by including well-justified and well-described inclusion criteria for empirical studies (Slavin, 1986:7). BES is therefore a method that could be considered to determine the components of NDSC. As defined by Slavin (1986:5) it does not provide synthesis of qualitative data, but rather of quantitative data, and only a summary of qualitative literature when employing the traditional narrative review.

BES is rather an outcome of the study when BPGs for NDSC are formulated. It is therefore not used as method of data synthesis in this part of the study since, as described by Slavin (1986:5-11), BES does not use a well-defined systematic process. The formula for presenting BES must be adapted to the literature being reviewed. Therefore some important studies may be excluded from the review and the level of evidence seems difficult to determine and compare.

It is therefore clear that qualitative meta-synthesis methods as described above are all useful to reach the study aim, but none can be used in isolation due to the risk of excluding important studies, smaller studies, studies focussing on certain types of data for example quantitative research, and more. The researcher was looking for a SR method that is transparent, would focus on synthesis and not purely a summary of both qualitative and quantitative data; include all literature, research and non-research, as well as small studies, but only including studies of high methodological

quality. None of the above options in itself had all these characteristics, and this brings us to the method of choice: *Integrative Literature Review.*

2.2.3.6 Integrative Literature Review

A good research synthesis should include quantitative and qualitative findings. Consequently, the methods used should be complementary rather than adversarial. This emphasises the importance of exploratory data analysis, which is guided by the nature of the study (Suri, 2000:53).

Comparing the traditional narrative review with ILR, it becomes clear that ILR (which will be discussed in more detail later in this chapter) is a scientific inquiry of primary qualitative and quantitative research studies with the aim to summarise accumulated knowledge and synthesise results from high quality studies, whether published or not. Unpublished non-research documents, such as training programmes on NDSC or guidelines on NDSC, which may contain important information on the subject, are included in the review. Even smaller studies are reviewed with regard to the quality of study methodology and size (Dixon-Woods et al., 2006; Russell, 2005 [Online]; Cooper, 1982b:291-292). Cooper (1982b:292) highlights the intention of ILRs to replace research papers that have fallen behind, as well as directing future research to produce the maximum amount of new information (Russell, 2005 [Online]).

The ILR involves techniques such as meta-analysis and narrative summary, which are concerned with assembling and pooling of data. It furthermore requires basic comparability between phenomena so that data can be aggregated for analysis. Dixon-Woods *et al.* (2004:11,12) state that ILR is primarily suitable for synthesising quantitative studies. They further elaborate on this argument and state that integrative synthesis focuses on summarising data, and the concepts under which this data are summarised are assumed to be largely secure and well specified. Categories are identified early in the synthesis and form the categories under which data are extracted from studies that are summarised (Dixon-Woods *et al.*, 2004:11,12; Forbes & Griffith, 2002:146). In this study ILR is used to identify, explain and describe the existing components of NDSC and not to develop new concepts.

The ILR method is the only method that allows for the combination of diverse methodologies (for example, experimental and non-experimental research) by summarising past empirical or theoretical literature to provide a more comprehensive

understanding of a particular phenomenon. ILRs incorporate a wide range of purposes (Whittemore & Knafl, 2005:547). It helps to define and develop concepts, review theories, review evidence and analyse methodological issues on a particular topic.

Based on the views of Wilson (1999 [Online]) and Whittemore and Knafl (2005:547, 548) the ILR in this study can be defined as an explicit, SR method that allows for simultaneous inclusion and critical summary of quantitative and qualitative evidence which in turn both include experimental and non-experimental research evidence on NDSC of the preterm infant.

ILR aims to address four questions:

- What is the current state of knowledge regarding NDSC?
- What is the quality of what is known?
- What should be known? and
- What is the next step for research or practice?

A large collection of analysis results from individual studies can statistically be analysed by means of clear criteria for analysis that is aimed to advance the theoretical understanding of the literature. Evidence from both quantitative and qualitative studies were gathered, critically appraised, analysed and synthesised during the ILR. The purpose of integrating the findings of previous research suggests synthesis of multiple outcomes and focuses the reviewer's attention on evaluation of the quality of research methodology and outcomes (Glass, 1976:4). It further intends to demonstrate the generalisability of the findings beyond a small subset of populations, settings and procedures (Shelby & Vaske, 2008:99).

The evaluation of the strength of the scientific evidence, identification of gaps in current research and the need for future research (Russell, 2005 [Online]; Cooper, 1982a:abstract) is part of the process of ILR. Table 2-3 highlights the strengths of the ILR.

Table 2-3: Strengths of the ILR

Strengths of the ILR
Scientific inquiry
Summarise accumulated knowledge (theoretical and empirical)
Qualitative and quantitative research studies included
Appraisal includes the quality of studies and summarises the characteristics of selected studies and reasons why other studies are excluded
Analysis of data utilises a systematic and explicit method
Synthesises results from published and unpublished research reports (grey literature) Smaller studies reviewed regarding methodology and size results to generalise findings and bring new information, using a systematic procedure
Good audit trail

ILR has the potential to build the body of knowledge of nursing science, inform research, practice and policy initiatives, thus playing a great role in evidence-based practice in nursing. The outcome can be a precise representation of the state of the current research literature, since more accurate data analysis is possible when analysing the results from a group of studies, rather than individual studies (Suri, 2000:49; Whittemore & Knafl, 2005:546; Cooper, 1982b. 292). Consequently, a contribution to practice and research in this case follows (Russell, 2005) in the form of suggested BPGs for NDSC of the preterm infant with the focus on the South African public hospital context. Due to the strong impact ILR potentially has, it is also the method of choice for this section of the research study. Such a strong theoretical base has the potential to, together with context-specific evidence, develop into BPGs for NDSC in the public hospitals in South Africa.

2.2.4 INTRODUCTION TO THE 5-STEP PROCESS OF ILR

The ILR aims to address two of the four questions identified by Russell (2005 [Online]) and Cooper (1982a:abstract) namely:

(i) What is the current state of knowledge? and (ii What is the quality of what is known? These two questions were addressed by performing an ILR on the

components of NDSC and the process of ILR is discussed now. The researcher strived to explicitly describe the conditions with which the phenomenon has to comply in advance, before it is awarded a specific label such as a concept or component. This ensures that its meaning becomes unambiguous (Mouton & Marais, 1996:158). To be able to describe these conditions, the researcher did an ILR to use literature of good methodological quality to explore the evidence that is available concerning the components of NDSC.

Although developmental care has been extensively researched, much of the research reported focused on the impact, benefits and outcomes of some components of an individualised developmental care protocol, rather than on the protocol as a whole (Lotas & Walden, 1996:681). Some studies focused on the effect of NIDCAP training on the outcome of the infants in the NICU. Different components of NDSC have been mentioned and described in the literature, especially components for which the evidence base was clearly established, such as the effect of positioning or environmental changes, but nowhere is it explicitly stated that *'NDSC should or does include the following components ….'* In other words: The conditions for the phenomenon - NDSC – are not clearly stated in the literature (Mouton & Marais, 1996:158). The aim of the ILR was therefore to identify and describe all the components that form part of NDSC from literature and explain the level of evidence that currently underlies the specific components.

The steps of the ILR process for this study was derived from the process described by Cooper (1982a:1-22; 1982b:191) and modified by Whittemore and Knafl (2005:548-551) and Shelby and Vaske (2008:99-108). The ILR is a process similar to the process followed in SRs (Allan *et al.,* s.a; Forbes & Griffiths, 2002:147-154). The main difference is found in the type of research or documents finally included for review purposes. As mentioned this process evolved over time and Table 2-4 shows this development.

Table 2-4: The process of the ILR as it evolved over time

Systematic review process		Other review processes				ILR
Higgens & Green, 2008 (Cochrane)	**Allan *et al.*, S.a (CASP)**	**Cooper, 1982a**	**Forbes & Griffiths, 2002**	**Whittemore & Knafl, 2005**	**Shelby & Vaske, 2008**	**Summary**
1. Formulating the problem	1. Clear definition	1. Problem formulation	1. Background and aim of the review	1. Problem identification	1. Problem conceptualisation & operationalisation	**1. Formulation of review question**
			2. Scope of the review			
2.Locating and selecting studies 3. Quality assessment of studies 4. Collecting data	2. Comprehensive search	2. Data collection	3. Search strategy	2. Literature search stage	2. Data collection & processing	**2. Search strategy**
5. Analysing and presenting results	3. Rigorous filtering method	3. Evaluation of data points	4. Study selection (appraisal)	3. Data evaluation		**3. Critical appraisal**
6. Interpreting results	4. Good reason to combine results	4. Data analysis & interpretation	5. Integration and synthesis	4. Data Analysis	3. Analysis	**4. Data analysis and synthesis**
7. Improving and updating reviews	5. Based on robust statistics	5. Public presentation	6. Implications of evidence synthesis for practice	5. Presentation	4. Reporting	**5. Conclusion statements**

In this section an overview of the 5-step process of ILR is provided. The 5 steps include the formulation of the review question (3.2.1), search strategy (3.2.2), critical appraisal using the Johns Hopkins Appraisal Instrument (3.2.3), data analysis and synthesis (3.2.4) and finally the conclusions reached from the reviewed literature (3.2.5) (Shelby & Vaske, 2008:99-108; Whittemore & Knafl, 2005:548-551; Cooper, 1982a:1-22; 1982b:191; Forbes & Griffiths, 2002:147-154; Allan *et al.*, s.a).

2.2.5 BRIEF OVERVIEW OF THE 5-STEP PROCESS OF ILR

The *5-step ILR process* is similar to the systematic process followed in the SR process. Figure 2-4 shows the comparison between the SR process and the process of ILR.

Step 1 Formulation of the Review Question

The review question refers to the problem formulation, starting with a clear identification of the problem statement, definitions and formulation of the review question to address the review purpose. During this stage variables are defined and the sampling frame is determined. The PICOT format was used for the formulation of the review question (detail in Paragraph 3.2.1).

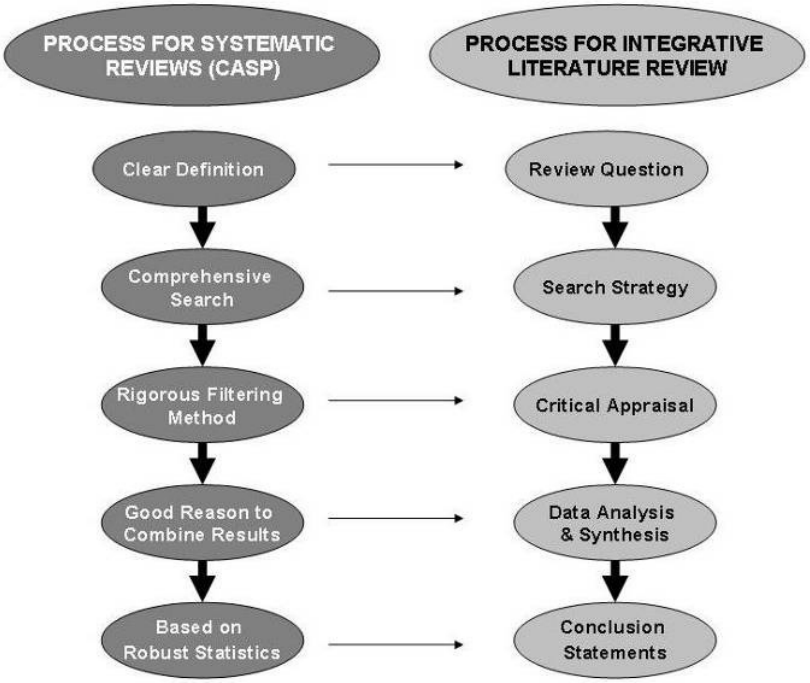

Figure 2-4: Comparison between the process of SR and ILR

Step 2 Search strategy

During the systematic data collection or literature search the population of elements referent for the inquiry was decided.

(a) Unit of analysis and study population

The unit of analysis for this stage is research studies and specific types of documents on NDSC that were evaluated. The study population for the ILR is all accessible national and international literature (studies and specific types of documents) on NDSC of the preterm infant in the NICU.

Data was collected using a multi-stage sampling of selected related paper topics – abstracts, indexes and manual and computer based searching. Literature was included from both research studies and specific non-research documents, such as policies, protocols and training manuals. A clear description of inclusion and exclusion criteria was used to direct the search process and to ensure a clear audit trail of the search process (SIGN, 2008:28).

(b) Key terms/words

Key terms/words used during the multi-stage sampling are discussed in detail with each sample that is discussed in the next section.

(c) Inclusion criteria

Inclusion criteria were all national and international literature (research and non-research) on components of NDSC of the preterm infant in the NICU, published between 1960 and 2008.

(d) Exclusion criteria

- Articles in languages other than Afrikaans or English were excluded due to the language barriers from the side of the reviewers.
- Prefaces, post-scripts, letters to editors and editorials, since it only included opinions and are not regarded as primary research. Furthermore, the editorial letters mostly proved to be a summary of a complete article that followed in the same issue of the journal.

- Duplicated articles were excluded after deciding which one (if they were not identical) provided the most comprehensive data regarding the study.
- Where articles were available on grey literature such as masters' and PhD-theses these were included for critical appraisal.
- During the search stage of the ILR, studies/documents that did not mention components of NDSC (by name or description) in the title, abstract or text were excluded. Titles of each article were read for applicability to the study topic. During the critical appraisal the abstract and/or full text were read if the researcher was uncertain about inclusion (more detail in Figure 2.5).
- Secondary reports (such as a report on a review) were excluded, in the case where original reports were included.
- Reviews of which a more recent version could be found (such as Cochrane review on developmental care by Symington and Pinelli, 2000, 2001, 2002, 2004) were excluded.
- Books were excluded from the review since they contain secondary results.

(e) Multi-staged sampling process

The researcher used the North-West University library website to guide the search strategy. The search process included a multi-stage sampling that was done in the following **six stages**:

- Stage 1: Electronic reference databases (MEDLINE, CINAHL, Pre-CINAHL, PsycINFO, Health Source: Nursing/Academic Edition, Health Source – Consumer Edition, ERIC, Academic Search Premier) – different keywords were searched (Table 3-1).

- Stage 2: A-Z journal list (electronically listed on NWU library site). This was the title of the webpage on the NWU website. However, the section included both electronic journals and hard copy journals and all these documents could be requested electronically, such as by fax or scanned versions (Table 3-2).

- Stage 3: Library catalogue. Electronic documents already included in the previous stage were omitted, but this sample provided titles of all the documents available in the library (including hard copy documents not available on the electronic databases). The hard copies were reviewed reading the titles in each journal, and as with the rest of the documents the abstract or text was read if the title was not

clear on whether the document included the components of NDSC. The library catalogue also provided a few health care specific databases that were not available in the first sample of electronic reference databases, and these were searched as well (Table 3-3).

- Stage 4: A search of SABINET (SA Publications and SA Media) followed. Although this database included mostly theses and dissertations, it was included, since the SABINET databases was not included with the first sample of electronic reference databases and to ensure no data has been omitted (Table 3-4).
- Stage 5: Reference lists from the bibliography of the documents sampled from the previous stages were searched, and documents not already included were therefore hand searched (Table 3-5).
- Stage 6: Finally, experts in the field were contacted via e-mail to request specific documents that might have been omitted or not found during the previous sampling stages (Table 3-6).

Figure 2-5 below is a presentation of the multi-stage sampling process.

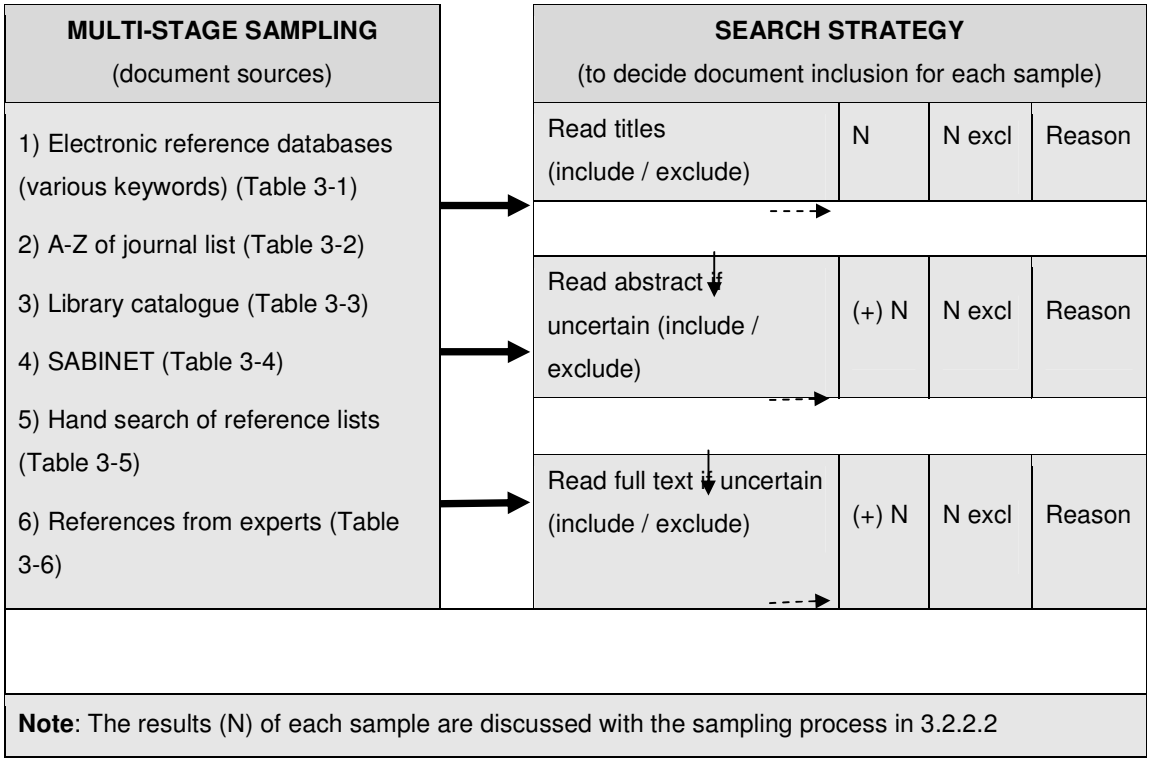

Figure 2-5: Process of multi-stage sampling during the search strategy

Step 3, the critical appraisal is the following step that will be discussed.

Step 3 Critical appraisal

Evaluation of the quality of the studies and documents occurred during the critical appraisal stage. The Johns Hopkins Evidence Appraisal Instruments (Newhouse *et al.,* 2007:198; 206-211) (addendum 3-2 & 3-3) were utilised for the evaluation of collected data to determine the relevance and quality of data to be included or excluded from the study for critical appraisal. A number of instruments are available for critical appraisal, such as Johns Hopkins Evidence Appraisal Instruments for research and non-research (Newhouse, *et al.*, 2007:198; 206-211), Critical Appraisal Skills Programme (CASP) (Allan *et al.*, s.a), Forbes and Griffiths (2002:150) appraisal questions for both qualitative and quantitative studies, Jadad Instrument (Fritshe, Einecke, Fleiner, Dragun, Neurmayer, Budde, 2004:742–743), Cochrane (Higgings & Green, 2008 [Online]), Johanna Briggs Institute (JBI) (Pearson *et al.*, 2005) and Registered Nurses Association of Ontario (RNAO, 2006). They were all explored for applicability in this study. Figure 2-6 provides a summary of appraisal instruments considered for the critical appraisal.

CASP	Forbes and Griffiths	JADAD
CASP provides a variety of instruments, including separate instruments for reviews, randomised clinical trials, quantitative and qualitative research. These instruments are very comprehensive for the assessment of each different type of study, but since the researcher was looking for a single instrument to determine methodological quality and levels of evidence and not only one that measures study outcomes for both research and non-research evidence, it did not seem as the most appropriate 'package' of instruments to use.	This instrument included appraisal questions for both qualitative and quantitative research. However, it is based on the Cochrane Effective practice and Organisation of Care Group guidelines and seemed suitable for use in this study, although a bit superficial. The selected instrument of Johns Hopkins provided more in-depth questions for appraisal and was selected as being more applicable for this study than the Forbes and Griffiths.	The JADAD instrument focuses on assessment of randomised trials only and asks questions to ensure that the study was performed as per the study protocol. It only allows for assessment of quantitative data and does not provide levels of evidence as a result.

Figure 2-6: Appraisal instruments considered for use in the ILR

JBI	RNAO	Cochrane
The JBI instruments described in the JBI Reviewers' Manual (JBI, 2008:151 – 158) also utilise separate appraisal instruments, similar to the CASP instruments. These include, amongst others: JBI Critical Appraisal Checklist for Randomised and Pseudo-randomised studies, cohort/case control appraisal, descriptive/case series studies, text/opinion, interpretive and critical research and economic evaluations. Since it was not the aim of this study to critically appraise only one type of research, but rather all research available on NDSC, these instruments were too comprehensive.	The RNAO describe their search strategy as part of the methodology of guideline development as giving preference to randomised controlled trials (RCTs), and qualitative research is only included to address appropriate questions. Since the aim of this study is to identify the components of NDSC, which also include important information from literature other than RCTs, this instrument was not the most suitable and therefore not selected.	The Cochrane Review Library is a very complex review method. In The Cochrane Review Handbook a very complex review method is recommended, but is aimed at RCTs primarily and this not sitable for other types of methodologies or non-research documents.

Johns Hopkins Evidence Appraisal Instruments (addendum 3.2 & 3.3)

The Johns Hopkins Evidence Appraisal Instruments (Newhouse, *et al.*, 2007:198; 206-211) used two instruments – one for research evidence and one for non-research evidence. Both these instruments differentiated between the different types of research evidence, such as experimental, meta-analysis, quasi-experimental, non-experimental, qualitative and meta-synthesis, but also between the different types of non-research evidence, such as expert opinions, systematic review, clinical practice guidelines, organisational (QI, financial data) and expert opinion, case study and literature review. The instruments measured both strength of evidence and quality of evidence, thus the outcome of both research and non-research evidence appraised could be presented in a similar format, i.e. strength and quality of evidence.

Figure 2-6: Appraisal instruments considered for use in the ILR (cont)

The following considerations were taken into account regarding appraisal instruments for different types of documents.

- The Johns Hopkins Evidence Appraisal Instruments for research and non-research was utilised (Newhouse *et al.*, 2007:198; 206-211).

- Theses/dissertations were not appraised, although the researcher did search for it and viewed the title for applicability. Articles based on these studies were identified and appraised.

An independent reviewer also reviewed the studies included in the sample. The findings of the researcher and independent reviewer were very similar, and where discrepancies were found it was discussed until consensus was reached. These complete findings can be viewed in addendums 3-4 and 3-5.

Step 4 Data analysis and synthesis: Data collected by the researcher was analysed and then synthesised into a unified statement during this stage. Thematic analysis was used for the interpretation process. The method of thematic analysis and critical interpretive synthesis were used to identify major or recurrent themes in literature, followed by a summary of the findings of primary studies under these thematic headings (Dixon-Woods *et al.,* 2004:15). Data extraction is described in Paragraph 3.2.4.2.

Step 5 Conclusions: The 'key components' of NDSC were identified. A list of the conclusion statements was sent to the independent reviewer for her confirmation of the statements reached. Consensus was reached on the conclusion statements and key components that were derived from this stage of the study (see addendums 2.3 and 2.4). Finally, the results were publicly presented in a document. Consequently, the NDSC concepts as derived from the literature review is presented in this thesis and will be presented in articles for publication (Shelby & Vaske, 2008:99-108; Forbes & Griffiths, 2002:143; Cooper, 1982a:abstract, 2, 3; 1982b:192-300). Each step of the ILR process will be discussed in detail (in Chapter 3) to provide in-depth description of the process followed in this study, including a discussion of the results derived.

2.2.6 RIGOUR OF THE INTEGRATED LITERATURE REVIEW METHOD

Improving rigour of an ILR can be a challenging task due to the complexity of conducting a thorough review. Research reviews are considered critical appraisals of available research and syntheses of high methodological quality studies; therefore it should meet the same standards as primary research in methodological rigour (Whittemore & Knafl, 2005:547, 548).

2.2.7 SUMMARY

The context of the components of NDSC are not clearly stated within the framework of quantitative data only. For this reason the researcher considered employing the analytical techniques used in narrative reviews (integrative versus interpretive), grounded theory, meta-ethnography, qualitative meta-analysis and qualitative meta-synthesis to describe the evidence base of NDSC, but also to ensure that no data has been omitted due to exclusion of certain studies. The conclusion was that some of these methods (or parts thereof) could be employed as techniques to synthesise qualitative and quantitative data to derive components of NDSC from the literature, but none of these methods in its totality were able to comprehensively synthesise the data needed.

The method of ILR as a methodology for synthesis was selected as the method of choice for this research study due to its flexibility, but also the good audit trail it provided for users of the research. It has also been argued that the ILR methodology is able to address possible weaknesses identified in the other methods explored.

CHAPTER 3
INTEGRATIVE LITERATURE REVIEW: REALISATION OF RESULTS

3.1 INTRODUCTION

As explained in the previous chapter the process of ILR followed in this study included the formulation of the review question, search strategy, critical appraisal, interpretation and synthesis and conclusion statements. These steps will now be discussed in detail together with the results obtained from each step. Figure 3-1 provides a visual presentation of the steps.

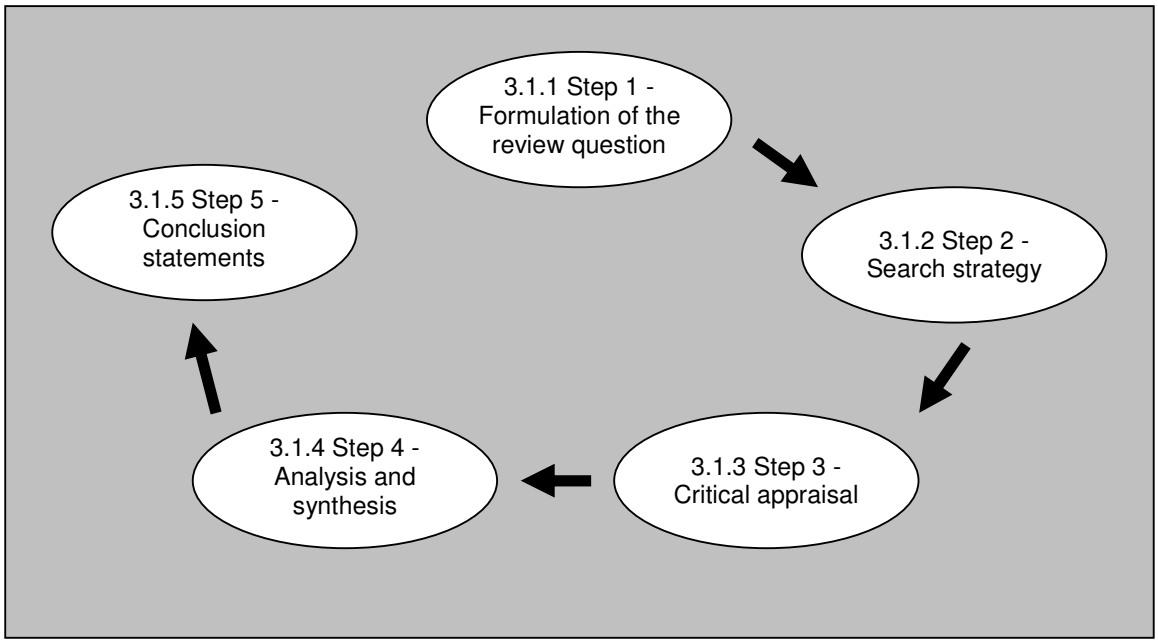

Figure 3-1: Text reference of the review process

3.2 DISCUSSION OF RESULTS

The results of the ILR are discussed according to the different steps followed in the review process.

3.2.1 STEP 1 - FORMULATION OF THE REVIEW QUESTION

Within the ILR method the first step of the process is described as the review question. The purpose, problem and review question for the ILR are first defined to support the ILR method as the most appropriate method for this study. The problem statement precedes the review question.

The preliminary literature search revealed that there is not an accepted agreement on what the components of NDSC are. Lotas and Walden (1996:681) state that "although individual components of developmental care have been researched in more depth, few studies have examined a total developmental care protocol". No literature could be found to disprove this statement. Furthermore, no written BPGs on NDSC are available on an international level, nor for the South African population (which is also the problem of this study). The purpose of this research study is to develop BPGs for NDSC of the preterm infant in the public sector NICU's in South Africa. The first phase of developing BPGs for NDSC is to conduct an ILR on NDSC.

The systematic integrative review of literature seeked to answer a specific question, and this process was guided by a clearly formulated review question. The question was broad enough to be of interest, but small enough to be manageable. This is especially important in qualitative reviews due to the narrative text being reviewed (Evans & Pearson, 2001: 112). The key question for this stage of the research study was defined by using an adaptation of the PICOT format.

According to Sackett, Rosenburg, Gray, Haynes, Richardson (2000:16) and Evans (2001:2) an answerable, searchable question consists of the following components: **P**atient/population of interest, **I**ntervention, **C**omparison (if applicable), **O**utcome and **T**ime or period of intervention. The review question for this step of the study was formulated as: *'What are the components of NDSC for the preterm infant (in the public sector NICU in South Africa)?'* No adequate information is available in literature on the specific topic (NDSC in the public sector hospitals in South Africa), and therefore the research question had to be broadened for the literature review (Russell, 2005 [Online]). The question was reformulated as: **What are the components of NDSC?** This question answers to the criteria provided in the PICOT format as follows:

P	I	C	O	T
Preterm neonate	NDSC (as defined in Chapter 1)	Conventional care not adapted to lower stress vs NDSC	n/a for this stage	During NICU stay

Figure 3-2: PICOT question for this study

After formulation of the review question, the next stage in the ILR process was the search strategy.

3.2.2 STEP 2 – SEARCH STRATEGY (SAMPLING)

Sampling is the second step in the process of the ILR and includes the search strategy, literature search and screening of literature for step 3. The population and multi-stage sampling for this step of the study are discussed together with the results of the search as gathered with each search.

3.2.2.1 Population

The population for stage one of the study (the review process) included reports of all accessible published and non-published literature on the problem, i.e NDSC of the preterm infant (Berman & Parker, 2002 [Online]; Cooper, 1982a). The target population for this study included (i) all available literature previously published on the topic of NDSC and (ii) the population of interest within these reports that the reviewer is targeting, namely preterm infants (Russell, 2005 [Online]). See Paragraph 2.2.5 for inclusion and exclusion criteria. The unit of analysis was primary studies and specific documents on NDSC. This unit of analysis is acceptable since (i) quantitative results have been generated, (ii) the results were conceptually comparable, (iii) the findings were statistically comparable, and (iv) the result came from similar research designs (Glass *et al*., 1981, Shelby & Vaske, 2008:98).

Data collection can include informal, primary, and secondary channels used to retrieve information (Cooper, 1982a:4; Cooper, 1982b:295). *Informal channels* include (i) personal research findings; (ii) the invisible college, which includes reviewers conducting similar research sharing information with each other; (iii) sharing between students and professors; and (iv) attendance at professional meetings and conferences. These information channels were accessed by means of *(i) Personal findings*: the literature study preceding this study as well as previous research by the researcher. *(ii) Invisible college*: the sharing of information of similar studies started with a title search conducted by the subject librarian to identify other research on the topic. Secondly, identified researchers were contacted to provide information should they be aware of studies or colleagues working on the topic. *(iii) Sharing*: Information and study processes and outcomes were shared at peer review opportunities, such as doctoral seminars, doctoral committee meetings and discussions with peer and co-students. *(iv) Attending conferences:* Results were and will be presented at conferences to share findings, and colleagues are invited to contribute to the best practice guidelines.

The study population included primary studies such as qualitative studies, clinical trials, peer-reviewed research journals (which report on primary studies) and conference reports, as well as *evidence summaries.* These summaries came from synthesised literature such as integrative reviews, textbooks, and meta-analyses (Newhouse *et al.*, 2007:60) and finding research studies by examining the reference lists of other articles and studies. *Translation literature* was also included in the search, including quality-filtered Internet sources and refers to practice guidelines, critical pathways, care plans, clinical innovation, protocols, standards, policies and evidence-based centres, as well as peer-reviewed journals and bibliographic research databases (Newhouse *et al.*, 2007:61). The comprehensive discussion of inclusion and exclusion criteria together with the sixth stage of sampling can be found in Paragraph 2.2.5.

3.2.2.2 Multi-stage sampling process

Sampling from the above population took place with the use of a multi-stage search process. These will now be discussed.

Different searches were conducted to stratify the purposefully selected sample for analysis. This process systematically focussed the search to ensure a representative sample. Six stages of sampling were used. For the first four samples keywords were used to identify and locate all relevant, available studies and specific types of documents on NDSC for possible review. Figure 3-3 on page 89 shows the six samples used in the multi-stage sampling process.

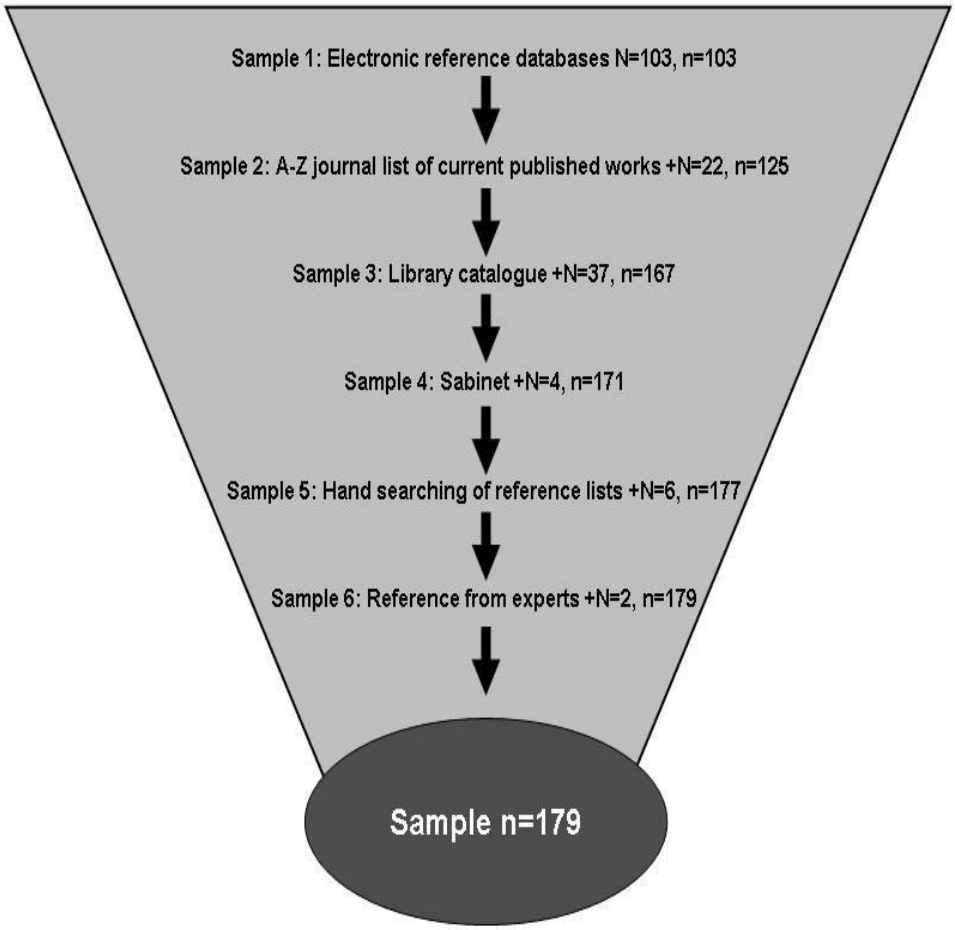

Figure 3-3: Multi-stage sampling using six different samples

Addendum 3-1 is a complete summary of the results from the different stages of sampling followed during the ILR, and an elaboration of Figure 3-3. Addendum 3-1 provides more detail on each sample, including a summary of inclusion criteria, keywords used in the sample, reasons for exclusion and the number of studies selected within each stage for critical appraisal. A complete list of the study titles found during the search process is provided in addendum 3-1 and not as part of this text, due to the comprehensiveness of this data. Each stage of sampling will now be discussed individually. This contributes to a good audit trail.

SAMPLE 1: Electronic reference databases

Purposive sampling of reference databases were conducted by searching *electronic reference databases* (MEDLINE, CINAHL, Pre-CINAHL, PsycINFO, Health Source: Nursing/Academic Edition, Health Source – Consumer Edition, ERIC, Academic Search Premier), using specific keywords.

MEDLINE encompasses information for Index Medicus, Index to Dental Literature, and International Nursing, as well as other sources of allied health and areas related to medicine and health care. MEDLINE contains bibliographic citations and author abstracts from over 7,300 journals published in the United Stated and in 70 other countries. It has 11 million records dating from 1965 to 16 November 2005. Abstracts are included for about 67% of the records (NZGG, 2001:23; MEDLINE, 2009 [Online]).

CINAHL, Cumulative Index to Nursing and Allied Health. Indexes virtually all English language publications in the field - more than 1200 journals. The database also provides access to health care books, nursing dissertations, selected conference proceedings, standards of professional practice, educational software and audiovisual materials in nursing (NZGG, 2001:24; CINAHL. 2009 [Online]).

PsycINFO covers the professional and academic literature in psychology and related disciplines including medicine, psychiatry, nursing, sociology, education, pharmacology, physiology, linguistics, and other areas. Coverage is worldwide, and includes more than 2.6 million records as on February 2009, references and abstracts to over 1300 journals in more than 30 languages, and to book chapters and books in the English language. Over 50,000 references are added annually. 98% of journals are peer reviewed (NZGG, 2001:24; PsycINFO, 2009 [Online]).

Studies published between 1960 and 2008 were included, since literature on preterm infant behaviour was documented from 1960 onwards and the term developmental care was introduced in neonatal terminology in the 1980's.

- Keywords used during the search included: 'best practice guidelines', 'developmental supportive care', 'developmental care', 'developmental care' AND 'policies' and 'developmental care' AND 'protocol', since these are all used interchangeably or synonymously in literature.

The purposively selected set of reference databases included: Medline, CINAHL, Pre-CINAHL, PsycINFO, Health Source: Nursing/Academic Edition, Health Source – Consumer Edition, ERIC, Academic Search Premier. During the first stage of searching literature was screened by reading the titles to determine applicability for possible review. If the title was applicable the document was selected for possible review and if the reviewer was uncertain the abstract was read and/or the full text. This was done to ensure relevance of the literature to be included (first level of screening). See summary of search results in addendum 3-1.

ERIC (Education Resources Information Center) is presently the largest education database in the world. ERIC contains over 1.2 million bibliographic records of journal articles and other relevant education-related materials, research documents, technical reports, conference papers, policy papers, program descriptions and evaluations, and curricular materials in the field of education (NZGG, 2001:24; ERIC, 2009 [Online]).

Sampling was done by means of inclusion criteria for this phase of the study, since inclusion and exclusion criteria for studies help safeguard against selection bias (Berman & Parker, 2002 [Online]). Primary studies of practices based on evidence are not only based on experimental studies, but also on a large body of qualitative research (Forbes & Griffith, 2002:145). Common study characteristics or inclusion criteria such as sample size, measurement of variables, attrition, data analysis methods, conceptual framework used, and significance of findings were determined using criteria as described by Ganong, 1987:2-11; Russell, 2005 [Online]; Froese *et al*., 1998:102, 103. The inclusion criteria for sample one therefore included:

Both research and non-research[5] literature was included in the literature search.

[5] Non-research evidence are defined as expert opinions, systematic review, clinical practice guidelines, organisational (QI, financial data) and expert opinion, case study and literature review (Newhouse, et al, 2007: 198; 206-211),

(a) Results of the first sample (Electronic reference databases) – refer to Table 3-1 for a tabled summary of these results.

The results for this keyword search delivered the following: Keywords 'Neuro Developmental Supportive Care', 'Neuro-developmental Supportive Care', 'Neurodevelopmental Supportive Care', 'Neurodevelopmental Care', 'Neuro-developmental Care' and 'Neuro Developmental Care' did not present any results on the database search. Further 'Developmental care policies', 'Developmental care protocol' and 'Developmental care' AND 'best practice guidelines' produced no results.

With keyword/phrase '**Developmental Supportive Care**' four (4) results were found and after reading the titles three seemed applicable for review, since one did not mention any components of NDSC.

Keyword/key phrase search for '**Best practice guidelines**' resulted in 806 articles found. These results were too general and therefore limiters were added to refine the results. The results were refined by selecting the subject '**Human**' as filter, and this adjustment delivered 276 results. All the titles were read to identify relevant abstracts. After reading the abstracts a total of two (2) articles were selected for review. 273 had topics not related to NDSC and one was an editorial.

Keyword/phrase '**Best practice guidelines**' were again searched on a different day and it delivered 827 hits. More hits were found than in the search in 3), probably due to the search being performed at a later date, resulting in more articles having been loaded onto the database. This time the search was narrowed by selecting the subject '**All Infant: birth-23 months**' for which no results were displayed and subject '**Infant, 1-23 months**' for which 4 results were found, but on reading the titles none of them were related to developmental care or the preterm infant.

Keyword/phrase 'Developmental Care' produced 397 hits, which again provided too general results. Filtering the subject narrowed the search: Major heading 'Infant, Premature'. This resulted in 103 hits of which the titles were read to determine applicability. 93 articles were considered for review after reading the titles and/or abstract, since one was listed twice (Webb, 1982) and three others were duplications of documents already included previously. Symington (2000, 2001, 2002, 2003 & 2006), were all included with Symington and Pinelli (2006). Ten titles were not relevant to the study aim, 2 theses were picked up with this search, 10 studies were

in foreign languages, 6 did not mention any components of NDSC and 1 was a secondary report.

For 'Developmental care' AND 'protocol' 7 articles were found. One was listed three times and one was a review article. Therefore this search resulted in 3 articles (review included).

'Developmental care' AND 'policies' resulted in 12 hits, of which 6 titles were not relevant due to a focus on adult development disabilities and the other on preventative health and child development. 5 documents were already listed in the previous sections. Therefore one document was included for review.

The total number of documents considered for inclusion during the first sample was 103. See Table 3-1 on page 94 for summary.

NOTE: Tables provided in this section start on new pages to prevent tables from being devided and result in white spaces below some text.

Table 3-1: Summary of sample 1 - Electronic reference databases

Sample	Keywords searched (incl criteria)	Limiter added (reason)	Hits	No Selected for review	Reasons for exclusion (number of studies)	N for this section	Accumulative Total
Sample 1: Electronic ref databases: Medline, CINAHL, Pre-CINAHL, PsycINFO, Health Source: Nursing/Academic Edition, Health Source – Consumer Edition, ERIC, Academic Search Premier							
	'Neuro Developmental Supportive Care'	-	0	-		-	-
	'Neuro-developmental Supportive Care'	-	0	-		-	-
	'Neurodevelopmental Supportive Care'	-	0	-		-	-
	'Neurodevelopmental Care'	-	0	-		-	-
	'Neuro-developmental Care'	-	0	-		-	-
	'Neuro Developmental Care'	-	0	-		-	-
	'Developmental care policies'	-	0	-		-	-
	'Developmental care protocol'	-	0	-		-	-
	'Developmental care' AND 'best practice guidelines'	-	0			-	-
	'Developmental Supportive care'		4	3	No NDSC components mentioned (1)	3	3
	'Best practice guidelines'	(too general – limiter added)	806	-		-	-
	'Best practice guidelines'	AND 'human'	276	2	▪ Topics not related to NDSC (273) ▪ Editorial (1)	3	6
	New search with 'Best practice guidelines'	(Too general) – limiters	827		(more hits due to search completed on later date)	-	-
	'Best practice guidelines'	'All Infant: birth-23 months'	0		*New limiters*	-	-
	'Best practice guidelines'	AND 'Infant, 1-23 months'	4	0	None related to developmental care or the preterm infant.	-	-
	'Developmental Care'	(Too general) – limiters	397			-	-
	'Developmental Care'	AND 'Infant, Premature'	103	93	▪ Titles not relevant (10) ▪ Duplicated listing (5) ▪ Updated reviews (4) ▪ Thesis (2)	93	99
	'Developmental care' AND 'protocol'	-	7	3	▪ Duplicated listing (4)	3	102
	'Developmental care' AND 'policies'	none	12	1	▪ Titles not relevant (6) ▪ Duplicated listing (5)	1	103
						103	103

Sample one provided 103 sample documents to be critically appraised.

SAMPLE 2: A-Z list of current published works

The search was further expanded to other resources. The NWU library was accessed on the Internet at http://www.nwu.ac.za/library/index_a.html, and 'Search according to subject' selected. The Potchefstroom Campus was selected and the link to 'Nursing' followed. The possible sources were explored according to the list provided on the web page. This sample was included to find publications not included in the databases covered in sample one. Although the title on the website suggests that both electronic journals and hard copy journals are included in this section, all these documents could be obtained in an electronic format provided by the library assistant via fax or scanned versions. The sample only included journal articles.

First the **A-Z list of current printed and electronic journals** was selected under the heading 'Journal Databases'. This was the title on the web page at the time of the search. The provided list was set to display according to subjects and the subject: 'Medicine' was selected, which resulted in about 3,526 possibilities. Under this heading 'Nursing' was selected, which displayed a possible 180 titles. The databases already explored in the first sampling (Medline, CINAHL, Pre-CINAHL, PsycINFO, Health Source: Nursing/Academic Edition, Health Source – Consumer Edition, ERIC, Academic Search Premier) were excluded and 'The Nursing Spectrum' was explored. The link 'free medical journals' were selected *< journals < go to resources < periodical < Elsevier < Find a periodical*. All the journal titles were read for applicability (i.e. excluding journals that are obviously not related to the subject field under investigation such as 'Advanced in Mathematical Physics') and Table 3-2 summarises the findings. Table 3-2 further indicates the number of documents excluded due to duplication of already listed documents in the previous sample as well as topics not related to NDSC. One study was a postscript and was therefore excluded (refer to exclusion criteria as explained in Paragraph 2.2.5.

Table 3-2: Summary of sample 2 - A-Z of current published works

Sample	Keywords searched (incl criteria)	Limiter added (reason)	Hits	No Selected for review	Reasons for exclusion (number of studies)	N for this section	Accumulative Total
Sample 2: A-Z list of current published works							
	Applied Nursing Research		**16**	**1**	**Topic not applicable (14)** **Duplicate listing (1)**	**1**	**104**
	Best practice and research – Subsection of Obstetrics and Gynaecology	**'developmental' AND 'care'**	**20**	**2**	**Topic not applicable (18)**	**2**	**106**
	Brain and development		**49**	**0**	**Topic not applicable**	**-**	**-**
	Critical care clinics		**11**	**0**	**Topic not applicable**	**-**	**-**
	Critical care nursing clinics in North America		**18**	**0**	**Topic not applicable**	**-**	**-**
	Early Human development	**'Developmental care'**	**20**	**6**	**Topic not applicable (8)** **Duplicate listing (6)**	**6**	**112**
	Newborn and Infant Nursing Reviews	**'Developmental care'**	**21**	**13**	**Topic not applicable (7)** **Duplicate listing (1)** **Postscript/editorial/preface (11)**	**13**	**125**
						22	**125**

Sample two added 22 documents to the total sample, bringing the total to 125.

SAMPLE 3: Third search in Library catalogue

- The next source selected was the Library catalogue. Electronic documents already included in the previous stages were omitted, but this sample provided titles of all the documents available in the library (including hard copy documents not available on the electronic databases) as well as documents other than journals. The hard copies were reviewed reading the titles of studies published in each journal and as with the rest of the documents the abstract or text were read if the title was not clear on whether the document included the components of NDSC. A keyword search was conducted for the subject

'Developmental care' and no hits came up. This was followed by a title search for 'Developmental care' and two entries were found for the same book: Developmental care of newborns & infants: a guide for health professionals/ [edited by] Carole Kenner, Jacqueline M. McGrath.. St Louis, MO: Mosby, c2004. This was followed by a keyword search for the keyword 'Developmental care' which resulted in 39 hits. The researcher viewed the titles and type of publications. All publications listed were books. Although books were excluded from the review as stated under exclusion criteria (Paragraph 2.2.5), the content pages of each book were reviewed for applicability to the title of the review to identify book sources for later use in context description.

- The library catalogue also provided a few health care specific databases that were not available in the first sample of electronic reference databases and these were searched next. Africa-Wide: NiPAD (BiblioLine) were selected, but could not be viewed due to the subscription from the NWU library being terminated.
- Emerald was the next journal database on the list (as per electronic library list). With a keyword search for 'developmental care', no results were displayed. Emerald was searched here since it was not included in the first sample of electronic databases.
- ScienceDirect was the next sample listed in the Library catalogue to be explored and the keyword search for 'developmental care' resulted in 45 journal hits. These titles were found as follows:
- Early Human Development (14), Newborn and Infant Nursing Reviews (8), Archives de Pédiatire (5), Journal of Neonatal Nursing (5) and Seminars in Neonatology (3). From the included 45 journal hits 11 were suitable for review and not yet included with previous searches. All the studies published in Early Human Development and Newborn and Infant Nursing Reviews were already included with the previous samples. Reasons for studies not included were duplications (30), topic not relevant to the research study (3) and one (1) study in a foreign language.
- Scopus was selected next, but could not be accessed.

- ISI Web of Knowledge was the following database explored. All databases were search with the keyword 'developmental' AND 'care'. No results were found.
- Web of science provided 6 results of which none had topics related to the study.
- JSTOR was searched using the keyword 'developmental care' and 19 results were found. All the titles were read and only one title seemed suitable for further reading.
- The Cochrane Library was the next journal database to be explored. All types of studies included in the Cochrane library were searched using the keywords 'developmental' AND 'care' and the results delivered was Cochrane Reviews (17), Other Reviews (5), Clinical Trials (83), Methods Studies (1), Technology Assessments (2), Economic Evaluations (8) and Cochrane Groups (0).
- The Cochrane Reviews were first explored by reading all the titles, and this resulted in 17 hits, with 2 reviews selected for further review, since 1 had a non-related topic and 14 were already listed elsewhere. In the section Other Reviews 5 results were found and the titles were read after which 1 study was selected for review. The excluded documents included 1 with a non-related topic and 3 that were already listed elsewhere.

Clinical Trials from the Cochrane Library provided 83 hits. The titles were read and then the abstracts of those that seemed suitable, after which a total of 21 results for possible review were found. Excluded documents amounted to 38 of which the topic was not applicable and 19 already listed elsewhere. Under the heading Method Studies only one result was given**,** which was not suitable for review. Under the heading Technology Assessment a total of 2 hits were displayed of which one was possibly suitable for review and the other excluded due to the topic not being relevant.

Next Economic Evaluations were explored and this produced 8 hits of which 6 topics were not relevant and 2 already listed elsewhere. For a search on Cochrane Groups no hits were found. This sample added 37 documents for review and took the accumulative total to 163. Table 3-3 below provides a summary of the third sample.

Table 3-3: Summary of sample 3 - Library catalogue

Sample	Keywords searched (incl criteria)	Limiter added (reason)	Hits	No Selected for review	Reasons for exclusion (number of studies)	N for this section	Accumulative Total
Sample 3:	*(printed journals)*	'Developmental Care'	39	0	Books not for review	-	-
Africa-Wide: NiPAD		Discontinued at library	-	-		-	-
Emerald		'developmental care'	0	-		-	-
ScienceDirect		'developmental care'	45	11	Topic not applicable (3)	11	136
	Early Human Development		(14)	(0)	Duplicate listing (14)	-	-
	Newborn and Infant Nursing Reviews		(8)	(0)	Duplicate listing (8)	-	-
	Archives de Pédiatire		(5)	-	Duplicate (5)	-	-
	Journal of Neonatal Nursing		(5)	3	Topic not suitable (2)	3	139
	Seminars in Neonatology		(3)	2	Duplicate (3)	2	141
Scopus				-	No access	-	-
ISI Web of Knowledge		'developmental' AND 'care'.	0	-		-	-
Web of science			6	0	Titles not related (6)	-	-
JSTOR		'developmental care'	19	1	Topic not suitable (18)	1	142
Cochrane Library	Cochrane Reviews	'developmental' AND 'care'	17	2	Topic not applicable (1)	2	143
	Other Reviews	'developmental' AND 'care'	5	1	Topic not applicable (1)	1	144
	Clinical Trials	'developmental' AND 'care'	83	21	Topic not applicable (38)	21	165
	Methods Studies	'developmental' AND 'care'	1	0	Topic not applicable (1)	-	-
	Technology Assessments	'developmental' AND 'care'	2	1	Topic not applicable (1)	1	166
	Economic Evaluations	'developmental' AND 'care'	8	0	Topic not applicable (6) Duplicate (2)	-	-
	Cochrane Groups	'developmental' AND 'care'	-	-	No hits	-	-
						37	167

Sample 3 – search of the library catalogue contributed 37 more documents for review, bringing the total of reviewed documents to 167. After sample 3 a search of Sabinet followed.

SAMPLE 4: Sabinet

The following and final database explored was Sabinet – SAePublications and SAMedia. Although this database includes mostly theses and dissertations, it was included, since the SABINET databases were not included with the first sample of electronic reference databases and to ensure that no data has been omitted in cases where no article on the thesis/dissertation had been published. Dissertations were not appraised, but if the results were published as an article the researcher decided whether the article was of good quality. If the article was incomplete or poorly presented (only presenting a part of the study) or if no article on the dissertation was available, the dissertations were referenced as a separate resource. Only one dissertation discussed some components of NDSC and the article from this dissertation could be retrieved and was included as reference.

The databases under Sabinet that were selected to be included in the search were: Current & Completed Research, FS ArticleFirst, FS WorldCat, Government Gazettes, ISAP by the National Library of South Africa, Kovsidex, NDLTD (Theses and Dissertations), Navtech (SA Technikon research), North-West University Catalogue, UCTD, Parliamentary Bills, Provincial Gazettes, SA ePublications, SACat, SANB. The databases mentioned were selected and searched for the keywords 'developmental care' AND 'preterm' and 120 results were found, distributed as follows:

FS ArticleFirst (16), SA ePublications (2), Government Gazettes (0), North-West University Catalogue (1), ISAP by the National Library of South Africa (1), SACat (12), UCTD (1), FS WorldCat (61) and the rest (0). Of the 102 results 3 were selected for further exploration after reading the titles. The documents were excluded for the following reasons: topic not relevant to NDSC (83), documents already listed earlier (4) and theses (11).

Although some of the previous searches already produced hits on dissertations and theses, a search in the databases specifically focussed on these kinds of studies was conducted to identify possible relevant studies and for published articles on these studies. The electronic dissertation and thesis section link on the NWU library website was searched for the keyword 'developmental care', and there was one hit for South African studies: *Hennessy. 2002. Developmentally supportive care: the*

effects of positioning on stress levels in the preterm infant. M Cur Thesis, which had already been included for review.

Following the database, Arrow was searched for the keyword 'developmental care' and 8 hits were found, including one article and 7 conference papers. 5 of these documents were duplications and 3 of the conference papers could not be retrieved even with the help of the librarian.

ProQuest was searched next and 19 dissertation results were revealed after the keyword 'developmental care' search. 0 studies were selected for possible review. Eight topics were not relevant and 11 were theses. Canadian Thesis was search and the keyword search for 'Developmental care' delivered 11 hit results of which 0 were considered for review, since 9 topics were not relevant and two were theses. DLA (Virginia Tech Electronic Thesis and dissertations) provided two hits of the same study, which was also a thesis and therefore excluded. BMC Nursing provided 0 hits.

Table 3-4: Summary of sample 4 - Sabinet

Sample	Keywords searched (incl criteria)	Limiter added (reason)	Hits	No Selected for review	Reasons for exclusion (number of studies)	N for this section	Accumulative Total
Sample 4: ***Sabinet – SAePublications and SAMedia***						-	-
		'developmental care' AND 'preterm'	102	3	Topic not relevant (83) Duplication (4) Book (4) Thesis (11)	3	170
	Current & Completed		(0)			-	-
	FS ArticleFirst,		(16)			-	-
	FS WorldCat,		(61)			-	-
	Government Gazettes,		(0)			-	-
	ISAP by the National		(1)			-	-
	Kovsidex,		(0)			-	-
	NDLTD (Theses and		(0)			-	-
	Navtech (SA		(0)			-	-
	North-West University		(1)			-	-
	Parliamentary Bills,		(0)			-	-
	Provincial Gazettes,		(0)			-	-
	SA ePublications,		(2)			-	-
	SACat,		(12)			-	-
	SANB.		(0)			-	-
	UCTD		(1)			-	-
Electronic dissertation and thesis	SA - link on the NWU library website	'developmental care'	1	0		1	171
Sample 4: ***Sabinet – Arrow***		'developmental care'	8	0	Paper not available (3) Duplication (5)	-	-
	Article		(1)	0		-	-
	Conference papers		(7)		No access	-	-
Sample 4: ***Sabinet – ProQuest***		'developmental care'	19	0	Topic not relevant (8) Thesis (11)	-	-
Canadian thesis		'developmental care'	11	0	Topic not relevant (9) Thesis (2)	-	-
Dla (Virginia Tech Electronic Thesis			2	0	Duplicate (1) Thesis (1)	-	-
BMC Nursing			0	-		-	-
						4	171

Sample 4 contributed to 4 more documents for review and raised the total of documents to be reviewed to 167.

1.1.1.1. Objective 1

SAMPLE 5: Hand searching of reference lists

Reference lists and bibliographies of prominent articles and the tables of contents from a number of key journals and textbooks were explored for studies and literature missed during the initial search. Hand searching can be defined as 'all literature regarding NDSC, excluding research studies already included for appraisal'. Research bibliographies as well as research reports and journals were included in this sampling.

Hand searched results retrieved from the reference list of Jacobs, Sokol and Ohlsson, (2002) provided 57 related articles of which 6 were considered for review. The rest were excluded due to topics not being relevant (21), documents already listed previously (27) and 3 documents in foreign languages. This sample contributed an additional 6 documents and brought the accumulated sample total to 177. Table 3-5 summarises sample 5.

Table 3-5: Summary of sample 5 - Hand search of reference lists

Sample	Keywords searched (incl criteria)	Limiter added (reason)	Hits	No Selected for review	Reasons for exclusion (number of studies)	N for this section	Accumulative Total
Sample 5: ***Hand searching of reference list***	**Hand searched results retrieved from Jacobs, Sokol and Ohlsson, (2002)**		**57**	**6**	**Topic not relevant (21)** **Duplication (27)** **Foreign language (3)**	**6**	**177**
						6	**177**

SAMPLE 6: References from experts

Experts were contacted via e-mail to request any specific documents that might have been omitted or not found during the previous sampling stages and two more documents were found that covered components of NDSC and they were included for review. This sample contributed 2 more documents and finalised the total for review at 179. Table 3-6 provides a summary of sample 6.

Table 3-6: Summary of sample 6 - Reference from experts

Sample	Keywords searched (incl criteria)	Limiter added (reason)	Hits	No Selected for review	Reasons for exclusion (number of studies)	N for this section	Accumulative Total
Sample 6: ***Reference from experts***			2	2		-	-
						2	179

The sampling stage of the ILR suggested 179 documents to be included in the critical appraisal step. During the sampling stage the reviewer critically judged whether the results were worthy of remaining in the study data set (Cooper, 1982a:abstract, 5) based on the title, abstract and or text that included components of NDSC. Inclusion criteria were specified to decide which articles were scientifically rigorous and would be included in the review (Russell, 2005 [Online]). All literature on Developmental Care was searched. All topics not applicable to Developmental Care of the preterm infant in the NICU were excluded as well as studies in languages other than English. This left a remainder that included both research (n=83) and non-research (n=88) evidence to be reviewed.

3.2.3 STEP 3 - CRITICAL APPRAISAL

Step 3 of the ILR followed to critically appraise the sampled documents. The aim of the critical appraisal is to assess the methodological quality (relevant to research evidence) of the literature. Both research and non-research[6] evidence as defined by Newhouse *et al.* (2007:210), were included in the sample previously gathered in step 2.

[6] Non-research evidence is defined as expert opinions, systematic review, clinical practice guidelines, organisational (QI, financial data) and expert opinion, case study and literature review (Newhouse, et al, 2007: 198; 206-211), further referred to as empirical research.

During step 2 (sampling) the titles and some abstracts were read to determine inclusion of the documents for critical appraisal (first level screening). Some documents seemed suitable during step 2 and were included in the sample. These documents were explored in more depth during step 3. The aim of the critical appraisal in step 3 was to identify documents of good methodological quality that mention or describe the components of NDSC based on good research evidence. Therefore not only research studies were appraised, but also documents that did not include primary research, such as systematic reviews, which is also considered research, although secondary research. The criteria for critical appraisal thus were:

- Documents of good methodological quality (research methodology or well described methodology in the case of non-research documents),
- Documents that include research evidence of a high quality (primary or secondary),
- Documents that state, list, describe, contextualise, or motivate components of NDSC.

Appraisal instruments (Johns Hopkins for research and non-research evidence) were used for critical appraisal of the primary studies and documents gathered during the multi-stage sampling (step 2). A checklist provided a structure to appraise all documents according to the same criteria, which allowed the researcher to get results that could be compared with each other. The appraisal instrument enabled the reviewer to evaluate the research evidence for unreliable values, which included whether the findings from one study were too different from the other studies to be considered, and whether data recording errors existed. Although the aim was not to compare studies with each other, the documents had to provide similar findings to be useful in determining the components of NDSC. The reviewer also evaluated the validity of each study's findings in and of itself, including good methodology. The use of an appraisal instrument also contributed to reviewer consensus, since the same criteria was used by different reviewers to appraise the documents. It furthermore contributes to replication of the review, as well as generalisation and transferability of results, since another reviewer or auditor can use the same instrument to determine whether the findings reached by the researcher were valid.

Critical appraisal in step three aimed to decide which documents was of good evidence, to what extent each document was evidence-based and contributes information relevant to describe components of NDSC.

3.2.3.1 Appraisal instruments

The most appropriate appraisal instruments seemed to be the Johns Hopkins research Evidence Appraisal Instrument for research (Newhouse *et al.,* 2007:206) and the Johns Hopkins Evidence Appraisal Instrument for non-research (Newhouse *et al*., 2007:210) instruments. The first instrument provides for the appraisal of strength and quality of both qualitative and quantitative research evidence. It appraises the strength of the study design (type of evidence), study results and conclusions, as well as grades the quality as 'High, good or low/major flaw' (Newhouse *et al*., 2007:90, 206). Applying the Johns Hopkins Evidence Appraisal Instruments further enabled the researcher (reviewers) to appraise and synthesise a huge volume of evidence as well as evidence across different methodological traditions (both qualitative and quantitative research), such as quantitative evidence from systematic reviews (which mostly provided an evidence basis for the outcomes that NDSC interventions provide for the preterm infant) (Dixon-Woods *et al*., 2004:iv,v,1).

These two instruments were selected as the most applicable for the appraisal process due to the large number of different types of documents to be appraised. Using these instruments provided a standardised method for appraisal and also streamlined the appraisal process (refer to Figure 2-6 for a discussion on the different appraisal methods available and considered for the critical appraisal and the selection of the Johns Hopkins Evidence Appraisal Instruments as the most suitable for this step of the study. The Johns Hopkins Evidence Appraisal Instruments can be viewed in addendum 3-2 and 3-3.

The use of tables is suggested to organise data in a clear and concise format (Russell, 2005 [Online]). A concise format for data collection greatly enhances the reviewer's ability to ascertain specific information from all information sources. According to Froese *et al.* (1998:103) the meta-analytic reviewers search for moderator variables among coded variables by systematically sorting outcomes by methodological differences across studies. This results in creative synthesis of the

reviewed information. For this reason the complete results of the critical appraisal for all studies can be viewed in Addendum 3-4 and 3-5.

3.2.3.2 Role of the independent reviewer

An independent reviewer validated the selection of articles and the components as identified for the checklist. The independent reviewer was provided with the selected articles and an instruction document (Addendum 3-1 and 2-1) that included the Johns Hopkins Evidence Appraisal Instruments (Newhouse, *et al.*, 2007:206, 210) on how to assess the articles. Her written feedback was requested and the reviewers only differed on the name of a component, but in general reached consensus about the methodological quality of the primary included studies and the other documents, as well as the components identified (see addendum 2-4 and 3-6).

3.2.3.3 Appraisal results

Table 3-7 provides a summary of the inclusion or exclusion of documents after in-depth exploration of the population described in the document and consensus results of the strength and evidence of appraised documents. It further indicates the inclusion of documents of good quality. The Johns Hopkins Evidence Appraisal Instruments (Newhouse, *et al.*, 2007:206, 210) describe levels of evidence as follows:

Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal

Evidence Level: _____

Article Title:					Number:
Author(s):					Date:
Journal:					
Setting:				Sample (composition/size)	
☐ Experimental	☐ Meta-analysis	☐ Quasi-experimental	☐ Non-experimental	☐ Qualitative	☐ Meta-synthesis
Does this study apply to the population targeted by my practice question?				☐ Yes	☐ No
If the answer is No, STOP here (unless there are similar characteristics).					

Strength of Study Design		
• Was sample size adequate and appropriate?	☐ Yes	☐ No
• Were study participants randomized?	☐ Yes	☐ No
• Was there an intervention?	☐ Yes	☐ No
• Was there a control group?	☐ Yes	☐ No
• If there was more than one group, were groups equally treated, except for the intervention?	☐ Yes	☐ No
• Was there adequate description of the data collection methods?	☐ Yes	☐ No
Study Results		
• Were results clearly presented?	☐ Yes	☐ No
• Was an interpretation/analysis provided?	☐ Yes	☐ No
Study Conclusions		
• Were conclusions based on clearly presented results?	☐ Yes	☐ No
• Were study limitations identified and discussed?	☐ Yes	☐ No
Pertinent study findings and recommendations		
Will the results help in caring for my patients?	☐ Yes	☐ No

Evidence Rating (scales on back)

Strength of Evidence			
Quality of Evidence (check one)	☐ High (A)	☐ Good (B)	☐ Low/Major flaw (C)

Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal

Strength of Evidence
Level I (Strong)

Experimental Study (Randomized Controlled Trial or RCT)
- Study participants (subjects) are randomly assigned to either a treatment (TX) or control (non-treatment) group
- May be:
  - Blind: subject does not know which TX subject is receiving
  - Double-blind: neither subject nor investigator knows which TX subject is receiving
  - Non-blind: both subject and investigator know which TX subject is receiving; used when it is felt that the knowledge of treatment is unimportant

Meta-analysis of RCTs
- Quantitatively synthesizes and analyzes results of multiple primary studies addressing a similar research question
- Statistically pools results from independent but combinable studies
- Summary statistic (effect size) is expressed in terms of direction (positive, negative, or zero) and magnitude (high, medium, small)

Level II

Quasi-experimental Study
- Always includes manipulation of an independent variable
- Lacks either random assignment or control group
- Findings must be considered in light of threats to validity (particularly selection)

Level III

Non-experimental Study
- No manipulation of the independent variable
- Can be descriptive, comparative, or relational
- Often uses secondary data
- Findings must be considered in light of threats to validity (particularly selection, lack of severity or co-morbidity adjustment)

Qualitative Study
- Explorative in nature, such as interviews, observations, or focus groups
- Starting point for studies of questions for which little research currently exists
- Sample sizes are usually small and study results are used to design stronger studies that are more objective and quantifiable

Meta-synthesis
- Research technique that critically analyzes and synthesizes findings from qualitative research
- Identifies key concepts and metaphors and determines their relationships to each other
- Aim is not to produce a summary statistic, but rather to interpret and translate findings

Quality of Evidence (Scientific Evidence)

A High: consistent results, sufficient sample size, adequate control, and definitive conclusions; consistent recommendations based on extensive literature review that includes thoughtful reference to scientific evidence

B Good: reasonably consistent results, sufficient sample size, some control, and fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence

C Low/Major flaw: little evidence with inconsistent results, insufficient sample size, conclusions cannot be drawn

Figure 3-4: Johns Hopkins Research Evidence Appraisal Instrument

Johns Hopkins Nursing Evidence-Based Practice
Non-Research Evidence Appraisal

Evidence Level: _____

Article Title:	Number:
Author(s):	Date:
Journal:	

☐ Systematic Review	☐ Clinical Practice Guidelines	☐ Organizational (QI, financial data)	☐ Expert opinion, case study, literature review

Does evidence apply to the population targeted by my practice question?	☐Yes	☐No
If the answer is No, STOP here (unless there are similar characteristics).		
Systematic Review		
• Is the question clear?	☐ Yes	☐ No
• Was a rigorous peer-reviewed process used?	☐ Yes	☐ No
• Are search strategies specified, and reproducible?	☐ Yes	☐ No
• Are search strategies appropriate to include all pertinent studies?	☐ Yes	☐ No
• Are criteria for inclusion and exclusion of studies specified?	☐ Yes	☐ No
• Are details of included studies (design, methods, analysis) presented?	☐ Yes	☐ No
• Are methodological limitations disclosed?	☐ Yes	☐ No
• Are the variables in the studies reviewed similar, so that studies can be combined?	☐ Yes	☐ No
Clinical Practice Guidelines		
• Were appropriate stakeholders involved in the development of this guideline?	☐ Yes	☐ No
• Are groups to which guidelines apply and do not apply clearly stated?	☐ Yes	☐ No
• Have potential biases been eliminated?	☐ Yes	☐ No
• Were guidelines valid (reproducible search, expert consensus, independent review, current, and level of supporting evidence identified for each recommendation)?	☐ Yes	☐ No
• Are recommendations clear?	☐ Yes	☐ No
Organizational Experience		
• Was the aim of the project clearly stated?	☐ Yes	☐ No
• Is the setting similar to setting of interest?	☐ Yes	☐ No
• Was the method adequately described?	☐ Yes	☐ No
• Were measures identified?	☐ Yes	☐ No
• Were results adequately described?	☐ Yes	☐ No
• Was interpretation clear and appropriate?	☐ Yes	☐ No
Individual expert opinion, case study, literature review		
• Was evidence based on the opinion of an individual?	☐ Yes	☐ No
• Is the individual an expert on the topic?	☐ Yes	☐ No
• Is author's opinion based on scientific evidence?	☐ Yes	☐ No
• Is the author's opinion clearly stated?	☐ Yes	☐ No
• Are potential biases acknowledged?	☐ Yes	☐ No

Pertinent conclusions and recommendations

Were conclusions based on the evidence presented?	☐Yes	☐No
Will the results help me in caring for my patients?	☐Yes	☐No

Quality of Evidence (scale on back):

Basic quality rating of the study under review (check one)	☐ High (A)	☐ Good (B)	☐ Low/Major flaw (C)

Johns Hopkins Nursing Evidence-Based Practice
Non-Research Evidence Appraisal

Strength of Evidence
Level I-IV

Systematic Review
- Research review that compiles and summarizes evidence from research studies related to a specific clinical question
- Employs comprehensive search strategies and rigorous appraisal methods
- Contains an evaluation of strengths and limitations of studies under review
- If peer-reviewed process such as Cochrane is used, rate at the level of the research evidence included in the review if not a meta-analysis, which is rated at level I. If non-peer reviewed, rate at Level IV

Level IV

Clinical Practice Guidelines
- Research and experiential evidence review that systematically develops statements that are meant to guide decision-making for specific clinical circumstances
- Evidence is appraised and synthesized from three basic sources: scientific findings, clinician expertise, and patient preferences

Level V (Weak)

Organizational
- Review of quality improvement studies and financial analysis reports
- Evidence is appraised and synthesized from two basic sources: internal reports and external published reports

Expert Opinion, Case Study, Literature Review
- Opinion of a nationally recognized expert based on non-research evidence (includes case studies, literature review, or personal experience)

Quality of Evidence (Summative Reviews)

A High: well-defined, reproducible search strategies; consistent results with sufficient numbers of well-designed studies; criteria-based evaluation of overall scientific strength and quality of included studies, and definitive conclusions

B Good: reasonably thorough and appropriate search; reasonably consistent results, sufficient numbers of well-designed studies, evaluation of strengths and limitations of included studies, with fairly definitive results

C Low/Major flaw: undefined, poorly defined, or limited search strategies; insufficient evidence with inconsistent results, conclusions cannot be drawn

Quality of Evidence (Expert Opinion)

A High: expertise is clearly evident

B Good: expertise appears to be credible

C Low/Major flaw: expertise is not discernable or is dubious

Figure 3-5: Johns Hopkins Evidence Appraisal Instrument for non-research

Table 3-7 provides the results of this appraisal. The appraisal results for each individual document are provided in addendum 3-4 and 3-5. The shaded lines in Table 3-7 indicate the studies that were included after appraisal.

Table 3-7: Summary of critical appraisal results of each individual study

Author Empiric Research Evidence	Applicable population	Strength of Evidence	Quality of Evidence	Included	Excluded
Ahn, Jun 2007	N				√
Aita, Snider 2003	Y	V	B	√	
Als & Gilkerson 1997	Y	V	A	√	
Als *et al.* 2006	Y	V	B	√	
Altimier 2004	Y	V	B	√	
Altimier, Sherrod 2001	Y	V	B	√	
Aucoott *et al.* 2002	Y	V	A	√	
Black 2005	Y	V	A	√	
Blauw, Hadders 2005	Y	I	A	√	
Bond 2002	Y	V	A	√	
Botha 2005	Y	V	A	√	
Bremmer et al 2003	Y	V	B	√	
Brindle 2006	Y	V	B	√	
Browne 2000	Y	V	B	√	
Byers 2003	Y	V	A	√	
Carrier 2002	Y	V	B	√	
Cole *et al.* 1997	Y	V	A	√	
Conde *et al.* 2008	Y	I	A	√	
Eichel 2001	Y	V	B	√	
Felderhoff-Mueser, Buhrer	N		B		√
Fern *et al.* 2002	Y	V	B	√	
Franck, Lawhon 1998	Y	V	A	√	
Gale, vd Berg 1998	Y	IV	A	√	
Gibbins Stevens 2001	Y	V	B	√	
Goldberg-Hamblin, Singer	Y	V	B	√	
Harrison 2001	Y	V	B	√	
Haumont 2005	Y	V	B	√	
Hayward 2003	Y	V	A	√	
Howland 2007	Y	V	B	√	
Hummel 2003	Y	V	B	√	
Hummel, Dijk 2006	Y	V	B	√	
Jacobs *et al.* 2002	Y	I		√	
Jones *et al.* 2001	Y	V	B	√	
Jorgenson 2002	Y		B		√
Kelly 2006	N		A		√
Kelly 2006b	N		A		√
Kenner 2002	N				√
Khan 2003	Y	V	A	√	
Lawhon, Hedlund 2008	Y	V	A	√	
Lawhon, Melzar 1988	Y	V	A	√	
Lotas, Walden 1996	Y	V	A	√	
Lott 1989	Y	V	B	√	
Lowman *et al.* 2006	Y	V	A	√	
Lutes 1996	Y	V	A	√	
Mahoney, Cohen, 2005	Y	I	A	√	
McGrath Brock 2002	Y	V	A	√	
McGrath et al 2002	N				√
McGrath et al 2007	Y	V	A	√	
McGrath, Lutes 2002	N				√
McLeod, Sherrif 2007	N		B		√

Author Primary Research Evidence	Applicable population	Strength of Evidence	Quality of Evidence	Included	Excluded
Aagaard, Hall 2008	N				√
Als *et al.* 1994	N	I	A		√
Als *et al.* 2003	Y	I	A	√	
Als *et al.* 2004	N	I	A		√
Als *et al.*1986	Y	II	A	√	
Ariagno *et al.* 1997	Y	I	B	√	
Ashbaugh *et al.* 1999	Y	III	A		√
Axelin et al 2006	Y	I		√	
Becker et al 1991	Y	II		√	
Bertelle *et al.* 2005	Y	II	A	√	
Bondi, Adhikari 2007	Y	III	A		√
Brown, Heermann 1997	Y	II	A	√	
Browne, Talmi 2005	Y	II	A	√	
Buehler *et al.* 1995	Y	I	A	√	
Byers *et al.* 2003	Y	II	B	√	
Byers *et al.* 2006	Y	II	A	√	
Catelin et al 2005	Y	II	B	√	
Chan *et al.* 1993	Y	I	B	√	
Chan *et al.* 1995	N	II	A		√
Charpak *et al.* 2001	Y	I	A	√	
Chou *et al.* 2003	Y	II	A	√	
Crawley, Emery 2006	Y	II	A	√	
Engebretson, Wardell	Y	I	B	√	
Feber, Makhoul 2008	Y	I	A	√	
Feldman, Eidelman 2003	Y	III	A		√
Ferber *et al.* 2006	N	III	B		√
Ferrari et al 2007	Y	II	C	√	
Fleisher *et al.* 1995	Y	I	A	√	
Franck *et al.* 2002	Y	III	A		√
Gale et al 1993	Y	I	B	√	
Glazebrook et al 2007	Y	I	A	√	
Gray *et al.* 1998	Y	II	A	√	
Hayward *et al.* 2007	Y	I	A	√	
Hendricks *et al.* 2002	Y	II	B	√	
Hennessay *et al.* 2007	Y	II	A	√	
Herbst, Maree 2006	Y	III	A		√
Hill 2005	Y	I	A	√	
Holsti *et al.* 2004	N	II	A		√
Holsti *et al.* 2005	Y	II	A	√	
Ingersoll, Thoman 1999	N	II	A		√
Kleberg *et al.* 2000	N	II	B		√
Kleberg *et al.* 2002	N	I	B		√
Kleberg *et al.* 2007	N				√
Louw, Maree 2005	Y	II	A	√	
Ludwig *et al.* 2008	Y	II	A	√	
Lutes Altimier 2001	Y	I	B	√	
Maguire et al 2007	Y	II	A	√	
Maguire et al 2008	Y	I	A	√	
McWhinnie 2003	N	II	A		√

Author Empiric Research Evidence	Applicable population	Strength of Evidence	Quality of Evidence	Included	Excluded
Montgomery 1999	Y	V		√	
Morag, Ohlsson 2008	Y	I	A	√	
Mpahlele 2007	Y	V	A	√	
Nyqvist 1996b	Y	V	A	√	
Nyqvist 2005	Y	V	A	√	
Nyqvistt 2004	Y	V	A	√	
Owens 2001	Y	V	A	√	
Pierrat *et al.* 2007	N				√
Pressler *et al.* 1998	N				√
Ramsey 2001	Y	V	B	√	
Rasmussen 2002	N		A		√
Rasmussen 2003a	N		A		√
Rasmussen 2003b	N		A		√
Rasmussen 2006	N				√
Rick 2006	Y	V	B	√	
Roze, Breart 2004	N				√
Ruiz 2001	Y	V	B	√	
Seghal, Stack 2006	Y	V	B	√	
Shaker Woida 2007	N				√
Sizun, Westrup 2004	Y	V	A	√	
Smith *et al.*, 2004	Y	V	B	√	
Spence, Lau 2006	Y	V		√	
Standley 2001	Y	V	A	√	
Starr, Hoye 1998	Y	V	A	√	
Strand, Jobe 2003	N				√
Symington, Pinelli 2006	Y	I	A	√	
Thoyre 2005	Y	V	A	√	
Tyebkhan *et al.* 1999	N				√
vd Berg 1996	N				√
vd Berg 1997	Y	V	A	√	
vd Berg 1999	N		B		√
vd Berg 2007	Y	V	A	√	
Waitzman 2007	Y	V	A	√	
Walther 2007	N				√
Webb, Sundahl 1985	N				√
Westrup 2007	Y	V	A	√	
Westrup *et al.* 2002b	N		B		√
Whitfield 2002	N		A		√
Young 1996	N				√
				62	**26**

Author Primary Research Evidence	Applicable population	Strength of Evidence	Quality of Evidence	Included	Excluded
Melnyk *et al.* 2006	N	I	A		√
Morison *et al.* 2003	N	II	A		√
Mouradian, Als 1994	Y	II	A	√	
Nelson et al 2001	Y	I	A	√	
Neu 1999	Y	III	B		√
Nyqvist *et al.* 1996a	N	III	B		√
Oehler, Vileiesis 1990	Y	I	B	√	
Ogunlesi *et al.* 2007	N				√
Ogunlesi *et al.* 2008	N				√
Petryshen *et al.* 1998	Y	II	A	√	
Piejper Hesseling 2007	N				√
Pressler *et al.* 2001	N		B		√
Pressler, Hepworth 2002	N				√
Rojas *et al.* 2003	Y	I	B	√	
Rowe *et al.* 2005	Y	III	A		√
Ruiz *et al.* 2001	N	II	A		√
Sizun *et al.* 2002	Y	II	A	√	
Slevin *et al.* 1997	Y	I	A	√	
Standley 1998	Y	I	A	√	
Swanepoel *et al.* 2005	N				√
Tessier *et al.* 2003	Y	I	A	√	
Thoman 2003	N	III	A		√
Thomas 2008		III	A		√
Thomas et al 2008	N	III	A		√
Vaivre-douret, Golse	Y	I	A	√	
vd Pal *et al.* 2007a	Y	III	A		√
vd Pal *et al.* 2007c	Y	I	B	√	
Velaphi et al 2005	N				√
Wang et al 1998	N	I	A		√
Westrup et al 2000	Y	I	A	√	
Westrup et al 2002a	Y	I	A	√	
White *et al.* 2007	N				√
Wielenga 2006	N				√
Wyly 1988	N				√
				46	**39**

The appraisal of 179 documents in step 3 indicated 108 documents of a high level of strength and quality of evidence. Although all 108 documents were of high level of strength and quality of evidence and all discussed topics related to NDSC only 16 of them described/stated/defined the components of NDSC which was the aim of this part of the study: To determine the components of NDSC. The rest discussed a variety of interventions that form part of each component or involved research that addressed the value and outcomes of each intervention.

Table 3-8 lists the selected documents of good quality that explicitely identified components of NDSC and were selected after critical appraisal to build the checklist for stage 2 of the study.

Table 3-8: Articles of good quality selected after critical appraisal to build the checklist used in the next step

Research:	**Strength / Quality of Evidence**
Gray *et al.,* 1998.	II / A - High
Non-research:	
Aita & Snider. 2003.	V / B - Good
Aucott *et al.,* 2002.	V / A – High
Byers, 2003.	V / A – High
Goldberg-Hamblin *et al., 2*007.	V / B – Good
Khan, 2003.	V / A – High
Lawhon & Melzar, 1988.	V / A – High
Lotas & Walden, 1996.	V / A – High
Lott. 1989.	V / B – Good
Lutes, 1996.	V / A – High
Sehgal & Stack. 2006.	V / B – Good
Sizun & Westrup, 2004.	V / A – High
Starr & Hoye, 1998.	V / A – High
Symington & Pinelli, 2006.	I / A – High
Van den Berg, 1997.	V / A – High
Van den Berg, 2007.	V / A – High
Note: Refer to Addendums 3-4 and 3-5 for a description of the strength/quality of evidence	

Step 3 was the critical appraisal step of the ILR and discussed the process of critical appraisal as followed in this research study. Of the sample derived in step 2, 108 documents were found to be of good quality. Of these documents only 16 were

selected as the ones that explicitly described the components of NDSC. They therefore formed the sample used to develop the checklist for use in the following stage of the research study.

3.2.4 STEP 4 OF ILR - DATA ANALYSIS AND SYNTHESIS

Data interpretation and synthesis were included in the fourth stage of the ILR process. This step aimed to synthesise the separate data points collected into a 'unified statement about the research problem.' Analysis of current research advanced the theoretical understanding of the phenomenon and contributed to the generalisability of the findings beyond a small subset of populations, settings, and procedures (Shelby & Vaske, 2008:99).

3.2.4.1 Method of interpretation

Since the researcher was interested in exploring the components of NDSC to enable the development of best practice guidelines, documents of high quality were analysed accordingly (Dixon-Woods *et al.*, 2004:15).

In order to explore the components of NDSC from the documents appraised and found to be of good quality, the data from primary sources were ordered, coded, categorised and summarised into integrated conclusions about the research problem. Due to the lack of strategies of data analysis with integrative reviews, this is one of the most difficult aspects (Whittemore & Knafl, 2005:550). To address the potential problem (lack of strategies) the method of systematical analysis was explicitly identified. A constant comparison method was considered to identify similar categories, because it is a broad overarching method used in qualitative designs to convert extracted data into systematic categories – in this study, components of NDSC. However, before moving to the development of categories, the researcher had to refine the selection of appropriate studies by focusing on the ones that specifically address components of NDSC (summarised in Table 3-8).

Separate components of NDSC were identified from the literature already reviewed and similar data was grouped together. This data was further analysed and synthesised to derive the components of NDSC (Whittemore & Knafl, 2005:550). This process is in line with reciprocal translational analysis stated in 3.2.4.2.

3.2.4.2 Critical interpretive synthesis

The goal of this stage is a thorough and unbiased interpretation of primary sources, along with an innovative synthesis of the evidence (Whittemore & Knafl, 2005:550). Since the strategies for data analysis with integrative reviews are one of the least developed aspects of the process, data analysis strategies were explicitly identified before commencing the review. Data extraction and thematic analysis are now discussed.

(a) Data extraction

Data for research studies were extracted based on author, reference, country, focus/ces, question, design, sample, method and findings (see Table 3-7).

Data from non-research studies were extracted according to the type of document (see Table 3-7). The Johns Hopkins Evidence Appraisal Instruments were used to critically appraise the documents to identify applicable documents that were of good quality (see Table 3-8).

(b) Thematic analysis

Critical interpretive synthesis as proposed by Dixon-Woods *et al.,* (2004:11,12) entails three strategies, namely reciprocal translational analysis (RTA), refutational synthesis and lines-of-argument (LOA) synthesis. Each strategy will now be discussed.

i. RTA

The key themes (components) in each study or document were identified (column 1, Figure 3-7) and translated to form the central components of NDSC (column 2, Figure 3-7) as the concept that is most suitable to describe a partial component. This was an important stage towards a more interpretive synthesis. According to Whittemore and Knafl (2005:550) this method of data analysis is compatible with the use of varied data from diverse methodologies.

Thematic analysis was preferred over quantitative content analysis due to the weaknesses of content analysis such as its inherent reductiveness and the tendency to diminish complexity and context. Quantitative content analysis uses frequency-counting, which may not reflect the importance of the underlying

phenomenon. A further problem is the danger of not reporting evidence. This may lead to evidence being regarded as unimportant, which may in turn result in oversimplification of results and the recording of what is easy to classify and count, rather than what is truly important (Dixon-Woods *et a.l*, 2004:23). To prevent these weaknesses, thematic analysis was used as a method of analysis to identify the components of NDSC, since it allowed for identification and description of the context of each component that was identified.

Thematic analysis for this study allowed for some degree of interpretation or adjustment of thematic labels, since the known components of NDSC as retrieved from literature differed within different contexts. Components where identified from systematic reviews (quantitative), but were then explained, described and contextualised using data from qualitative studies (Dixon-Woods *et al.*, 2004:15). According to Dixon-Woods *et al.* (2004:13, 14, 15) thematic analysis offers several advantages:

- Clear identification of prominent or recurrent themes
- Organised and structured ways to deal with literature when employing these themes
- Flexible method, allowing considerable latitude to reviewers
- Enables the researcher to cope with diverse evidence types.

Thematic analysis also suffers from important problems (threats to rigour):

- The process through which thematic analysis can be achieved lack clarity
- Lack of explicitness regarding procedures and aims, including how far analysis should be descriptive and interpretive. This includes examples such as:
    - unclarity regarding how themes can be identified,
    - should the structure reflect the frequency of reported themes?
    - should analysis be weighted towards themes that have a high level of explanatory value?
    - are the analysis data-driven (by themes identified in the literature itself) or theory-oriented (oriented to evaluation of particular themes through interrogation of the literature)?
- Limitations in the ability to deal with contradictions, other than describing them

- If limited to summarising themes reported in primary studies, it limits the ability of thematic analysis to take full advantage of the potential offered by synthesis.

Addressing the weaknesses:

Poor clarity regarding how themes can be identified (Dixon-Woods *et al.,* 2004:15) was addressed by using data-driven thematic analysis utilising systematic reviews that provided themes (or components of NDSC). Contradictions were dealt with by describing the context of components of NDSC. Since an objective of this study was to identify the components of NDSC, the problem that thematic analysis offers little in the way of theoretical structure within which to develop higher-order thematic categories was not seen as a limitation, but rather gave rise to suggestions for future research.

The reviewed literature documents discussed the identified components of NDSC, making use of main categories, sub-categories and intervention techniques. These categories were used to provide some structure during the following discussion due to the comprehensiveness of the data, therefore it should not be regarded as premature final results (components of NDSC). A complete summary of the components identified from each selected document as well as the categories that have been derived can be viewed in addendum 3-6.

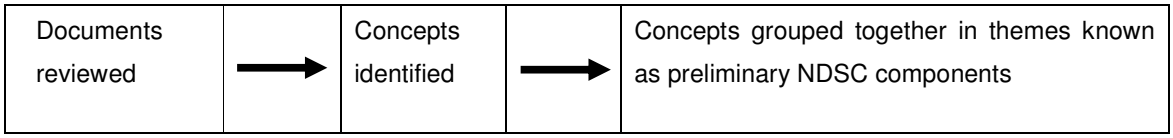

Figure 3-6: Clarification of the process to derive NDSC components

ii. Refutational synthesis

Contradictions between the studies/documents were analysed, characterised and an attempt was made to explain them (Dixon-Woods *et al.,* 2004:17). Contradictions included terms used for certain interventions, such as KMC and KC. These contradictions are described and clarified in Chapter 4.

iii. LOA synthesis

A general interpretation of each component was grounded in the findings of the individual research studies. The most prominent themes that represented the components of NDSC were identified by constant comparison between individual studies and the non-research documents. This strategy helped the researcher to reach a level of interpretation that supports a synthesising argument or conclusion statement. Dixon-Woods *et al., (*2004:18) refers to this as a "third order construct".

In this study a total of 179 documents were sampled in step 2 (Paragraph 3.2.2) and critically appraised in step 3 (Paragraph 3.2.3). From these documents only 16 specifically described components of NDSC, and the rest discussed a variety of interventions that form part of each component or involved research that addressed the value and outcomes of each intervention. These 16 documents were therefore selected to identify the components of NDSC (see Table 3-8 for a summary). From these 16 documents 42 concepts regarding NDSC components were identified. Refer to Figure 3-7 for an illustration of this process.

42 concepts were labelled and grouped together according to similarity. Some concepts were related, but documents might have addressed different perspectives or aspects of the concepts, for example, some documents only addressed flexion, while others addressed a detail description of flexion or only a single aspect of flexion such as flexion of the hips. However, all of these concepts addressed a single aspect of NDSC known as positioning, and positioning is a NDSC concept described in literature. This gave rise to categorising of the concepts to provide manageable data. As a result nine categories were identified of which the category headings were either headings that have been identified from the appraised documents or a descriptive category heading was allocated to each category if nothing was available in literature. This data was summarised onto a spreadsheet to ease in the analysis process (Whittemore & Knafl, 2005:550; De Vos & Van Zyl, 2000:273).

Apart from the concepts regarding NDSC described in the appraised documents, specific interventions were also described. These interventions provided the description of each concept and were also listed and sorted to support the concepts identified. A complete list of these interventions is provided in Figure 3-7.

3.2.4.3 Data display

The American Dietetic Association (ADA),(2009) recommends that the evidence from the critical appraisal is summarised in a manner that is relevant to the review question and then a step follows (write and grade conclusion statements): Develop a concise conclusion statement (the answer to the question). Assign a grade to indicate the overall strength or weakness of evidence informing the conclusion statement. (ADA uses Grades I, II, III, IV, and V for strong, fair, weak, expert opinion only, and no evidence, respectively). Data display involves converting the extracted data from individual sources into a display that assembles the data from multiple primary sources around particular subgroups (Whittemore & Knafl, 2005:551). This display is presented in Figure 3-7. In order to provide a complete picture the whole figure can be viewed on the next page.

3.2.4.4 Drawing a conclusion and verification

Drawing a conclusion and verification is the final phase of data analysis during which conclusion statements are formulated and verified (Whittemore & Knafl, 2005:550; Cooper, 1982a:7) and interpretation is used to move from description of themes to higher levels of abstraction. All discernment of themes requires verification with primary source data for accuracy and confirmability. An independent reviewer assisted in verifying the themes and categories arrived at. The final step of data analysis in an integrative review is the synthesis of important components into an integrated summation of the phenomenon. A new conceptualisation of the primary sources integrates all subgroups into a comprehensive portrayal of NDSC, thus completing the review process (Whittemore & Knafl, 2005:551). Conclusion statements are given at the end of Chapter 4.

179 documents in sample	→	179 documents critically appraised of which 108 were of good quality (see addendum 3-4 and 3-5 for complete list)	→	16 documents described concepts and/or components of NDCSC (refer to Table 3-8)

Thematic and reciprocal translational analysis (42 concepts)	Translating concepts into broader NDSC components through deductive logic →	**NDSC components** (themes)
Anatomical infant positioning Co-bedding multiples Day and night cycle Developmentally appropriate care Environment to promote growth and development care according to developmental maturity Family-centred care philosophy Flexion Flexion with positioning (hips) Flexion with positioning (limbs and shoulders) Individualised bedding / support Individualised care giving method Kangaroo care Macro environment Management of external environment Micro environment Modifying direct hands-on care -giving Modification of care-giving Move slowly, as a whole, keeping body and head aligned and limbs tucked in Non-nutritive sucking (NNS) NNS during gavage feeding Olfactory stimulation Parents as active participants in care Positioning Positive tactile stimulation Preparing for feeding Primary nursing care Privacy and comfort Promoting self-regulation Promoting state regulation Promoting periods of rest Prone or side-lying rather than supine (lung disease) Quiet times Reading of preterm infant cues and behaviours Reducing environmental stimuli - light Reducing environmental stimuli - noise Reducing sensory monotony Support gradual state changes Swaddling Systematic observation / continuous assessment and evaluation of preterm infant's developmental needs Teaching of professionals on developmental care Teaching parents to interact with preterm infant Uterine environment		NICU DESIGN INDIVIDUALISED CARE FAMILY-CENTERED CARE PHILOSOPHY POSITIONING HANDLING TECHNIQUES (TRANSITION SUPPORT) MANAGEMENT OF EXTERNAL ENVIRONMENT MANAGEMENT OF PAIN FEEDING METHODS KNOWLEDGE OF PRETERM INFANT DEVELOPMENT

Figure 3-7: Development of components from critical interpretive synthesis

Each of the components included in this table are now discussed separately. The discussion of each component employs the following structure: a short literature description of the component, including the clinical impact shown in literature, such as risk, benefit or harm and cost. A potential benefit should be sufficiently great to justify a recommendation in practice. This is followed by a summary of the volume of evidence, applicability and generalisability as well and the quantity and consistency. Volume of evidence refers to the sample sizes of the selected studies. Applicability refers to the recommendations based on the best available evidence directly applicable to the South African public sector setting. With quantity and consistency (overall direction of evidence) both the number of studies and the number of participants studied should be considered in the development of recommendations. If findings across studies are reasonably consistent, groups will have greater confidence in its conclusions. If not, greater weight is given to designs most appropriate for the study question and studies with minimal bias (NZGG, 2001:51). A conclusion statement follows from the synthesis of the entire body of evidence with the quality scores, and finally implementation recommendations as provided in literature are summarised (see Chapter 6 – BPG formulation). Figure 3-8 provide a visual explanation of the translation of concepts into preliminary concepts. More detail is provided in Chapter 4. Figure 3-8 is presented as a complete figure on the next page to provide a complete understanding of how the results were derived.

42 CONCEPTS IDENTIFIED FROM ILR		
1. Anatomical preterm infant positioning	17. Modifying of care-giving	32. Quiet times
2. Co-bedding multiples	18. Move slowly, as a whole, keeping body and head aligned and limbs tucked in	33. Reading of preterm infant cues and behaviours
3. Day and night cycle	19. Non-nutritive sucking	34. Reducing environmental stimuli - light
4. Developmentally appropriate care	20. Non-nutritive sucking during gavage feeding	35. Reducing environmental stimuli - noise
5. Environment to promote growth and developmental care according to developmental maturity	21. Olfactory stimulation	36. Reducing sensory monotony
6. Family-centred care philosophy	22. Parents as active participants in care	37. Support gradual state changes
7. Flexion	23. Positioning	38. Swaddling
8. Flexion with positioning (hips)	24. Positive tactile stimulation	39. Systematic observation/continuous assessment and evaluation of preterm infants' developmental needs
9. Flexion with positioning (limbs and shoulders)	25. Preparing for feeding	40. Teaching of professionals on developmental care
10. Individualised bedding/support	26. Primary nursing care	41. Teaching parents to interact with preterm infant
11. Individualised care giving method	27. Privacy and comfort	42. Uterine environment
12. Kangaroo care	28. Promote self-regulation	
13. Macro environment	29. Promote state regulation	
14. Management of external environment	30. Promoting periods of rest	
15. Micro environment	31. Prone or side-lying rather than supine (lung disease)	
16. Modifying direct hands-on care - giving		

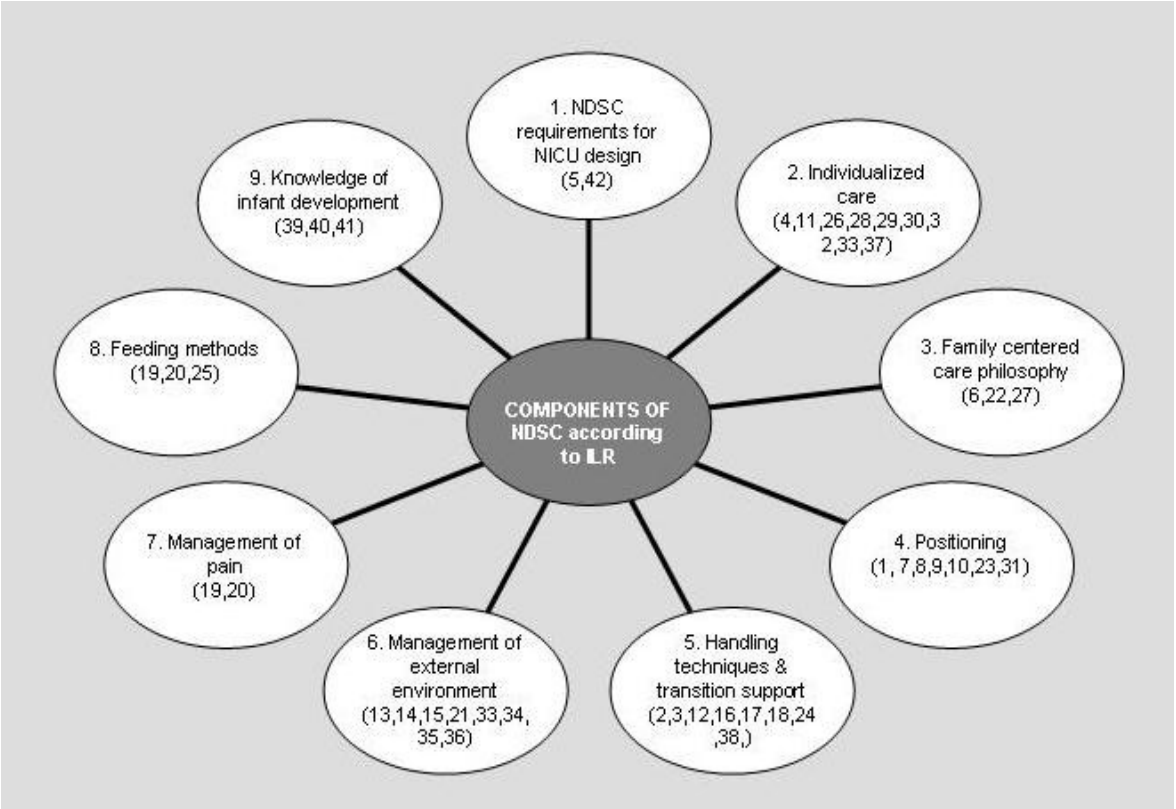

Figure 3-8: Concepts translated grouped into nine components (categories) of NDSC as derived from the ILR (concepts indicated in brackets)

COMPONENT 1: NDSC REQUIREMENTS FOR NICU DESIGN

Literature support

As a member of the human species the preterm infant is a social being who needs the security of three integrated environments for her development: the mother's uterus, her parent's bodies, her family and community.

Aita and Snider (2003:223), Byers (2003:176) and Symington and Pinelli (2006 [Online]) specifically state that the NICU environment is quite different from that of the intra-uterine environment. In the NICU environment the preterm infant is continuously exposed to a stressful environment in stark sensory mismatch to the developing nervous system's biological input needs (Perlman, 2007:1342; Als & Gilkerson, 1997:179; Aita & Snider, 2003:223). The NICU is an area of high technology, bright lighting, noise and hectic activity (Lawhon & Melzar, 1998:58). The NICU environment influences preterm neurodevelopment just as the intra-uterine environment influences foetal neurological development (Aucott *et al.*, 2002:298) and is therefore not suitable to support the growth and development needs of the preterm infant. The NICU environment has adverse developmental effects resulting from prolonged diffuse sleep states and periods of unattended crying, supine positioning, routine and excessive handling, ambient noise, lack of opportunity for sucking and poorly timed social and caregiving interactions (Als & Gilkerson; 1997:180).

Clinical impact and supporting evidence

Risk, benefit/harm & cost

Researchers such as Aita and Snider (2003:223), Byers (2003:176) and Symington and Pinelli (2006 [Online]) discuss available evidence on the environment that is most suitable for the preterm infant.

Studies included in the Symington and Pinelli (2006) SR included multiple interventions in most studies, therefore the environment manipulation was not measured as a single intervention. However, the authors concluded that there is limited evidence of the benefit of the concept of developmental care. The evidence demonstrated no major harmful effects and produced a large number of outcomes with no or conflicting effects.

The conclusion is therefore that environmental manipulation (according to Symington & Pinelli, 2006) is not harmful to the preterm infant and can be recommended as intervention for the preterm infant. Aita and Snider (2003:229, 230) recommend the creation of an environment closer to that of the intra-uterine environment as beneficial to the preterm infant's growth and neurobehavioural development. This includes the reduction of environmental stimuli such as light and noise, positioning and modified caregiving.

Byers (2003:176, 178) provides evidence from consensus groups and expert recommendations that a reduction of noise and light, as well as sensory monotony and promotion of day-night cycle are beneficial for the preterm infant in NICU with regard to weight gain, length of hospitalisation and ventilation. Their conclusion is that no negative effects were found in the application of developmental care in the adaptation of NICU design and it would be beneficial, but that a lack of long-term research does exist. Table 3-9 provides and overview of the evidence to support NDSC requirements for NICU design.

Table 3-9: Evidence to support NDSC requirements for NICU design

Reference	**Volume of evidence**	**Level of evidence**	**Appli cable**	**Consistency**
	3 studies: two literature reviews, one SR including 36 RCTs		Yes	No evidence of harm
Symington & Pinelli (2006)	Systematic review (36 RCTs)	I / A – High	Yes	
Aita & Snider (2003)	Literature review (concept analysis)	V / B - Good	Yes	
Byers (2003)	Literature review	V / A – High	Yes	
Van den Berg (2007)	Literature review	V / A – High	Yes	
Concepts idendified from ILR: 5, 42 (Refer to Figure 3-8).				

From the selected documents the following statements regarding the NDSC requirements for NICU design were derived:

Conclusion Statement
Statement 1: Members of the NICU team are encouraged to create an environment closer to the intra-uterine environment in order to promote normal neonatal growth and development in the preterm infant.

Implementation recommendations as described in literature

Description of the course of action

Only Van den Berg (2007:434) describes some of the 'womb-like' environment, while the other authors (mentioned in Table 3-9) all support that such an environment is essential, but provide no description of what is meant by a 'womb-like' environment. Other authors describe the intra-uterine environment, although not specifically as a component of NDSC, therefore this description was used to formulate the implementation recommendations. Als (2001:4) describes the intra-uterine environment as an environment supporting the co-regulation process between a mother and her unborn baby. This is an environment where the foetus can develop in a supportive and well-regulated environment provided by the mother (Als & Gilkerson, 1997:179). The foetus receives optimal protection from the outside environment, with an ongoing supply of nutrients, continuous temperature control, contained movement pattern and a tightly flexed posture, suspension of gravity, muted and regular sensory inputs, physiological support and regulation of chronobiological rhythms (Van den Berg, 2007:434; Als *et al.*, 1992:44; Als & Gilkerson, 1997:179; Aucott *et al.*, 2002:298) and protection from excessive stimulation that may hamper normal foetal development.

COMPONENT 2: INDIVIDUALISED CARE

Literature support

Individualised care is based on the relationship between the preterm infant and her caregivers (parents or health care professionals) and should incorporate all aspects of care required by the preterm infant (Lawhon & Melzar, 1998:57; Van den Berg, 1997:69). Individualised care further emphasises that it is crucial to evaluate each intervention for need and frequency to minimise stress (Lawhon & Melzar, 1998:57). Als and Gilkerson (1997:180, 181) describe this relationship as addressing the

preterm infant's developmental agenda and implementing care in a way that respects and supports preterm infant development. Aita and Snider (2003:227,230) describe developmental care as being dependant on individualisation. This implies that care-giving interventions change with the developmental needs of the infant. To reach this aim, staff should individualise their caregiving interventions according to the gestational age and the preterm infant's adaptation to interventions, including acting on the preterm infant's cues and behaviours communicated during interactions (Lott, 1989:25). Individualised interventions respect the individuality of the infant (Aita & Snider, 2003:227,230). Caregivers and parents should provide appropriate interactions during periods of calm. This includes engaging in eye contact, gently touching, and respectful communication with the preterm infant at times when she is most capable of interacting (Goldberg-Hamblin *et al.*, 2007:165).

Individualised primary care further includes primary nursing care and is defined as each preterm infant being assigned a team of nurses to provide care for the duration of the preterm infant's time in the NICU (Goldberg-Hamblin *et al.*, 2007:165).

Clinical impact and supporting evidence

Risk, benefit/harm & cost

The outcomes of a relationship-based-individualised approach to care include improved health outcomes of VLBW ventilated preterm infants in terms of shorter stay on the ventilator and supplemental oxygen, and a reduction in the incidence of intraventricular haemorrhage and severity of chronic lung disease. Shorter duration on gavage feeding with earlier onset of oral feeding and better daily weight gain.

Further outcomes include lower scores of morbidity in the first 4 weeks of hospitalisation, shorter hospital stay and improved overall behavioural functioning at discharge. All of which contributes to cost savings. Integrating individualised developmental care into the preterm infant's nursing care enhances the competencies of the preterm and very-low birth weight infant, as well as parenting skills and abilities (Lawhon & Melzar, 1998:58-64). Table 3-10 provide evidence to support individualized care.

Table 3-10: Evidence to support individualised care

Reference	Volume of evidence	Level of evidence	Applicable	Consistency
Aita & Snider (2003)	Literature review (concept analysis)	V / B - Good	Yes	No evidence of harm
Aucott *et al.* (2002)	Literature review	V / A – High	Yes	
Byers (2003)	Literature review	V / A – High	Yes	
Goldberg-Hamblin *et al.*	Literature review	V / B – Good	Yes	
Khan (2003)	Literature review	V / A – High	Yes	
Lawhon & Melzar (1988)	Literature review	V / A – High	Yes	
Lott (1989)	Literature review	V / B – Good	Yes	
Lotas & Walden (1996)	Critical review	V / A – High	Yes	
Sizun & Westrup (2004)	Literature review	V / A – High	Yes	
Starr & Hoye (1998)	Literature review	V / A – High	Yes	
Symington & Pinelli (2006)	Systematic review (36 RCTs)	I / A – High	Yes	
Van den Berg (1997)	Literature review	V / A – High	Yes	
Van den Berg (2007)	Literature review	V / A – High	Yes	
Concepts idendified from ILR: 4,11,26,28,29,30,32,33,37 (Refer to Figure 3-8).				

Conclusion Statement

Statement 2: Integrating age-appropriate, individualised developmental care into the preterm infant's nursing care enhances the development of the preterm and very-low-birth-weight infant, as well as parenting skills and abilities.

Implementation recommendations as described in literature

Description of the course of action

- Adapt caregiving interventions by neonatal nurses and other health care professionals that form part of the NICU team should according to the preterm infant's gestational age, preterm infant's adaptation to interventions and infant's cues and behaviours communicated during interventions to provide appropriate developmental care (Van den Berg, 1997:69).
- Do a systematic assessment to determine readiness for intervention (Lott, 1989:25).
- Put signs on the preterm infant's bed to indicate her unique behaviours, including likes and dislikes. Remind staff and parents of her individuality (Lott, 1989:25; Van den Berg, 1997:69).

- Identifying a 'primary caregiver' who is consistently assigned to a preterm infant, can promote a very nurturing and rewarding relationship between nurse, preterm infant and family. It provides nurses with satisfaction and contributes to parent participation in care (Aita & Snider, 2003:230).

COMPONENT 3: FAMILY-CENTERED CARE PHILOSOPHY

Literature support

Als and Gilkerson (1997:178) describe family-centred care as "a professional alliance, that supports the parent's engrossment with their child and the child's neurobiologically based expectations for nurturance from the family, an alliance that listens to the language of the infant's behaviour and uses the dialogue between the preterm infant, family and professional caregiver to guide the delivery of care where parents have active partnership in the preterm infant's plan and delivery of care even in the highly technical NICU environment" (Aucott *et al.*, 2002:303; Byers, 2003:178). Khan (2003) described family-centred care as placing the preterm infant in the context of the family and it is sensitive to the personal, social and cultural influences of the family unit. The goal is to support parents to develop care skills and techniques, thus including the family as part of the health care team and leave the power with them (Sizun & Westrup, 2004:385; Aita & Snider, 2003:227, Van den Berg, 1997:70; Van den Berg, 2007:439).

The importance of parent involvement became clear when tertiary care centres noted a high incidence of child abuse and neglect in preterm children who were separated from their parents for a period of time. Failure to form an attachment during the first few weeks and months, or disruption of the attachment process, lead to a higher risk of abuse and neglect of the infant (Aucott *et al.*, 2002:303). Sizun and Westrup (2004:385) stated that neonatal illness may have negative effects on parent-infant interactions. Fewer behavioural problems and better mental development were noted under socially underprivileged mothers who were involved in a mother centred developmental care intervention. Optimal school outcome is also strongly associated with stability of family composition and the level of parental education rather than with medical complications (Sizun & Westrup, 2004:385).

Aita and Snider (2003:228,230) describe parent involvement on two levels: (i) information sharing on how to recognise the specific cues and behaviours to promote

the developmental needs of the preterm infant are essential between parents and professionals and (ii) parents should be considered as active participants in establishing a care plan of the individualised intervention in order for them to apply it during their own handling of the preterm infant. They further state that family-centred care provides optimal care that is designed to support individual development. Good communication includes sharing, asking, listening and helping and is essential to successful partnership (Khan, 2003).

Clinical impact and supporting evidence

Risk, benefit/harm & cost

A family-centred approach emphasizes the individuality of the client and multidisciplinary interaction. Family-centred care furthermore provides optimal care that supports individual preterm infant development. Parent interaction such as touch decreases parental stress experiences and diminishes feelings of guilt and resentment, helping parents to adapt to parenting and assisting parents in the assessment of their preterm infant's growth (Aita & Snider, 2003:225, 226, 228). The time immediately after birth is the most important for bonding, since the preterm infant is generally in a quiet alert state and both mother and preterm infant are most receptive to bonding (Aucott *et al.*, 2002:303). Family-centred care has shown to reduce maternal stress and depression and improve parent-infant feeding and physical contact. It further increased self-esteem and lessened anxiety (Byers, 2003:178). Table 3-11 provide evidence to support a family-centered philosophy.

Table 3-11: Evidence to support a family-centred philosophy

Reference	**Volume of evidence**	**Level of evidence**	**Applicabl**	**Consistency**
Aida & Snider (2003)	Literature review (concept analysis)	V / B - Good	Yes	No evidence of harm
Aucott *et al.* (2002)	Literature review	V / A – High	Yes	
Byers (2003)	Literature review	V / A – High	Yes	
Goldberg-Hamblin *et al.*	Literature review	V / B – Good	Yes	
Khan (2003)	Literature review	V / A – High	Yes	
Lawhon & Melzar (1988)	Literature review	V / A – High	Yes	
Sehgal & Stack (2006)	Literature review	V / B – Good	Yes	
Sizun & Westrup (2004)	Literature review	V / A – High	Yes	
Starr & Hoye (1998)	Literature review	V / A – High	Yes	

Symington & Pinelli (2006)	Systematic review (36 RCTs)	I / A – High	Yes	
Van den Berg (1997)	Literature review	V / A – High	Yes	
Van den Berg (2007)	Literature review	V / A – High	Yes	
Concepts idendified from ILR: 6,22,27 (Refer to Figure 3-8).				

Conclusion Statements

Statement 3: A family-centred approach emphasizes the individuality of the preterm infant and multidisciplinary interaction and furthermore provides optimal care that supports individual preterm infant development.

Statement 4: The goal of family-centred care is to support parents to develop care skills and techniques, thus including the family as active participants of the health care team and leaving the power with them.

Statement 5: A family-centred approach reduces maternal stress and depression, improves parent-infant bonding and physical contact, increases self-esteem and lessens anxiety.

Implementation recommendations as described in literature

Description of the course of action

- Parents should be allowed to see and touch their preterm infants immediately after birth, before transferral to the NICU (Aita & Snider; 2003:228; Aucott *et al.*, 2002:303; Khan, 2003). Parents should be provided with opportunities that promote parent-infant interaction such as visits, holding, talking to their preterm infant and taking part in basic care to help them cope with the stressful time in the NICU (Aucott *et al.*, 2002:303; Khan, 2003; Van den Berg, 2007:430).
- Family-centred care is provided by twenty-four hour visiting policies for parents, encouraging sibling visitation, a warm and comfortable atmosphere and facilities, privacy (Starr & Hoye, 1998:34), parental support groups and attempts to arrange specific child care activities for parents such as breastfeeding and/or expressing breast milk, nipple feeding, bathing, time for kangaroo care (Starr & Hoye, 1998:34), decoration of preterm infant bed spaces and early discharge training. These activities should be arranged around parent schedules (Aucott

et al., 2002:303; Byers, 2003:178; Goldberg-Hamblin *et al*., 2007:165; Khan, 2003).

- Consider family needs when planning care and feeding times (Seghal & Stack, 2006:1008).
- Reinforce parenting skills by encouraging parental suggestions for, and participation in, planning and implementing care strategies for their preterm infant (Seghal & Stack, 2006:1008; Starr & Hoye, 1998:34; Van den Berg, 2007:439). This may also include posting notes in the chart and parental presence at daily rounds (Van den Berg, 2007:439).
- Promote and practice open, honest communication among all members of the health care team and parents (Seghal & Stack, 2006:1008).
- Share information in a timely and supportive manner (Seghal & Stack, 2006:1008).
- Foster a non-judgemental atmosphere in which parents can openly express feelings and concerns (Seghal & Stack, 2006:1008).
- Help parents to interpret preterm infant cues and model developmental interventions (Starr & Hoye, 1998:34).

COMPONENT 4: POSITIONING

Literature support

The positioning of the foetus inside the uterus provides the guidelines for positioning of the prematurely born infant in the NICU. The uterus constricts foetal movement and consequently leads to the tightly flexed foetal posture. This *flexed* posture (limbs drawn toward the middle of the body) is important for the normal development of head control, midline hand play, rolling over and getting into and out of sitting. The preterm infant often lacks the capability to maintain a flexed position necessary for rest, sleep, smooth movements, self-soothing and proper muscular development due to low muscle tone and having to work against gravitation to move their limbs. They have less flexor hypertonia than their fullterm counterparts, leading to a more extensor tone that interferes with the milestones mentioned above (Aucott *et al*., 2002:298, 302; Goldberg-Hamblin-Hambling *et al*., 2007:164, 165; Khan, 2003). Anatomically and developmentally appropriate positioning of the preterm infant affects the infant's autonomic, motor and self-regulatory subsystems (Lotas & Walden, 1996:681).

Neurological complications such as neonatal seizures and intraventricular haemorrhage, respiratory disorders including respiratory distress syndrome and chronic lung disease and pathologies affecting cardiac, endocrine and gastro-intestinal systems may lead to impairment in the preterm infant that may consist of abnormalities in tone, range of motion, quality of movement and an inability to control state of arousal and automatic postural reactions. These activity limitations may furthermore lead to a delay in developmental milestones, such as poor motor ability in activates such as midline orientation and head control (Mahoney & Cohen, 2005:194). Preterm infants of less than 32 weeks appear limp and floppy at times, since they lack strong muscle tone. They generally move little and their movements are jerky and irregular. Muscle tone improves with maturity and at 40 weeks the preterm newborn may exhibit better muscle control of head and trunk than the term newborn (Lott, 1989:22).

Preterm infants, especially when sedated, may develop fixation of the hips in hip abduction and external rotation resulting in contractures (also known as frog-leg posture) when positioned in prone or supine for days or weeks. This complication of hypotonia interferes with subsequent neuromotor development and can be prevented by positioning a preterm infant's legs with the hips in neutral position with some adduction (Aucott *et al.*, 2002:302).

Preterm infants predominantly positioned in the supine position shows a marked tendency to turn to the right and asymmetric posture. This is related to the asymmetric tonic neck reflex that is present in preterm infants from 30 weeks gestation (Aucott *et al.*, 2002:302). When prone positioning is not possible, a side-lying position with sufficient support should be provided. Support in the flexed position (even in supine) can be provided by positioning aids and even small stuffed animals (Lawhon & Melzar, 1998:59, 60). Common neuromotor abnormalities such as asymmetries and extensor hypertonia seen in preterm infants in the first year and which do not signal disability may be the results of positioning while in the NICU (Aucott *et al.*, 2002:302).

Clinical impact and supporting evidence

Risk, benefit/harm & cost

Prone positioning: The prone position is developmentally appropriate, since it promotes physiologic stability (Van den Berg, 1997:70). Several studies found more effective breathing and oxygenation in preterm preterm infants with lung disease in the prone position (Lawhon & Melzar, 1998:59; Lotas & Walden, 1996:682). Lotas and Walden (1996,682) stated benefits of prone positioning as increase time in sleep states, less movement, less time in crying states and a reduction in the incidence of reflux.

Non-ventilated LBW infants demonstrate significantly lower rates of energy expenditure and intubated preterm infants experience significantly higher partial pressure of oxygen in arterial blood (PaO_2). Even the most acutely ill preterm infant with assisted ventilation, umbilical catheter or a chest tube may be placed in a prone position (Lawhon & Melzar, 1998:59). Unsupported supine positioning of ventilated preterm infants shows evidence of obstructed cerebral venous draining when their heads were turned to the side. Prone positioning was further found to improve head control, utilize balance skills when lifting their heads, facilitate antigravity control, trunk and shoulder stability, fine motor function and bringing their hands to the midline (Aucott *et al.*, 2002:301, 302).

Prone position can be promoted by the use of positioning aids such as towel rolls to maintain flexion while in side-lying.

Flexion: Flexion mimics the intra-uterine support posture and supports the development of flexor tone. Trunk flexion supports the hands in midline to reach the mouth for self-consoling behaviour. These actions lead to improved oxygenation, increased quiet sleep, improved respiration and heart rates and a reduced incidence of reflux. All of above promote development. Lack of a flexed posture and neutral head position leads to the higher neck, trunk and extremity extensor tone seen in preterm infants in NICU and follow-up. Neck extensor muscles are stronger than flexors at approximately 32-34 weeks gestation (Mahoney & Cohen, 2005:203; Aucott *et al.*, 2002:302). Preterm infants are better able to co-ordinate their movements when head and body are in alignment and flexion is achieved (Khan, 2003).

Bedding and side-lying: Supportive bedding and side-lying with flexion during care and handling helps with self-comforting (Khan, 2003). Table 3-12 provide a summary of the evidence to support positioning.

Table 3-12: Evidence to support positioning

Reference	Volume of evidence	Level of evidence	Applicable	Consistency
Aucott *et al.* (2002)	Literature review	V / A – High	Yes	No evidence of harm
Aida & Snider (2003)	Literature review (concept analysis)	V / B - Good	Yes	
Byers (2003)	Literature review	V / A – High	Yes	
Goldberg-Hamblin *et al.*	Literature review	V / B – Good	Yes	
Gray *et al.* (1998)	Research utilization (quasi-experimental)	II / A - High	Yes	
Khan (2003)	Literature review	V / A – High	Yes	
Lawhon & Melzar (1988)	Literature review	V / A – High	Yes	
Lott (1989)	Literature review	V / B – Good	Yes	
Lotas & Walden (1996)	Critical review	V / A – High	Yes	
Sehgal & Stack (2006)	Literature review	V / B – Good	Yes	
Sizun & Westrup (2004)	Literature review	V / A – High	Yes	
Starr & Hoye (1998)	Literature review	V / A – High	Yes	
Symington & Pinelli (2006)	Systematic review (36 RCTs)	I / A – High	Yes	
Van den Berg (1997)	Literature review	V / A – High	Yes	
Concepts idendified from ILR: 1, 7,8,9,10,23,31(Refer to Figure 3-8).				

Conclusion Statements

Statement 6: Positioning of the preterm infant in a contained, flexed posture with firm boundaries, neck neutral, shoulders protracted and the body symmetric, mimicking the intra-uterine conditions, supports the development of flexor tone prior to term and provides the preterm infant with a sense of containment and hand-to-midline position that allows better self-organisation and self-consoling behaviour.

Statement 7: Prone or side-lying positions with adequate support are preferable to supine positioning.

Implementation recommendations as described in literature

Description of the course of action

- Anatomical position means the preterm infant is positioned with her neck in a neutral position, protracted shoulders, the body symmetric, knees flexed and the hips and arms in midline, which are reached with the use of containment or snug firm boundaries (Aucott *et al.*, 2002:302; Starr & Hoye, 1998:34; Symington & Pinelli, 2006 [Online]; Van den Berg, 1997:70).

- Limbs and shoulders should be flexed during positioning. This is attained with postural support using firm boundaries (Aucott *et al.*, 2002:302)
- The head should be positioned in midline and in line with the body, especially the acutely ill preterm infants in supine position. This posittion encourages hands to face (Aucott *et al.*, 2002:302; Starr & Hoye, 1998:34).
- Maintain a rounded back (Starr & Hoye, 1998:34)
- The hips should be in a neutral position with some adduction (Aucott *et al.*, 2002, 302) with hip and knee flexion (Starr & Hoye, 1998:34).
- Prone or side-lying positions should be used rather than a supine position, especially in the case of lung diseases (Aucott *et al.*, 2002:301; Lott, 1989:26)
- Change the nappy while the preterm infant is in prone or side-lying position to avoid unnessary turning (Lott, 1989:24)
- Avoid sudden positional changes (Lott, 1989:24)
- Provide containment during and after position changes (Lott, 1989:24)
- Encourage parents to play with preterm infants in a prone position on a firm mattress when the preterm infant is awake (Aucott *et al.*, 2002:298)
- Individualised bedding and support should be used with positioning (Lotas & Walden, 1996). The caregiver or parent's hands can provide containment during care and procedures (Van den Berg, 1997:70).
- Use positioning aids such as blanket rolls, support wedges, stuffed toys, nappies, or loose swaddling to stabilise the preterm infant's position and contain the preterm infants in flexion and neutral hips to reduce stress (Aucott *et al.*, 2002:302; Goldberg-Hamblin *et al.*, 2007:165; Lott, 1989:24,26; Van den Berg, 1997:70). Use bedding for positioning that is comfortable, providing gentle resistance for bracing, but flexible enough to allow room for manoeuvre. Positioning is effective when the preterm infant can curl up with limbs tucked in, and movements can be made for comforting such as hands-to-mouth, hands together and hands and feet pressing against bedding (Khan, 2003).

COMPONENT 5: HANDLING TECHNIQUES AND TRANSITION SUPPORT

Literature support

Handling refers to a variety of techniques such as a specific way of touch, care-giving to promote rest, tactile stimulation, swaddling, skin-to-skin care, movement, co-bedding and the support of self-regulation.

State regulation can be implemented by providing a quiet, soothing environment, individualised care, appropriate timing for caregiving events with regard to sleep/wakefulness cycle and support and pacing events to minimise stress and promote stable relaxed care (Van den Berg, 1997:71).

Clustered care: Necessary medical and regular procedures such as feeding and diaper changes are clustered together and postponed until the preterm infant is more awake so that the preterm infant has longer periods (2-3 hours) of undisturbed rest (Goldberg-Hamblin *et al*., 2007:165; Lott, 1989:24; Starr & Hoye, 1998:34).

Time-out: Time-out is the brief rest periods interspersed with manipulations (Lawhon & Melzar, 1998:58). Attention should be given according to the preterm infant's thresholds for stress, need for rest or for stopping handling altogether (Van den Berg, 2007:436).

Swaddling: Swaddling refers to tight wrapping of the preterm infant in a blanket with the limbs flexed, hips neutral without rotation, shoulders forward, head neutral and hands accessible for exploration of the face and to provide containment and predictable support, mimicking the security of the uterus (Aucott *et al.,* 2002:302).

Movement: Movement of the mother stimulates the foetal vestibular apparatus and foetal movements provide kinaesthetic stimulation with the amniotic fluid stimulating tactile receptors. At 30-32 weeks gestation tactile stimuli evoke somatosensory responses. Preterm infants should be moved slowly as a whole, keeping the body and head aligned and limbs tucked in (Aucott *et al*., 2002:300,302). Reduced movement such as rocking or bouncing may decrease preterm infant overstimulation (Goldberg-Hamblin *et al*., 2007:164).

Skin-to-skin contact: Skin-to-skin involves placing the naked preterm infant (dressed in a nappy only) on the mother's bare chest, between her breasts in an upright position for several hours a day and providing exclusive breast feeding (Aucott *et al*., 2002:304; Byers, 2003:177; Sizun & Westrup, 2004:385). Skin-to-skin care should be started as soon as the preterm infant is stable. Stable means no deterioration of condition within 24 hours before KC (Ludington-Hoe, Morgan & Abouelfettoh, 2008:S3). Components such as KMC contribute to increased survival rate of up to 72% in infants under 1kg and 89% for infants between 1-1.5kg (Bond, 2002: 480).

Touch: Still holding or containment hold is described by Khan (2003) as incorporating resting or cupping the baby's head or resting a still hand on any part of the preterm infant's body. Positive touch contributes to improved short-term growth and shorter length of hospital stay (Symington & Pinelli, 2006:8).

Self-regulation: Self-regulation can be promoted by providing support before, during and after routine daily cares, to allow the preterm infant to experience each event as a comfortable activity (Van den Berg, 1997:71).

Clinical impact and supporting evidence

Risk, benefit/harm & cost

Movement: Babies of less that 32 weeks gestation often sleep through caretaking procedures. By 38 weeks, the preterm sleep/awake times are similar to that of the term infant (Lott, 1989:22). Moving the preterm infant through space, for example for weighing, may cause physiological instability (Khan, 2003). Abrupt stimulation or quick turning of a preterm infant will often evoke a startle reflex or apnoeic episode (Lawhon & Melzar, 1998:60).

Skin-to-skin care decreases neonatal energy expenditure, assists LBW infants with thermal regulation, oxygenation and provides nutrition and stimulation. It is further associated with a reduction in nosocomial infection, severe illness and respiratory disease. Preterm infants cared for in skin-to-skin shows an average weight gain of 3.6 grams or more per day and are more likely to continue on exclusive breastfeeding. Skin-to-skin care has positive effects on behaviour states in preterm infants of at least 28 weeks gestation. Mothers who provide skin-to-skin are less likely to be dissatisfied

with the NICU care and positive parental and preterm infant outcomes are seen in specific situations such as depressed mothers, skin-to-skin care started in the NICU within 4 hours after delivery, multiples, adolescent parents, adoptive parents and mothers with eclampsia (Aucott *et al.*, 2002:304; Byers, 2003:177).

Vestibular stimulation facilitates quiet sleep (Aucott *et al.*, 2002:301). Rocking or walking with the baby provides vestibular-proprioceptive stimuli and may help bring the infant to a more alert state (Lott, 1989:26).

Positive stimulation around feeding time has shown to improve weight gain that persists through 12 months after conception (Aucott *et al.*, 2002:301).

Risk, benefit/harm & cost

Containment/Swaddling: Research found that swaddled infants had less physiologic distress, better motor organisation and more effective self-regulatory abilities (Byers, 2003:177,178; Lawhon & Melzar, 1998:59). Lotas and Walden (1996:683) state that generalised motoric containment of the preterm infant's arms and legs close to the body while in a side-lying or supine position resulted in significantly lower mean heart rates, shorter mean crying and sleep disruption times, and fewer sleep-state changes after painful procedures.

Co-bedding of multiples: Preterm infants demonstrate motor activities directed at the sibling when multiples are co-bedded, less fussiness and more sleep-wake synchronicity as well as lessened incubator temperature to maintain normal body temperature (Byers, 2003:177). Improved growth rate and development, decreased length of hospital stay and costs as well as rehospitalisations are benefits of co-bedding multiples. They show improvement in heart rate, respiratory control, oxygen requirement and weight gain. Motor development improves with increased flexor-extensor patterns. Co-regulation, when the siblings are balancing and supporting one another, and the facilitation of state control, which become consistent between or among the multiples, have also been noted (Lutes, 1996:61, 62). IV's, gavage feeding, cardiac and apnoea monitors, oximetry, and phototherapy are all permitted with co-bedding (Lutes, 1996:62). Some twins do not like being bedded together and their responses should be monitored to separate them if that is their preference (Lutes, 1996:62). Parent-infant bonding improves with co-bedding, and easier transition to home is an added result. Parent-nurse communication also improves due to one nurse caring for multiples bedded together and care consistency increase. Finally, preparation for discharge is enhanced (Lutes, 1996:62).

Clustering of care: Clustering of care supports infant development by decreasing preterm infant energy expenditure, decreasing stress, enhancing the preterm infant's maturation of sleep states and promoting longer periods sleep and rest. Enhancement of the sleep/wake cycle affects the physiologic stability and maturation of the VLBW infant and encourages parent's participation in caregiving (Byers, 2003:177; Lawhon & Melzar, 1998:58; Starr & Hoye, 1998:34).

Risk, benefit/harm & cost

Time-out: Responding to the preterm infant's cues and pausing regularly during care gives the preterm infant time to recover and gather energy (Khan, 2003). Ignoring early warning signs of stress can lead to severe distress and jeopardise the preterm infant's health and development (Lott, 1989:26).

Self-soothing: Non-nutritive sucking assists the preterm infant with soothing and encourages self-regulation (Khan, 2003). Swaddling, grasping and non-nutritive sucking contributes to physiological stability during interventions (Lawhon & Melzar, 1998:60).

Table 3-13 summarise the evidence to support handling techniques.

Table 3-13: Evidence to support handling techniques

Reference	Volume of evidence	Level of evidence	Applicable	Consistency
Aida & Snider (2003)	Literature review (concept analysis)	V / B - Good	Yes	No evidence of harm
Aucott *et al.* (2002)	Literature review	V / A – High	Yes	
Byers (2003)	Literature review	V / A – High	Yes	
Goldberg-Hamblin *et al.*	Literature review	V / B – Good	Yes	
Gray *et al.* (1998)	Research utilization (quasi-experimental)	II / A - High	Yes	
Khan (2003)	Literature review	V / A – High	Yes	
Lawhon & Melzar (1988)	Literature review	V / A – High	Yes	
Lotas & Walden (1996)	Critical review	V / A – High	Yes	
Lott (1989)	Literature review	V / B – Good	Yes	
Lutes (1996)	Case study	V / A – High	Yes	
Sehgal & Stack (2006)	Literature review	V / B – Good	Yes	
Sizun & Westrup (2004)	Literature review	V / A – High	Yes	
Starr & Hoye (1998)	Literature review	V / A – High	Yes	
Symington & Pinelli (2006)	Systematic review (36 RCTs)	I / A – High	Yes	
Van den Berg (1997)	Literature review	V / A – High	Yes	
Van den Berg (2007)	Literature review	V / A – High	Yes	
Concepts idendified from ILR: 2,3,12,16,17,18,24,38 (Refer to Figure 3-8).				

Conclusion Statements

Statement 8:

State regulation is supported by a quiet, soothing environment, individualised care, appropriate timing for caregiving events with regard to sleep/wakefulness cycle and support and pacing events to minimise stress and promote stable relaxed care.

Statement 9:

Sleep is important for growth and development. Care and handling should be planned carefully, taking into consideration the preterm infant's cues and responses to provide continuous rest periods of at least 2-3 hours.

Statement 10:

Care-giving should be modified by scheduling interventions around sleep (clustering), maintaining of flexion, containment and facilitation during procedures.

Statement 11:

Providing handling that is responsive to the preterm infant's cues minimises stress, therefore care-giving should be modified by providing pacing and rest periods according to preterm infant cues (time-out), and multi-modal stimulation when applicable.

Statement 12:

Swaddled preterm infants show less physiological distress, better motor organisation and more effective self-regulatory abilities. Generalised motoric containment of the preterm infant's arms and legs close to the body while in a side-lying or supine position results in significantly lower mean heart rates, shorter mean crying and sleep disruption times, and fewer sleep-state changes after painful procedures.

Statement 13:

Moving the preterm infant slowly as a whole, keeping the body and head aligned and the limbs tucked in supports physiological stability.

Statement 14:

Skin-to-skin care supports thermoregulation, oxygenation, weight gain and behavioural states in preterm infants of at least 28 weeks gestation and should be started as soon as the preterm infant is regarded as physiologically stable (i.e. no deterioration of condition within 24 hours before KC).

Statement 15:

The preterm infant should be touched, and direct hands-on care-giving should be modified according to the individual behaviours and physiological responses of the preterm infant.

Statement 16:

Self-regulating opportunities contributes to physiological stability during interventions and are provided by means of positioning the preterm infant to support the hands in the midline, close to the face, provide opportunities for grasping and a pacifier for non-nutritive sucking if applicable.

Statement 17:

Vestibular stimulation facilitates quiet sleep and may help bring the stable preterm infant to a more alert state.

Statement 18:

Co-bedding supports co-regulation, balancing and support for siblings placed next to each other in the same bed.

Statement 19:

Transitional support assists the preterm infant to reach a calm and regulated state before beginning an intervention, to improve tolerance and help with easy recovery after completion of interventions.

Implementation recommendations as described in literature

Description of the course of action

Movement:

- Soothe the preterm infant with still hand to help make the transition for handling (Khan, 2003).
- Change the diaper in the side-lying or even prone position for a preterm infant that is easily stressed (Lawhon & Melzar, 1998:60; Lott, 1989:24).
- Contain the lower extremities to facilitate both motoric and autonomic stabilisation, for example by enclosing the preterm infant's legs, flexed within a diaper (Lawhon & Melzar, 1998:60). Plan position changes carefully and

support the preterm infant to avoid dramatic limb and hand extensions (Van den Berg, 1997:70).

- Handle the preterm infant gently and avoid sudden posture changes to promote tactile and vestibular development (Seghal & Stack, 2006:1009).

Cluster care:

- Provide hands-on care as the preterm infant becomes more alert, rather than interrupting sleep (Lott, 1989:24). Coordinate interventions such as blood sampling, X-rays and mutli-disciplinary activities to allow adequate rest periods of at least 2-3 hours (Seghal & Stack, 2006:1009; Starr & Hoye, 1998:34). Use wakeful states for nursing care and stimulation and interaction opportunities (Starr & Hoye, 1998:34).

Skin-to-skin care

- Start skin-to-skin care within 24-48 hours after delivery for the stable preterm infant.

Skin-to-skin care of the ventilated preterm infant:

- Ventilate the preterm infant for 24 hours before the first session of KMC. Start KMC once the preterm infant is stable on the ventilator at low settings (intermittent mandatory ventilation < 35 bpm, FiO_2 < 50%), shows stable vital signs, is not on vasopressors and do not have any chest tubes. Oxygen saturation is not a limitation, nor broviac, umbilical, arterial and IV lines as long as it is well secured (Ludington-Hoe, Ferreira, Swinth & Ceccardi, 2003:579).

Transitional support:

- Avoid interruption of the preterm infant in deep sleep by postponing interventions until the preterm infant is in light sleep or a drowsy state. Prepare the preterm infant before carrying out a procedure and assess readiness and availability for interaction by checking the environment, position, behavioural reactions and monitors and reduce lighting and noise (Seghal & Stack, 2006:1009; Van den Berg, 1997:71). Rouse the preterm infant gently from light sleep or drowsiness, using mild stimulus initially then gradually increasing the stimuli as the baby responds. Introduce one stimulus at a time such as talking softly and then gently touching the preterm infant (Lott, 1989:24; Seghal &

Stack, 2006:1009). Assist the preterm infant to reach a calm and regulated state before beginning an intervention to improve tolerance and help with easy recovery (Seghal & Stack, 2006:1009).

- Stay at the preterm infant's bedside after interventions until the preterm infant has returned to drowsy or light sleep states. Provide containment, repositioning, support such as non-nutritive sucking, and boundaries to help the preterm infant transition to a calm sleep or quiet awake state (Seghal & Stack, 2006:1009; Van den Berg, 1997:71).

Time-out:

- Provide 'time-out' for the preterm infant to recover during stressful interventions (Lawhon & Melzar, 1998:60; Lott, 1989:26; Starr & Hoye, 1998:34), i.e. carry out procedures in stages when autonomic changes are observed in the preterm infant during handling and allow for periods of rest and recovery during support. Provide opportunities for the preterm infant to suck on a pacifier or finger, experience containment or to hold a finger and grasp (Van den Berg, 1997:70; 71).

Containment:

- Use containment, grasping opportunities and non-nutritive sucking interventions to calm preterm infant and enhance self-regulation during interventions (Lawhon & Melzar, 1998:60; Starr & Hoye, 1998:34).
- Provide additional increased oxygen temporarily for the ventilated preterm infant if needed (Lawhon & Melzar, 1998:60).

Co-bedding of multiples:

- Flexibility and preplanning is important when co-bedding multiples (Lutes, 1996:62).
- Bed stable multiples together (Lutes, 1996:62).
- Lightly swaddle multiples with one blanket. Hands free to reach their own face and the face/body of sibling to facilitate touching and impact motor organisation (Lutes, 1996:62).
- Provide cluster care (Lutes, 1996:62).
- Keep multiples lightly swaddled together in the same bed until they are ready for discharge. Encourage co-bedding at home after discharge (Lutes, 1996:62).

- Separate multiples if one or more becomes unstable and resume bedding together when they are stable again (Lutes, 1996:62).
- Manage the administration of medication by colour coding equipment, medicine charts, IV tubing, medication, nappies and everything in the bed with a single colour per preterm infant (Lutes, 1996:62).
- Place a clear ID band on each preterm infant and maintain at all times (Lutes, 1996:62).
- Control the incubator temperature by placing the skin probe on the smallest preterm infant and adjust the incubator to a constant air temperature (Lutes, 1996:62).
- Separate preterm infants if they show responses that they do no like co-bedding (Lutes, 1996:62).

Social interaction:

Social interaction interventions are described by (Als, 1982:241).

- Provide social interaction in keeping with state transitions
- Do not interrupt the preterm infant during quiet sleep
- Once in quiet alert state social interaction can proceed gradually. Start from a distance and gradually increase complexity of interaction depending on the preterm infant's response.
- Monitor autonomic and motoric stress signals throughout interaction.
- Reduce stimulation or terminate in case of stress.
- Stabilise and reorganise an aroused and stressed preterm infant before leaving her alone.

Diaper changing and cleaning:

Diaper changing and cleaning interventions are described by (Als, 1982:241).

- Time care to the baby's state of transition.
- Position in prone or side position.
- Ensure stabilisation by facilitating flexion and finger holding, sucking if necessary and by aiding postural and autonomic restabilisation after the procedure.
- Calm, soothing talk if the preterm infant can accommodate it.

COMPONENT 6: MANAGEMENT OF THE EXTERNAL ENVIRONMENT

Literature support

Neonatal sensory development emerges in a specific sequence over the course of the foetal life. This sequence is touch, kinaesthetic/proprioception, vestibular, smell, taste and vision. Each system has a rapid period of maturation during which the other systems do not advance, thus avoiding competition with the current emerging system. If one system is stimulated out of the typical developmental sequence it will interfere with the current emerging system. It has been shown that inappropriate visual activation during the stage of hearing development will not only alter hearing, but will also affect vision. Sensory input introduced to the growing human being before the sequence is ready to be activated, may influence perceptual and behavioural development (Van den Berg, 2007:435).

The preterm infant is more susceptible to the sensory mould of the NICU environment. The brain and nervous system of the VLBW preterm infant may be highly sensitive and vulnerable to sensory input, therefore the preterm infant's lack of the ability to selectively process input, large amounts of tactile, auditory, visual and kinaesthetic stimuli, may result in overloading and be stressful to the preterm infant. The usual bright and noisy environment of the NICU has been found to be physiologically stressful to the preterm infant and therefore negatively impacts growth and development, disrupts sleep-wake patterns and negatively impacts on parent-infant bonding (Byers, 2003:176).

The external environment comprises factors that influence the sensory system of the preterm infant, such as tactile, vestibular and proprioception, gustatory (taste), olfactory (smell), hearing and vision. However, only the sound and vision systems are discussed as part of the external environment.

Sound:

The loudness of sound is described as decibels (dB) (Van den Berg, 2007:436). In-utero the sound is muffled (Gray, Dostal, Ternullo-Retta, Armstrong, 1998:34) and the auditory input in-utero consists of low-pitched, variable sounds, about 40-60 dB, originating from the maternal cardiovascular and gastro-intestinal systems (Lott, 1989:24; Seghal & Stack, 2006:1008). Foetuses and preterm infants as young as 23-26 weeks gestation move in response to sound, and the amniotic fluid conducts sound well (Aucott *et al.*, 2002:300; Van den Berg, 2007:436). Hearing is essential

for normal language development as well as the development of attention and perception (Van den Berg, 2007:436).

Sensitivity to excessive noise begins at 6 months gestation and extends through the newborn period to 2-3 months after birth. Developmental difficulties resulting from sound processing can be seen in distractibility, hyperactivity and inhibited or disorganised responses to sound (Van den Berg, 2007:436). Preterm infants are more vulnerable to the effects of noise exposure due to their immaturity.

The NICU has peak noise levels that frequently exceed 90 dB and rarely goes below 60 dB, exceeding the recommended 45 dB safe for preterm infants (Byers, 2003:176; Goldberg-Hamblin *et al.*, 2007:163). Preterm infant behavioural states change in response to noise from regular sleep to fussy and crying states (Byers, 2003:176; Lotas & Walden, 1996:682; Van den Berg, 2007:436). Exposure to NICU noise contributes to hearing loss in preterm infants (Byers, 2003:176), changes in cerebral blood flow (which may lead to IVH), physiological changes, such as increased heart and respiratory rates, mottling, apnoea and bradycardia in response to sudden sound increases (Khan, 2003; Lotas & Walden, 1996:682; Seghal & Stack, 2006:1008; Van den Berg, 2007:436). It further leads to disturbances in sleep, behavioural changes, disturbing brain activity and body chemistry (Khan, 2003; Lotas & Walden, 1996:682).

Incubator noise is monotonous and full of intense, noxious stimuli as well as limited in pleasant sensory experiences (Lawhon & Melzar, 1998:58). The preterm infant may 'shut down' or exhibit signs of stress when exposed to any degree of noise. 'Shut down' is a state where the preterm infant becomes non-reactive and unavailable to the environment (Lawhon & Melzar, 1998:58).

Vision:

"Measurements used to describe light environments include irradiance (kind of light) or luminance (brightness) and are described in terms of lux (lumens/m^2) or foot-candles (ftc). Lux divided by 10 is closely equivalent to foot-candles. The American Academy of Paediatrics recommended in the l970's that light in the NICU should not be brighter than 100 ftc for adequate visualization of NICU patients" (Van den Berg, 2007:435).

Preterm infants have thin eyelids, lacks pupil constriction and the retina is set for 200lux. Inappropriate high lighting levels may cause distress, physiological instability

and state changes in the preterm infant (Khan, 2003). The visual system is the last of the sensory systems to develop and is the most mature system at fullterm birth. Rapid development of visual neuronal connections and processing occurs between 28 and 34 weeks gestation (Van den Berg, 2007:436) and visual fixation and visual pattern preference by 30-32 weeks gestation (Aucott *et al.*, 2002:300). Overstimulation by light may interfere with the development of the central visual system of the preterm infant. Bright light further affects the preterm infant's overall socialisation skills and increases the incidence of squinting and 'shutting out' behaviours. Preterm infants in reduced levels of light show more interest in and capability of engaging (Seghal & Stack, 2006:1009). The visual environment of the NICU may alter visual acuity, colour vision, problems with visual processing, visual attention, pattern discrimination, visual recognition, memory, and visual motor regulation (Van den Berg, 2007:435). Treatment lamps used in the NICU average up to 350 foot-candles and bilirubin lights may be as high as 10,000 foot-candles.

Kinaesthetic:

Previously bedding such as waterbeds and sheepskin were suggested to facilitate flexion and kinaesthetic stimulation (Lawhon & Melzar, 1998:58). However, new development in the field suggests that the use of waterbeds may be overstimulating and sheepskin may provide negative tactile stimulation when re-used, therefore memory foam mattresses are suggested as the alternative.

Cycled light:

Cycled light implies 12-hour cycles similar to normal day-night time, with lower artificial light at night-time or by using normal nursery light and uncovering windows during the day (Morag & Ohlsson, 2008:2).

Clinical impact and supporting evidence

Risk, benefit/harm & cost

Providing age-appropriate sensory input for the preterm infant protects the preterm infant from inappropriate, excessive and stressful stimulation (Lotas & Walden, 1996:681).

Physiology of cycled light:

- Continuous bright light is related to preterm infant stress as manifested by increased levels of activity, disturbances in body temperature, decreased sleep, bradycardia and feeding pattern disturbances (Morag & Ohlsson, 2008:1; 2).
- Circadian rhythms are endogenously generated predictive rhythms that have a period length of about 24 hours. It influences the rhythmic production of several hormones (melatonin, cortisol, growth hormone), respiratory and cardiac function, sleep-wake state, level of alertness and body temperature. It may promote growth and prevent other morbidities. It may furthermore increase the satisfaction of care experienced by parents and health care professionals (Morag & Ohlsson, 2008:1,2).
- Keeping the preterm infant continuously in a near-dark environment (5-10 lux), such as when continuously dimming lights, may deprive the preterm infant from time-of-day information they would have received in-utero. It may also overlook the auditory, tactile and kinaesthetic sensory rich environment intra-uterine (Morag & Ohlsson, 2008:1,2).
- Timing to start circadian rhythms has not yet been established (Morag & Ohlsson, 2008:1,2).
- Cycled light (decreased sound and light for 12 hours at night) results in improved weight gain, increased time sleeping and provides beneficial rhythmicity for preterm infants (Aucott *et al.*, 2002:301; Byers, 2003:176).

Sound:

- Preterm infants may respond to the sound of a rattle as early as 28 weeks post-conceptual age by turning and searching, and by 33 weeks this behaviour is well established (Lott, 1989:22).

Risk, benefit/harm & cost

- Soft earplugs/covers have been found to increase oxygen saturation, decrease behavioural state changes and increase quiet sleep time (Byers, 2003:176).
- A change of 3dB in sound represents doubling the sound intensity (Gray *et al.* 1998:36).

Light:

At 32 weeks post-conceptual age, preterm infants without eye pathology have the visual capacities of the term newborn (Lott, 1989:22). Reduced environmental lighting levels showed enhanced biological rhythms, increased alertness, decreased activity and improved respiratory stability, decreased heart rates and respiratory rates and improved sleep patterns, feeding and weight gain (Lotas & Walden, 1996:682; Van den Berg, 2007:435). Lower intensity light in the room provides a more conducive environment for the preterm infant to come to an alert state (Lawhon & Melzar, 1998:58). Table 3-14 provides the evidence to support management of the external environment.

Table 3-14: Evidence to support management of the external environment

Reference	Volume of evidence	Level of evidence	Appli cabl	Consistency
Aida & Snider (2003)	Literature review (concept analysis)	V / B - Good	Yes	No evidence of harm
Aucott *et al.* (2002)	Literature review	V / A – High	Yes	
Byers (2003)	Literature review	V / A – High	Yes	
Goldberg-Hamblin *et al.*	Literature review	V / B – Good	Yes	
Gray *et al.* (1998)	Research utilization (quasi-experimental)	II / A - High	Yes	
Khan (2003)	Literature review	V / A – High	Yes	
Lawhon & Melzar (1988)	Literature review	V / A – High	Yes	
Lotas & Walden (1996)	Critical review	V / A – High	Yes	
Lott (1989)	Literature review	V / B – Good	Yes	
Sehgal & Stack (2006)	Literature review	V / B – Good	Yes	
Sizun & Westrup (2004)	Literature review	V / A – High	Yes	
Starr & Hoye (1998)	Literature review	V / A – High	Yes	
Symington & Pinelli (2006)	Systematic review (36 RCTs)	I / A – High	Yes	
Van den Berg (1997)	Literature review	V / A – High	Yes	
Van den Berg (2007)	Literature review	V / A – High	Yes	
Concepts idendified from ILR: 13,14,15,21,33,34,35,36 (Refer to Figure 3-8).				

Conclusion Statement
Statement 20: Providing age-appropriate sensory input for the preterm infant protects the preterm infant from inappropriate, excessive and stressful stimulation. This can be achieved by management of the macro and micro NICU environment and includes a reduction of noise and light. Providing quiet times and day and night cycles for preterm infants from 32 weeks gestation supports the development of diurnal rhythms, improves weight gain and the time spent sleeping.

Implementation recommendations as described in literature

Description of the course of action

Auditory stimulation:

- Reduce the overall noise level in the NICU (Lawhon & Melzar, 1998:59; Lott, 1989:24; Van den Berg, 2007:436).
- Keep noise level below 45 dB (Goldberg-Hamblin *et al*., 2007:163).
- The combination of background and transient sound should not exceed an hourly mean of 50 dB (Sizun & Westrup, 2004:385; Van den Berg, 2007:436).
- Maximum transient sound should not exceed 70dB (Sizun & Westrup, 2004:385; Van den Berg, 2007:436).
- Measure the sound levels in the NICU and inside the incubator (Lawhon & Melzar, 1998:59).
- Evaluate the auditory impact on each preterm infant (such as conversation, phones, doors, dustbin lids closing and intercoms) and keep it to the minimum (Lawhon & Melzar, 1998:58; Lott, 1989:24).
- Use incubator covers to decrease noise levels inside the incubator (Byers, 2003:176; Lawhon & Melzar, 1998:58; Lott, 1989:24; Seghal & Stack, 2006:1008; Starr & Hoye, 1998:34).
- Use soft ear plugs or ear covers (Byers, 2003:176).
- Promote a NICU environment in which the preterm infant can pick out the mother's voice (Khan, 2003).

- Take architectural features into account when adapting the physical environment (Khan, 2003), such as sound absorbing materials to reduce sound in the NICU (Van den Berg, 2007:436).
- Pad doors and trash can bottoms with felt stripping to cushion the sound of closing (Lawhon & Melzar, 1998:59; Lott, 1989:24).
- Do not tap with fingers on the incubators or place charts on incubators (Starr & Hoye, 1998:34).
- Avoid the use of stereo equipment, radios and telephones in the nursery and move it to the nurses' lounge or station (Lawhon & Melzar, 1998:58; Lott, 1989:24; Starr & Hoye, 1998:34).
- Provide a boundary around an open incubator to remind staff to speak softly and avoid unnecessary disturbance. Place the preterm infant in a closed incubator as soon as possible (Lawhon & Melzar, 1998:59).
- Arrange traffic away from the incubators (Starr & Hoye, 1998:34).
- Close incubator portholes quietly by depressing the button latch until after the porthole is closed (Lott, 1989:24; Seghal & Stack, 2006:1008).
- Ensure good maintenance of all equipment surrounding the preterm infant's bed space (Lawhon & Melzar, 1998:59).
- Closely monitor all humidification devices to ensure no build-up of excess water causing gurgles (Lawhon & Melzar, 1998:59).
- Keep alarm monitors at a level loud enough to be heard, but low enough not to startle the preterm infant (Lawhon & Melzar, 1998:59).
- Respond quickly to alarms (Lott, 1989:24; Seghal & Stack, 2006:1008).
- Move conversations away from the preterm infant's bedside (Lott, 1989:24).

Visual stimulation:

- Note each preterm infant's level of threshold for light via behavioural signals for disorganisation or stress (Van den Berg, 2007:435).
- Decrease ambient light (range of 10-600 lux (Sizun & Westrup, 2004:385) and use incubator covers to shield individual beds from light (Aucott *et al*., 2002:300; Goldberg-Hamblin *et al*., 2007:165; Khan, 2003; Lott, 1989:24; Seghal & Stack, 2006:1008).

- The light in the NICU should not be brighter than 100 foot-candles for adequate visualisation of NICU patients (Van den Berg, 2007:435).
- Use natural light whenever possible (Goldberg-Hamblin *et al.*, 2007:164). At least one source with shading devices (Sizun & Westrup, 2004:385) such as incubator covers.
- Know light equipment lux levels of brightness and adjust to reduce preterm infant exposure (i.e., warming lights during bath time should be directed from back of preterm infant, not side or front facing head on) (Van den Berg, 2007:435).
- Augment bright overhead lighting with individual bedside-controlled lighting (Lawhon & Melzar, 1998:58; Seghal & Stack, 2006:1008).
- Ensure dimmer capability for overhead room lights (Lawhon & Melzar, 1998:58; Seghal & Stack, 2006:1008; Starr & Hoye, 1998:34).
- Ensure adequate lighting to observe the preterm infant (Lott, 1989:24; Seghal & Stack, 2006:1008), but balance the degree of lighting in the room between the amount needed for critical care of an preterm infant without impinging on the needs of other preterm infant (Lawhon & Melzar, 1998:58).
- Avoid direct light of preterm infant care space except for procedures (Van den Berg, 2007:435).
- Direct spotlights away from the preterm infant's head (Lott, 1989:24).
- Individualise light exposure by providing shields, incubator covers, etcetera (Van den Berg, 2007:435).
- Have separate procedural lighting available at each preterm infant's bedside (Sizun & Westrup, 2004:385).
- Ensure a calm and relaxing visual environment that enhances developmental maturation by ensuring pictures and toys that are not overstimulating (Lawhon & Melzar, 1998:59).
- Protect and facilitate REM sleep (Van den Berg, 2007:435).
- Provide periods of reduced lighting of about two hours without interruption: 'quiet times' (Lott, 1989:24; Seghal & Stack, 2006:1008).
- Hold preterm infant in an upright position with lights dimmed to encourage eye opening with social interaction times (Lott, 1989:26).

- Ensure eye protection for preterm infants receiving phototherapy and during interventions which necessitates bright lights (Seghal & Stack, 2006:1008; Starr & Hoye, 1998:34).

Cycled light and quiet times:

- Provide cycled light from 32 weeks gestation (Aucott *et al.*, 2002:301) or when the preterm infant begins to differentiate sleep and wake cycles, to help develop diurnal rhythms (Lawhon & Melzar, 1998:59; Van den Berg, 2007:435).
- Implement quiet times of 2-3 hours during day-time and 12 hours during the evening (Gray *et al.*, 1998:37).
- Close window blinds during daylight quiet time, dim overhead lights and cover incubators and cribs. Lower voices and minimise conversation, while keeping routine procedures to the minimum (Gray *et al.*, 1998:35).

COMPONENTS 7: PAIN MANAGEMENT IN THE PRETERM INFANT

Literature support

The nociceptive pathways develop in the foetus as young as 23 weeks gestation and show an increase in cortisol and endorphin production in response to amniotic infusions. However, neurotransmitters responsible for the modulation of pain only develop later in postnatal life, and for this reason preterm infants have an increased sensitivity to pain compared to adults. These nociceptive neurons are easily stimulated, which leads to a windup phenomenon resulting in exaggerated responses to non-noxious stimuli such as handling, and experiencing these stimuli as painful. A result of these early experiences is that preterm infants may have both structural and functional reorganisation of their nervous system. This could result in diminished behavioural and autonomic pain reactivity to invasive procedures at 32 weeks as well as long-term alteration in pain responses (Aucott *et al.*, 2002:304. 305).

Non-pharmacological treatment of pain includes interventions such as non-nutritive sucking, the administration of sucrose, swaddling and containment and the limitation of environmental sound and light (Sizun & Westrup, 2004:385).

Clinical impact and supporting evidence

Risk, benefit/harm & cost

Pain management within the developmental supportive care approach includes methods of non-pharmacological pain relief options. This includes interventions such as non-nutritive sucking and the use of oral sucrose. The use of oral sucrose showed a decrease in crying, heart rate and pain scores (Aucott *et al.*, 2002:298, 305).

A risk of the use of oral sucrose stated by Aucott *et al.* (2002:305) is desaturation when administering sucrose by syringe. However, no desaturation has been reported in the study and the possible risks are outweighed by the benefits. Table 3-15 provides the evidence to support pain management in the preterm infant.

Table 3-15: Evidence to support pain management in the preterm infant

Reference	**Volume of evidence**	**Level of evidence**	**Applicable**	**Consistency**
Aucott *et al.* (2002)	Literature review	V / A – High	Yes	No evidence of harm with correct administration
Byers (2003)	Literature review	V / A – High	Yes	
Goldberg-Hamblin *et al.* (2007)	Literature review	V / B – Good	Yes	
Khan (2003)	Literature review	V / A – High	Yes	
Lotas & Walden (1996)	Critical review	V / A – High	Yes	
Sehgal & Stack (2006)	Literature review	V / B – Good	Yes	
Sizun & Westrup (2004)	Literature review	V / A – High	Yes	
Starr & Hoye (1998)	Literature review	V / A – High	Yes	
Van den Berg (1997)	Literature review	V / A – High	Yes	
Concepts idendified from ILR: 9,20 (Refer to Figure 3-8).				

Conclusion Statement

Statement 21: Non-pharmacological pain management in the preterm infant includes the use of oral sucrose and the provision of opportunities for non-nutritive sucking to aid in the endurance of painful and minor procedures.

Implementation recommendations as described in literature

Description of the course of action

- Provide non-nutritive sucking with a pacifier during painful procedures, such as heel pricks and intravenous lines insertions (Aucott, 2002:303; Lawhon & Melzar, 1998:60).

COMPONENT 8: FEEDING METHODS

Literature support

Non-nutritive sucking is behaviour present in the preterm infant as early as 27 weeks gestation and is characterised by organised periods of rapid sucking separated by brief periods of rest. Provision of non-nutritive sucking during minor procedures in the NICU is beneficial (Aucott, 2002:301, 302).

Breastfeeding or expressing breast milk for the preterm infant allows mothers to nurture their preterm infants even when there is little else they can do (Aucott *et al.*, 2002:304). Feeding provides opportunities for social interaction with the preterm infant depending on her ability to tolerate stimulation (Lott, 1989:26).

Clinical impact and supporting evidence

Risk, benefit/harm & cost

Non-nutritive sucking: Non-nutritive sucking during gavage feeding has been associated with faster progress to bottle or breast feeding (Lawhon & Melzar, 1998:60; Lotas & Walden, 1996:682; Sizun & Westrup, 2004:385), maturation of nutritive sucking, improved gastro-intestinal motility and the improvement of feeding tolerance, digestion (Sizun & Westrup, 2004:385) and feeding performance. Non-nutritive sucking has also been associated with a decrease in activity and heart rate and an increased weight gain and oxygen saturation, decreased crying with painful procedures, decreased defensive behaviour with gavage feeding and reduction in hospital length of stay (7.1 days). Non-nutritive sucking is also associated with a significant decrease in somatostatin levels (Aucott, 2002:301, 302; Byers, 2003:177; Khan, 2003; Lotas & Walden, 1996:682; Lott, 1989:26; Sizun & Westrup, 2004:385).

It further promotes social interaction when the preterm infant is awake (Mahoney & Cohen, 2005:203) and improves behavioural state when offered before feeding (Byers, 2003:177; Lawhon & Melzar, 1998:60; Lott, 1989:26; Sizun & Westrup, 2004:385). No harmful effects have been reported with non-nutritive sucking (Aucott, 2002:302; Byers, 2003:177).

Breastfeeding: Mothers who are encouraged to breastfeed report that providing breast milk helped them to cope with the NICU and to stay connected to their preterm infant during the hospitalisation (Aucott *et al.*, 2002:304). Table 3-16 provides evidence to support feeding methods.

Table 3-16: Evidence to support feeding methods

Reference	Volume of evidence	Level of evidence	Applicable	Consistency
Aucott *et al.* (2002)	Literature review	V / A – High	Yes	No evidence of harm
Byers (2003)	Literature review	V / A – High	Yes	
Goldberg-Hamblin *et al.*	Literature review	V / B – Good	Yes	
Khan (2003)	Literature review	V / A – High	Yes	
Lawhon & Melzar (1988)	Literature review	V / A – High	Yes	
Lotas & Walden (1996)	Critical review	V / A – High	Yes	
Lott (1989)	Literature review	V / B – Good	Yes	
Sizun & Westrup (2004)	Literature review	V / A – High	Yes	
Concepts idendified from ILR: 19,20,25 (Refer to Figure 3-8).				

Conclusion Statement

Statement 22: Provision of non-nutritive sucking opportunities during gavage feeding contributes to feeding maturation in the preterm infant and is associated with physiological stability.

Implementation recommendations as described in literature

Description of the course of action

- Provide non-nutritive sucking with a pacifier during gavage feeding and painful procedures (Aucott, 2002:303; Mahoney & Cohen, 2005:203; Lawhon & Melzar, 1998:60).

- Provide the preterm infant with self-regulation opportunities through sucking by providing a pacifier or place her hands near her mouth to increase self-soothing (Goldberg-Hamblin *et al.*, 2007:164, 165; Khan, 2003).
- Prepare the preterm infant for feeding by wrapping and positioning her inside the incubator in a manner that will decrease the need for repositioning after the feed. When holding the preterm infant during feeding place the monitor leads beneath the swaddling so as to not disturb the preterm infant when placing her back (Lawhon & Melzar, 1998:60).
- Cradle the preterm infant in the arms with the face approximately 20cm away from the caregiver to provide containment and visual stimulation (Lott, 1989:26).
- Reduce light and noise during feeding time to promote optimal interaction (Lott, 1989:26)

Feeding procedures:

Als described feeding procedure implementation recommendations (Als, 1982:240).

- Do not interrupt when in deep sleep or quiet alert state.
- Gavage fed preterm infants on the ventilator should be in a flexed position for better hip, knee, shoulder and elbow flexion.
- Provide containment along the back and the soles of the feet.
- A soft graspable cloth or caregiver's finger in both hands can facilitate sucking and trunkal-flexion configuration.
- Offer a pacifier to suck during gavage feeds as soon as the preterm infant is facially relaxed.
- Ensure a period for stabilisation after feeding.

Oral feeding:

Als described feeding procedure implementation recommendations (Als, 1982:240, 241):

- Feed in a state appropriate for feeding
- Cradle preterm infant in the arm and lap about 20cm away from caregiver's face
- Face away from direct light
- Ensure subdued ambient noise and light
- If appropriate talk softly to the preterm infant to encourage alert state

- Introduce the nipple while the preterm infant is in a supported tucked (flexor) position
- Burp gently over the shoulder to promote flexion, cuddling and visual alertness
- Allow resting periods as needed and prevent overstimulation.

COMPONENT 9: KNOWLEDGE OF PRETERM INFANT DEVELOPMENT

Literature support

Aita and Snider (2003:227, 228) state that all professionals should have *accurate* knowledge of the development of preterm infants in the NICU environment. For this reason not only neonatal nurses, but also other health care professionals and follow-up clinic staff should be educated. This professional knowledge is essential in the ability to read the cues and behaviours of the preterm infant during interactions.

Preterm infants who are difficult to soothe often cry, makes little eye contact, and shows little positive, attention-seeking behaviour from the caregiver. Preterm infants show sensitivity to noise, light and other sensory stimuli (Goldberg-Hamblin *et al.*, 2007:163).

Parental education: Lott (1989:26) states that a few well-spent minutes teaching parents about their baby can have a more lasting influence than hours actually caring for the baby. Caregivers should focus parents' attention on their baby's abilities rather that the condition. They should be taught to recognise early signs of stress demonstrated by the preterm infant. Parents have more time, patience, and motivation to provide appropriate stimulation to their preterm infant, and in addition their role in doing so increases their self-esteem, self-confidence, and a feeling of control (Lott, 1989:27).

Team approach: Preterm infants with complications such as neck extensor hypertonia that is difficult to position; asymmetries and joint contractures warrants consultation with a therapist (Aucott *et al.*, 2002:302).

Clinical impact and supporting evidence

The supporting evidence for this component are provided in table 3-17.

Table 3-17: Evidence to support the value of having knowledge of preterm infant development

Reference	Volume of evidence	Level of evidence	Appli cable	Consistency
Aita & Snider (2003)	Literature review (concept analysis)	V / B - Good	Yes	No evidence of harm
Aucott *et al.* (2002)	Literature review	V / A – High	Yes	
Goldberg-Hamblin *et al.*	Literature review	V / B – Good	Yes	
Lott (1989)	Literature review	V / B – Good	Yes	
Sehgal & Stack (2006)	Literature review	V / B – Good	Yes	
Concepts idendified from ILR: 39,40,41 (Refer to Figure 3-8).				

Conclusion Statements

Statement 23: A multi-disciplinary approach to developmental care requires collaboration of all health care professional in the NICU who interact with the preterm infant and sharing of knowledge between the various professionals involved in the care of a preterm infant.

Statement 24: Parental involvement and family education are important and parents should be taught to interact with their preterm infant, including reading of behavioural signs and stress cues.

Statement 25: Professionals who are in interaction with preterm infants in an NICU environment need to have accurate knowledge about their development, including reading of preterm infant cues and behaviours during interaction. Developmental care training should be offered in advanced practice courses in neonatal care.

Implementation recommendations as described in literature

Description of the course of action

Professional education:

- Teaching about developmental care should be expanded to non-nursing professionals as well.
- Professional knowledge should include the ability to read facial expressions and motoric cues and behaviours during interactions to determine whether the

preterm infant is calm or stressed (Aita & Snider, 2003:227, 228; Goldberg-Hamblin *et al.*, 2007:165).

- Familiarity with any materials to provide developmental care in the NICU is essential.
- Developmental care training should be offered in advanced practice courses in neonatal care.

Multidisciplinary team approach:

- Share knowledge between professionals and follow a multi-disciplinary team method in the NICU. All should be familiar with preterm infant's developmental care plan, and should participate in its application.
- Set clear criteria for situations or complications when a therapist should be consulted (Aita & Snider, 2003:227,228; Aucott *et al.*, 2002:203).

Parent education:

- Focus parental attention on the preterm infant and not the condition (Lott, 1989:26).
- Teach parents to recognise early stress signs in their preterm infant (Lott, 1989:26).
- Teach parents appropriate touch to 'tune in' to the preterm infant and provide or assist with care (Seghal & Stack, 2006:1008).

Parental support:

Als described implementation recommendations regarding knowledge of preterm infant development (Als, 1982:241, 242; Als *et al.* 1982:56, 57; Als, 1992:359):

- Acknowledge the difficult task of preterm parenting and free parents from feelings such as guilt, helplessness, anxiety and fear.
- Acknowledge parents as an integral part of preterm infant care, both as partner and participant.
- Assure parents of the significance of the preterm infant's communication and the importance of them responding to these communications.
- Encourage parents to observe the preterm infant and to trust their own observations.
- Support parents into recapturing their baby as theirs, their need to protect and grow trust in the preterm infant's integrity and autonomy.

Figure 3-8 shows the results after critical interpretive synthesis of data.

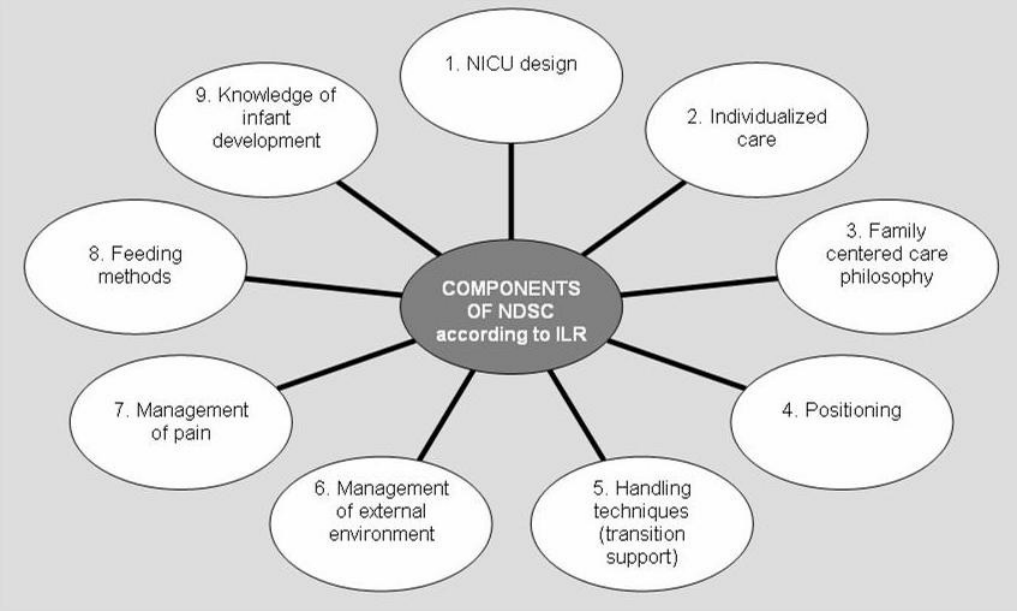

Figure 3-9: Nine components of NDSC as derived from the ILR

3.2.5 STEP 5 OF IINTEGRATIVE LITERATURE REVIEW - CONCLUSION STATEMENTS AND PRESENTATION

The presentation phase is the fifth and final step of the integrative review where conclusion statements are formulated and verified (Whittemore & Knafl, 2005:552; Cooper, 1982a:7). There is no accepted format for reporting ILRs. Several journals do offer guidelines, but they are inconsistent. Cooper (1982a:7) suggests a format for ILR reporting that is similar to primary research, which includes introduction, methods, results, and discussion sections. Conclusions of the integrative review of this study are reported in table or schematic form. Explicit details from the primary sources and evidence to support conclusions are provided to demonstrate a logical chain of evidence. This contributes to rigour, since it allows the reader of the review to ensure that the conclusion of the review did not exceed the evidence. Conclusion statements have implications for practice, research and policy initiatives.

Dissemination of the findings from an ILR is paramount to the development of the body of knowledge of nursing. Commonalities, differences and generalisations were identified. A visual diagram was developed and revised and all conclusions verified with the independent reviewer and peers. Finally, the review process was completed by a new conceptualisation of the topic. However, this conceptualisation was only done after completion of stage 2 of the study – situational analysis, since the

conceptualisation for this study was specific to the components of NDSC in the South African public sector NICU's and the results at this stage is applicable to the international context, since this is where the literature reviewed originated. The components of NDSC as derived from the ILR were listed in schematic form and defined (Whittemore & Knafl, 2005:552).

NOTE: As stated earlier, the themes derived from literature are regarded as preliminary components of NDSC for this study and may still change depending on the results gathered from the situational analysis making it specific to the South African context. It should therefore not be regarded as premature categorising of data. The summary of the conclusion statements are numbered, since more statements follow later in the study and numbered statements aids in referencing when synthesising.

3.2.5.1 Summary of conclusion statements

(1) Members of the NICU team are encouraged to create an environment closer to the intra-uterine environment in order to promote normal neonatal growth and development in the preterm infant.

(2) Integrating age-appropriate, individualised developmental care into the preterm infant's nursing care enhances the competencies of the preterm and very-low-birth-weight preterm infant, as well as parenting skills and abilities.

(3) A family-centred approach emphasises the individuality of the preterm infant and multidisciplinary interaction, and also provides optimal care that supports individual preterm infant development.

(4) The goal of family-centred care is to support parents to develop care skills and techniques, thus including the family as active participants of the health care team and leaving the power with them.

(5) A family-centred approach reduces maternal stress and depression, improves parent-infant feeding and physical contact, increases self-esteem and lessens anxiety.

(6) Positioning of the preterm infant in a contained, flexed posture with firm boundaries, neck neutral, shoulders protracted and the body symmetric, mimicking the intra-uterine conditions, supports the development of flexor tone prior to term and provides the preterm infant with a sense of containment and

hand-to-midline position that allows better self-organisation and self-consoling behaviour.

(7) Prone or side-lying positions with adequate support are preferable to supine positioning.

(8) State regulation is supported by a quiet, soothing environment, individualised care, appropriate timing for caregiving events with regard to sleep/wakefulness cycles and supporting and pacing events to minimise stress and promote stable relaxed care.

(9) Sleep is important for growth and development. Care and handling should be planned carefully, taking into consideration the preterm infant's cues and responses to provide continuous rest periods of at least 2-3 hours.

(10) Care-giving should be modified by scheduling interventions around sleep (clustering), maintaining of flexion, containment and facilitation during procedures.

(11) Providing handling that is responsive to the preterm infant's cues minimise stress, therefore care-giving should be modified by providing pacing and rest periods according to preterm infant cues (time-out), and multi-modal stimulation when applicable.

(12) Swaddled preterm infants show less physiological distress, better motor organisation and more effective self-regulatory abilities. Generalised motoric containment of the preterm infant's arms and legs close to the body while in a side-lying or supine position results in significantly lower mean heart rates, shorter mean crying and sleep disruption times, and fewer sleep-state changes after painful procedures.

(13) Moving the preterm infant slowly as a whole, keeping the body and head aligned and the limbs tucked in supports physiological stability.

(14) Skin-to-skin care supports thermoregulation, oxygenation, weight gain and behavioural states in preterm infants of at least 28 weeks gestation and should be started as soon as the preterm infant is regarded as physiologically stable (i.e. no deterioration of condition within 24 hours before KC).

(15) The preterm infant should be touched and direct hands-on care-giving should be modified according to the individual behaviours and physiological responses of the preterm infant.

(16) Self-regulation opportunities contribute to physiological stability during interventions and are provided by means of positioning the preterm infant to support the hands in the midline, close to the face, provide opportunities for grasping and a pacifier for non-nutritive sucking if applicable.

(17) Vestibular stimulation facilitates quiet sleep and may help bring the stable preterm infant to a more alert state.

(18) Co-bedding supports co-regulation, balancing and support for siblings placed next to each other in the same bed.

(19) Transitional support assists the preterm infant to reach a calm and regulated state before beginning an intervention, to improve tolerance and help with easy recovery after completion of interventions.

(20) Providing age-appropriate sensory input for the preterm infant protects the preterm infant from inappropriate, excessive and stressful stimulation. This can be achieved by management of the macro and micro NICU environment and include a reduction of noise and light. Providing quiet times and day and night cycles for preterm infants from 32 weeks gestation supports the development of diurnal rhythms, improve weight gain and the time spent sleeping.

(21) Non-pharmacological pain management in the preterm infant includes the use of oral sucrose and the provision of opportunities for non-nutritive sucking to aid in the endurance of painful and minor procedures.

(22) Provision of non-nutritive sucking opportunities during gavage feeding contributes to feeding maturation in the preterm infant and is associated with physiological stability.

(23) A multi-disciplinary approach to developmental care requires collaboration of all health care professional in the NICU who are interacting with the preterm infant and sharing of knowledge between the various professionals involved in the care of a preterm infant.

(24) Parental involvement and family education are important and parents should be taught to interact with their preterm infant, including reading of behavioural signs and stress cues.

(25) Professionals who are in interaction with preterm infants in an NICU environment need to have accurate knowledge about their development, including reading of preterm infant cues and behaviours during interaction. In

addition, developmental care training should be offered in advanced practice courses in neonatal care.

3.3 STRATEGIES TO ENSURE RIGOUR IN PHASE ONE OF THE STUDY

Rigour refers to the establishment of confidence in the truth (credibility) of the findings, including the strategies used; the evidence provided and the criteria according to which this credibility was established (Lincoln & Guba, 1985:290). General aspects of rigour as stated by Lincoln and Guba's classification (1985:290) are discussed in Table 3-18 and then more detailed strategies for ensuring rigour follow.

Table 3-18: Rigour during phase one of the study

Criterion	Strategies to ensure rigour
Validity	Detailed documentation of all the steps of the ILR provided to allow for replicability by other researchers (Cooper, 1982a:8)
Credibility	Prolonged engagement (refer to Table 1-7) Triangulation of data sources: Journals, Books, Studies, Policies, Protocols and Guidelines. Literature and documents assessed on different levels such as the opinions of respected authorities, based on clinical experience and the use of descriptive studies or reports of expert committees (refer to Table 1-7) Thick description of method and procedure (refer to Table 1-7) Evidence together with the levels of evidence of data are described (refer to addendum 3-4 and 3-5)
Transferability	Thick description of methods, processes and results (refer to Table 1-7) Purposive sampling (refer to Table 1-7) Findings congruent with the 'Synactive Theory of Infant Development' (refer to 1.5.3.1) Findings not generalisable – the intention of the study was to contextualise findings for South Africa
Confirmability	Audit trail provided through documentation of the systematic collection of material and documents (refer to Table 1-7) Researcher immersed into data Peer examination of findings (refer to Table 1-7) Confirmability established when credibility and transferability proven (refer to Table 1-7)
Dependability	Demonstrated credibility and thick description of context (refer to 1.6.5) Research question is stated clearly and the features of the ILR design are congruent with it (refer to 1.3) Data was collected across the full range of appropriate settings and respondents as suggested by the research question (refer to 1.6) Themes/categories were checked by using independent reviewers and adequate agreement was reached through consensus meetings (refer to Table 1-7)
Reflexivity	Research perspective stated by making beliefs and values explicit (refer to 1-4)

3.3.1 RIGOUR IN THE PROBLEM FORMULATION STAGE

Rigour during the problem formulation stage are now discussed

3.3.1.1 Measures to ensure validity

Cooper (1982a:3) suggests that the broadest conceptual definition possible be used and attention paid to the differences in study methodologies. The reviewer constantly balanced the conceptual definition and methods during the process. As already discussed the research question was broadened to describe the components of NDSC, not specific to preterm infants or in the South African context. The problem was clearly identified and the review purpose and variables well specified to ensure an appropriate sampling frame as well as t facilitate the ability to accurately operationalise variables and extract appropriate data from primary sources, including research and non-research studies. The review was further carried out from an explicit theoretical framework – the Synactive Theory of Development (Whittemore & Knafl, 2005:548).

3.3.2 RIGOUR IN THE LITERATURE SEARCH STAGE

Search strategies were well defined in order to ensure validity. The literature search process was clearly documented, including search terms, databases used, additional search strategies, and inclusion and exclusion criteria for determining relevant primary sources.

An independent reviewer validated the search strategies and results, to ensure complete database search and unbiased search results.

More than one search strategy was used to ensure a comprehensive search that identified the maximum number of eligible primary sources:

- Computerised databases were utilised for efficiency and cost effectiveness;
- Journal hand searching;
- Networking;
- Searching search registries were used to address the limitation of possible inconsistency in search terminology and indexing problems.

Purposive sampling was further combined with the comprehensive search, and sampling was justified, discrepancies discussed and studies included or excluded by means of consensus with the independent reviewer.

3.3.3 RIGOUR IN THE DATA COLLECTION STAGE

Cooper (1982a:5) stated threats to validity and these threats were considered to ensure that the current techniques used in this study really address these threats and ensure a more rigorous process.

3.3.3.1 Threats to validity in data collection:

- The review may not include all studies pertinent to the topic of interest in case of the population or inclusion criteria not being wide enough (Cooper, 1982a:5).
- The individuals in the retrieved studies may not represent all individuals in the target population (Cooper, 1982a:5).
- Only one reviewer was responsible for the data collection process, which could result in human error.
- Repeating the identical search on different dates led to different results (N values), since databases are continuously updated.

3.3.3.2 Ensuring validity during data collection:

Inadequate sampling was addressed by identifying studies that were not included with a description of why they were not included, followed by a discussion of how they might have shown results different from the selected studies (Russell, 2005 [Online]). Discrepancy between collected studies and the target population may also threat the validity. The reviewer determined how the elements contained in the collected studies were different from the target population. Retrieval procedures where exhaustive in that the comprehensive integrative review contained articles conducted at different times, in different places, with different samples of ages and gender, while using different methodologies. This method increased generalisability, because the target population is often better represented in the reviewed articles (Cooper, 1982a:5).

3.3.4 RIGOUR OF DATA INTERPRETATION AND SYNTHESIS DURING THE ILR

A variety of threats to the validity of data interpretation and synthesis may be evident and will be discussed shortly to demonstrate how validity was ensured for this study.

3.3.4.1 Threats to validity

One threat to validity in the data evaluation phase is the tendency to positively evaluate research that is congruent with the reviewer's own beliefs and negatively evaluate those studies that are not. The reviewer evaluated each study's methodology to determine whether the findings were valid and reliable (Cooper, 1982a:5). Objectivity in methodology evaluation was enhanced by using a methodological evaluation list to score each study's methods (Johns Hopkins instrument). A limitation may be when a single person performs the complete review, since this may give rise to bias, therefore an independent reviewer was used at different stages of the study.

There were several threats to the analysis and interpretation stages. The first threat involved reviewers not following appropriate rules of inference. The assumptions for statistical tests were not always clearly delineated in the studies. If additional secondary analyses were undertaken, the reviewer had to assume that the primary researcher interpreted rules of inference correctly. The second threat was inferring causality that was inappropriate when examining research review data. Cooper notes (in Russell, 2005 [Online]), that 'study-based evidence is capable of establishing causal precedence among variables while review-based evidence is always purely associational' (Cooper, 1998:155).

3.3.4.2 Ensuring validity

Experts were consulted and the review compiled under guidance of promoters. An independent reviewer who is an expert in the fields of nursing research and NDSC was used to validate the search strategy and co-appraise all studies. An appraisal instrument suitable for each type of source included for review was used and the instrument for each paper is available for audit (Whittemore & Knafl, 2005:550) (addendums 3-2 & 3-3).

In accordance with Cooper's (1982a:6) recommendations and Whittemore and Knafl's (2005:551) suggestions the following strategies were followed for reviewers to preserve validity: (i) the entire process of data analysis was well documented

regarding decisions, analytical hunches, thoughts and any other idea that may directly relate to the interpretation of the data, (ii) analytical honesty was priority and the analysis process was made transparent, (iii) assumptions were made clear by the reviewer when discussing results and inferences, (iv) important interpretation rules were identified, and (v) evidence that is single study-based was clearly delineated from those that are review-based.

3.3.5 RIGOUR DURING THE PRESENTATION OF THE RESULTS

Rigour during the presentation of the results is now discussed.

3.3.5.1 Threats to the validity in the presentation of results

Several threats to validity exist when writing the integrative review. First, the reviewer might omit important details and information about how the integrative review was conducted (Cooper, 1982a:7). This omission could affect the availability of information about the relationships between variables in study. Second, the ability to reproduce review findings is impaired if details of the study methods and moderators of relationships are not stated. Suggestions to reduce these threats include giving much attention to all possible details of the report. In reporting integrative reviews the reviewer must be so explicit that another reviewer could follow the same strategy without difficulty.

3.3.5.2 Ensuring presentation validity

Explicit details from primary sources and evidence were provided as summaries to demonstrate the logical chain of evidence, and are included in more detail in Addendums. Implications for practice, research and policy initiatives were emphasised. All methodological limitations of the review were explicitly stated (Whittemore & Knafl, 2005:552).

3.3.6 RIGOUR IN THE CONCLUSION STATEMENTS

Rigour in the formulation of conclusion statements is now discussed.

3.3.6.1 Validity of conclusion statements

The entire process of data analysis was documented including: decisions, thoughts, puzzles, or any other related that could influence decision making. This also provided an audit trail for users of the research. Analytical honesty received high

priority and the data analysis process was made transparent with documentation and explanation (Whittemore & Knafl, 2005:551).

3.4 SUMMARY

Chapter 3 described the results of the ILR as employed in this research study. Fourty-two components of NDSC were identified. These components were categorised according to themes described in the literature mentioned and nine components of NDSC of the preterm infant in the NICU were identified from the ILR including: NICU design, individualised care, family-centred care philosophy, positioning, handling techniques (transitional support), management of the external environment, management of pain, feeding methods and knowledge of preterm infant development. Specific interventions were described under each of the components.

Specific interventions were described in literature and these interventions provided the description of each of the components. The evidence from stage one was used to develop a checklist. The checklist was used for the sitational analysis of the operationalisation of NDSC in public sector NICUs in South Africa.

Components of NDSC will be confirmed after completion of stage 2. Figure 3-10 below gives a schematic overview of the research process as described in this section in order to summarise the ILR process.

Chapter 4 focusses on stage 2 of the study and involves situational analysis of selected NICU's in the South African public sector by means of a checklist design, observation guided by a checklist, interviews and field notes.

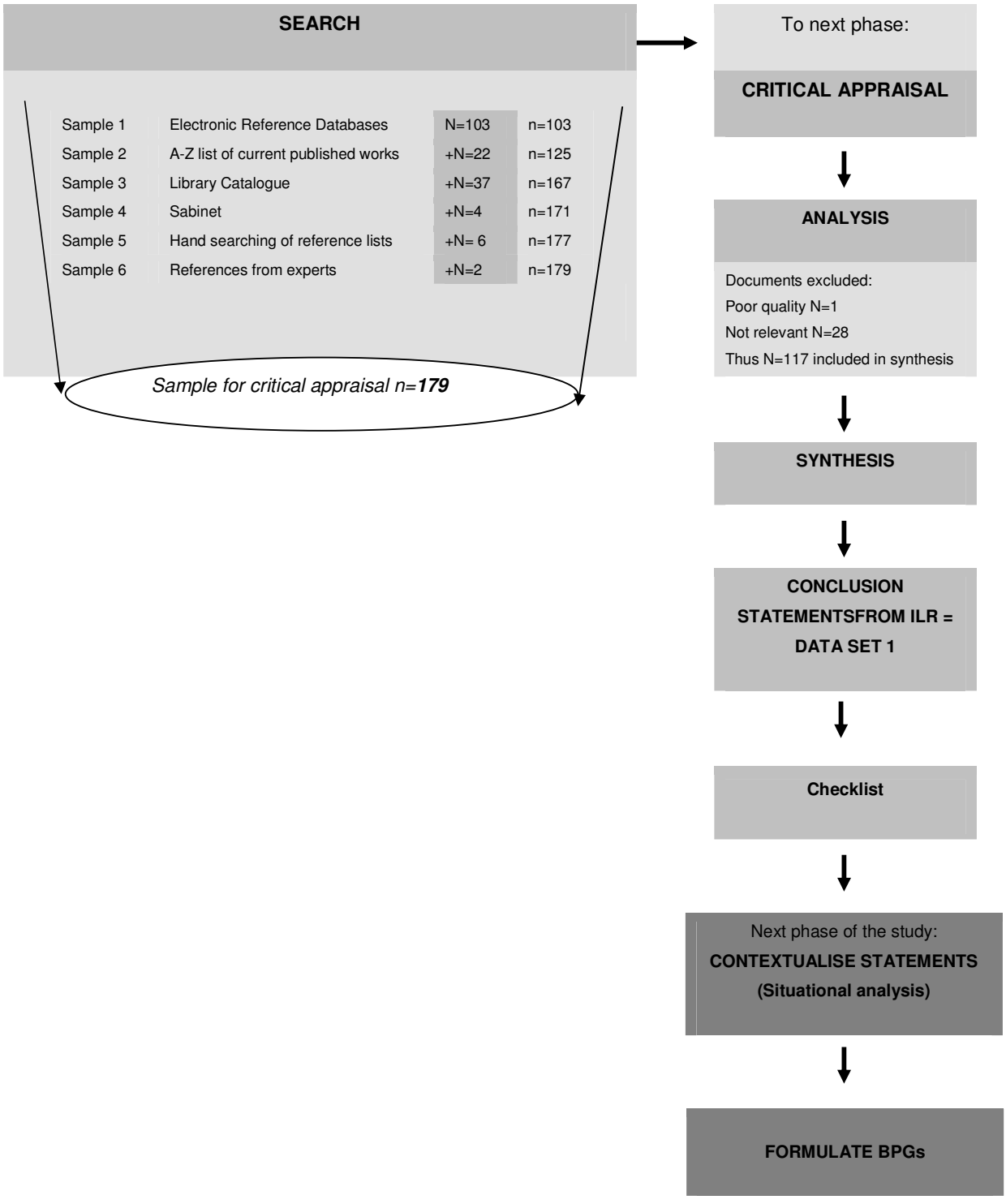

Figure 3-10: Summary of the research process followed in this study, highlighting the ILR process

CHAPTER 4: SITUATIONAL ANALYSIS

4.1 INTRODUCTION

The previous chapter discussed the identification of the components of NDSC as derived from literature, making use of the ILR method. 42 concepts were identified, which were grouped together to derive the components of NDSC. Figure 4-1 on the next page provides a list of the 42 concepts and the identified components derived through deductive logic. The number of the concepts is placed in brackets after the components to indicate the process. This table was also provided earlier as Figure 3-8.

Chapter 4 is a discussion of the method of the situational analysis as performed during stage 2 of the research study. The focus is on the achievement of objective 2 of the study.

OBJECTIVE 2: To conduct a situational analysis of the operationalisation of NDSC in the public sector hospital in South Africa.

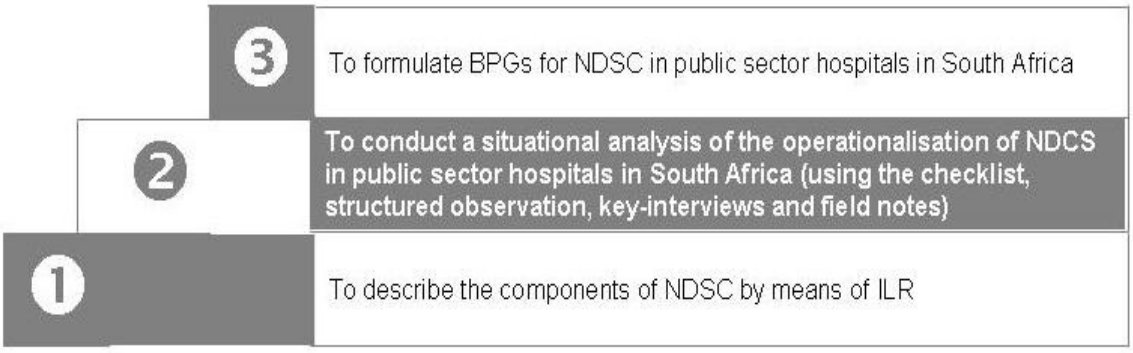

Figure 4-1: Schematic presentation of the stages followed in this study, highlighting stage 2 (addressing objectives 2 and 3)

The situational analysis consisted of four steps:

- design of checklist and its implementation
- structured observation complemented by
- interviews; and
- field notes.

Figure 4-2 demonstrates how the 42 concepts from the ILR were grouped together to derive nine components of NDSC. Concepts indicated in brackets next to components. Refer to Figure 3-7 to view the process followed.

42 CONCEPTS IDENTIFIED FROM ILR		
1. Anatomical preterm infant positioning	17. Modifying of care-giving	32. Quiet times
2. Co-bedding multiples	18. Move slowly, as a whole, keeping body and head aligned and limbs tucked in	33. Reading of preterm infant cues and behaviours
3. Day and night cycle	19. Non-nutritive sucking	34. Reducing environmental stimuli - light
4. Developmentally appropriate care	20. Non-nutritive sucking during gavage feeding	35. Reducing environmental stimuli - noise
5. Environment to promote growth and developmental care according to developmental maturity	21. Olfactory stimulation	36. Reducing sensory monotony
6. Family-centred care philosophy	22. Parents as active participants in care	37. Support gradual state changes
7. Flexion	23. Positioning	38. Swaddling
8. Flexion with positioning (hips)	24. Positive tactile stimulation	39. Systematic observation/continuous assessment and evaluation of preterm infants' developmental needs
9. Flexion with positioning (limbs and shoulders)	25. Preparing for feeding	40. Teaching of professionals on developmental care
10. Individualised bedding/support	26. Primary nursing care	41. Teaching parents to interact with preterm infant
11. Individualised care giving method	27. Privacy and comfort	42. Uterine environment
12. Kangaroo care	28. Promote self-regulation	
13. Macro environment	29. Promote state regulation	
14. Management of external environment	30. Promoting periods of rest	
15. Micro environment	31. Prone or side-lying rather than supine (lung disease)	
16. Modifying direct hands-on care - giving		

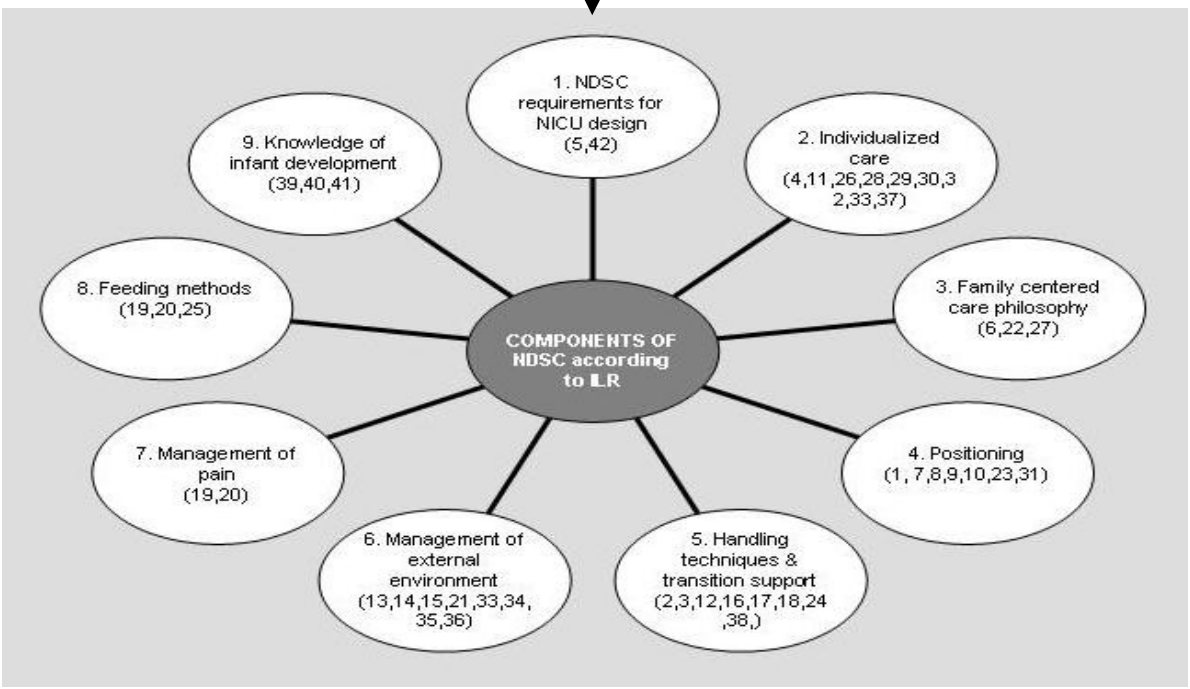

Figure 4-2: Components of NDSC as derived from the ILR

Each of these steps is discussed in this chapter with reference to the method. Research method as defined by Klopper (2008: 69) includes the steps of population and sample, data collection, ensuring rigour and data analysis.

4.2 THE CHECKLIST

The first step of the situational analysis was to design a checklist from the results of the ILR (stage one). The purpose of the checklist was to use it as an instrument during the structured observation process (step 2). The process followed to design the checklist is explained in Figure 4-3 below.

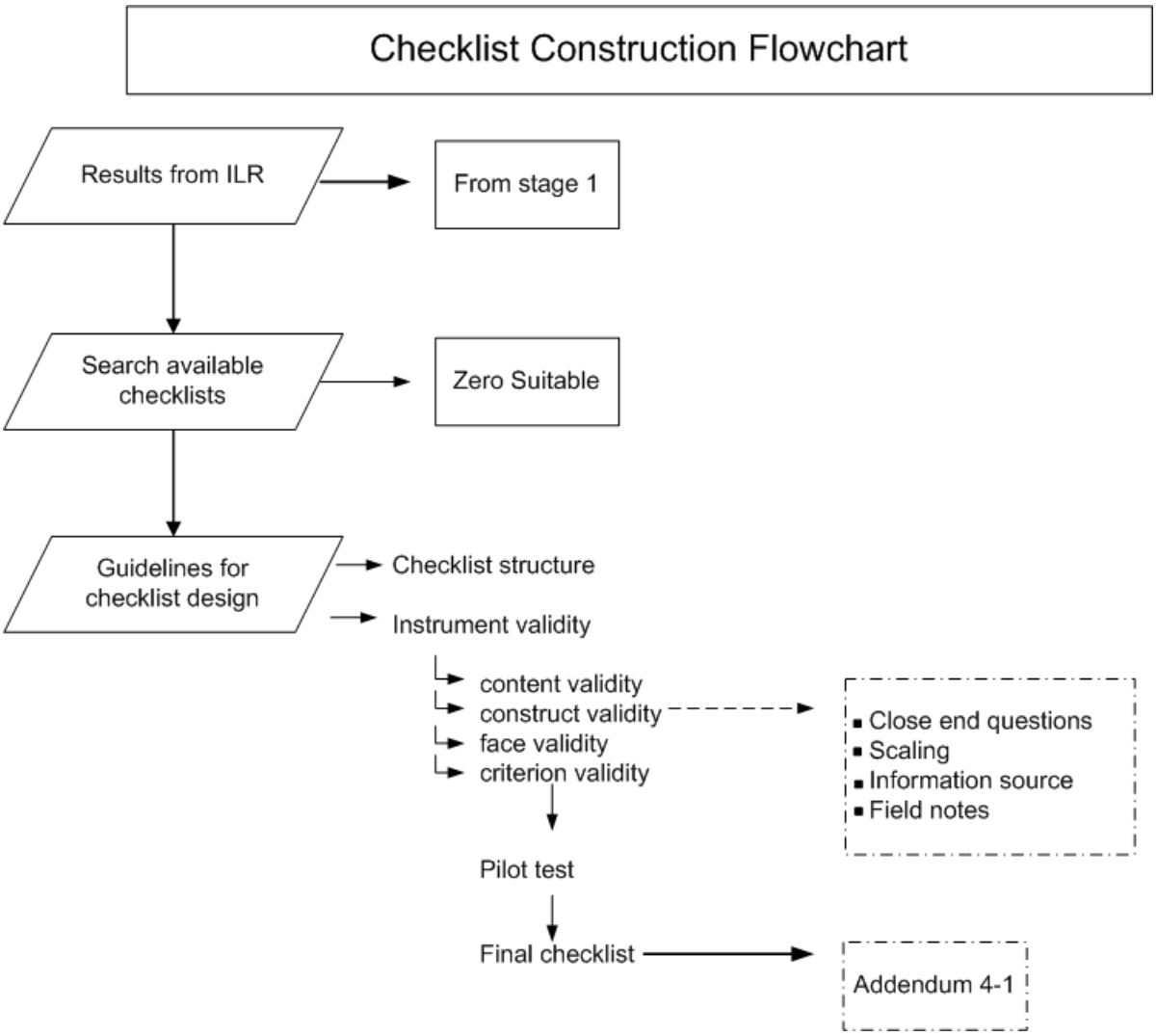

Figure 4-3: Flowchart of the checklist design process

As indicated earlier the purpose of the checklist was to use it during the structured observation process in order to determine to which extend the components of NDSC were implemented in selected neonatal intensive care units (NICU) in the public sector in South Africa. Prior to the development of the checklist, literature was searched to ascertain the existence of checklists that could be used during the situational analysis. A number of guidelines, assessment tools and evaluation instruments were available, but no suitable checklist could be found. Firstly, no comprehensive checklist was available that focused on all the components of NDSC, and secondly, only one checklist was available applicable to the South African context (Hennessy, 2006). However, it could not be used in its entirety for this study, since the components as identified during the ILR and the components addressed in the existing instrument did not correlate. The available guidelines that were evaluated for possible inclusion in the checklist included the:

- "*Recommended Standard for Newborn ICU Design*" (White, 2006 [online]). It includes 25 standards of the NICU, many of which entail aspects of NICU design, infection and is organisational in character and not purely NDSC.
- "*Developmental Care Guidelines for Use in the Newborn Intensive Care Unit (NICU)*" (Als & McAnulty, 2001). This document identifies useful guidelines. However, it is based on literature older than 10 years. The researcher wanted to ensure that the checklist is based on the most current available evidence.
- "*Profile of the Nursery Environment and of Care Components*" (Als *et al., 2006*). This document is very detailed and had the ability to be adapted into a comprehensive checklist, especially since it has been developed by authorities in the field of NDSC such as Heidelise Als. However, it is a NIDCAP Federation International document that is part of the NIDCAP training and therefore not available to the public and professionals who have not completed NIDCAP training.
- *Newborn Individualised Developmental Care and Assessment Programme* (NIDCAP) (Lawhon & Hedlund, 2008:133-144). This NIDCAP document describes the training programme on developmental care. The assessment program focuses on the infant and not on NDSC components and requires extensive and expensive training (abroad and payable in USD currency) prior to any implementation, and it does not address the context specific needs of the South African public sector hospital, since the programme was designed for a

first world context and not a developing country and is not easily accessible as explained.

- Finally a South African audit instrument was found known as the "*Environmental Audit Instrument*" designed by Hennessy (2006). It was considered since it was a study performed in the South African public sector context. However, nine NDSC components were identified during the ILR (Stage 1 of this study) in contrast to the seven identified for the Hennesy instrument. It furthermore evaluated patients, while the researcher in this study aimed to assess the unit as a whole and not the individual patients. Although the Hennessy Instrument provided a good structure, the researcher wanted to ensure that all aspects included in the checklist were thoroughly based on evidence and measured the identified components NDSC and not examples of interventions.

The above-mentioned guidelines, assessment tools and evaluation instruments have been reviewed for possible use, but it is clear that a suitable checklist was not available and it was not suitable for use without significant adaptation. Therefore a checklist based on the most recent available evidence was developed for use in the South African public sector as part of the situational analysis in this study.

During the design of the checklist basic principles listed by Fouche (2000:157-158) and Babbie and Mouton (2002:233-239) provided a framework for asking questions that should be taken in consideration during instrument development. The next section discusses these basic principles.

4.2.1 BASIC PRINCIPLES FOLLOWED IN THE DESIGN OF THE CHECKLIST

Since no checklist was available for use the components of NDSC were identified through the ILR in stage 1 of this study. The conclusion statements and recommendations for implementation were translated into questions. The checklist that was developed was brief in order to include only the necessary questions to collect the relevant information, but without sacrificing any important information that may be needed. This is known as the economic principle, allowing respondents to communicate as much information as possible in the briefest possible time (Fouche, 2000:156).

The basic principles employed for asking questions included (Fouche, 2000:157-158; Babbie & Mouton, 2002:233-239):

- Brief, clear sentences in a style that is understandable to the respondents.
- Questions must not reflect the bias of the researcher.
- Every question must contain only one thought/idea/construct.
- Every question asked had to be relevant to the purpose of the checklist.
- Negative items should be avoided.

All of these basic principles were adhered to in the design of the checklist.

The checklist was developed from the 25 conclusion statements based on evidence as derived from the ILR in stage 1 (refer to Chapter 3; 3.2.5.1 for summary of statements and Addendum 4.1 for the checklist). The conclusion statements were translated into closed questions and a scale was included after careful consideration by the researcher on what data is needed to answer the research question. This translation was reviewed by a statistician as well as an independent reviewer who is a subject expert (refer to Addendum 2-4).

Closed questions (the fieldworker – in this case the researcher - is requested to select and answer from a list provided) were used for the checklist. The advantages of using closed questions include the result being processed more easily, questions can be answered within the same framework and responses can consequently be compared with one another (Fouche, 2000:161; Babbie & Mouton, 2002:233).

Scaling was selected to facilitate the answering of the research question and the coding of the closed-ended questions included in the checklist. The researcher, in consultation with the statistician, decided to use an ordinal scale, i.e. always (2), sometimes (1), unsure (0), never (-1) and not applicable. The ordinal scale allowed for a value to be assigned to the components and attributes. With a rating of (2) the component is optimally applied, with (1) the application is fair, but there is room for improvement, (0) indicates that it could not be detected and the component is on a warning level, whereas (-1) indicates a high-risk practice due to non-application of NDSC components. If N/A is chosen in a subsection, it would have the effect that the total score of that subsection must be reduced by 2 for each N/A selected. From this the use of NDSC could be calculated as a percentage. For example, if a section had a maximum total of 8, but N/A was marked in one question, then 2 points were deducted from the total of 8, changing the maximum total for that section to 6. This provided each section with a separate value that indicates whether the components

were applied effectively or left room for improvement (The results of the checklist are explained in Chapter 5, Paragraph 5.2.1).

Information source: The checklist also contained a second section in which the source for the information could be indicated (please refer to Addendum 4.1 for checklist). Each question had an additional section in which the researcher could indicate whether the data was obtained from structured observation, records, such as patient files, protocols or policies or from other sources such as the staff in the unit or the parents of the infant. This information provided an accurate audit trail and the information could be useful when identifying possible strengths and gaps in the operationalisation of NDSC. It furthermore provided space for field notes to be recorded by the researcher to complement the structured observation.

COMPONENTS OF NDSC	Question derived from Chapter 2	Always (2)	Sometimes (1)	Unsure (0)	Never (-1)	N/A	If always or sometimes describe how? (Field notes)	Observed	Verified from records	Verified other (specify)
1. NICU DESIGN										
	Is a uterine-like environment created for each infant to support an environment of growth and development?									

Figure 4-4: Extract from the checklist

The checklist provided qualitative and quantitative data and the statements were structured using a 5-point Likert scale. To allow the accommodation of response patterns not anticipated, the researcher made use of field notes (qualitative data), (refer to Chapter 5 and Addendum 5-1). Within the strucutred observation the researcher does not become involved with the phenomena and therefore refrained from getting involved in patient care.

4.2.2 INSTRUMENT VALIDITY

Instrument validity is related to the internal and external validity of the study, but a separate aspect to be addressed. Instrument validity refers to whether an instrument accurately measures what it is supposed to measure, given the context in which it is applied (Brink, 1996:167). The four types of validity used to evaluate the accuracy of an instrument are: content validity, construct validity, face validity and criterion validity.

4.2.2.1 Content validity

Content validity examines the extent to which the method of measurement includes all the major elements relevant to the construct being measured (Burns & Grove, 2005:377). This evidence is obtained from literature, representatives from the relevant population and content experts. The 25 conclusion statements derived from the ILR were used to construct the questions in order to ensure content validity of the checklist. As the 25 conclusion statements are based on the latest evidence available (as established through ILR) on the components of NDSC, the researcher is confident to state that the instrument meets content validity based on evidence-based literature. Furthermore, the checklist was reviewed by a nursing expert in NDSC and neonatal care, as well as the two research promotors (both senior researchers and one an Advanced Midwife and Neonatal Nurse), and the statistician that acted as consultant throughout the study (Ellis, 2008). The experts had a wide range of experience in the field and are familiar with the literature and theory. They evaluated the checklist according to the criteria provided by Burns and Grove (1993) for appropriateness, accuracy, and representation of the professional nurse.

The experts agreed that the checklist was an accurate translation and representation of the data gathered in the ILR (stage 1). However, the combination of four questions into two was suggested to prevent duplication. The checklist has been divided into different sections to facilitate the eventual processing of the data (Fouche, 2000:159). The statistician suggested using the checklist in about eight (8) units to ensure representation of the professional nurse. This was done by applying the checklist in the separate neonatal departments of the selected institutions, which brought the number of checklists completed to twelve (12).

4.2.2.2 Construct validity

Construct validity refers to the question: How does the researcher really know that the items included in the checklist actually measure the construct that the items are supposed to represent? (Mouton & Marais, 1996:68). Burns & Grove (2005:217) state that examination of construct validity determines whether the instrument actually measures the theoretical construct it purports to measure. The following section addresses possible threats to the construct validity of the checklist, but also strategies employed by the researcher to address these threats.

(a) Threats to construct validity and strategies to address it

Three major threats to construct validity of the checklist were identified (Mouton & Marais, 1996:68,69). The threats and strategies to address it are presented in table format (refer to Table 4-1).

Table 4-1: Threats of construct validity and strategies to address it

Threats	Strategies
1. Inadequate pre-operational explication of constructs.	A precise explanation of constructs permits for high construct validity. This was done by conceptualisation of the components of NDSC as described in stage 1 through the ILR.
2. Mono-operation bias refers to the situation that arises when single measurement of a construct is employed.	▪ Through the ILR the components of NDSC were identified. For each of the components the attributes (or empirical indicators) were described. ▪ By using the components and 25 conclusion statements, content and construct validity is ensured. ▪ The systematic research design and method and meticulous planning further added to the construct validity. ▪ To ensure validity for the checklist, interviews and field notes were used for verification of data.
3. Mono-method bias refers to the situation resulting from using the same type of measurement technique for collection data on the construct that is being investigated.	▪ Pilot testing was used to test the items employed within the checklist (Mouton & Marais, 1996:95). ▪ The ILR provided evidence for NDSC components.

4.2.2.3 Face validity

Face validity verifies that the instrument looks like or gives the appearance of measuring the content desired for a study (Burns & Grove, 2005:700; Castle,

2009:2). In this study the checklist measured the content desired for the study in that the conclusion statements regarding the components of NDSC was translated into questions taken up in the checklist. An independent reviewer also verified the translated questions as true translations.

4.2.2.4 Criterion validity

Concurrent validity was not applied in this stage of the research study, however for the sake of comprehensiveness a short explanation is given. Criterion validity is a pragmatic approach to establish a relationship between the scores on the instrument in question and other external criteria (Brink *et al*., 2006:160). *Predictive validity* involves comparing research instrument results obtained from a particular population to a criterion that is expected to occur in that population in the future, for example instrument re-application of NDSC in selected neonatal units (Brink *et al*., 2006:161). *Concurrent validity*: Results of the new instrument are compared to those of a criterion measured at the same point in time, for example self-report of pain compared to physiological indicators of pain (Brink *et al*., 2006:162).

4.3 PILOT STUDY

The checklist developed for this study was verified for content, construct and face validity by experts (refer to Paragrahp 4.2.2.3 for discussion). The checklist was then pilot-tested at one of the selected research sites. The researcher used the checklist personally and therefore improved it based on the experience of the researcher and the data obtained (Fouche, 2000:158). The following changes were made after pilot-testing: Five questions on 'Anatomical infant positioning' and 'flexion' were reshuffled and combined to provide better flow in the checklist (refer to Figure 4.5).

COMPONENTS OF NDSC	Question derived from the ILR
4. POSITIONING	
4.1 ANATOMICAL INFANT	Is the infant positioned anatomically?
Containment	Is the infant contained?
	Does the infant have firm boundaries that fit snugly?
Midline	Is the body position symmetric?
	Is the neck in a neutral position? Head in midline and in line with the body?
	Are the shoulders protracted?
	Are the arms in midline?
Flexion	Are the knees flexed?

	Are the hips flexed in a neutral position with some adduction?
	Is infant kept in flexion (limbs and shoulders) during positioning with postural

Figure 4-5: Re-organisation of questions on anatomical infant positioning after pilot testing

In the section on 'Orientation' as part of 'Positioning' the positioning was presented as a percentage to enable 'quantification' of the results, that is using the percentage and grouping it with the classification of 'always', 'sometimes', 'unsure' and 'never' (refer to Figure 4.6).

Components of NDSC	Question derived from Chapter 2	Always (2)	Sometimes (1)	Unsure (0)	Never (-1)	N/A	If always or sometimes describe how? (Field notes)
4.2 ORIENTATION	In what position is the infant positioned						(**Nb/total: 100% - always, 50-99% - sometimes, < 25-49% - unsure, <25% -**
	Prone? / %						
	Side-lying? / %						
	Supine? / %						

Figure 4-6: Percentages used to determine the category selection of 'always', 'sometimes', 'unsure' and 'never'

Additional space was included on the checklist to provide for demographic data of the unit observed inclusive of the following aspects: (Creswell, 2003:189):

Unit		**Bed capacity**		**No of patients**		**Time**		**Date**	

Figure 4-7: Additional section included for demographic data

This however, did not change any data and therefore the data gathered from the pilot study was included with the final data used for analysis. The final checklist can be viewed in Addendum 4.1 and the results are discussed as part of the situational analysis in Chapter 5. The checklist as designed was used to perform the structured observation as part of the situational analysis.

4.4 STRUCTURED OBSERVATION

Data was collected during the situational analysis by means of structured observation. Observation can be defined as that form of behaviour by means of which a researcher is able to register information from her environment under controlled conditions. It is a process through which the researcher establishes a link between reality and her theoretical assumptions (Mouton & Marais, 1996:157–159,162). In other words, observation is a technique for collecting descriptive data on behaviour, events and situations (Brink, 1996:150) and is a valuable method of data collection to enhance triangulation of information gathered by other means, such as the interviews and checklists used in this study (Tjora, 2006:430). Observation is structured or unstructured. Structured observation was used in this study and "involves behaviours/events to be observed using checklists, categorisation systems and rating scales" (Brink, 1996:150; Klopper & Knobloch, 2009:5).

The structured observation included observation and description of (i) the physical setting of the NICU, (ii) the participants and their roles and tasks, (iii) formal and informal interactions and routines, (iv) frequency and duration of actions and (v) subtle factors such as non-verbal communication, and (6) things that did not happen, but that should have happened (Tjora, 2006:432).

4.4.1 CHALLENGES POSED BY OBSERVATION

According to Tjora (2006:429,430), the use of observation in research has a number of challenges, and is a difficult method of research to apply. Observation makes substantial demands on the researcher, such as potentially uncomfortable, ethical dilemmas, the difficulty of managing a relatively inobtrusive role, the challenge to identify the 'big picture' and finally observing a huge number of fast-moving and complex behaviour and economic constraints on the researcher's time.

Challenges furthermore include the risk of being turned down (by the institution where the research has to be performed) because of the substantial need for the researcher to be present. The second risk is that the researcher may not be able to cope with spending so much time in the research setting and finally there is the dilemma of ending up with piles of data that one may not be able to analyse in such a why to make sense within a social scientific discourse (Tjora, 2006:429).

Although Tjora (2006:432) stated that the general rule about the approach to observation is one of entering the field with complete openness, structured observation in this study was done by means of the checklist developed from the ILR (Mouton & Marais, 1996:157–159,162).

4.4.2 PROCESS OF OBSERVATION

Creswell (1998:125,126) describes observation as method of data collection in a series of steps, similar to the steps followed in this study.

- Select site to be observed.
- At the site, identify who or what to observe, when and for how long.
- Determine a role as an observer.
- Design an observational protocol as a method for recording notes in the field.
- Record aspects such as portraits of the informant, the physical setting, particular events and activities and your own reactions.
- Have someone introduce you if you are and outsider. Be passive and friendly with limited objectives in the first few sessions of observation.
- After observing, slowly withdraw from the site, thanking the participants and informing them of the use of the data and the accessibility to the study.

4.4.3 POPULATION

The unit of analysis for stage 2 (step 1-4) of the study was NDSC. In South Africa there are currently 151 neonatal units of which 53 are in the public sector, and these units form the target population for this part of the study (see 1.6.5 Contextual). These units provide different levels of care ranging from levels one to four (as described in Paragraph 1.5.3.6). Therefore one hospital may provide different levels of care in the different neonatal units. Statistics on the number of registered beds for each level are not publicly available and the information had to be gathered for the sampling process. Different regions and hospitals were not always willing to support the researcher in providing this information due to lack of time and staff, and therefore this data is still limited. However, the academic hospitals' (tertiary level hospitals – refer to 1.5.3.6) data was more accessible.

Firstly, academic public sector hospitals with NICU's, whether they are secondary or tertiary hospitals, were targeted as they are linked to a university. They are also responsible for the highest volume of the most ill and preterm infants in the specific region. Academic hospitals are also the referral hospitals for each region and are responsible for lower level (secondary and primary) hospitals in their region, including protocol and guideline development, implementation and training.

South Africa has nine provinces that have either or all of the following facilities in the region: Community health centres, district, regional and tertiary hospitals. Community health centres and district hospitals render level 1 care, regional hospitals level 2 and tertiary hospitals level 3 and these are usually also academic hospitals and linked to a tertiary institution. The only data available for the public sector hospitals are in the *Saving Babies Report,* which is a report on the *Perinatal Problem Identification Program* (PPIP) funded by the Medical Research Council. This data is not comprehensive due to a variety of reasons (refer to Pattinson, 2005) and not all hospitals provide data or complete data for this program. Table 1-4 in Chapter 1 provided the data that is available from the Saving Babies Report and Statistics South Africa.

4.4.4 SAMPLE

Three provinces were purposively selected namely the Gauteng, Northern Cape and the Free State. The criteria used for selection are the following: Gauteng is the most densely populated province with 9.6 million people (20.2% of total population) occupying just 1.4% of the country's land area. Northern Cape is a typical representation of a province that does not have a level three hospital, but needs to provide most of the level three services at the academic level two hospital (SA, 2009a). The Free State hospital is a tertiary (level 3) academic hospital is the referral hospital for the region.

The units in the selected hospitals delivered different levels of care. These units included NICU care, high care, growing preterm infants and/or KMC wards. Since the assumption is that different units should provide care at different levels, in line with infant maturity, the different units were observed using the same checklist instrument. Three hospitals were therefore purposively selected, and 12 units were observed in total, comprising 3 NICU, 4 high care and 3 growing premature infant

units and 2 KMC units. After identifying the sample an observation protocol was designed.

4.4.5 OBSERVATION PROTOCOL

An observation protocol was designed to ensure consistency in data collection in a similar manner in the different units. The following were included:

- Use of a header to record essential information about the project and as a reminder to go over the purpose of the study with the staff in the structured observation area.
- Provision for field notes on the questionnaire.
- Closing comments were provided.
- A written note to the unit manager thanked them for the opportunity provided to conduct the observation in their unit.
- Follow-up information was requested from the unit manager/respondent if needed.

The complete observation protocol for this study can be viewed in Addendum 4.2, and is inclusive of the following process:

- obtaining permission
- arranging the observation
- walk through
- observation using the checklist and field notes
- analysis of data
- results

Analysis and results are discussed in Chapter 5. The protocol for the structured observation was based on a description by Creswell (1998:129) and is included as Addendum 4-2. The first step in the observation process was to obtain permission from the role-players.

Consent: Both institutional and key-informant participant consent was obtained prior to performing the situational analysis in the purposively selected hospitals (see Addendums 1-1 - 1-8 and 4-3, 4-4). Verbal permission was also obtained from the

unit-manager to arrange a suitable time for the researcher to visit and complete the checklist and to identify the most suitable person to act as the key-informant for the interview if it had to be someone different from the unit manager.

Arrangement of the observation: The researcher contacted each unit manager to explain the research study and arrange a suitable time for the structured observation. The time of observation for each unit differed and included a morning shift, late afternoon shift and mid-day shift.

Walk through: On arrival in the neonatal units, the researcher introduced herself to the unit manager and/or shift leader and briefly explained the research and produced the institutional and hospital consent documents. Firstly, the researcher walked through the unit to get an overall idea of the situation regarding NDSC and made concise field notes on the observations. The researcher then used the checklist to record the needed detail on each unit. Results are discussed in Chapter 5.

The following section discusses the interview process and Figure 4-8 is a flowchart of the interview process.

4.5 INTERVIEWS

The flowchart of the interview process is now given.

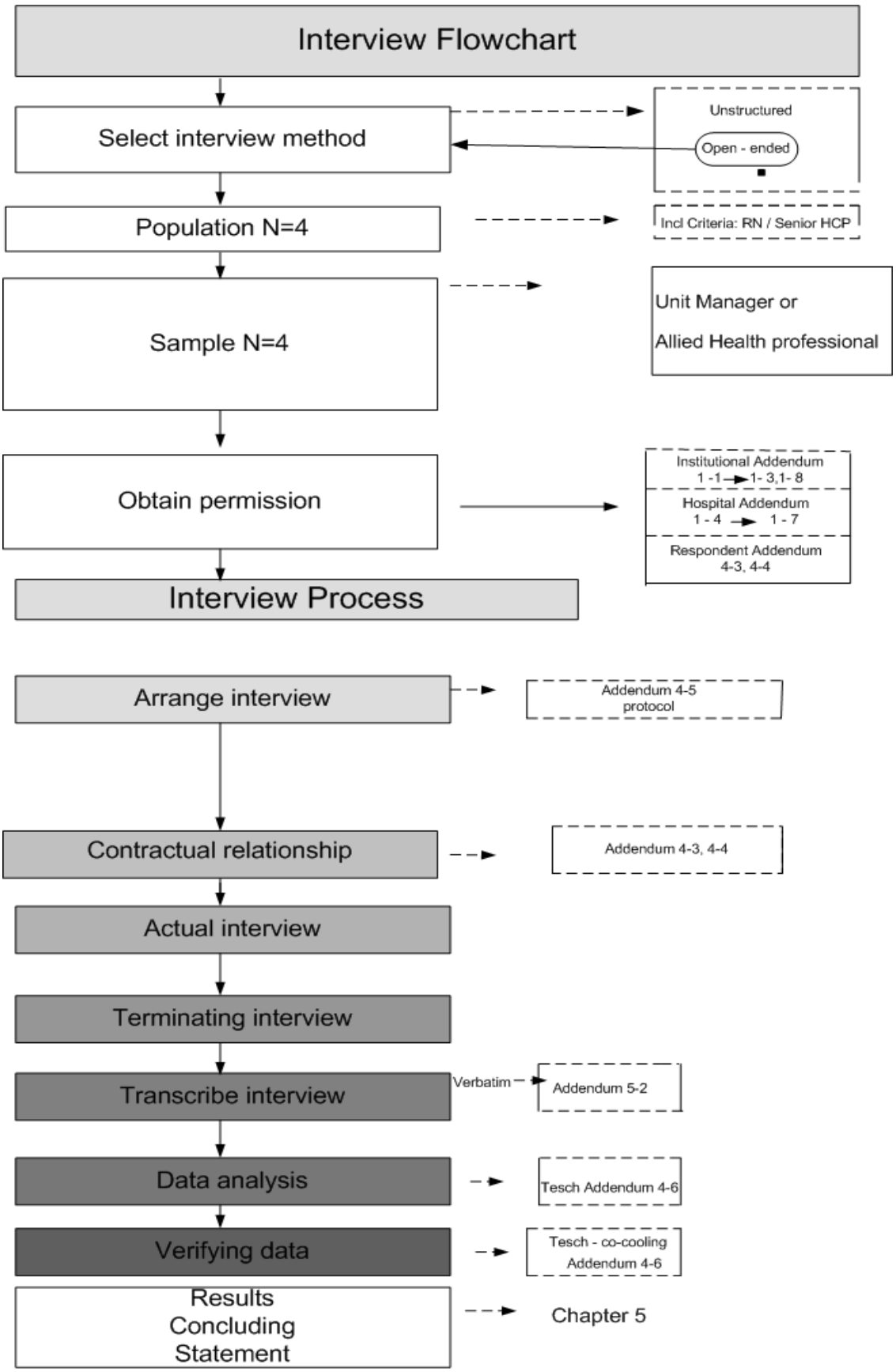

Figure 4-8: Flowchart of the interview process

Denzin and Lincoln (1994:353) recommended that interpretive practices of qualitative research be implemented to collect and analyse data. In this section the method of data collection is described for step 3 – stage 2. The method of key-informant interviews is described followed by the process of interview transcription and data analysis using Tesch's approach. The description of the results from the interviews follows in Chapter 5.

Interviewing is the most common method of data collection used by researchers to inform them about social life and can be regarded as the universal mode of systematic enquiry (Creswell, 2003:186-187; Schurink, 2000:297). Interviews allowed the researcher control over the line of questioning, providing the information needed. However, interviews may have limitations such as information being filtered through the views of the respondents. The researcher's presence may lead to bias responses from the respondents and people are not equally articulated and perceptive (Creswell, 2003:186). Some of these limitations were experienced during the interview and the challenges will be addressed when describing the actual interview later in this chapter.

4.5.1 TYPES OF INTERVIEWS

The interview as data collection method has a variety of forms and multiple uses, such as individual interviews, face-to-face interviews, or telephone interviews. It can further be a short one-time event or require multiple lengthy sessions. All of these variations are not discussed in this chapter, but the two major types of interviews are shortly discussed namely: structured and unstructured interviews (Denzin & Lincoln, 1994:353; Fontana & Frey, 1994:361; Creswell, 2003:188).

4.5.1.1 Structured interview

The structured interview refers to a situation where the researcher has a series of pre-established questions with a limited set of response categories. There is little room for variation and a coding scheme has already been established beforehand. The researcher controls the pace of the interview and each respondent receives the same kind of questions, asked in the same order. The structured interview can be conducted as telephone interviews, face-to-face interviews or interviews with survey research (Fontana & Frey, 1994:363 - 364). Fontana and Frey describe guidelines that are set to produce the ideal interview, such as:

- Provide a short overview of the research – do not get involved in long explanations of the research.
- Never deviate from the study introduction, sequence of questions or wording for questions.
- Never let another person interrupt the interview or answer for the respondent.
- Never suggest and answer, agree or disagree with an answer.
- Never interpret the meaning of a question, only repeat the question and give clarifications provided beforehand by the research supervisor.
- Never improvise by adding answer categories or make wording changes.

In spite of these guidelines errors still occur and they commonly evolve from three sources, namely the type of interview (face-to-face or telephonically) or wording of the questions, when the respondent responds in a certain way to try and please the researcher or try to hide information, and a researcher with flawed interviewing skills who changes wording of questions (Fontana & Frey, 1994:364).

Since the aim of using interviews in this study was to explore and describe the barriers and support for operationalisation of NDSC in the public sector hospitals in South Africa (as part of the situanal analysis), the structured interview did not allow for gathering this data. The second type of interview, the unstructured interview, was therefore explored for applicability to use within this research study.

4.5.1.2 Unstructured interview

The unstructured interview provides more breadth than the other types of interviews due to its qualitative nature. The traditional type of unstructured interview is the open-ended in-depth interview. With this kind of interview the researcher also answers questions asked by respondents and also lets personal feelings influence him/her. Schurink (2000:299-301) discusses the main types of unstructured interviews, known as unstructured interview with a schedule (often referred to as 'semi-structure' interview), the in-depth interview and the open-ended interview.

(a) Unstructured interview with a schedule

The unstructured interview with an interview schedule provides the researcher with a guideline and contains questions and themes that are important to the researcher

and that do not have to be asked in a specific sequence. This kind of interview is specifically valuable in a group context as a form of exploratory research. It allows the researcher to formulate hypotheses that could later be tested. The main advantage of the unstructured interview with an interview schedule is that it provides for relatively systematic collection of data and ensures that important data is not omitted. The disadvantage is that this kind of interview requires a highly trained and proficient researcher (interviewer) (Schurink, 2000:299-300). Since the aim of the interviews used in this part of the study is explorative and descriptive, but specific to the 'support and barriers to operationalisation', the unstructured interview with an interview schedule was not the most applicable interview method to be used. Interviews with key-informant individuals were used and not group interviews.

(b) In-depth interview

When using the in-depth interview the researcher does not acquaint him-/herself with the literature, fearing that it might affect his objectivity. No questions are formulated, since they develop spontaneously in the course of the interview. The in-depth interview often requires numerous sessions with the same respondent (Schurink, 2000:300).

The advantages of in-depth interviews are that the reality can be reconstructed from the world of the respondent. It enables the researcher to obtain an 'insider view' of the phenomenon being studied. The disadvantage is that it is time-consuming. Furthermore, the vast amount of data that is collected makes ordering and interpretation difficult. These interviews also need to be conducted by the researcher personally and not by field-workers (Schurink, 2000:300). As with the unstructured interview with a schedule, the in-depth interview does not address the objective to explore and describe the support and barriers to the operationalisation of NDSC and is therefore not the applicable method of interview for this part of the research study.

(c) Open-ended interviews

The open-ended interview uses preformulated questions that are carefully arranged and put to all the respondents in a similar sequence. The advantage of using open-ended interviews is that the data are gathered systematically to facilitate the comparison of the data and the researcher does not have to be particularly skilled in interviewing. A disadvantage may be that little information is gained about the

respondent's world, because the questions are structured (Schurink, 2000:299). However, in this study the researcher was looking for very specific data and therefore the open-ended question interview was the most suitable, since it collected the most useful information to answer the research question. As part of the situational analysis key-informant (face-to-face) interviews using open-ended questions were used (Creswell, 1998:123-124; De Vos & Fouché; 2000:90; Schurink, 2000:299). The basic principles employed for asking questions included (Creswell, 1998:131; Fouche, 2000:157-158; Babbie & Mouton, 2002:233-239):

- Appropriate questions were asked.
- Brief, clear sentences in a style that was understandable to the respondents.
- Questions did not reflect the bias of the researcher.
- Every question contained only one thought.
- Every question was relevant to the purpose of the interview.
- Respondents were competent and willing to answer.
- Questions were relevant.
- Negative items were avoided.
- The researcher did not take it for granted that the respondents had knowledge about the subject.
- The sequence of questions presented was arranged from general, non-threatening questions first to more sensitive, personal questions later.
- Respondents were interviewed and allowed to answer in Afrikaans or English.

The respondents were purposefully selected with care to provide optimal data and the population and sample are now discussed.

4.5.2 SAMPLE

In some hospitals, one and the same person is responsible for the different units within the neonatal department, and in others each unit has its own manager. The unit managers (registered nurses) of the selected units were contacted telephonically or via e-mail and the study explained to them, asking them if they would agree to be interviewed or could suggest a resourceful senior staff member or then an allied

health care professional if nursing was not available, that would be suitable for the interview.

The sample was either the unit manager or the shift leader on duty at the time of the interview. In one unit the nominated key-informant was a physiotherapist closely involved with the care of the preterm infants in the neonatal units, since the unit manager was not willing to partake in the study, but for the rest it was either the unit manager or shift leader on duty.

Table 4-2: Sample distribution for key-informant interviews

Hospital A	Hospital B	Hospital C
Unit A (Key-informant A[1])	Unit E (Key-informant B[2])	Unit G (Key-informant D[4])
Unit B (Key-informant A[1])	Unit F (Key-informant C[3])	Unit H (Key-informant D[4])
Unit C (Key-informant A[1])		Unit I (Key-informant D[4])
Unit D (Key-informant A[1])		Unit K (Key-informant D[4])
		Unit L (Key-informant D[4])
	[2] Senior Nursing staff	[4] Senior Nursing staff
[1] Allied Health professional	[3] Unit Manager	

4.5.3 OBTAINING PERMISSION FOR INTERVIEWS

Institutional consent from the North-West University Ethics Committee and the different institutions selected for the study was already obtained earlier in the study and described in Paragraph 1.9. Hospital consent was also obtained from the different hospitals, from either the CEO or the Director of Clinical Services; depending on the applicable person to give permission as per each hospital's internal structure (see Addendums 1-1 to 1-8). Finally, permission was obtained from the respondents on the day of the interview, as stated in 4.5.4.2 (addendum 4-3 and 4-4).

4.5.4 THE INTERVIEW PROCESS

Figure 4.9 provides a summary of the interview process that was followed in this study and cross reference to Figure 4-8.

4.5.4.1 Arrange the interview: time, place, length, interview schedule (protocol)	Addendum 4-5
4.5.4.2 Establishing contractual relationship	Addendum 4-3 and 4-4
4.5.4.3 Actual interview	
4.5.4.4 Terminating interview	
4.5.4.5 Transcribe interview	Addendum 5-2
4.5.4.6 Data analysis of unstructured interviews (coding, independent coding and consensus)	Tesch's approach (Addendum 4-6)
Chapter 5 Results	

Figure 4-9: The interview process

Each aspect of the interview process will now be discussed.

4.5.4.1 Arrange the interview: time, place, length

Preparation of the interviewer: The researcher was the interviewer for this stage of the research study. Her role was to plan the interviews and conduct it. She had to prepare herself emotionally for the interviews in order to enter the world of the respondents (Schurink, 2000:301).

Thematising was done to clarify the purpose of the interviews and the concepts to be explored. The literature was thoroughly reviewed in stage one of the study, which enabled the researcher to define concepts, assess data and construct the checklist inclusive of the interview schedule.

Designing the process through which the purpose of the research was accomplished. Decisions had to be made about the questions that would be asked, the interviewer and the preparation of the environment. This information has all been gathered in the 'Key-informant Interview Protocol' (addendum 4-5) as suggested by Creswell (1998:124,126,127).

Interview schedule: Questions were formulated that were most likely to answer the applicable research question, i.e. **What is the current status of the operationalisation of NDSC in public sector hospitals in South Africa?** (Creswell, 1998:124). Care was taken in formulating the questions to ensure that the responses gained could be analysed, and the questions furthermore flowed in a logical sequence. These questions aimed to address objective 3 of the research study, namely to conduct a situational analysis of the operationalisation of NDSC in public sector hospitals in South Africa.

The first interview was conducted as a pilot study to see whether adjustments were required. Open-ended questions were used to gather data and initially two questions were formulated to guide the key-informant interviews:

- *Tell me what helped your unit to implement NDSC.*
- *Tell me about those factors you experienced as barriers to implement NDSC in your unit.*

The researcher also allowed for field notes (described also as *reflective notes)* where personal thoughts, such as speculation, feelings, problems, ideas, hunches, impressions and prejudices were recorded (Creswell, 2003:189). Field notes are discussed in more detail later in this chapter.

After testing the interview questions in a pilot interview a third question was added at the start of the interview, namely, *What do you understand under Neurodevelopmental Supportive Care?* The complete interview protocol is attached as addendum 4-5. The interview conducted during the pilot study was included as part of the data, since it contained valuable data and within the qualitative paradigm it is not necessary that all the interviews must be conducted in exactly the same way. The additional question was presented to the respondent at a later stage. The researcher conducted the interviews to ensure no information was missed and to enable her to make field notes that provide valuable additional information.

Time: Appointments were made for specific days set aside for data-collection. On the day of the interviews, the key-informants were provided with a document that explained the study in more detail. It provided information about the research, a consent form for participating in the interview and allowing the interview to be

recorded, as well as a form on which the participant could indicate if she would want feedback after completion of the research and where it should be sent (refer to Addendum 4-3 and 4-4).

Selection of the environment: The institutions at which the key-informants were working were selected, but precautions were taken as far as possible to ensure privacy and to limit interruption. Despite these precautions certain interviews had to take place inside the neonatal unit, due to the limited number of staff on duty at the time; or the key-informant had to be available to the other staff members, since she was the person in charge of the unit at that time. Being in the neonatal unit did not allow for a very quiet environment. However, the quietest area was selected. Interviewing in the neonatal unit did however provide rich additional information regarding NDSC observed and experienced by the researcher during the interview. The interview was set-up at a work surface where the researcher and respondent were seated diagonally to each other. The researcher and respondents were placed far enough from each other to prevent a feeling of personal space being invaded, but also close enough to ensure a good quality recording when the recorder was placed on the surface between them.

Length of interviews The time allocated for interviews was between 30 minutes and two hours. However, the interviews were all completed within 30 minutes. The next step in the interview process was establishing a contractual relationship with respondents in the form of informed consent.

4.5.4.2 Establishing contractual relationship

Permission was obtained as described in 4.5.3. The researcher pointed out that by agreeing to the interview and providing some information the respondent may contribute to building the body of knowledge that will enable the researcher to develop guidelines that will be useful in the everyday practice of nursing professionals working with preterm infants (Schurink, 2000:302,303). A written consent agreement was signed between the researcher and each respondent to protect the respondent (refer to Addendum 4-3 and 4-4). Consent was specificly obtained for recording of the interviews.

4.5.4.3 Actual interview

The initiation of the interviews, communication skills used and recording of the interviews are discussed in this section.

The researcher and respondent are initially strangers to each other and this may give rise to challenges such as the respondent not wanting to give permission to be interviewed, since she may feel uncertain, self-conscious and overly critical. The respondent may further not answer questions honestly, especially if it is of a personal nature and finally, may end the interview at any time (Schurink, 2000:301-302). Establishing trust between the researcher and respondent ensures cooperation of the respondent and also improves the quality of the collected data (Schurink, 2000:303).

The researcher addressed the challenges regarding the interview in the following ways (Creswell, 1998:131; Schurink, 2000:302):

- The interviewer (researcher) introduced herself before each interview and provided the respondent with her credentials as well as the aim and utilisation of the interview – how it will be done, how long it will take and where it will be done.
- The interview questions were shared before the interview and a relaxed atmosphere was set.
- The researcher was honest and sincere at all times.
- The researcher further scheduled the interview time to suit the participants.
- The researcher tried to say 'little' during the interviews and listened rather than talked. Probing was used when the participant did not seem to know how to respond to a question.
- Practical aspects of the interview were made clear such as tape recording of the interview for the purpose of gathering all the data and having it coded by a second reviewer (increasing the validity), but the reviewer explicitly stated that anonymity will be maintained at all times.
- A digital recording device was used to ensure high quality recording and possible digital transcription. However, some interviews were in Afrikaans and the transcription program can only read English.
- The researcher realised the costliness and lengthy process of transcribing data before the study and included it in the financial planning.

- Notes were taken with ease during the interview.
- Consent to recording of the interview did not pose a challenge, since all participants agreed to have their interviews recorded.
- The interviewer checked and tested the audio equipment before the interview to ensure ease in using the equipment.

4.5.4.4 Terminating the interview

The interviews were terminated when the researcher gathered the data that met the objective set and the respondent no longer provided new information (Schurink, 2000:303,304).

4.5.4.5 Transcribing the interview

Transcribing an interview means writing a text of the interviews that can be coded and co-coded by the researcher and an independent coder. All the interviews were transcribed *verbatim* and the data-analysis followed (sample transcription can be viewed in Addendum 5-2). The recordings were played back and the dialogue was written down as it took place. Only the real conversations were transcribed and no interpretations made during the interviews.

4.5.4.6 Data analysis

Data analysis was conducted by means of open coding using Tesch's approach (Creswell, 2003:191-197; also compare Poggenpoel, 2000:345-346).

(a) Coding

Data analysis for the key-informant interviews was conducted by using Tesch's approach to coding and making use of an independent co-coder to verify the data (Creswell, 2003:191-197; Poggenpoel, 2000:343-344). Tesch proposes eight steps to consider when analysing data:

- The interviews were transcribed verbatim, and the field notes typed. View a sample interview and field notes in addendum 5-2.

- The researcher read through all the transcriptions and field notes carefully to get a sense of the whole and wrote down some ideas as it came to mind. The researcher attempted to place preconceived ideas in brackets.
- The researcher then selected one interview randomly and wrote down thoughts about the meaning of the information that came up. The major categories were identified as the researcher read through the transcripts and field notes. Units of meaning that were related to the identified major categories were underlined. This provided the context for or description of categories.
- After completing this process for all (four) the interviews, a list of topics was compiled. Similar topics were clustered together, starting with the main topics 'barriers' and 'support' and formed into columns that were arranged into major and unique topics.
- The researcher found the most descriptive wording for the topics and wrote these topics next to the appropriate sections.
- The topics were grouped together and relationships drawn to try and reduce the total list of categories.
- The researcher made a final decision on the categories and alphabetised the codes.
- The data material belonging to each category was assembled and a preliminary analysis performed.
- The existing data was re-coded as needed.

(b) Verifying data (independent coding and consensus)

Independent coding was done to ensure trustworthiness. The criteria for selecting the independent coder was that she was knowledgeable regarding research, (specifically qualitative research and coding of written data), she was geographically available for a consensus meeting, and she had already completed doctoral studies. A coding protocol (addendum 4-6) was sent to the independent coder, together with the transcribed interviews (addendums 5-2) to ensure consistency of the coding process according to Tesch's approach. The protocol for the independent coder described the specifics of the coding procedure as given by Poggenpoel (2000:345). Open coding was done, since the independent coder was not given any pre-arranged

themes or categories to use (Poggenpoel, 2000:345). The protocol only provided guidelines for data analysis.

After both the researcher and independent coder finished coding, a consensus discussion was held. The discussion centred on the issues regarding the analysis of the data. The inter-coder variability was low as the researcher and independent coder differed in very few aspects of the results of the study.

In addition to the structured observation and key-informant interviews valuable data was obtained by means of field notes made by the researcher. The following section discusses the method used with regard to field notes.

4.6 FIELD NOTES

Field notes (described also as reflective notes) are the documentation of observation (Tjora, 2006:429; Wolfinger, 2002:86). This an important data source in qualitative research. It is the recording of the researcher's personal thoughts, such as speculation, feelings, problems, ideas, hunches, impressions and prejudices, experiences and observations that is made in the course of collecting and reflecting on the process (Creswell, 2003:189; Groenewald, 2004:13; Lee & Gregory, 2008:33; Sobo, Bowman & Gifford, 2008:1532; Tjora, 206:434).

Field notes are used because the human mind tends to forget quickly and they are therefore crucial in qualitative research to retain data gathered (Groenewald, 2004:15 [cited Lofland & Lofland, 1999; Tjora, 2006:429; Wall, 2008:45). The researcher must therefore be disciplined in recording, subsequent to each interview, comprehensively and without judgement what happened during the interview, who was involved, why incidents took place and how it actually happened? Field notes for this study included observations that struck the researcher as the most noteworthy and most telling of the situation regarding NDSC operationalisation in the NICU. Particular observations were recorded because it stood out and this selection was built on the researcher's knowledge on the subject of NDSC (Wolfinger, 2002:87,89,90). Lofland and Lofland (1999:5) further emphasise that field notes should not be written later that the morning after the interview was conducted; however, as stated by Wolfinger (2002:87) preliminary notes were taken at the time of the observation and interviews to provide an outline for the complete notes.

Creswell provides the following guidelines for taking fieldnotes (1998:131):

- Determining whether field notes are credible.
- Writing down ‘jottings’.
- Incorporating ‘quotes’ into field notes.
- Assuming an observer role and how to change roles.
- Learning how to ‘funnel’ from broad observations to narrow ones.

Miles and Huberman (1994; 45,52) emphasise the importance of dating field notes so that the researcher can later correlate it with the data. Groenewald (2004:15) describes four different types of field notes:

- Observational notes (ON) — 'what happened notes' deemed important enough to the researcher to make. Bailey (1996) emphasises the use of all the senses in making observations.
- Theoretical notes (TN) — 'attempts to derive meaning' as the researcher thinks or reflects on experiences.
- Methodological notes (MN) — 'reminders, instructions or critique' to oneself on the process.
- Analytical memos (AM) — end-of-a-field-day summary or progress reviews.

Field notes formed part of the data gathered during structured observation and interviews to provide more detailed descriptions (Tjora, 2006:432). The researcher made field notes as needed and afterwards categorised it as ON, TN, MN or AN as mentioned above.

As explained, space was left for field notes to be made by the researcher while completing the structured observation, as well as during the conduction of the interviews (Penner & McClement, 2008:98; Tjora, 206:434). This provided the researcher with rich information on the context of the South African public sector NICU and also contributed to understand barriers and support to the operationalisation of NDSC. The environment in which the interviews took place, observation regarding the participants and the dynamics of the interview, were recorded by means of field notes (Penner & McClement, 2008:98). Field notes are in itself already a step toward data analysis, because it involves interpretation and it is

therefore important that the researcher refrains from premature categorising. The writing of field notes during the research process contributes to the clarification of the observation and interview settings (Groenewald, 2004:16).

4.6.1 STORAGE OF DATA

After all the data (interviews, structured observation and field notes) was gathered, analysed and discussed it was stored to ensure availability after completion of the study to provide an audit trail. Data were stored in the following ways (Creswell, 1998:134):

- Backup copies were made of all computer files.
- A master list was developed of all types of information gathered.
- The anonymity of participants (neonatal units) was protected by masking their names in the data.
- All data is stored at the School of Nursing Science of the North-West University for a minimum period of five years.

All the data was collected and the results follow in Chapter 5.

4.7 SUMMARY

The aim of Chapter 4 was to describe the methods of data gathering followed in stage 2 (steps 1-4) of the study: Situational analysis of operationalisation of NDSC in the public sector hospitals in South Africa.

Different methods of data gathering were used, including structured observation by means of a checklist constructed from the 25 conclusion statements derived from stage one, the ILR. An independent reviewer and the statistician validated these statements. The statistician and experts confirmed that the questions as presented for the checklist was an accurate representation of the 25 conclusion statements and would actually measure the components of NDSC as derived from the ILR.

A checklist was suggested including the questions as described above. A 5-point Lickert scale was used as answer options for the closed questions to aid in the coding of data. The checklist allowed for a section to indicate the source where the

data was obtained such as observation, records or other, to contribute in the situational analysis. Finally, space was allowed for field notes by the researcher.

The checklist was piloted and minimal changes were made, none of which changed the data gathered, and therefore the data from the pilot study was also included as part of the main study. This was followed by the discussion of the structured observation method, which includes the design of the observation protocol and the actual structured observation using the checklist.

The next method described was the key-informant interviews. The discussion included the process of constructing unstructured interview questions to be used with key-informants in the selected institutions. Finally, the use of field notes as part of data gathering during both the structured observation and key-informant interviews were discussed.

Chapter 5 focuses on the discussion of the results of the situational analysis in the selected NICU's.

CHAPTER 5
SITUATIONAL ANALYSIS: RESULTS

5.1 INTRODUCTION

Chapter 5 of the study discusses the results of the situational analysis performed to reach objective two of the study. The results will be discussed according to the observation using the checklist and interviews with key-informants in combination with the results of the field notes.

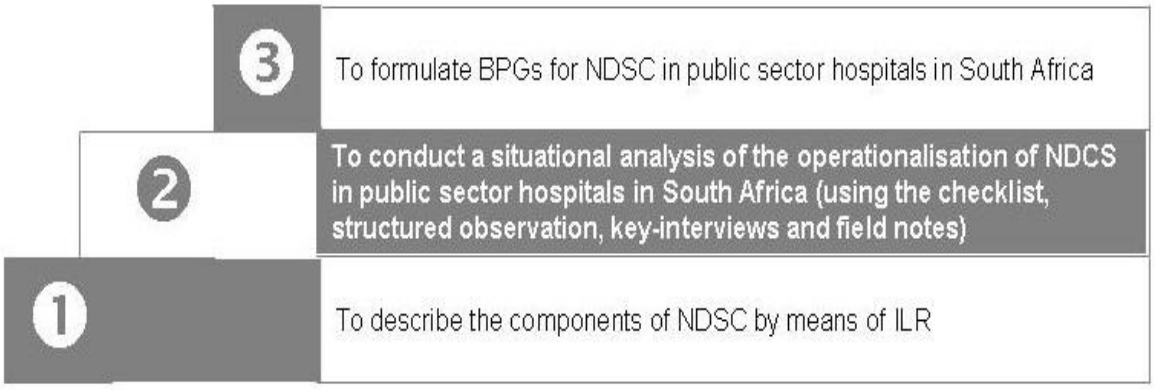

Figure 5-1: Schematic presentation of the stages followed in this study indicating stage 2

The data analysis of the bservation results is now discussed.

5.2 DATA ANALYSIS OF THE OBSERVATION RESULTS

Observation included identifying the population, selecting the sample, obtaining institutional and hospital consent and arranging the observations. The process followed for the structured observations was a walk-through of each unit, followed by the observation of each unit by means of the checklist. The data was analysed and results were synthesised in conclusion statements. Figure 5-2 demonstrates the process of observation followed, by means of a flowchart, after which the discussion of the results will follow.

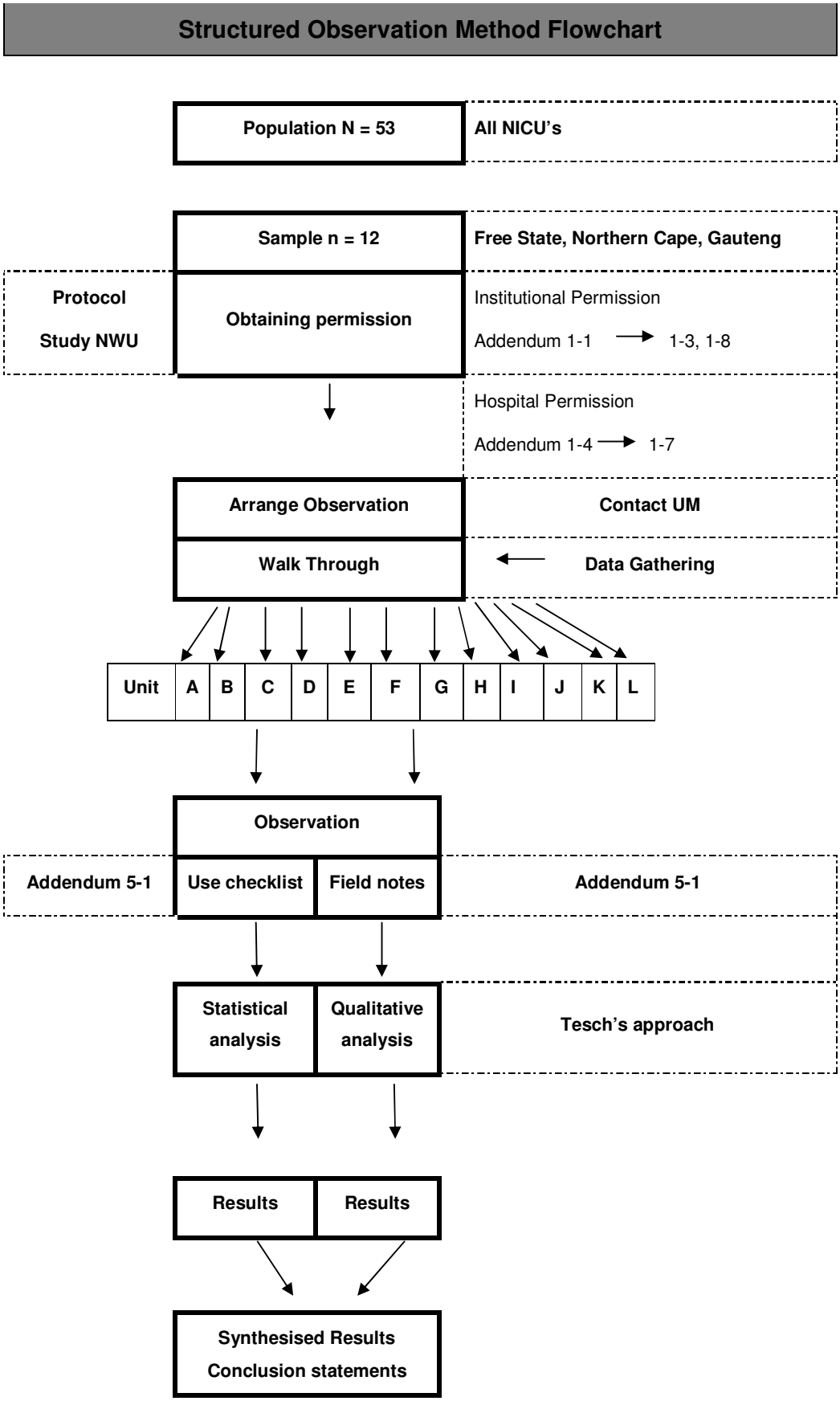

Figure 5-2: Flowchart of the structured observation process

5.2.1 CLOSED QUESTION (CHECKLIST) RESULTS

The following step in the process of the situational analysis was to analyse the data from the checklists. A numerical scale (Fouche, 2000:169) was included with the checklist to aid in the analysis, since positives and negatives are accommodated in the index, giving weight values to the answers and making the data analysis easier. The index weights were allocated as follow (refer to Table 5-1): Always (2), Sometimes (1), Unsure (0), Never (-1) or N/A. With a rating of (2) the component is optimally applied, with (1) the application is fair, but there is room for improvement, (0) indicates that it could not be detected and the component is on a warning level, whereas (-1) indicates a high-risk practice due to non-application of NDSC components. If N/A is chosen in a subsection, it would have the effect that the total score of that subsection must be reduced by 2 for each N/A selected. From this the application could be calculated as a percentage. For example if a section had a maximum total of 8, but N/A was marked in one question, 2 points were deducted from the total of 8, changing the maximum total for that section to 6. This provided each section with a separate value that indicated whether the components were applied effectively or left room for improvement.

Table 5-1: Numerical scale used to quantify results of checklist

Always (2)	**Sometimes (1)**	**Unsure (0)**	**Never (-1)**	**N/A** (deduct 2 from max available for the section)

Refer to Table 5-2 for a summary of the results of the closed questions included in the checklists for each unit for easy reference. All units are just referred to as neonatal wards, although different levels of care are provided in different units within the same hospital.

Units A, E and G were classified as neonatal intensive care units (level 3 and 4), which are units that provide highly specialised services for the sickest and most fragile preterm infants. All three these units are part of teaching hospitals and affiliated to a faculty of Health Sciences with a medical school. Staff in these units should include specialist paediatricians, super-specialists, e.g. neonatologists and neonatal cardiologists as well as paediatric registrars in specialist training, medical officers and interns are also staffed at these hospitals. Nursing staff at level III and IV facilities include nurses with advanced training in midwifery and/or neonatal care,

midwives, professional nurses, enrolled nurses and enrolled nursing assistants (Directorate, 2008: 15). These facilities provide high care plus the care of neonates requiring assisted ventilation. Sub-specialist care of infants with compicated conditions or infants needing complicated care are also provided at level III and IV facilities (Directorate, 2008: 6,7).

Units B, C, F, H, I, J and K provided a combination of care defined for level II and I facilities (regional hospitals). This include the provision of standard inpatient care plus care of the LBW infant that weighs less that 1500 grams, care to infants with severe neonatal jaundice, expecially those requiring exchange transfusion. Infants with moderate to severe respiratory distress are cared for in level II hospitals as well as infants with severe HIE, infants requiring TPN and infants requiring simple neonatal surgical procedures (pre-operative and post-operative care). They also provided level I care including routine care plus care of the sick infant requiring intravenous therapy, naso-gastric fluids, antibiotics, phototherapy and/or oxygen therapy (ideally including nasal CPAP), care for unstable LBW infants that do nod need ventilation as wel as stable LBW infants (Directorate, 2008: 6,7). Staffing at these units included general paediatricians, paediatric registrars, medical officers and interns as well as visiting specialist. Nursing staff include nurses with advanced training in midwifery and/or neonatal care, enrolled nurses and enrolled nursing assistants (Directorate, 2008: 15). In this study these units were part of the same teaching hospitals mentioned in level III nurseries although they provided a different level of care.

Finally units D and L are known as KMC units (level I healthcare facilities at district level). These units render care to preterm infants who require minimal observation and are cared for by their mothers in a skin-to-skin position.

Different levels of care nurseries were observed, but they were all situated in the same hospitals, staff were often rotating between the different levels of care and one manager might be responsible for different units of different care levels.

Table 5-2: Summary of results of the checklist performed in the different units

PRINCIPLES OF DC	Question derived from Chapter 2	Unit A	Unit B	Unit C	Unit D	Unit E	Unit F	Unit G	Unit H	Unit I	Unit J	Unit K	Unit L
Bed capacity		4	8	12	10	14	16	4	4	8	8	10	12
No of patients		3	8	12	10	9	13	3	1	8	8	8	3
Date		31-10-2008	31-10-2008	31-10-2008	31-10-2008	08-12-2008	08-12-2008	05-02-2009	05-02-2009	05-02-2009	05-02-2009	05-02-2009	05-02-2009
Time of day		12:30	11:30	10:30	09:30	17:00	18:00	12:20	13:00	13:15	13:30	14:00	14:00
1. NICU DESIGN		1/2	1/2	-1/2	1/2	-1/2	1/2	-1/2	-1/2	-1/2	-1/2	-1/2	½
	Is a uterine-like environment created for each preterm infant to support an environment of growth and development?	1	1	-1	1	-1	1	-1	-1	-1	-1	-1	1
2. INDIVIDUALISED CARE		2/4	2/4	-5/12	4/12	-5/12	9/12	-6/12	-6/12	-4/12	-3/12	-5/12	0/12
2.1 OBSERVATION	Are the preterm infant's cues and behaviours read by the caregiver?	1	1	-1	1	-1	1	-1	-1	1	-1	0	0
	Do staff respond to cues and behaviours?	1	1	-1	0	-1	2	-1	-1	-1	1	-1	0
	Does the caregiver continuously and systematically assess and evaluate the preterm infant's developmental needs?	N/A	N/A	-1	1	-1	1	-1	-1	-1	0	-1	0
	Is care adapted accordingly?	N/A	N/A	-1	0	0	2	-1	-1	-1	-1	-1	1
2.2 CARE	Is care provided according to individual developmental maturity?	N/A	N/A	0	2	-1	2	-1	-1	-1	-1	-1	0
	Are autonomic, motoric, and behavioural cues identified and used to support individualised caregiving?	N/A	N/A	-1	0	-1	1	-1	-1	-1	-1	-1	-1
3. FAMILY-CENTERED CARE PHILOSOPHY		3/22	3/22	4/26	15/24	2/26	17/22	-7/26	-6/26	-6/26	-4/26	-3/26	7/26
3.1 PARENTS AS ACTIVE PARTICIPANTS	Do parents see their preterm infant immediately after birth (before transfer to the NICU)?	2	2	2	2	1	N/A	0	1	2	2	2	2
	Are parents allowed to touch their preterm infant immediately after birth (before transfer to the NICU)?	N/A	N/A	-1	N/A	1	N/A	-1	-1	-1	-1	-1	-1
	Do parents hold their preterm infant?	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1
	Are parents involved with childcare activities, e.g. feeding, bath, Kangaroo care?	1	1	1	2	1	1	-1	-1	1	0	1	2
	Are parents allowed to personalise their preterm infant's bed space?	N/A	N/A	-1	1	-1	2	-1	-1	-1	-1	-1	1
	Are mothers encouraged to breastfeed / pump milk for their preterm infants?	-1	-1	2	2	1	1	1	1	-1	1	1	0
	When does discharge training start?	1	1	-1	2	-1	2	-1	-1	-1	-1	0	2

PRINCIPLES OF DC	Question derived from Chapter 2	Unit A	Unit B	Unit C	Unit D	Unit E	Unit F	Unit G	Unit H	Unit I	Unit J	Unit K	Unit L
3.3 PRIVACY AND COMFORT	Is the nursery atmosphere warm, comfortable and soothing, with a homelike appearance?	-1	-1	-1	1	-1	2	-1	-1	-1	-1	-1	1
	Is privacy provided for parents?	-1	-1	-1	-1	-1	1	-1	-1	-1	-1	-1	1
	Is information shared between parents and professionals re preterm infant developmental needs?	-1	-1	0	2	-1	1	-1	-1	-1	-1	-1	0
3.3 VISITATION	Are parents allowed to visit 24-hours?	2	2	2	2	1	2	2	2	1	2	1	2
	May siblings visit?	-1	-1	-1	-1	1	2	-1	-1	-1	-1	-1	-1
3.4 PARENT SUPPORT GROUPS	Does the hospital have parent support groups?	1	1	2	2	0	2	-1	-1	-1	-1	-1	-1
4. POSITIONING		7/28	7/28	8/28	18/28	-5/28	13/28	-5/28	-11/28	-10/28	-11/28	-11/28	22/28
4.1 ANATOMICAL PRETERM INFANT POSITIONING (symmetry/midline, containment, flexion)	Is the preterm infant positioned anatomically?	1	1	1	1	1	1	-1	-1	-1	-1	-1	2
Containment	Is the preterm infant contained?	1	1	1	2	1	2	-1	-1	-1	-1	-1	2
	Does the preterm infant have firm boundaries that fit snugly?	-1	-1	-1	2	-1	1	-1	-1	-1	-1	-1	2
Midline	Is the body position symmetric?	1	1	1	1	-1	1	-1	-1	-1	-1	-1	2
	Is the neck in a neutral position? Head in midline and in line with the body?	1	1	1	1	-1	1	-1	-1	-1	-1	-1	2
	Are the shoulders protracted?	1	1	1	2	-1	1	-1	-1	-1	-1	-1	2
	Are the arms in midline?	1	1	1	2	-1	1	-1	-1	-1	-1	-1	2
Flexion	Are the knees flexed?	1	1	1	2	-1	2	-1	-1	-1	-1	-1	2
	Are the hips flexed in a neutral position with some adduction?	1	1	1	2	-1	2	-1	-1	-1	-1	-1	2
	Is preterm infant kept in flexion (limbs and shoulders) during positioning with postural support?	-1	-1	1	2	-1	1	-1	-1	-1	-1	-1	2
4.2 ORIENTATION	In what position is the preterm infant positioned mostly?												
	Prone? / %	0	0	-1	1	-1	0	1	-1	1	0	-1	2
	Side-lying? / %	1	1	1	-1	-1	0	1	-1	1	1	0	-1
	Supine? / %	-1	-1	-1	-1	2	-1	4	2	-1	-1	1	-1
4.3 INDIVIDUALISED BEDDING	Are individualised bedding used?	1	1	1	2	1	1	-1	-1	-1	-1	-1	2
5. HANDLING TECHNIQUES (TRANSITION SUPPORT)		-6/36	-7/34	-6/38	16/34	-9/38	16/38	-18/38	-14/38	-11/38	-14/38	-11/38	11/36
5.1 CARE ACCORDING TO MATURATION	Does care changes as the preterm infant matures?	-1	-1	-1	1	-1	2	-1	-1	-1	-1	-1	1
5.2 STATE CHANGES	Does the caregiver support gradual state changes (using transitional touch)?	-1	-1	-1	0	0	-1	-1	-1	-1	-1	-1	-1

PRINCIPLES OF DC	Question derived from Chapter 2	Unit A	Unit B	Unit C	Unit D	Unit E	Unit F	Unit G	Unit H	Unit I	Unit J	Unit K	Unit L
5.3 PROMOTION OF REST PERIODS	Does the preterm infant receive at least 2-3 hours uninterrupted sleep?	1	1	-1	2	-1	2	-1	1	-1	1	0	2
	Does the unit have quiet times when all routine care is delayed?	-1	-1	-1	2	2	2	-1	0	-1	0	-1	2
5.4 MODIFIED HANDS-ON CARE-GIVING	Are care interventions clustered around sleep?	-1	-1	-1	1	-1	2	-1	-1	-1	-1	-1	0
	Are calm, gentle, containment and facilitation provided during handling procedures to support flexion?	-1	-1	1	1	0	1	-1	0	-1	-1	-1	0
	Is the preterm infant provided with 'time-out' or rest periods according to his/her cues?	-1	-1	-1	0	-1	0	-1	-1	-1	-1	-1	-1
	Is direct hands-on-caregiving modified by providing positive tactile stimulation?	-1	-1	-1	2	-1	0	-1	-1	-1	-1	-1	-1
5.5 POSITIVE TACTILE STIMULATION	Is positive tactile stimulation provided, e.g. stroking of massage if applicable?	-1	-1	-1	0	-1	1	-1	-1	-1	-1	-1	1
	Is containment or still hold provided?	0	0	-1	0	-1	0	-1	0	-1	-1	-1	2
	Are parents allowed to do skin-to-skin care with their preterm infants?	0	0	1	2	-1	2	-1	-1	1	0	1	2
	Are preterm infants swaddled? Tightly wrapped in blanket, limbs flexed, hips neutral without rotation, shoulders forward, head neutral and hands accessible for exploration	1	N/A	1	1	-1	1	-1	-1	1	-1	1	2
5.6 MOVEMENT (KINESTETIC STIMULATION)	Are preterm infants moved slowly, as a whole, keeping the body and head aligned and the limbs tucked in?	N/A	N/A	-1	0	-1	0	0	-1	-1	-1	-1	1
	Are waterbeds and sheepskin used?	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	N/A
	Are multiples co-bedded?	1	1	2	N/A	-1	0	-1	-1	-1	-1	-1	0
5.7 SELF-REGULATION	Is self-regulation promoted?	1	1	1	2	1	1	-1	-1	1	-1	1	1
	Is the preterm infant provided with opportunities for grasping?	1	1	1	2	0	1	-1	-1	1	0	0	1
	Is state regulation promoted?	-1	-1	-1	N/A	-1	1	-1	-1	-1	-1	-1	0
	Is non-nutritive sucking provided to support self-regulation?	-1	-1	-1	1	1	2	-1	-1	-1	-1	-1	-1
6. ENVIRONMENTAL MANIPULATION		-15/62	-14/64	-28/60	-7/40	4/52	36/60	-6/56	-16/60	-18/58	-23/60	-16/58	4/44
6.1 REDUCTION OF NOISE	Which of the following are employed to ensure reduction in noise?												
Ambient environment	Avoid radio and stereo equipment, telephones	-1	-1	-1	1	1	1	-1	1	-1	-1	0	-1
	Sound-rated frames and doors - Doors & drawers padded with felt strips or whether stripping	-1	-1	-1	-1	2	2	0	-1	-1	-1	-1	0
	Bottoms of trashcans padded	-1	-1	-1	-1	2	2	2	2	2	2	2	2
	Measure sound levels in NICU	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Soft music when appropriate	-1	-1	-1	-1	N/A	1	-1	-1	-1	-1	-1	0

PRINCIPLES OF DC	Question derived from Chapter 2	Unit A	Unit B	Unit C	Unit D	Unit E	Unit F	Unit G	Unit H	Unit I	Unit J	Unit K	Unit L
	Beds away from traffic	-1	-1	-1	-1	1	2	1	1	0	0	0	2
	Sound absorption in preterm infant spaces (walls, floors, curtains)	-1	-1	-1	-1	1	2	-1	-1	-1	-1	-1	-1
	Monitor alarms kept at a safe minimum volume (or vibrating/flashing)	1	1	N/A	N/A	-1	1	-1	1	N/A	N/A	1	N/A
	Respond to alarms quickly	1	1	N/A	N/A	-1	2	-1	0	N/A	N/A	1	N/A
Immediate preterm infant environment	Use of incubator covers	1	1	-1	N/A	-1	2	N/A	-1	-1	-1	-1	N/A
	Soft ear plugs / covers	-1	-1	-1	N/A	-1	-1	-1	-1	-1	-1	-1	N/A
	Close portholes quietly using the button latch	-1	-1	-1	N/A	N/A	1	N/A	-1	-1	-1	N/A	N/A
	Measure sound levels inside the incubator	-1	-1	-1	N/A	-1	-1	-1	-1	-1	-1	-1	N/A
	No water in ventilator tubes	-1	-1	-1	N/A	2	0	2	N/A	N/A	1	1	N/A
	Minimal background noise	-1	-1	-1	-1	0	2	1	0	-1	-1	0	0
Staff generated	No tapping or charts on top of incubator	N/A	1	1	N/A	N/A	1	N/A	-1	0	-1	N/A	N/A
	Keep voices down & away from bedside	-1	-1	-1	-1	-1	1	1	0	0	-1	0	0
6.2 REDUCTION OF LIGHT	Which of the following are employed to ensure reduction in light?												
Ambient light	Reduced ambient light (dimmer)?	1	1	-1	-1	1	1	0	-1	-1	-1	-1	0
	Are blinds closed during daylight hours?	-1	-1	-1	-1	N/A	N/A	-1	-1	-1	-1	-1	-1
	Are activity levels kept as low as possible?	-1	-1	-1	-1	0	2	0	1	0	0	-1	1
Immediate preterm infant bed space	Are incubator covers used?	1	1	-1	N/A	N/A	2	N/A	-1	-1	-1	-1	N/A
	Is direct bright light avoided?	-1	-1	-1	1	0	2	-1	-1	-1	-1	-1	1
	Is individual bedside controlled / titrated light used?	-1	-1	-1	-1	-1	2	0	-1	-1	-1	-1	0
	Are light levels measured inside the incubator?	-1	-1	-1	N/A	-1	-1	-1	-1	-1	-1	-1	-1
	Is eyes protected with phototherapy?	1	1	-1	N/A	2	2	1	N/A	1	-1	N/A	N/A
	Is one source of daylight used together with shading devices?	-1	-1	-1	-1	N/A	N/A	-1	-1	-1	-1	-1	0
	Are overhead lights dimmed?	-1	-1	-1	-1	1	2	0	-1	-1	-1	-1	1
	Are procedures kept to the minimum to ensure minimal handling?	-1	-1	-1	0	1	2	1	-1	-1	-1	-1	1
	Are toys, picture and music in the incubator used carefully to reduce sensory monotony?	-1	-1	-1	N/A	2	2	-1	-1	-1	-1	-1	0
Cycled light	Is cycled light provided?	-1	-1	-1	1	-1	2	0	-1	-1	-1	-1	0
	Does the unit support a day and night cycle with at least 12 hours of lower light and sound at night?	1	1	-1	2	-1	2	-1	-1	-1	-1	-1	-1
6.3 OLFACTORY STIMULATION	Is olfactory stimulation provided, such as mom's smell inside the incubator?	1	1	-1	2	-1	-1	-1	-1	1	-1	-1	2

PRINCIPLES OF DC	Question derived from Chapter 2		Unit A	Unit B	Unit C	Unit D	Unit E	Unit F	Unit G	Unit H	Unit I	Unit J	Unit K	Unit L
7. PAIN MANAGEMENT			-2/4	-2/4	-2/4	-1/4	4/4	4/4	-2/4	-2/4	-2/4	-2/4	-2/4	-2/4
	Is oral sucrose administered as pain management option?		-1	-1	-1	-1	2	2	-1	-1	-1	-1	-1	-1
	Is non-nutritive sucking provided during pain and minor procedures?		-1	-1	-1	0	2	2	-1	-1	-1	-1	-1	-1
8. KNOWLEDGE OF PRETERM INFANT DEVELOPMENT			5/10	5/10	3/10	2/10	-1/10	7/10	-3/10	-4/10	-4/10	-3/10	-3/10	-4/10
8.1 STAFF	Are staff members able to read preterm infant cues and behaviours during interaction with the preterm infant?		1	1	1	-1	0	1	-1	-1	-1	-1	-1	-1
	Is knowledge shared between professionals?		1	1	1	0	0	2	1	0	0	1	1	0
	Does the unit apply a multidisciplinary team approach in the NICU?		1	1	1	1	1	2	-1	-1	-1	-1	-1	-1
8.2 PARENTS	Are parents taught preterm infant behavioural cues and stress signs?		1	1	1	1	-1	1	-1	-1	-1	-1	-1	-1
	Are parents taught how to interact with their preterm infant?		1	1	-1	1	-1	1	-1	-1	-1	-1	-1	-1
9. FEEDING			-3/6	-3/6	-3/6	5/6	1/6	1/6	-3/6	-3/6	-3/6	-3/6	-3/6	-2/6
	Are preterm infants prepared for feeding?		-1	-1	-1	1	0	0	-1	-1	-1	-1	-1	-1
	Are preterm infants positioned in a way that prevents repositioning after feeding?		-1	-1	-1	2	-1	-1	-1	-1	-1	-1	-1	0
	Are NNS offered during gavage feeding?		-1	-1	-1	2	2	2	-1	-1	-1	-1	-1	-1
Overall compliance with NDSC principles		**Grand total for unit**	-8/174	-8/174	-30/186	53/160	-10/178	104/182	-51/182	-63/186	-59/184	-64/186	-55/184	37/168
		Compliance in percentage	-104.6%	-104.6%	-116.1%	33.1%	-105.6%	57.1%	-128.0%	-133.9%	-132.1%	-134.4%	-129.9%	22.0%

The index weights were allocated on a scale that accommodated positive and negative values (refer to discussion in paragraph 5.2.1). After consensus discussion between the researcher and the statistician the decision was reached that the weight of ratings can be explained as follow:

With a rating of (2) the component is optimally applied, with (1) the application is fair, but there is room for improvement, (0) indicates that it could not be detected and the component is on a warning level, whereas (-1) indicates a high-risk practice due to non-application of NDSC components. If N/A is chosen in a subsection, it would have the effect that the total score of that subsection must be reduced by 2 for each N/A selected. From this the application could be calculated as a percentage, which is only intended as an indication of how effective the application for that particular unit is and due to statistical limitations this value may read as a negative value.

Data from the closed questions was analysed with the help of Microsoft 2003 Excel spreadsheet and analysed with the help of the statistician at the North-West University. These findings indicated that Unit F had a fairly good (55%) implementation of the principles of NDSC as identified in literature. The KMC units (Units D & L), also had a fair (22-33%) application of NDSC principles, probably by default of the nature of the KMC intervention, since the use of KMC in principle provide an environment for the preterm infant closer to that of the intra-uterine environment. None of the other units implemented the principles of NDSC. The results from the checklist will now be discussed in collaboration with the field notes, which provided clarification on the context of NDSC operationalisation.

5.2.2 DISCUSSION OF RESULTS FROM OBSERVATION AND FIELD NOTES

Field notes were taken together with the structured observations using the designed checklist. A narrative report including results from the checklist and the observation field notes will now follow to explain the context for certain components. The ideal situation for each component is given in *italics*, followed by the results.

5.2.2.1 NDSC requirements for NICU design

The ideal NICU design is described in the literature as an environment that is uterine-like and created to support preterm infant growth and development.

Most of the units did not have the physical appearance and facilities that support the environment created by the uterus. In Units A, B, F and L the lights were dimmed and a quiet atmosphere was observed, possibly due to the dimmed light. In Units C, D, E, G – K the lighting was overall bright (fluorescent lights were mostly used) and Units C, D, G - L have windows, but only sometimes have curtains (thus partially

available). In the units where light was bright, noise levels were also high. Foetal positioning was implemented in some units and will be discussed under the heading: Positioning.

Conclusion statement 26: NICU design does not support an intra-uterine environment.

5.2.2.2 Individualised care

Observation include the reading of preterm infant cues and behaviours by caregivers, as well as the caregivers responding to these cues and adapting care according to the preterm infant's developmental needs.

In Unit A the doctors tried to respond to preterm infant cues, but the staff stated that they (nursing staff) were not skilled in observing the preterm infants. Parents that attended parenting training did attend to their preterm infants' cues, but not all the time. In Unit F some of the nursing staff did attend NDSC training and they did read and respond to the preterm infant cues and behaviour and they tried to adapt care accordingly. However, the researcher noted that some actions taken were done because 'that is the way it should be done', but the staff members were not always able to integrate (understand and apply) their knowledge with the practice and seemed to be rigid regarding care interventions. In the majority of units there was no immediate reaction to the stress cues displayed by the preterm infants.

*Conclusion statement 27***:** Knowledge regarding preterm infant cues and behaviour are not well integrated for the staff members.

Care is defined as care provided according to individual developmental maturity, identifying preterm infant cues and providing individualised support according to the preterm infant behaviour.

Except for Unit F and the two KMC units (D and L), care was not individualised. All the preterm infants in a unit received the same sensory input irrespective of their developmental maturity. The KMC units usually admit preterm infants (and their mothers) who are healthy and only growing. It could therefore be assumed that these preterm infants are in the coming-out or reciprocity developmental stages, which mean that they are mature enough to tolerate the kind of handling, positioning and sensory stimulation usually provided in a KMC environment. Unit F was the only

unit where staff attempted to adapt care according to preterm infant maturity. Different levels of care were provided in the different units, but the general trend found was that preterm infants were 'promoted' to a lower care level once they reached a certain level of health rather than a specific level of developmental maturity.

Conclusion statement 28: Care is not consciously adapted to suit preterm infant developmental maturity, but rather adapted according to the level of illness.

5.2.2.3 Family-centered care

Positioning parents as active participants in the care of their preterm infants include allowing them to see, touch and hold their preterm infants immediately after birth and in the neonatal unit. It further involves the care of the preterm infants e.g. feeding, bathing and KMC by parents and it includes the personalisation of preterm infant bed spaces by parents, encouraging mothers to breastfeed or express and also the early onset of discharge training.

In all the intensive care sections of the selected hospitals parents were only allowed to do skin-to-skin care once their preterm infants was in room air and stable and then for a maximum of 30 minutes at a time. In none of the intensive care units were KMC encouraged by nursing staff or doctors and KMC of the ventilated preterm infant is not even considered. In the lower care sections (high care, growing prem unit or low care and kangaroo mother units) the parents were mostly allowed to care for the preterm infants whenever they (the parents) were in the unit, but initiation of care (bathing, nappy change) and skin-to-skin care was dependent on parental request and not initiated by the nursing staff.

Only in Unit F were parents allowed to personalise the preterm infant's bed space. The KMC units (D and L) also provided for personalisation of preterm infant bed spaces, but only as a result of the mothers 'being' the preterm infant beds. Finally, discharge training was usually not started before the actual discharge. However, it seemed that this was started earlier in units that provided support to parents in the form of support groups for example Unit F.

Conclusion statement 29: KMC and holding preterm infants are only permitted for stable preterm infants in room air.

Conclusion statement 30: Discharge training is only stated just before discharge.

Privacy and comfort include a warm, homelike appearance, privacy for parents and the sharing of information between parents and professionals regarding preterm infant needs:

In general preterm infants were cared for in open single room wards. No dividers were available. Some units did have mobile screens that could be used on request. The use of these screens was only observed in Unit F. Most of the units did have curtain rails between beds, but these were either not positioned correctly to provide privacy for a certain bed space and therefore not used; or the curtains were just altogether removed. Privacy was therefore not provided, except for Unit F that provided some degree of privacy. Some chairs were available for parents, but these were not comfortable for sitting long periods and there was not one available at each bed space. Again only Unit F provided a padded chair, although only a few were available for the whole unit. Units' doors were mostly left open, even in the KMC wards, therefore no privacy is provided, especially not for mothers doing KMC. Unit F once again aimed to provide a friendlier atmosphere by painting walls in warm colours with pictures on the walls and incubator covers made of soft colour materials. None of the units provided a dedicated space for parents to personalise their preterm infant's bed space with toys, cards or any other personal items.

Sharing of information seemed to be lacking in all the units. No preterm infant information were volunteered in any of the units, but was made available to parents only on request. None of the units had a communication system in place to provide parents with continuous information regarding their preterm infants. None of the units assessed had a separate parenting room where parents could relax or have private conversations.

Conclusion statement 31: Privacy is not provided for parents.

Conclusion statement 32: No effective communication systems are in place.

The observation of visitation included the visitation hours for parents and siblings:

Parents were allowed to visit all the time, but they were not always on the hospital premises, due to living far away. In Units G to L visitation was not really encouraged. Mothers could visit all the time while they were admitted to the hospital after birth, and as the preterm infants become more healthy mothers were allowed to visit (due to breastfeeding) all the time, but not fathers. In one of the units siblings were allowed to visit and grandparents could also visit each day after 12h in the afternoon. In all the other units no siblings or grandparents were allowed to visit.

Conclusion statement 33: Twenty-four hour visitation for parents is practiced in all the units, but sibling visitation is limited.

Parent support groups are the final action assessed as part of family-centred care and should be provided by the hospital:

Five of the units presented Little Steps™ Parenting workshops for all parents at some stage during their stay. One intensive care unit only provided parenting support on an individual basis and although the workshops were presented at their institution, they did not invite parents to attend while the preterm infant was still in intensive care.

Conclusion statement 34: Parent support groups are available in Units A to D and F.

5.2.2.4 Positioning

Positioning include observing the physical position of the preterm infant, positioning orientation as prone, supine or side-lying and the use of individualised bedding:

Anatomical preterm infant positioning includes the positioning of the preterm infant in a contained, flexed position with the hands in midline, similar to how a foetus is positioned while still in-utero. The use of individual bedding was also observed.

Preterm infants in the KMC units (D and L) were positioned anatomically due to the curled-up foetal position they were placed in on the mother's chest. In most of the other units, except for Unit F, preterm infants were placed in a semi-anatomical position or not supported in an anatomical position at all. Only in Unit F was positioning aids used to provide snug fitting boundaries to support this anatomical position. In some units linen or towel rolls were used to attempt to nest preterm

infants. However these were not very successful, since they were not able to provide firmness. In the intensive care units observed no individual bedding was provided.

Conclusion statement 35: Anatomical positioning is best achieved in KMC units.

Another area of positioning observed was the orientation of the preterm infant. This section assessed which position preterm infants were placed in most of the time – prone, supine or side-lying.

The orientation of the preterm infants differed for each unit. The intensive care units (A, E, G) gave preference to positioning preterm infants in the supine position. The rest gave preference to either supine or side-lying positions and only the KMC units (D,L) gave preference to prone positioning due to the nature of positioning of the preterm infant on the mother's chest.

Conclusion statement 36: No clear preference to positional orientation could be determined in any of the units.

5.2.2.5 Handling techniques

Care according to maturation: Only in Units D, F and L was care provided according to preterm infant maturation by changing the external environment. This happened by default, since KMC was only provided to preterm infants who could tolerate increased sensory stimulation such as light, sound, touch and handling. Care was changed based on the health or age of the preterm infants and not preterm infant maturity. The handling and stimulation did not change according to maturation and no records to support change of care could be found. In the intensive care sections care was provided to the preterm infants in a manner that suit the staff. All the units have open areas with a number of preterm infants placed in a single area, therefore all the preterm infants in a particular area received the same sensory stimulation irrespective of preterm infant maturity.

Conclusion statement 37: Care and handling is changed based on preterm infant health and illness, rather than according to maturation.

State changes include the support of preterm infants to move through different states:

In none of the units did the care givers support gradual state changes by providing transitional touch, supporting the researcher's assumption that staff apply certain learned splinter skills regarding NDSC, rather than understanding the concept of NDSC and its implementation. For example: "Staff seem to understand the concepts of nesting, but cannot integrate this knowledge to support state changes. Seems like splinter skills were learned and are now applied, instead of applied integrated knowledge" (Field note from Unit F observation).

Conclusion statement 38: State transition was not supported in any of the units.

Promotion of rest periods include uninterrupted sleep periods of at least 2 to 3 hours as well as quiet times during which routine cares are delayed:

Most of the units attempted to have a quiet time in the afternoons. However, this seemed to happen mostly by accident. Quiet time and rest periods were also more evident in the KMC units (D and L) where mothers tended to take rest times. Units E and F also implemented quiet time in the afternoons, but no written protocol or policy was available.

Conclusion statement 39: Sleep was supported by quiet times, but no written protocols were available.

Modified hands-on care giving includes the clustering of care interventions around the preterm infants' sleep cycles and providing rest periods during interventions according to preterm infant cues. Handling is calm and gentle, supporting flexion and containment as well as positive tactile stimulation.

Care was more often clustered and supporting flexion, containment and positive tactile stimulation when provided by mothers in the KMC units (D, L). Only in Unit F was clustered care, sleep cycles and rest periods observed. In the rest of the units immediate touch (instead of transitional touch) of the preterm infants were observed when intervention took place. No team approach was evident and therefore clustering of care and cycled sleep were not supported. Finally, preterm infants were moved without supporting containment and flexion.

Conclusion statement 40: Care was clustered in KMC units.

Positive tactile stimulation is described as providing stroking or massage when applicable or containment or still hold when needed. Skin-to-skin care between parents and their preterm infants is also regarded as positive tactile stimulation, and preterm infant swaddling that supports a flexed and contained position further provides appropriate positive stimulation:

In the KMC units (D and L) and Unit F parents were allowed to hold their preterm infants for extended periods of time (not always 24 hours per day), but in the higher level of care units KMC or holding of preterm infants were only permitted when stable and then not necessarily skin-to-skin. Holding also happened mostly with feeding times and was usually not otherwise encouraged. Staff knowledge on the application of skin-to-skin care seemed insufficient, since in most units parents were allowed to hold preterm infants when they were stable and in room air and then only for a period of up to one hour at a time, not supporting a sleep cycle of at least ninety minutes and not utilising the benefits of skin-to-skin care. Swaddling of preterm infants were not observed while they were in closed incubators, since the belief of nursing staff is that swaddling will effect the temperature regulation provided by the incubator.

Conclusion statement 41: Benefits and application of skin-to-skin is not utilised in full.

Movement (kinaesthetic stimulation) included the physical movement of preterm infants. Movement provided by bedding such as waterbeds or sheepskin and the co-bedding of multiples.

In none of the units were the physical movement of preterm infants supporting flexion. Therefore, although some units aimed to position preterm infants in good flexion the conclusion can be drawn that the staff do not fully understand the principle of flexion and containment and its application in actions such as moving the preterm infant. None of the units used bedding such as waterbeds or sheepskin. However, unit A attempted to provide soft, supportive bedding by placing the preterm infants on a layer of cotton wool that is placed under the blanket. Units A to D and F allowed co-bedding of stable multiples, however no written policy was available on this practice. Co-bedding was only allowed when the preterm infants were stable and in the rest of the units co-bedding was not the policy, and therefore not implemented.

Conclusion statement 42: Co-bedding was mostly not used or supported.

Self-regulation is the preterm infant's ability to regulate herself when the environment is overstimulating. This includes the preterm infant's own ability to self-regulate in case of behavioural maturity of preterm infants or the provision of opportunities to support self-regulation in preterm infants that are not yet mature enough. Self-regulation support may include opportunities for grasping, state regulation and non-nutritive sucking.

Self-regulation only seemed to happen accidentally in most units. Pacifiers are available in some units, but in many, such as Units A to D and G to L, it is not allowed due to the misinterpretation of the Baby-friendly Initiative (clarification follow with feeding). No grasping opportunities were provided and parents were not educated or supported to provide grasping opportunities. Grasping only happened accidentally when a preterm infant grasped onto the linen. Skin-to-skin and side-lying positioning was sometimes used to support self-regulation, as seen for example in Units D, F and L. State regulation was only supported in Units A, B and F where dimmed light aided in sufficient sleep times.

Conclusion statement 43: Self-regulation was not purposively supported.

5.2.2.6 Environmental manipulation

Environmental manipulation includes reduction of noise and light and the provision of olfactory stimulation.

(a) Sound

When observing environmental sound the ambient environment was considered, followed by the immediate preterm infant environment and finally staff generated noise.

In Units A to C and G to K, no separate area was available for administrative purposes. It was situated in close proximity of the preterm infant beds, making telephone generated noise stressful events for preterm infants. Except for Unit F, none of the other units had doors that were kept closed, allowing for noise from outside the unit to affect the ambient sound levels within the units. Units E and F made use of sliding doors that had lower noise levels when opened and closed. Except for Unit F, none of the other units had monitors in place to measure sound, nor were sound absorbing material used on physical spaces such as walls and floors.

None of the monitor alarms were set to the flashing setting instead of alarming with sound. however, in Units A and F the monitor alarm limits were set to a safe minimum volume. The KMC units (D, L) and some of the lower level units, such as B, C, H to K did not have monitoring equipment available for each patient and therefore this lack of technology actually contributed to a lower noise environment for the preterm infants in those areas. Only in Unit F did staff respond to monitor alarms quickly, but in the rest of the units alarms were continuously ignored. In all of the units the washbasins are next to at least one preterm infant bed, causing higher noise levels for that preterm infant. Units G to L made use of open trashcans therefore did not have the risk of noise being generated by trashcans, and Units E and F made use of trashcans padded at the bottom. In Unit G and the KMC units (D,L) the televisions were playing loudly and none of it displayed educational material.

Conclusion statement 44: Unit design and decoration does not support low environmental sound levels.

Conclusion statement 45: Lack of technology, for example monitors, actually supported low ambient sound levels.

The immediate sound environment of the preterm infant includes the use of incubator covers and soft earplugs or covers, quiet closing of incubator portholes, background noise and water in ventilator tubes.

Only Unit F made use of incubator covers. The KMC units (D, L) did not use incubators, but the mother's body acts as a sound barrier. The intensive care units (A, E, G) all made use of open incubators and therefore these preterm infants did not receive any protection from environmental sound, since they were totally exposed to ambient noise. None of the units used earplugs or ear covers, nor were sound levels measured inside any of the incubators observed. In units that made use of closed incubators, the button latch of the portholes was rarely used to close portholes quietly. Unit F was once again the only unit closing the portholes softly and keeping the background noise to a minimum.

The final observation as part of the sound environment was that of staff-generated noise.

All the units that had closed incubators, had files or bottles placed on top of the incubators, mostly due to a lack of workspace or no dedicated area for files or a writing space for files.

In all the units conversations took place next to the preterm infant's bedside, except for Unit F that tried to move conversation away from the bedside. In the KMC units (D, L) staff were talking loudly and even held lectures in the ward, which was quite noisy.

Conclusion statement 46: Lack of dedicated workspace contributed to staff generated noise.

(b) Light

Observing the light environment in the neonatal units included ambient light, light in the immediate preterm infant bed space and the use of cycled light.

Units E and F did not have any form of natural light and in Unit F the ambient light was reduced by the use of dimmer lights, but in Unit E bright fluorescent lights were used even though dimmer lights were available. In Units D and G to K windows had curtains, but these were either not closed, or not in a good working order. Unit A to C had curtains and it was closed at the time of the observation. However, in Units B and C the fluorescent lights were also turned on. In units with lower ambient light levels, the activity levels also seemed lower.

Immediate preterm infant bed spaces were observed for the use of incubator cover, titration of light, use of eye protection with phototherapy, dimmed overhead light and sensory monotony.

In the KMC units (D, L) direct light was avoided by the position of the baby on the mother's chest, facing towards the mother. In none of the other units were there any devices that could be used to protect preterm infants from daylight sources or bright overhead lights, nor was any attempt observed to shield preterm infants from bright overhead lights when these were turned on during procedures. Incubator covers were only used in Unit F and provided a lot of protection against environmental light, however, some incubators was positioned in such a way that overhead lights could still shine on the preterm infants' faces. In Units A to C incubator covers were not used and lights not turned down since the nursing staff responded that "they could

not see the preterm infants from the door" when incubators are covered. Unit E had titrated light available at each bedside, but it was not used due to staff resistance. All preterm infants receiving phototherapy were protected against the light by means of eye covers, but their neighbouring patients were not shielded from the phototherapy, except for Unit F. In none of the units were toys or pictures used inside incubators, so this did not pose the risk for sensory overstimulation. None of the units measured the light levels inside the incubator.

Conclusion statement 47: Insight regarding lowering of light levels seemed insufficient.

Cycled light is the use of different levels of light throughout the day and supporting a day and night cycle with lower levels of light for at least 12 hours at nighttime.

In the KMC units (D, L) cycled light were provided to the preterm infants when the mothers' sleep at night in a darker environment. Unit F implemented cycled night and made an effort to turn lights down after 12 noon. None of the units had a written policy regarding cycled light and in most it was only implemented when a staff member was on duty who felt it was important.

Conclusion statement 48: Cycled light was implemented depending on staff members on duty, but no written policies were found.

(c) Olfactory stimulation

Olfactory stimulation is the provision of the mother's scent inside the incubator or to the preterm infant.

Olfactory stimulation was continuously provided in the KMC units (D, L) and in the other units only when mothers were allowed to hold or KMC their preterm infants. In none of the units was there specific effort, policy or intervention implemented to support olfactory stimulation.

Conclusion statement 49: No effort was made to support olfactory stimulation.

5.2.2.7 Pain management

Pain management as a principle of NDSC includes the administration of oral sucrose as a non-pharmacological pain management option with the performance of painful

or stressful interventions and the offering of non-nutritive sucking during painful and minor procedures.

Only Unit F had a written protocol on the use of oral sucrose as non-pharmacological pain management and they made use of pacifiers for non-nutritive sucking. Unit E allowed the use of pacifiers, but none of the other units did due to having a baby-friendly approach, which to their understanding did not allow the use of pacifiers. However, this is a misinterpretation, since the baby-friendly initiative was developed for use in mothers with healthy pregnancies, having a normal delivery of a healthy, fullterm, normal preterm infant and where mother and baby are not separated from each other. These principles are not applicable to preterm infants, due to them being separated and ill and in addition they can loose the sucking reflex if not stimulated.

Conclusion statement 50: Non-pharmacological pain management was not actively managed.

5.2.2.8 Knowledge of preterm infant development

Knowledge of preterm infant development was assessed by observing staff knowledge in their ability to read preterm infant cues and behaviours during interaction with the preterm infant, knowledge sharing between professionals and the use of a multi-disciplinary approach in the unit.

Except for Unit F, preterm infant cues and behaviours were not read by nursing staff, and in some cases no staff member (or any other caregiver) was present with the preterm infant. In Units A to C only members of the rehabilitation team were able to read preterm infant cues and act accordingly. Staff from Units A to D and F attended Little Steps™ training on NDSC and they showed the ability to apply the knowledge. In the rest of the units staff did not receive any prior training and was uninformed on NDSC and its application.

Conclusion statement 51: Staff who attended NDSC training demonstrated a better ability to read preterm infant cues and apply the knowledge accordingly, indicating good integration of knowledge.

In all of the units knowledge regarding preterm infant development were only shared by means of the nursing notes, which did not seem very effective, since the person on duty did not always read it. In addition referrals were made only when needed.

Unit F also attempted to share knowledge verbally. A multi-disciplinary team approach was not evident in any of the units except for Unit F, which has a weekly multi-disciplinary ward-round discussion. No systems seemed to be in place to support good communication.

Parents' knowledge of their preterm infants was observed with regard to parents being taught to read cues and stress signs and how to interact with their preterm infants:

In the units where parenting support groups (such as the Little Steps™ parenting workshops) were implemented (Units A to D and F) parents were taught about their preterm infants' behaviour and how to interact with their preterm infants. Where no support groups were evident parents had to ask to be taught about their preterm infants and no support was volunteered by the staff.

*Conclusion statement 52***:** Parents in units with parent support groups were better able to interact with their preterm infants.

5.2.2.9 Feeding

Feeding as part of NDSC were observed with regard to the preparation of preterm infants for feeding, positioning of preterm infants before feeding to prevent repositioning after feeding and offering of non-nutritive sucking opportunities during gavage feeding.

In Unit K preterm infants were fed three-hourly irrespective of feeding readiness. In Units A to D preterm infants were also schedule-fed. However, 'cycling' exercises were introduced to support preterm infants to move into a more alert state, getting them ready for feeding. In none of the units the preterm infant positions were changed prior to feeding to prevent repositioning after completion of the feed.

Conclusion statement 53: Preterm infant position where not changed prior to feeding to prevent repositioning after feeding.

As with pain management, pacifiers were not used in most of the units due to the baby-friendly initiative approach, but in Unit F pacifiers were always offered with gavage feeding and in Unit E it was sometimes offered.

Most of the units motivated mothers to express breast milk for their preterm infants, except for Units G to L where the doctors prescribe formula and the dietician apparently sees the breast milk bank as a burden rather that a life saving intervention. Units G to L also have a breast milk pasteuriser that is not used.

Conclusion statement 54: Breast milk feeds are not always the preferred method of feeding.

Conclusion statement 55: Preterm infants were schedule-fed irrespective of feeding readiness.

Conclusion statement 56: Pacifiers were not used to support self-regulation, due to the interpretation of the Baby-Friendly Initiative.

The observations and the field notes were followed by interviews with key-informant respondents. The results of the interviews will now be discussed.

5.2.3 DATA ANALYSIS

5.2.3.1 Data analysis of unstructured interviews

Data was analysed in relation to the purpose of the study. Coding was done using the steps according to Tesch's approach as described in Chapter 4.

5.2.3.2 Verifying data

To ensure validity and the prevention of bias the researcher used an independent coder. The independent coder received a letter with instructions (Addendum 4-6) on the coding process (Tesch's approached as described earlier) together with a copy of all the transcribed interviews. She was requested to follow the same procedure and provide written feedback, which was discussed between the coder and independent coder to reach consensus.

5.2.4 RESULTS

The following section provides results from the interviews.

5.2.4.1 Participants understanding of the concepts of NDSC

Results are discussed according to the three questions posed to the respondents. Question one was: ***What do you understand under Neurodevelopmental Supportive Care?*** The response from the different respondents regarding an explanation of NDSC is given in Table 5-3, below.

Table 5-3: Topics identified from interviews on the first questions posed.

Interview 1	**Interview 2**
Help the preterm infant to adapt to the environment. Optimal support Positioning in nests Correct handling Reduced light and sound to reduce risk of later problems.	Neurology of the baby The infant seen holistically Lowering of noise and light and minimal handling.
Interview 3	**Interview 4**
Try to help baby grow up normally Reduce noise The light is a problem for the preterm infants Neurological development	Extra-uterine similar to the intra-uterine environment

From these responses it became clear that not all the respondents were well informed on the NDSC approach. Noting the understanding of staff regarding the topic contributed to a better understanding of the state of operationalisation in the different units. Respondent 4 was a representative of Unit F. Unit F had a 55% compliance with the observation. This respondent understood the concept of NDSC and it was clear that operationalisation in this unit was more effective than the other units observed when referring to the results of the observation. Respondents 2 and 3 did not have a good idea of NDSC and it was also clear from the observation of the units they were working in (E and G to L) that the operationalisation was also not very good. Respondent 1 also understood the NDSC approach well, however the units she works in only attained a fair score on the operationalisation. The following section gives attention to the results from the interviews with regard to factors supporting the implementation of NDSC.

5.2.4.2 Factors supporting the implementation of NDSC

The next question posed to respondents was: ***Tell me what helped your unit to implement NDSC.*** This question aimed to identify the support towards NDSC implementation. Table 5-4 summarise the themes and categories that support the operationalisation of NDSC. The results will be discussed more broadly with the field notes.

Table 5-4: Supportive themes and categories identified from interviews

SUPPORTIVE THEMES	CATEGORIES
Interview 1	
Training of staff on NDSC	Staff training
A team approach	Team approach
Community support in making NDSC products	Community involvement
Support from departmental managers	Management support
Support from the doctors	Positive staff attitude
A breast milk bank	Facilities/equipment
Interview 2	
Working equipment	Facilities/equipment
Interview 3	
Talking softly	Staff attitude
Babies warm on arrival from theatre	Policy
Linen available for positioning	Facilities/equipment
Interview 4	
New facility	Facilities/equipment
Training of staff (short course)	Staff training
Rehabilitation staff in unit	Team approach
Donations from annual money raising event	Community involvement
Positive attitude from staff	Staff attitude
Equipment available	Facilities/equipment
Support from management	Management support
Two year implementation	Extended implementation time

The categories that became clear as supporting factors for the operationalisation of NDSC in the selected units are listed and described below. Indication is given to literature supporting the results from the interviews.

Category	Supporting literature
▪ Staff training	Hendricks-Munoz *et al.,* 2001:40; Jorgenson, 2002:5-8; Lawhon and Hedlund, 2008:133-144; Louw and Maree, 2005:31-32
▪ Team approach	Ashbaugh, 1999:48-52; Aucott *et al.,* 2002:300; Montgomery, 1999:47-49
▪ Community involvement	No literature – specific to South Africa
▪ Management support	Lawhon and Hedlund, 2008:141; Smith *et al.,*
▪ Positive staff attitude	Crawley and Emery, 2006:143
▪ Facilities / Equipment	Als, 2006:7; North East Benchmark Group, s.a.
▪ Extended implementation time	Jorgenson, 2002:6; Hennessy, 2006:106

Table 5-5: Categories supporting NDSC implementation and supporting literature

(a) Staff training

Staff training included the training of nursing and other staff members regarding the concept of NDSC. This training was identified as 'developmental care' training provided by a registered nurse about eight years ago and more recently training presented by Little Steps™. Both these training events were presented in the form of short courses. Interviewee 4 (Unit F) also identified continuous in-service training as a support factor. Where training was not mentioned, such as with interviewee 2 and 3, there was a lack of understanding of the concept of NDSC and in the observation it was clear that NDSC was not operationalised.

Conclusion statement 57: NDSC training directly relates to the operationalisation of NDSC.

(b) Team approach

The interviewees representing units that were more successful in the operationalisation of NDSC also reported some sort of a team approach being followed. The doctors were usually either aware of NDSC and one or more members of the rehabilitation team (therapists) were involved in the unit with the implementation of NDSC. *"Ek dink dat ons in 'n span werk en nie een–een nie, dit het baie, baie gehelp."* (Direct translation: I think that we work in a team and not alone, that helps very, very much.)

Conclusion statement 58: Involvement of the whole multidisciplinary team contributes to successful operationalisation of NDSC.

(c) Community involvement

Interviewees from successful units (F, D) reported that their communities are involved in some way with the neonatal units. Unit F gets financial support from a local group who has an annual fundraising event specifically for the paediatric department at their hospital. In Unit F the mothers from the community are involved in making supportive aids such as incubator covers. *"Nee, ek het 'n RA-groep… so 6-7 vrouens gewoonlik. Een van hulle was voorheen by 'n naaldwerkfabriek, hulle het klere gemaak. Haar skoonsuster werk daar en sy het gaan vra het hulle nie oorskiet lappe nie toe kom hulle met sakke en sakke hier uit. Toe was hulle sommer na 'n ander fabriek ook…".* (Direct translation: No, I have a RA group... usually about 6-7 women. One of them used to be with a sewing factory previously, they made clothes. Her sister-in-law works there and she went to ask if they have off-cut fabric and they arrived with bags and bags filled. Then they went to another factory as well...).

Conclusion statement 59: Community involvement, financial or otherwise contributes to the successful operationalisation of NDSC.

(d) Management support

Support from departmental as well as hospital management seems to contribute greatly to the success of NDSC implementation. Interviewees from Units D and F both stated that the support of their head of department, the doctors working in the units, as well as hospital management contributed greatly to the implementation of NDSC in their units.

"Ek dink wat dit vir ons makliker maak is omdat ons bestuur agter ons is en ons ondersteun, hospital bestuur, sowel as verpleegbestuur en dan ons mediese hoofde." (Direct translation: I think what makes it easier for us is that we have management behind us they support us, hospital management as well as nursing management and our medical heads). The other units all stated a lack in support from the management and did evidently also not have successful implementation.

Conclusion statement 60: Support from departmental as well as hospital management contributes to the success of NDSC operationalisation.

(e) Positive staff attitude

The attitude of the staff towards change, implementation and the parents proved to contribute towards the operationalisation of NDSC when it was a positive attitude.

"...dat my staf almal inkoop in die idee, dit maak dit goed." (Direct translation: ...that my staff all buy into the idea, makes it good.) Enthusiastic doctors also influenced nursing staff more positively. *"Wat positief is, is die dokters. Die jong dokters wil graag help, maar hulle weet nie hoe nie, hulle is nie regtig seker nie…"* (Direct translation: What is positive is the doctors. The young doctors want to help, but they do not know how, they are not really certain...).

Conclusion statement 61: A positive and enthusiastic staff attitude contributes to the operationalisation of NDSC.

(f) Facilities/equipment

A newer facility that has been renovated contributes to less effort in the implementation of a NDSC approach. Equipment such as spotlights for use as individual lighting at bedsides seems to be a contribution. *"...omdat ons redelik nuwer is as wat die ander staatshospitale is ondersteun dit ons beter."* (Direct translation: ...because we are newer than the other state hospitals, it supports us better).

Conclusion statement 62: Equipment in good working order and newer facilities contribute to the operationalisation of NDSC.

(g) Extended implementation time

Interviewee 4 from Unit F reported that the staff attended NDSC training and following that the physiotherapist has been involved in the unit with NDSC for a period of over two years. In her opinion this extended time of NDSC involvement contributed largely to the successful implementation of NDCS. *"Dat dit net 'n nuwe konsep is en dan ook natuurlik die fisioterapeut help baie, in die jare, 2jr wat sy nou by ons is. Ek dink tog dit help baie".* (Direct translation: It is a new concept and then off course also the physiotherapist helps a lot in the years, 2 years, that she has been with us. I do think it helps a lot). The units that did not report previous or long-term implementation did not have a high compliance score with the observation.

Conclusion statement 63: Implementation of NDSC over an extended period of time contributes to successful NDSC operationalisation.

(h) Policy

Interviewee 3 from Unit E stated that their preterm infants arrive warm and covered from theatre, which implies that some practice guideline or policy must be in place to support this intervention. No written policy was found except for the policy on use of oral sucrose in Unit F.

Conclusion statement 64: Policies that direct care contributes to successful operationalisation of NDSC.

Units D, F, and L had positive ratings on the observation, indicating some degree of compliance with NDSC. Barriers to NDSC were also mentioned by interviewees and will now be discussed.

5.2.4.3 Barriers to the operasionalisation of NDSC

Question three was posed to identify barriers to operationalisation: ***Tell me about those factors you experienced as barriers to implement NDSC in your unit.***

Interviewees identified different barriers to the implementation of NDSC in the different units are listed and described below. Indication is given to literature supporting the results from the interviews.

Table 5-6: Categories of barriers to NDSC implementation and supporting literature

Category	Supporting literature
▪ Communication	**
▪ Parental profile	**
▪ Resources	**
▪ Staff attitude	Hennessy, 2006:134
▪ Physical facilities/equipment	**
▪ Policies	Hennessy, 2006:108
▪ Parental involvement	**
** no literature could be found that describe these specific categories as barriers, however, the literature supporting implemetionation stated in Table 5-6 implied that the lack of these categories may be regarded as barriers.	

Table 5-7 discussed the barriers that were identified:

Table 5-7: Barrier themes and categories identified from interviews

BARRIER THEMES	CATEGORIES
Interview 1	
Head of department does not provide feedback to junior doctors Poor communication from nursing staff Language barrier between parents and staff	Communication
High staff turnover/rotation (nursing and doctors) Staff from other wards Nursing staff resistance to change Poor attitude of nursing staff towards parents Need for a champion to drive operationalisation	Staff profile / attitude
Financially motivated parental attitude (grants) Poverty and illiteracy of parents Parents want to go home Parental age – teenagers or older moms	Parental profile

BARRIER THEMES	CATEGORIES
Lack of resources e.g. linen get lost when send to central laundry	Resources
Physical facilities lack space No privacy for mothers	Physical facilities
Lack of management drive - management talk, don't do	Management
Interview 2	
Change of staff Use of agency staff Lack of staff training Not enough nursing staff Doctors do not cluster care	Staff profile / attitude
Interview 3	
Doctors do not support NDSC interventions Doctors do rounds during quiet time Doctors turn lights on Doctors know what to do, but don't X-rays done at any time of day	Staff profile / attitude
Communication between staff and parents only when preterm infant condition changes	Communication
Limited stock availability Nests not available	Equipment
Limited number of lodger beds	Physical facilities
Restricting unwritten 'policies'	Policies
Mothers only visit at care times	Parental profile
Interview 4	
Loud staff culture	Staff profile / attitude
Correct size nappies not available Tender process does not support correct products	Equipment
Lack of funds	Resources

These barrier themes were grouped together in the following categories that will now be discussed:

(a) Communication

Interviewee one reported a lack of communication between health care professionals, among nursing staff and between the medical doctors, head of department and junior doctors. The communication between staff and parents are also lacking. *"...only if the condition of the baby changes we do phone the parent."* Another communication problem is the language. Not all parents can speak or understand English or Afrikaans, which are the languages mostly used by staff. Some parents speak African languages (Khoi San in this instantce) and in one of the units the most frequently used language is 'Xu' and 'Khwe' – pronounced 'koo' and 'kwe'.

Conclusion statement 65: Lack of communication among health care professionals; between nursing staff and parents and language barriers are barriers to NDSC operationalisation.

(b) Parental profile

The parent profile also seemed to be a barrier. This 'profile' includes the age of parents, who are either still teenagers or mothers who are over 40 years of age. Parents in the public sector hospitals in South Africa are also poor and often illiterate (Interview 1*). "Ek dink dit is maar ongeletterdheid…ek weet nie wat…armoede ook maar...".* (Direct translation: I think it is illiteracy...I don't know what... poverty also...). Another barrier is that parents receive a grant for each child and therefore many pregnancies are financially motivated: *"...want dit gaan baie maal net om die 'grant'. Dit gaan vir baie net om die geld en nie om die kinders nie".* (Direct translation: ...because a lot of times it is just about the grant. It is just about the money and not the children).

Conclusion statement 66: A parental profile of teenage parents, older mothers and parents who had a financially motivated pregnancy is a barrier to NDSC operationalisation.

None of the interviewees stated that parents are encouraged to be involved with their preterm infants. However, KMC is available to stable preterm infants and their parents (refer to observations). In the same units the parents are not interested to be very involved: *"Baie van hulle sal loop saam met die kêrel en die babatjie net daar los en verdwyn, sonder melk, sonder niks".* (Direct translation: Many of them will

leave with their boyfriend and just leave the baby and disappear, without milk, without anything). Parents are furthermore not encouraged to visit often: *"The parent only comes when the mother has to come to the baby".*

Conclusion statement 67: Lack of encouragement for parental involvement is a barrier to NDSC operationalisation.

Conclusion statement 68: Lack of parental interest in involvement with their preterm infant is a barrier to NDSC operationalisation.

(c) Resources

Interviewee 1 mentioned a lack of resources. She reported that linen has to go to a central laundry and then get lost, so they have less linen to use for things like nesting. Interviewee 3 reported that in their unit *"The stock is the problem"* as well as the availability of nests. Interviewee 4 stated that they have a problem obtaining the correct size nappies for their patients and that the tender process does not support having the correct products, since when a tender elapses the tender department orders incorrect products. *"Maar natuurlik wat wel 'n probleem is, die doeke."* (Direct translation: But off course something that is a problem is the diapers).

Only interviewee 4 reported that a lack of funds tends to be a barrier to NDSC implementation. *"...en dan natuurlik die geld, die beskikbaarheid daarvan"*. (Direct translation: ...and the off course the money, the availability of it".

Conclusion statement 69: Lack of resources, such as linen, positioning aids, stock, funding and an unsupporting tender process are barriers to NDSC operationalisation.

(d) Staff attitude

Nursing staff members that have been working in the neonatal units for an extended period of time are resistant to change. *"(laggie) Suster wat al 20 jr werk...".* (Direct translation: (laugh) Sisters who have been working for 20 years…). The interviewee (1) implied with this statement that staff who work in the neonatal wards for a long time do not want to change their practice. The perception exists in some cultures that when you talk loudly you are being honest (not hiding anything) and therefore the culture of staff in most units tends to be one of loud talking*: "... en dan kultuur...hard praat..."* (direct translation: ....and then culture....talking loudly...". Staff

members tend to be very loud due to culture, according to interviewee 4. *"Maar die barriers is maar defnitief deel van die kultuur, sou ek sê. Ek dink dinge soos geraas gaan bietjie 'n probleem wees, veral waar dit meer swart is gaan dit defnitief meer van 'n probleem wees, van 'n kulturele perspektief"*. (Direct translation: But the barriers are definitely part of the culture, I would say. I think things like noise will be a bit of a problem, especially where it is more black [African cultures] it will definitely be more of a problem, from a cultural perspective).

In units were there are no champion to drive the operationalisation of NDSC, the implementation seems more difficult: *"...iemand moet opcheck..."* (Direct translation: ...someone has to check-up...).

Another aspect of the staff attitude is the attitude towards parents. Staff members do not always treat parents with dignity. They tend to talk down to mothers and scold them. *"Nog iets wat baie negatief is, is die susters se hantering van die ma"*. (Direct translation: Something else that is very negative, is the sisters' management of the mother).

Interviewee 2 reported that doctors do not cluster care, but do rounds at any time of the day. There is also a lack of staff training*: "The doctors do not help us. ...they just start the rounds at 12 o'clock when we are supposed to dim the lights".* Interviewee 3 stated that doctors do not support NDSC interventions, they do rounds during quiet time, turn lights on and actually know what to do, but don't do it. Furthermore, x-rays are done at any time of day and this is not supportive of quiet or rest times for preterm infants.

More barriers to NDSC operationalisation is the high staff turnover/rotation (nursing and doctors), lack of nursing staff, staff from other wards or agency staff working in the neonatal units without proper experience or training. *"Ek weet nie of ruil hulle nie, as hulle te kort is kom help ander daar uit. Daar is een suster spesifiek, sy praat so hard, mens sal dink sy skree op iemand…Sy kom van een van die kindersale, wat sommer inkom. Partykeer doen hulle dit ook, kom net in, kom uithelp."* (Direct translation: I don't know whether they rotate, if they are short others come to help out. There is one sister in particular, she talks so loudly, you would think she is shouting at someone...she comes from one the children's wards, just comes in. Sometimes they do that also, they just come in, come to help out).

Conclusion statement 70: Resistance to change due to a certain way of practice over an extended period of time is a barrier to NDSC operationalisation.

Conclusion statement 71: Cultural sensitivity is needed to overcome barriers to operationalisation.

Conclusion statement 72: Lack of respect for parent dignity is a barrier to NDSC operationalisation.

Conclusion statement 73: Ignorance of patient needs is a barrier to NDSC operationalisation.

Conclusion statement 74: High staff turnover and rotation is a barrier to NDSC operationalisation.

Conclusion statement 75: Lack of a champion to drive NDSC is a barrier to NDSC operationalisation.

(e) Physical facilities/ equipment

Physical facilities such as lack of lodging facilities for mothers who are discharged from hospital is a problem. The lodger facilities are often overcrowded and there is not enough privacy: "*Ag, daar's net nie genoeg privaatheid nie."* (Direct translation: Oh, there is just not enough privacy). *"Because here we only have two beds available for lodgers."* Interviewee 2 stated that they do not have a problem with equipment, but she referred to ventilation equipment only and not NDSC equipment.

Conclusion statement 76: Lack of lodging facilities and privacy is a barrier to NDSC operationalisation.

(f) Policies

Written policies on NDSC were not available in any of the units observed. However, non-written policies, or rather practices, were evident from the observation and confirmed by the interviews. Interviewee 2 stated that the doctors do not support cluster care, since they do their rounds at any time: *"...they don't have specific times".* Interventions are not clustered: "*The x-ray… they will only come when it's*

been ordered. We don't order the x-rays and the sonar. They come and fiddle with the baby". "And the doctors?..... No they don't have specific times".

'Non-written policies' have a strong influence on clinical practice as was evident from a statement by interviewee 2: *"When the baby's condition changes we have to switch on the light, everybody is now awakening. We have to".*

Conclusion statement 77: Lack of written policies to support NDSC is a barrier to the operationalisation of NDSC.

(g) Management Support

Interviewee 1 stated that the management are not very supportive. They will talk positively, but when it comes to doing, nothing happens. *"Die bestuur is baie positief met praat, maar as dit kom by doen, dan gebeur niks"*. (Direct translation: The management is very positive with talk, but when it comes to doing, then nothing happens).

Conclusion statement 78: Management that is not actively supportive is a barrier to NDSC operationalisation.

(h) Understanding the subject

Lack of subject knowledge (NDSC) seemed to be a barrier to the operationalisation of NDSC, since interviewee 2 demonstrated a lack of knowledge during the interview. She *"Responded to questions with difficulty due to lack of subject knowledge. Needed a lot of guiding questions to gather any information. Participant gave examples of what NDSC can include rather than discussing aspect that support implementation"* (field notes interview 2). The units where she works also rated low on the observation. Another example was the answer of interviewee 3 on the question from the interviewer: '*What do you understand under the term 'Neuro-developmental supportive care'?* The answer was as follows: *"We try to help the baby to grow up normally. …any extra problems they already have, by dimming the light e.g. One having problems because of the light, because … the light, and the noise. We are trying to reduce the noise…so that their brain can also function normally. They are not well because they are newborns and they are also premature, and Ja…the brains, the eyes…I forgot the others".*

Some of the other participants demonstrated a better knowledge of the subject, as was evident from the third interview: "*The participant is fairly knowledgeable on the subject. Participant gave examples of what NDSC can include rather than discussing aspect that support implementation. Even with guidance she was not able to answer the question satisfactorily"* (field notes interview 3). On the other hand, the units that rated high on compliance (Unit F) during the observation correlated with an interviewee that was knowledgeable on the subject of NDSC: *"The participant was very knowledgeable on the subject and provided valuable information"* (field notes interview 4).

Conclusion statement 79: Poor understanding of the concept NDSC is a barrier to operationalisation of NDSC.

5.2.4.4 Storage of data

To ensure that data does not get lost and is available for future review if needed, the researcher ensured that data was stored correctly.

- All interviews, *verbatim* transcripts, and field notes were stored as electronic back-up computer copies as well.
- High-quality digital recording equipment was used during interviews.
- A master list of the types of information gathered was compiled.
- Masking their names in the data ensured the anonymity of participants.

5.2.5 VALIDATING THE ACCURACY OF FINDINGS

Validity is used to determine whether the findings are accurate from the point of departure of the researcher, the participants or the readers. The following strategies were followed in this part of the study (Creswell, 2003:195-196; Klopper & Knobloch, 2009:12):

- *Triangulation* of different data sources was used to build a coherent justification for themes. The researcher used both transcribed interviews and field notes as data sources. The data was then coded and co-coded, followed by consensus discussion to ensure the themes and categories derived at.
- A *rich, thick description* of the findings was used when discussing the results that transported readers to the setting and allowed for shared experiences.

- *Bias* that the researcher might have brought to the study was clarified. No bias was identified in this phase of the study.
- *Negative or discrepant information* that countered the themes were also presented when it emerged, such as identifying the most knowledgeable person as key-informant, but that person could not even describe the concept of NDSC, making the rest of the interview questions of little use. However, this brought to the researcher's attention that limited knowledge on the side of 'knowledgeable' nursing professionals is a reality when exploring and operationalising NDSC.
- *Prolonged time* was spent in the field, starting with an in-depth ILR (Chapter 2), followed by structured observations in the selected units and then the key-informant interviews. Furthermore, the researcher spent considerable time in the field of NDSC training and implementation with her day-to-day clinical duties.
- *Peer debriefing* was done by means of the researcher's study leaders who reviewed the methodology of the study on an ongoing basis.
- An external auditor in the shape of external international examiners will review the entire project. These auditors or examiners are new to the project and can therefore provide and assessment of the project at the conclusion of the study.

5.3 SUMMARY

Chapter 5 discussed the results of the situational analysis performed in this study. Firstly a walk-through of the 12 selected units was performed, followed by a more detailed observation using the checklist designed earlier. The statistical value of the checklist was explained and a summary of the results given in Table 5-2. The KMC units had a high compliance score. Only Unit F had a fairly high compliance score, but none of the other units showed evidence of compliance, and therefore their existing practice is actually putting their patients at risk.

The results of the checklist were discussed together with the field notes. This discussion was followed by the results of the key-informant interviews. Interviews were recorded, transcribed *verbatim,* coded and co-coded using Tesch's approach. On the first question: ***What do you understand under Neurodevelopmental Supportive Care?,*** two of the interviewees did not have a good understanding of the concept NDSC, while the other two had a good understanding and they could

therefore provide much more information towards supportive factors to NDSC implementation.

On the second question: ***Tell me what helped your unit to implement NDSC?,*** seven categories were identified that support NDSC operationalisation. These categories were: staff training, team approach, community involvement, management support, positive staff attitude, facilities / equipment, extended implementation time.

The third question: ***Tell me about those factors you experienced as barriers to implement NDSC in your unit,*** provided seven categories that acted as barriers to operationalisation of NDSC in public sector hospitals in South Africa. These included: communication, parental profile, resources, staff attitude, physical facilities / equipment, policies and parental involvement. Twenty-three conclusion statements were formulated in this stage of the study and they are listed in Table 5-8.

Table 5-8: Conclusion statements from Observations as part of stage 2

Conclusion statements - observations
26. NICU design does not support an intra-uterine environment.
27. Knowledge regarding preterm infant cues and behaviour are not well integrated for the staff members.
28. Care is not consciously adapted to suit preterm infant developmental maturity, but rather adapted according to the level of illness.
29. KMC and holding preterm infants are only permitted for stable preterm infants in room air.
30. Discharge training is only commenced just before discharge.
31. Privacy is not provided for parents.
32. No effective communication systems are in place.
33. Twenty-four hour visitation for parents is practiced in all the units, but sibling visitation is limited.
34. Parent support groups are available in Units A to D and F.
35. Anatomical positioning is best achieved in KMC units.
36. No clear preference to positional orientation could be determined in any of the units.
37. Care and handling is changed based on preterm infant health and illness, rather than according to maturation.
38. State transition was not supported in any of the units.
39. Sleep was supported by quiet times, but no written protocols were available.
40. Care was clustered in KMC units.
41. Benefits and application of skin-to-skin is not utilised in full.
42. Co-bedding was mostly not used or supported.
43. Self-regulation was not consciously supported.
44. Unit design and decoration does not support low environmental sound levels.
45. Lack of technology, for example monitors, actually supported low ambient sound levels.
46. Lack of dedicated workspace contributed to staff generated noise.
47. Insight regarding lowering of light levels seemed insufficient.

48. Cycled light was implemented depending on staff members on duty, but no written policies were found.
49. No effort was made to support olfactory stimulation.
50. Non-pharmacological pain management was not actively managed.
51. Staff who attended NDSC training demonstrated a better ability to read preterm infant cues and apply the knowledge accordingly, indicating good integration of knowledge.
52. Parents in units with parent support groups were better able to interact with their preterm infants.
53. Preterm infant positions were not changed prior to feeding to prevent repositioning after feeding.
54. Breast milk feeds are not always the preferred method of feeding.
55. Preterm infants were schedule-fed irrespective of feeding readiness.
56. Pacifiers were not used to support self-regulation, due to the misinterpretation of the Baby-Friendly Initiative.

Table 5-9: Conclusion statements from Interviews as part of stage 2

Factors supporting NDSC operationalisation
57. NDSC training is directly related to the operationalisation of NDSC.
58. Involvement of the whole multidisciplinary team contributes to successful operationalisation of NDSC.
59. Community involvement, financial or otherwise contributes to the successful operationalisation of NDSC.
60. Support from departmental as well as hospital management contribute to the success of NDSC operationalisation.
61. A positive and enthusiastic staff attitude contributes to the operationalisation of NDSC.
62. Equipment in good working order and newer facilities contribute to the operationalisation of NDSC.
63. Implementation of NDSC over an extended period of time contributes to successful NDSC operationalisation.
64. Policies that direct care contributes to successful operationalisation of NDSC.

Table 5-9: Conclusion statements from Interviews as part of stage 2 (cont)

Barriers towards NDSC operationalisation
65. Lack of communication among health care professionals; between nursing staff and parents and language barriers are barriers to NDSC operationalisation.
66. A parental profile of teenage parents, older mothers and parents who had a financially motivated pregnancy is a barrier to NDSC operationalisation.
67. Lack of encouragement for parental involvement is a barrier to NDSC operationalisation.
68. Lack of parental interest in involvement with their preterm infant is a barrier to NDSC operationalisation.
69. Lack of resources, such as linen, positioning aids, stock, funding and an unsupporting tender process are barriers to NDSC operationalisation.
70. Resistance to change due to a certain way of practice over an extended period of time is a barrier to NDSC operationalisation.
71. Cultural sensitivity is needed to overcome barriers to operationalisation.
72. Lack of respect for parent dignity is a barrier to NDSC operationalisation.
73. Ignorance of patient needs is a barrier to NDSC operationalisation.
74. High staff turnover and rotation is a barrier to NDSC operationalisation.
75. Lack of a champion to drive NDSC is a barrier to NDSC operationalisation.
76. Lack of lodging facilities and privacy is a barrier to NDSC operationalisation.
77. Lack of written policies to support NDSC is a barrier to the operationalisation of NDSC.
78. Management that is not actively supportive is a barrier to NDSC operationalisation.
79. Poor understanding of the concept NDSC is a barrier to operationalisation of NDSC.

Validating the accuracy of findings were also discussed in this section and included strategies such as triangulation of data sources and data collection methods, thick, rich description of findings, clarification of bias, presentation of negative or discrepant information, prolonged engagement, peer debriefing and external auditing. Synthesising all the findings from stages one and two formed the platform for development of NDSC PBGs, which will be discussed in Chapter 6.

CHAPTER 6
FORMULATION OF BEST PRACTICE GUIDELINES FOR NDSC OF PRETERM INFANTS IN PUBLIC SECTOR HOSPITALS IN SOUTH AFRICA

6.1 INTRODUCTION

Chapters one to five dealt with the collection, review and appraisal of evidence on Neurodevelopmental Supportive Care (NDSC) to extract best available evidence. Due to the context of the research an ILR was the method of choice selected to review and extract literature evidence NDSC. The comprehensive explanation of taking this route was described in detail in Chapter 2. The ILR was the first stage of this study and the results were discussed in Chapter 3.

The development of a checklist from the selected literature followed, which was used in stage two – a situational analysis of NDSC in purposively selected public sector NICU's in South African hospitals. Chapter 4 discussed the situational analysis method and Chapter 5 discussed the results of the situational analysis of the operationalisation of NDSC in the selected NICU's and in addition described measures that were supportive of, as well as barriers to NDSC operationalisation.

In this chapter the evidence compiled in stage 1 and 2 of the study is synthesised and used as basis for the development of PBGs. *Objective 4* is addressed in this chapter: *To formulate BPGs for NDSC in public sector hospitals in South Africa.*

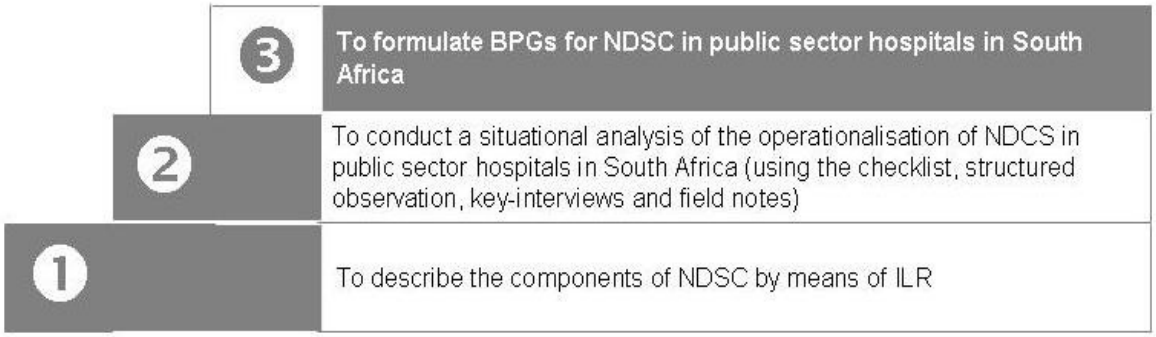

Figure 6-1: Schematic presentation of the stages to be followed in this study indicating stage three

The researcher followed a specific developmental process that culminated in the formulation of the best practice guidelines for NDSC or the preterm infant in public sector hospitals in South Africa. The evidence compiled in stage one and two were used to develop the BPGs in stage three. A short overview of BPGs is now given to support the choice for using BPGs in this study.

6.2 WHAT ARE BPGS

This section discusses the philosophy behind BPGs. The task for nursing as a science is to both define and defend the nature of knowledge and therefore the nature of the evidence required to provide clinically effective care. In addition health care professionals need to make better use of existing evidence to inform practice by using the best available knowledge based on most current evidence to guide practice (Fulbrook, 2003:97, 98). 'Evidence' can be defined as knowledge leading to a belief that something is true or valid. This belief is substantiated or confirmed by available facts indicating very strong evidence of this truth. 'Evidence based' health care further implies the use and application of this strong research evidence as the basis on which to make health care decisions, as opposed to decisions not based on evidence (Pearson *et al*., 2005:210). In addition evidence-based health care is based on the view that clinical decisions should be based on the best available scientific evidence, but also recognise patient preferences, the context of the health care as well as the judgement of the clinician (Pearson *et al*., 2005:207).

Clinical practice has changed to a practice based on best available evidence, and this implied a paradigm shift. The former paradigm of medical practice was to follow the lead of more experienced clinicians, with emphasis on intuition, unsystematic clinical experience and pathophysiologic rationale as sufficient grounds for clinical decision making (Evidence-based medicine, 1994:2420).

'Evidence-based medicine' is the new paradigm and stresses the examination of evidence from clinical research and involves skills of problem defining, literature searching, evaluating and applying original medical literature (Evidence-based medicine, 1994:2420, 2422).

Guidelines have been linked to the provision of clinical care to address clinical problems. Practice guidelines can be tied to costs, quality, access, patient empowerment, professional autonomy, medical liability, competition, benefit design

and more. Although the development of guidelines is not new, the emphasis is now based on systematic, evidence-based guidelines and the interest in the processes, structures and incentives that support the effective use and evaluation of the guidelines. Guidelines can furthermore be described as tools and building blocks for positive change and may have powerful contributions towards economic interests (costs), policy making and the expansion of knowledge. However, it should be considered and encouraged within the context for which it was intended (Field & Lohr, 1992:1,2). Different types of guidelines are available in literature, therefore the conceptualisation of guidelines are discussed to show the argument for choosing Best Practice Guideline Development in this study.

6.3 CONCEPTUALISATION OF GUIDELINES

The conceptualisation of 'guideline' is used in different ways in literature and five different types of guidelines are defined by the New Zealand Guidelines Group (NZGG) namely: Best Practice Guidelines, Protocol, Consensus Based Guidelines, Evidence Based Guidelines and Explicit Evidence Based Guidelines (NZGG, 2001:5). These are now discussed and weaknesses and strengths are listed in Table 6-1 with the aim to provide a good overview of the available options and as a result selecting BPGs as the best route for this study.

Table 6-1: Definitions of different types of guidelines, including a summary of strengths and weaknesses

Types of guideline - definition	Weaknesses	Strengths
***Evidence-based medicine*:** According to Fulbrook (2003:96) the knowledge that informs practice must be drawn from many sources, due to the very nature of nursing research. Initially, the focus of evidence-based medicine was primarily on determining the best research evidence relevant to a clinical problem and applying that evidence in resolving the issue. However, this definition de-emphasised determinants such as physiological rational and individual clinical experience in the clinical decision-making (Haynes, Devereaux, Guyatt, 2002:383). In a positive sense it also de-emphasises intuition, unsystematic clinical	De-emphasises physiological rational and individual clinical experience.	De-emphasises intuition and unsystematic clinical experience. Determines best evidence relevant to a clinical problem. Applies best evidence to resolve the issue. Later Definition: Use best available and current evidence in

Types of guideline - definition	Weaknesses	Strengths
experience and pathophysiologic rationale as sufficient grounds for clinical decision-making. It stresses effective literature searching and examining of the evidence from clinical research (Evidence-based medicine, 1994:2420). In a later definition evidence-based medicine is defined as the use of the best available and current evidence or knowledge in making decisions about individual patient care, integrating the context of health care, individual clinical expertise of the clinician and the best available external clinical evidence from systematic research (Pearson *et al.,* 2005:207, 208; Sackett *et al*., 1996:71).		decision making
Protocol: "… specific guidelines which are expected to be followed in detail with little scope for variation…" Protocol guidelines are used in specialty high-risk areas such as emergency resuscitation, or where legislation regulates the practice, for example forensic psychiatry (NZGG, 2001:5).	Little scope for variation	Specific, detailed guidelines for high-risk areas
***Guidelines*:** A guideline implies a greater degree of compliance than documents such as protocols. The term 'guideline' should only be applied to a systematically developed advisory statement devised according to validated scientific methodologies (NZGG, 2001:5).		Systematically developed, Advisory statement. Validated scientific methodologies.
Consensus Based Guideline is the most common form of guideline and is developed as agreement among a group of experts (NZGG, 2001:5).	Evidence may not be clear	Based on agreement among group of experts
***Clinical practice guidelines*:** Systematically developed statements that assist practitioners and patient decisions about appropriate health care for specific clinical circumstances. The purpose of clinical practice guidelines is to identify effective diagnostic, screening and treatment		Systematically developed statements. Identify effective diagnostic, screening and treatment

Types of guideline - definition	Weaknesses	Strengths
strategies, making explicit recommendations with a definite intent to influence what clinicians do and encourages the use of these to improve the quality of health care and therefore also the patient outcomes. Clinical guidelines should influence policies that promote allocation of resources and better delivery systems based on best available evidence (Grimshaw *et al.,* 1995:55; NZGG, 2001:4; Field & Lohr, 1992:2; The AGREE Collaboration, 2001: 2).		strategies. Encourage use of above to improve the quality of health care and patient outcomes. Influence policies to promote allocation of resources and delivery systems based on best available evidence.
***Evidence-based practice*:** Regan (1998:245) states that "providing clinically effective care for patients is the cornerstone of evidence-based practice". Clinical effectiveness is further defined by the Royal College of Nursing as, "doing the right thing in the right way for the right patient at the right time" (Regan, 1998:245). NZGG (2001:5) define evidence-based guidelines as a guideline developed after systematic retrieval and appraisal of information from the literature. They include strategies to describe the strength of evidence and in to clearly separate opinions from evidence. These guidelines further quantify the absolute differences in outcome, including both benefits and harms.		Systematic retrieval and appraisal of information from literature. Strategies to describe strength of evidence. Quantify differences in outcomes.
Following on evidence-based guidelines is ***Explicated Evidence Base Guidelines*** which is defined by NZGG (2001:5) as being developed as an evidence-based guideline, "…but also projects the health care outcomes (benefits, harms, utilization and costs) of the change in practice on a defined population".		As with evidence based guideline. Projects health care outcomes on defined population
***Best Practice Guideline*:** (also called practice guidelines, clinical guidelines, statements of best practice, and boundary guidelines). Systematically developed statements, based on the best evidence available, to assist		Systematically developed statements. Based on best available

Types of guideline - definition	Weaknesses	Strengths
practitioner and consumer decisions about appropriate health or disability care for specific circumstances, taking into account evidence for effectiveness and competing claims, and form a fundamental basis for planning. BPGs are based on Systematic Review results and not on primary empiric research. Development are done by teams of role players and verified by experts (NZGG, 2001:5; RNAO, 2005:91; RNAO, 2006:18-47).		evidence from SR. Assist practitioner with decisions about appropriate health care specific to circumstances. Fundamental basis for planning. Teams involved in development (researcher, reviewers and clinical practitioners). Experts verify BPGs.

Best Practice Guidelines as conceptualised in this research study

In this study BPGs are systematically developed statements, based on the best evidence available, to assist practitioner decisions about appropriate health or disability care (NDSC) for the preterm infant in the public sector hospitals in South Africa. BPGs are based on results from an ILR, which included research and empirical results. The statements took into account evidence for effectiveness, which included SRs and primary empirical research to support statements and form a fundamental basis for planning. Teams of role players (researcher, reviewers and clinical practitioners) assisted in the development of the guidelines (NZGG, 2001:5; RNAO, 2005:91; RNAO, 2006:18-47).

6.4 WHY USE BPGS?

Grimshaw *et al.* (1995:60) and Fulbrook (2003:101) recommend that practice development is a continuous process and the evidence strongly suggest that properly developed guidelines can change clinical practice, the process of health care delivery and may lead to improvements in patient outcome. This contributes to influencing policies, resource allocation and better delivery systems based on evidence.

"Guidelines provide guidance in decision making at each level of interaction; between health professional and consumer, between purchaser and provider, and between 'funder' and 'purchaser'" (NZGG, 2001:5).

6.4.1 PURPOSE OF BPGS

Field and Lohr (1992:3) define five major purposes for guidelines while Fulbrook (2003:100) describes a fourfold purpose similar to the 'concept analysis of practice development'. This study adheres to these statements as well, and sees the purpose of BPGs directing clinical practice based on best available evidence. The purpose of BPGs is to:

- Assist in clinical decision-making and as a result improve patient care – improving health and preventing disability.
- Employ a systematic approach to effect changes in practice by presenting current and best available evidence to support change.
- Educate individuals or health care teams to gather the best available evidence and to implement this knowledge to transform clinical practice and the culture and context in which nursing care takes place from conventional unsupportive nursery care to Neurodevelopmental Supportive Care that aims to mimic the intra-uterine environment.
- Utilise quality of care assessment and assurance.
- Facilitate health care teams.
- Guide allocation of resources for health care.
- Reduce the risk of legal liability for negligent care.

Evidence-based health care is concerned with five interrelated ideas that support the need to base clinical practice on best available evidence, critically appraise research reports for validity and usefulness, and to incorporate the rapidly growing body of evidence into practice (Pearson *et al.*, 2005:208). These ideas are:

- To base clinical and other health care decisions on the most representative patient population and laboratory-based evidence.
- The nature and source of the evidence needed depends on the particular clinical question, which is either qualitative or quantitative data.

- The identification of the best available evidence requires the application of epidemiological, economic and biostatistical principles plus pathophysiology and personal experience.
- This identification and appraisal of the evidence must be acted upon.
- There should be continuous evaluation of performance.

The success of practice development can be measured using seven successful outcomes: achieving optimum practice, providing a patient-orientated service, disseminating innovative practice, team work, enabling practitioners to develop their full potential and adopting a strategic approach to change and autonomous functioning (Fulbrook, 2003:100).

6.4.2 ATTRIBUTES OF BPGS

The change brought forward by the implementation of clinical guidelines are only worthwhile if the changes result in improved quality of care and efficient use of resources (Grimshaw *et al.*, 1995:61). Guidelines are referred to as valid if, when followed, they lead to improvement in patient outcomes at acceptable costs. Validity of BPGs depends on how well evidence is identified, synthesised, incorporated, contextualised and accepted (consensus) into the guideline. Chapters 2 to 5 of this document describes the evidence and synthesis used as basis to derive the guidelines by using the IDLE-method™ (Klopper, 2010) as presented in this chapter, and therefore provides the validity for this guideline development.

When considering the kind of knowledge that constitutes evidence, reference is made to experimental research-generated knowledge, since non-experimental (empirical) evidence is still in general regarded as low level evidence (Fulbrook, 2003:97; Evans, 2001:1). Traditionally nursing has followed the medical model of theory generation, based on positivist philosophy and utilising quantitative methods. More recently nursing begun to develop its own knowledge base, with a distinct paradigm shift that favours interpretive approaches to theory generation and employing qualitative methodologies such as phenomenology. There has been a call for nursing participation in SRs in order to prevent the risk of negligent use of quantitative research approaches and overlooking of some areas of knowledge within nursing (Fulbrook, 2003:97). Performing SRs of so-called 'low class' qualitative research evidence have also been established as the most reliable way to manage large-

volume research evidence, resulting in the quantification of qualitative results and increasing the value of the research (Evans, 2001:1-6; Fulbrook, 2003:97).

6.5 METHODS OF BPG DEVELOPMENT

Pearson *et al.* (2005:208-210) developed a conceptual framework for evidence-based practice building on frameworks that evolved and were constructed from experience with the evidence-based practice field and the emerging international work with the Joanna Briggs Institute. This framework is inclusive of diverse sources of research and empirical research-based evidence (as implemented in this study), and places the process of evidence-based practice in a broader context that is grounded in practice and directed towards improving global health.

As stated a number of different methods of BPG development are available that attempt to represent the components of evidence-based nursing to facilitate understanding, analysis, improvement and/or the replacement of the process as it is currently conceived and practised. Pearson *et al.* (2005:208,209) mention a few models: The Star Model of Knowledge Transformation, Dawes and colleagues, the Rogers' Diffusion of Innovation Model and the Stetler Model of Research Utilisation. Other models also described in literature include Dobrow, Goel and Upshur (2004:207-217) and the JBI model of evidence-based health care (JBI, 2008:9). Table 6-2 summarises these methods and the processes followed in each. From these methods the process of BPG development followed in this study was identified.

Table 6-2: Methods of guideline development considered

METHODS	The Star Model of Knowledge Transformation	Dawes and colleagues	Rogers' diffusion of innovation model	Stetler Model of Research Utilisation	Dobrow *et al.*	JBI model of evidence-based health care
Overview	Simple, parsimonious depiction of the relationships between various stages of knowledge transformation, as newly discovered knowledge is moved into practice. Configured as a simple five-point star.	Presents five stages of evidence-based health care	Addresses four areas	Applies research findings at the individual practitioner level.	Framework arising from a well-constructed critique of the current, dominant view of evidence-based practice. Model describes axes of evidence-based decision-making to describe the relationship between evidence and context.	Conceptualises evidence-based practice as clinical decision-making that considers the best available evidence, context in which care is delivered, client preference and professional judgement of the health care professional. This model uses a cyclical process.
Process	5 stages	5 stages	Four areas	6 phases	Axes	4 major components of process
OUTCOME	Knowledge discovery	Translation of uncertainty to an answerable question	Characteristics of the guideline	Preparation	'Evidence axis' describes the scientific evidence sourced to inform a clinical decision	Health care evidence generation

METHODS	The Star Model of Knowledge Transformation	Dawes and colleagues	Rogers' diffusion of innovation model	Stetler Model of Research Utilisation	Dobrow *et al.*	JBI model of evidence-based health care
	Evidence summary ⬇	Systematic retrieval of the best evidence available ⬇	Users of the guideline ⬇	Validation ⬇	'Content axis' describes contextual factors that inform the decision ⬇	Evidence synthesis ⬇
	Translation into practice recommendations ⬇	Critical appraisal of evidence for validity, clinical relevance and applicability ⬇	Method of communicating the guideline ⬇	Comparative evaluation ⬇	Their view: evidence-based practice is currently focused on the evidence axis and pays little attention to the way that context impacts on evidence-based decision-making	Evidence (knowledge) transfer ⬇
	Integration into practice ⬇	Application of results in practice ⬇	Social system in which it is being adopted	Decision-making ⬇		Evidence utilisation
	Evaluation ⬇	Evaluation of performance		Translation ⬇		
				Application and evaluation		

The process of BPG development followed in this research study has similarities with the Star Model of Knowledge Transformation, Dawes and colleagues and the JBI model of evidence-based health care. However, the Scottish Intercollegiate Guidelines Network (SIGN, 2008) also described a detailed process for BPG development that was applicable and will be used to describe the process of BPG development as utilised in this study.

6.6 PROCESS OF BPG DEVELOPMENT IN THIS STUDY

NZGG (2001:7) described general guiding principles for guideline developers, which were followed by the researcher. These guiding principles embrace all the steps describe in Table 6-2.

6.6.1 GUIDING PRINCIPLES FOR BPG DEVELOPERS

The guiding principles for guideline developers as recommended by NZGG (2001:7) was used as foundation for the BPG method followed in this study.

- Processes for developing and evaluating guidelines focused on outcomes valued by health care professionals (e.g. quality of life measures).
- Guidelines are based on the best available evidence and include an indicator of success in the form of a statement about the strength of the recommendations, which is a critical element of a BPG.
- The method used to synthesise the evidence was the strongest applicable. Best available evidence was identified in stage one – the ILR.
- The process of guideline development was multidisciplinary (researcher, second reviewers, statistician, expert panel).
- Guidelines are flexible and adaptable so that individual circumstances can be taken into consideration.
- Guidelines were developed with some consideration of limitations such as resource constraints and the setting that may influence implementation strategies.

Dissemination and implementation of clinical practice guidelines are particularly important steps, but are not within the scope of this study. Therefore the last three principles were not address in this study, but were identified as opportunities for future research.

- Guideline development should include a dissemination and implementation plan.
- The usefulness and impact of the guidelines should be evaluated.
- Guidelines should be reviewed and updated regularly.

Steps followed in the development of BPGs included topic identification (NDSC for preterm infants in the public sector NICU's in South Africa), suitability screen, developing the clinical questions (what should NDSC in South Africa entail?), searching for all available evidence, critically appraising and synthesising the evidence (ILR), describing BPGs (using IDLE-method™), drafting recommendations and dissemination and implementation of BPGs (NZGG, 2001:6, 9).

6.6.2 THE PROCESS

The process of BPG formulation followed in this study consisted of four stages.

Stage 1: ILR to determine the components of NDSC evidence used for development of the checklist

Stage 2: Situational analysis in 12 selected units: identified barriers and support to NDSC operationalisation

Stage 3: **BPG development based on stages 1 and 2.**

Formulation of a draft set of BPGs – synthesise evidence from stage 1 and 2

Grading of evidence – according to available grading systems

Consensus discussions of draft with promoters and amend

Stage 4: Refine and validate BPGs – in future research

The steps followed in stage 3 are now discussed.

6.7 FORMULATION OF A DRAFT SET OF BPGS

The first step in guideline development for this study was to formulate a draft guideline, and this process started with synthesising the evidence obtained in stages 1 and 2.

Stage 1: During stage one an ILR was performed that aimed to identify the components of NDSC. Guidelines are based on a literature review of the evidence to ensure a reflection of current medical knowledge and prevent bias. The review

furthermore allowed for generalisability and consistency of research findings to be assessed and data inconsistencies to be explored (SIGN, 2008:28). The researcher and independent reviewers who were involved part-time in the project undertook the review. Although this could lead to more limited coverage of the literature than with dedicated systematic review groups such as the Cochrane Collaboration, the essential elements of systematic review were met in that the literature was (SIGN, 2008:28):

- Identified according to an explicit search strategy.
- Selected according to defined inclusion and exclusion criteria.
- Evaluated against consistent methodological standards.

The process of formulation of the draft set of guidelines are now discussed starting with the logical reasoning that guided the process, followed by summary of conclusion statements from stages one and two. Similar themes were then arranged together to identify the components used as heading for the guidelines. The results are now discussed.

6.8 IDLE-METHOD™

As discussed earlier in the thesis deductive and inductive reasoning were used in the formulation and description of the BPGs. However, the researcher moved beyond the reasoning and used the conclusion statements as 'evidence' in the BPG development. This method is referred to as the IDLE-method™ (Klopper, 2010). The IDLE-method™ refers to 'inductive and deductive logic evidence'. It is a process where logical reasoning is used, inductive and/or deductive by generating conclusions from the empirical data and/or literature. The conclusions serve as evidence for the BPGs (Klopper, 2010).

An assumption of this method is that it is possible to distinguish correct reasoning from incorrect reasoning based on the arguments presented. The structure of a argument is the fundamental unit that is accepted or rejected and this proposition (or statement) is typically 'expressed' as declarative sentence (or called a conclusion), (Klopper, 2010). The premise and the conclusion are defined in relation to each other within a given argument (Kemerling, 2001 in Klopper, 2010). An argument is differentiated from collective propotisions, by the inferences between the statements to draw a conclusion. The application of the IDLE-method™ in this study is by

generating conclusions from the empirical data and the ILR. The conclusions (Figure 3-7 & 3-8; Tables 5-6 & 5-7) provide the 'evidence' for the formulation of the PBGs. The IDLE-method™ ensures rigour of the theory, as an audit trial of evidence of the reasoning process can be provided (Klopper, 2010).

As explained the conclusion statements from phase 1 and 2 were used as basis to formulate Best Practice Guidelines, as the following summary will indicate.

6.9 SUMMARY OF CONCLUSION STATEMENTS FROM STAGE 1 AND 2

Table 6-3 depicts a combination of the conclusion statements from the first two stages. Stage 2 was divided in 2(a) for the structured observations and 2(b) for interviews identifying support factors and 2(c) for interviews identifying barriers to operationalisation. This was done to provide a clear audit trail for the sufficiency of evidence as part of the BPGs.

Stage 1: ILR of the components of NDSC

Stage 2 (a): Structured observation – Current practice regarding NDCS operationalisation in public sector hospitals in South Africa

Stage 2 (b): Interviews – Factors supporting NDSC operationalisation

Stage 2 (c): Interviews – Barriers towards NDSC operationalisation

Detail on this process and findings can be viewed in Chapters 2 and 3 of this study. Table 6-3 summarises the conclusion statements reached in stage 1 and 2. The statements are numbered from 1 to 79, and statements will be referred to according to their numbers in the rest of the chapter. Statements from stage 1 was numbered 1 to 25 (refer to Paragraph 3.2.5.2), statement from stage 2 followed on the numbering starting at 26 to 79 (refer to Tables 5-6 & 5-7).

Table 6-3: Summary of the conclusion statements from stage 1 and 2

Stage 1: ILR of the components of NDSC
(1) Members of the NICU team are encouraged to create an environment closer to the intra-uterine environment in order to promote normal neonatal growth and development in the preterm infant.
(2) Integrating age-appropriate, individualised developmental care into the preterm

infant's nursing care enhances the competencies of the preterm and very-low-birth-weight infant, as well as parenting skills and abilities.

(3) A family-centred approach emphasises the individuality of the preterm infant and multidisciplinary interaction and furthermore provides optimal care that supports individual preterm infant development.

(4) The goal of family-centred care is to support parents to develop care skills and techniques, thus including the family as active participants of the health care team. It leaves the power with them.

(5) A family-centred approach reduces maternal stress and depression, improves parent-infant feeding and physical contact, increases self-esteem and lessens anxiety.

(6) Positioning the preterm infant in a contained, flexed posture with firm boundaries, neck neutral, shoulders protracted and the body symmetric, mimicking the intra-uterine conditions, supports the development of flexor tone prior to term and provides the preterm infant with a sense of containment and hand-to-midline position that allows better self-organisation and self-consoling behaviour.

(7) Prone or side-lying positions with adequate support are preferable to supine positioning.

(8) State regulation is supported by a quiet, soothing environment, individualised care, appropriate timing for caregiving events with regard to sleep/wakefulness cycles and support and pacing events to minimise stress and promote stable relaxed care.

(9) Sleep is important for growth and development. Care and handling should be planned carefully, taking into consideration the preterm infant's cues and responses. Infants should be provided with continuous rest periods of at least 2-3 hours.

(10) Care-giving should be modified by scheduling interventions around sleep (clustering), maintaining of flexion, containment and facilitation during procedures.

(11) Providing handling that is responsive to the preterm infant's cues minimises stress, therefore care-giving should be modified by providing pacing and rest periods according to preterm infant cues (time-out), and multi-modal stimulation when applicable.

(12) Swaddled preterm infants show less physiological distress, better motor

organisation and more effective self-regulatory abilities. Generalised motoric containment of the preterm infant's arms and legs close to the body while in a side-lying or supine position results in significantly lower mean heart rates, shorter mean crying and sleep disruption times, and fewer sleep-state changes after painful procedures.

(13) Moving the preterm infant slowly as a whole, keeping the body and head aligned and the limbs tucked in supports physiological stability.

(14) Skin-to-skin care supports thermoregulation, oxygenation, weight gain and behavioural states in preterm infants of at least 28 weeks gestation and should be started as soon as the preterm infant is regarded as physiologically stable (i.e. no deterioration of condition within 24 hours before KC).

(15) Touch should be given and direct hands-on care-giving modified according to the individual behaviours and physiological responses of the preterm infant.

(16) Self-regulation opportunities contribute to physiological stability during interventions and are provided by means of positioning the preterm infant to support the hands in the midline, close to the face, providing opportunities for grasping and a pacifier for non-nutritive sucking if applicable.

(17) Vestibular stimulation facilitates quiet sleep and may help bring the stable preterm infant to a more alert state.

(18) Co-bedding supports co-regulation, balancing and support for siblings placed next to each other in the same bed.

(19) Transitional support assists the preterm infant to reach a calm and regulated state before beginning an intervention, to improve tolerance and help with easy recovery after completion of interventions.

(20) Providing age-appropriate sensory input for the preterm infant protects the preterm infant from inappropriate, excessive and stressful stimulation. This can be achieved by managing the macro and micro NICU environment, including the reduction of noise and light. Providing quiet times and day and night cycles for preterm infants from 32 weeks gestation supports the development of diurnal rhythms, improves weight gain and the time spent sleeping.

(21) Non-pharmacological pain management in the preterm infant includes the use of oral sucrose and the provision of opportunities for non-nutritive sucking to aid in the endurance of painful and minor procedures.

(22) Provision of non-nutritive sucking opportunities during gavage feeding contributes to feeding maturation in the preterm infant and is associated with

physiological stability.

(23) A multi-disciplinary approach to developmental care requires collaboration of all health care professional in the NICU who interact with the preterm infant and sharing of knowledge between the various professionals involved in the care of a preterm infant.

(24) Parental involvement and family education are important and parents should be taught to interact with their preterm infant, including reading of behavioural signs and stress cues.

(25) Professionals who are in interaction with preterm infants in an NICU environment need to have accurate knowledge about their development, including reading of preterm infant cues and behaviours during interaction. In addition, developmental care training should be offered in advanced practice courses in neonatal care.

Stage 2 (a): Structured observation – Current practice regarding NDCS operationalisation in public sector hospitals in South Africa

(26) NICU design does not support an intra-uterine environment.

(27) Knowledge regarding preterm infant cues and behaviour are not well integrated for the staff members.

(28) Care is not consciously adapted to suit preterm infant developmental maturity, but rather adapted according to the level of illness.

(29) KMC and holding preterm infants are only permitted for stable preterm infants in room air.

(30) Discharge training is only commenced just before discharge.

(31) Privacy is not provided for parents.

(32) No effective communication systems are in place.

(33) Twenty-four hour visitation for parents is practiced in all the units, but sibling visitation is limited.

(34) Parent support groups are available in Units A to D and F.

(35) Anatomical positioning is best achieved in KMC units.

(36) No clear preference to positional orientation could be determined in any of the units.

(37) Care and handling is changed based on preterm infant health and illness, rather than according to maturation.

(38) State transition was not supported in any of the units.

(39) Sleep was supported by quiet times, but no written protocols were available.
(40) Care was clustered in KMC units.
(41) Benefits and application of skin-to-skin is not utilised in full.
(42) Co-bedding was mostly not used or supported.
(43) Self-regulation was not consciously supported.
(44) Unit design and decoration does not support low environmental sound levels.
(45) Lack of technology, for example monitors, actually supported low ambient sound levels.
(46) Lack of dedicated workspace contributed to staff generated noise.
(47) Insight regarding lowering of light levels seemed insufficient.
(48) Cycled light was implemented depending on staff members on duty, but no written policies were found.
(49) No effort was made to support olfactory stimulation.
(50) Non-pharmacological pain management was not actively managed.
(51) Staff who attended NDSC training demonstrated a better ability to read preterm infant cues and apply the knowledge accordingly, indicating good integration of knowledge.
(52) Parents in units with parent support groups were better able to interact with their preterm infants.
(53) Preterm infant positions were not changed prior to feeding to prevent repositioning after feeding.
(54) Breast milk feeds are not always the preferred method of feeding.
(55) Preterm infants were schedule-fed irrespective of feeding readiness.
(56) Pacifiers were not used to support self-regulation, due to the misinterpretation of the Baby-Friendly Initiative.

Stage 2 (b): Interviews – Factors supporting NDSC operationalisation

(57) NDSC training is directly related to the operationalisation of NDSC.
(58) Involvement of the whole multidisciplinary team contributes to successful operationalisation of NDSC.
(59) Community involvement, financial or otherwise contributes to the successful operationalisation of NDSC.
(60) Support from departmental as well as hospital management contribute to the success of NDSC operationalisation.
(61) A positive and enthusiastic staff attitude contributes to the operationalisation of

NDSC.

(62) Equipment in good working order and newer facilities contribute to the operationalisation of NDSC.

(63) Implementation of NDSC over an extended period of time contributes to successful NDSC operationalisation.

(64) Policies that direct care contributes to successful operationalisation of NDSC.

Stage 2 (c): Interviews – Barriers towards NDSC operationalisation

(65) Lack of communication among health care professionals; between nursing staff and parents and language barriers are barriers to NDSC operationalisation.

(66) A parental profile of teenage parents, older mothers and parents who had a financially motivated pregnancy is a barrier to NDSC operationalisation.

(67) Lack of encouragement for parental involvement is a barrier to NDSC operationalisation.

(68) Lack of parental interest in involvement with their preterm infant is a barrier to NDSC operationalisation.

(69) Lack of resources, such as linen, positioning aids, stock, funding and an unsupporting tender process are barriers to NDSC operationalisation.

(70) Resistance to change due to a certain way of practice over an extended period of time is a barrier to NDSC operationalisation.

(71) Cultural sensitivity is needed to overcome barriers to operationalisation.

(72) Lack of respect for parent dignity is a barrier to NDSC operationalisation.

(73) Ignorance of patient needs is a barrier to NDSC operationalisation.

(74) High staff turnover and rotation is a barrier to NDSC operationalisation.

(75) Lack of a champion to drive NDSC is a barrier to NDSC operationalisation.

(76) Lack of lodging facilities and privacy is a barrier to NDSC operationalisation.

(77) Lack of written policies to support NDSC is a barrier to the operationalisation of NDSC.

(78) Management that is not actively supportive is a barrier to NDSC operationalisation.

(79) Poor understanding of the concept NDSC is a barrier to operationalisation of NDSC.

In the next section the 79 statements were grouped according to themes as presented in Table 6-4.

6.10 CONCLUSION STATEMENTS ACCORDING TO THEMES

The next step in the development of the BPGs was to arrange the 79 conclusion statements according to themes that could be combined to act as headings for the BPGs.

Table 6-4: Conclusion statements and themes

Conclusion statements according to themes	Combination of themes
Environment close to the intra-uterine environment Conclusion statements: 1 **Quiet, soothing environment** Conclusion statements: 8 **Lack of intra-uterine like environment** Conclusion statements: 26, 44 **Lack of technology supports lower sound** Conclusion statements: 45 **Lack of dedicated staff work areas (noise)** Conclusion statements: 46	Create an environmental design similar to the intra-uterine environment
Family-centred care Conclusion statements: 4 **Reduced maternal stress and depression** Conclusion statements: 5 **Parent involvement in care** Conclusion statements: 24, 66, 67 **Twenty-four hour visitation** Conclusion statements: 33 **Sibling visitation** Conclusion statements: 33 **Parent support groups** Conclusion statements: 34	Provide family-centred care to support parental empowerment and family involvement
Anatomical positioning Conclusion statements: 6, 16 **Support prone or side-lying positioning**	Provide anatomical positioning that mimics the intra-uterine conditions

Conclusion statements according to themes	Combination of themes
Conclusion statements: 7 **KMC supports anatomical positioning** Conclusion statements: 35 **No clear preference re position orientation** Conclusion statements: 36	
Support sleep Conclusion statements: 9, 39 **Continuous rest for at least 2-3 hours** Conclusion statements: 9 **Cluster care** Conclusion statement: 10, 40 **Vestibular stimulation** Conclusion statement: 17 **Cycled light** Conclusion statement: 20, 48	Provide a supportive environment for sleep
Flexion and containment during handling Conclusion statements: 10, 13 **Pacing and rest during handling** Conclusion statements: 11 **Swaddle** Conclusion statements: 12 **Transitional support** Conclusion statements: 19, 38	Provide handling that support flexion, containment and self-regulation
Handling in response to preterm infant cues Conclusion statements: 11 **Skin-to-skin care** Conclusion statements: 14 **Touch** Conclusion statements: 15 **KMC not permitted unless in room air** Conclusion statements: 29 **Co-bedding** Conclusion statements: 18 **Lack of co-bedding** Conclusion statements: 42	Individualise handling and care in response to preterm infant cues, behaviour and maturity

Conclusion statements according to themes	Combination of themes
KMC benefits not utilised Conclusion statements: 41 **Individualised care appropriate to developmental age** Conclusion statements: 2, 3 **Age-appropriate sensory input** Conclusion statements: 20 **Care according to illness not maturity** Conclusion statements: 28, 37	
Self-regulation opportunities Conclusion statements: 16 **Self-regulation not provided** Conclusion statements: 43 **Pacifiers for NNS not used** Conclusion statements: 56 **Non-nutritive sucking** Conclusion statements: 21, 22, 50 **Oral sucrose** Conclusion statements: 21, 50	Provide opportunities for self-regulation to support stress management, physiological stability, self-regulation and feeding support
Vestibular stimulation Conclusion statements: 17 **Transitional support** Conclusion statements: 19 **State transition not supported** Conclusion statements: 38	Support transition into different states
Parent education Conclusion statements: 24 **Parent support groups** Conclusion statements: 52 **Lack of early discharge training** Conclusion statements: 30	Provide family education to support parental interaction with their preterm infants
Staff knowledge about preterm infant cues and behaviours Conclusion statements: 25, 51 **NDSC training as part of advanced courses** Conclusion statements: 25	Ensure staff education regarding preterm infant development

Conclusion statements according to themes	Combination of themes
Poor integration of knowledge re preterm infant behaviour Conclusion statements: 27 **Lack insight regarding low light** Conclusion statements: 47 **Training improves NDSC operationalisation** Conclusion statements: 57 **Lack of subject knowledge** Conclusion statement: 78	
Lack of effective communication system Conclusion statements: 32, 64	Ensure effective communication systems between health care professionals and health care professionals and parents
No written protocols Conclusion statements: 39, 48, 76	Develop protocols to support the implementation of interventions
Lack of olfactory stimulation support Conclusion statements: 49 **Quiet environment** Conclusion statements: 8 **Age-appropriate sensory input** Conclusion statements: 20 **Cycled light** Conclusion statement: 20, 48	Create a micro environment conducive to preterm infant development
Position change prior to feeds Conclusion statements: 53 **Breast milk not preference** Conclusion statements: 54 **Feeding readiness ignored** Conclusion statements: 55 **Pacifiers for NNS not used** Conclusion statements: 56 **Non-nutritive sucking** Conclusion statements: 21, 22, 50	Create a suitable environment to support feeding success
Multi-disciplinary care approach Conclusion statements: 23, 58	Ensure a multi-disciplinary team approach to contribute to successful operationalisation of NDSC

Conclusion statements according to themes	Combination of themes
Management support Conclusion statements: 60 **Lack of management support** Conclusion statements: 77	Ensure management support on different levels to contribute to successful NDSC operationalisation
Positive staff attitude Conclusion statements: 61 **Resistance to change** Conclusion statements: 69 **Loud cultures** Conclusion statements: 70 **Ignorance of patient dignity** Conclusion statements: 71 **Ignorance of patient needs** Conclusion statements: 72 **High staff turnover** Conclusion statements: 73 **Lack of champion** Conclusion statements: 74	Create a positive staff attitude
Lack of resources Conclusion statements: 68 **Community involvement** Conclusion statements: 59 **Working equipment** Conclusion statements: 62 **New facilities** Conclusion statements: 62 **Lack of lodging facilities** Conclusion statements: 75 **Lack of privacy for parents** Conclusion statements: 31	Ensure availability of resources
Extended implementation time Conclusion statements: 63	Ensure implementation over extended period of time
Teenagers or older mothers Conclusion statements: 65	Identify parent profile to address high-risk profiles

6.11 FORMULATION OF BEST PRACTICE GUIDELINES

The conclusion statements related to the themes were used as the evidence for the BPGs that were subsequently formulated. The PBGs were arranged under themes and sub-themes as identified in Table 6-5. These themes were grouped into five headings, also referred to as caterogies: direct preterm infant environment, direct preterm infant care, the family unit, staff and systems.

Table 6-5: Themes, components and headings derived from conclusion statements

SUB-THEME	THEMES (components)	HEADINGS (categories)
▪ Create an environmental design similar to the intra-uterine environment ▪ Provide a supportive environment for sleep ▪ Create a micro environment conducive to preterm infant development	Environment	**Direct preterm infant environment**
▪ Provide anatomical positioning that mimics the intra-uterine conditions	Positioning	**Direct preterm infant care**
▪ Provide handling that supports flexion, containment and self-regulation	Handling	
▪ Individualise handling and care in response to preterm infant cues, behaviour and maturity ▪ Support transition into different states	Individualised care	
▪ Provide opportunities for self-regulation to support stress management, physiological stability, self-regulation and feeding support	Self-regulation	
▪ Create a suitable environment to support feeding success	Feeding	
▪ Provide family-centred care to support parental empowerment and family involvement	Family-centred care	**Family unit**
▪ Provide family education to support parental interaction with their preterm infants	Family education	
▪ Identify parent profile to address high-risk profiles	Parent profile	

▪ Ensure staff education regarding preterm infant development	Staff education	**Staff**
▪ Ensure a multi-disciplinary team approach to contribute to successful operationalisation of NDSC	Multi-disciplinary team	
▪ Create a positive staff attitude	Staff attitude	
▪ Ensure effective communication systems between health care professionals and health care professionals and parents	Communication	**Systems**
▪ Develop protocols to support the implementation of interventions	Protocols	
▪ Ensure management support on different levels to contribute to successful NDSC operationalisation	Management support	
▪ Ensure availability of resources	Resources	
▪ Ensure implementation over extended period of time	Implementation time used to implement NDSC components	

Each BPG was graded to ensure the sufficiency of evidence on which the guideline is based (conclusion statements from table 6-3) as well as a grade for the strength of recommendation for implementation and supplied with a motivation for the allocated grades. The grading system used in this study is now discussed.

6.12 GRADING SYSTEM

The following section discusses the grading system used to indicate the sufficiency of the supporting evidence and the strength of the recommendations for implementation, starting with a short discussion on the available grading systems considered.

6.12.1 AVAILABLE GRADING SYSTEMS

Various grading systems are available such as the SIGN grading (SIGN, 2008) and Grading of Recommendations Assessment, Development and Evaluation (GRADE)

that is currently suggested in the Guidelines for WHO Guidelines (Schunemann, Fretheim & Oxman, 2006 [Online]). Other grading systems include The FAME scale (Feasibility, Appropriateness, Meaningfulness and Effectiveness) as used by the Joanna Briggs Institute (www.joannabriggs.edu.au, 2008 [Online]), the NZGG guideline (NZGG, 2001:43) and The American Dietetic Association (ADA) who adopted a grading system from Greer, Mosser, Logan, Wagstrom (Greer *et al.,* A practical approach to evidence grading. Jt Comm J Qual Improv. 2000; 26:700-712).

The latter grading systems (NZGG & ADA) are fairly simple and easy to understand, and these grading systems also allow for different study design characteristics to be graded – as was included in this study. However, some characteristics of this study did not fit in with the criteria as set in these grading systems. In this study an individual researcher was responsible for the guideline development, and not a panel as in the mentioned grading systems. BPGs are usually based on the results of a systematic review (and not on the results of primary empirical research) by teams that consist of all role players, and they are usually verified by experts (Melnyk & Fineout-Overholt, 2005:232; RNAO, 2006:18-47). In this research study the guidelines were based on an ILR and also included primary empirical research. Input of role-players was obtained with empirical research (key-informant interviews) and the study promoters as well as subject experts provided expert opinions. For these reasons the grading system used in this study was based on the grading system suggested by Minnie (2007:192,193).

6.12.2 GRADING SYSTEM FOR THIS STUDY

Evidence in the form of conclusion statements from stages one and two were synthesised to form guideline recommendations (Table 6-5). Guidelines were graded differentiating between the strength of the evidences PLUS evidence of the guideline per se. This judgement was made on the basis of an objective assessment of the design and quality of each study (refer to addendums 3-4 and 3-5). During the ILR stage the researcher addressed the quality of evidence by assessing the quantity and consistency of the studies considered, as well as applicability and clinical impact. The aim was to formulate recommendations that are evidence-based, but which are also relevant to the context of neonatal care in South Africa and are therefore implementable, relevant and appropriate (SIGN, 2008:34; NZGG, 2001:51).

'Guideline recommendations need to be based on the best available evidence. There should be explicit links between the strength of the available evidence and the grade of the recommendation' (NZGG, 2001:42). The grading of each BPG recommendation was therefore determined by the strength of the evidence supporting it (NZGG, 2001:42,53). According to SIGN (2008:34) the grading does not relate to the importance of a recommendation, but rather to the strength of the supporting evidence and to the predictive power of the study designs from which the data was obtained. This is an objective assessment of design and quality of each individual study (quality scores). Grading is furthermore based on a more subjective judgement of the consistency, relevance and applicability of the whole body of evidence to the questions the guideline seeks to answer. Grading therefore indicates what the chances are that the predicted outcome will be achieved once a recommendation has been implemented (SIGN, 2008:34; NZGG, 2001:42).

The grade of the recommendation is based on consideration of a number of factors (NZGG, 2001:530):

- The design and quality of individual studies that have been identified to provide answers to the question posed. These were converted into a summary Conclusion Statement reflecting the body of evidence as seen in Addendum 3-4 and 3-5.
- Quantity, consistency, applicability and clinical impact of the body of evidence that is applicable to the guidelines question is also recorded in Addendum 3-4 and 3-5.
- The researcher and an expert panel reached consensus.

In this study a simple grading system was adapted from Minnie (2007:192,193). This system is used to indicate the sufficiency of evidence (based on quality and quantity of evidence sources) as well as the strength of the recommendation for implementation.

6.12.2.1 Sufficiency of evidence

'Sufficiency' indicates the degree to which supporting evidence is sufficient, reliable, and indicates that the recommendation is true (Pearson *et al*., 2005:210). Evidence from a variety of sources that support one another are considered more sufficient than studies based on fewer sources. In this study evidence was gathered from the

ILR and findings from qualitative research using different data-collection methods – observation, interviews and field notes.

6.12.2.2 Strength of recommendation

The grade for the strength of recommendation for implementation is allocated according to the degree to which implementation of the BPG will positively impact on practice, as well as the difference between the benefits and harms/costs. The FAME criteria (feasibility, appropriateness, meaningfulness and effectiveness) from JBI (Pearson, *et al.,* 2005:210) were considered when deciding on the grade for the strength of recommendation for implementation, allocated to a BPG. The grading system used for the BPGs developed in this study is indicated in Table 6.6.

Table 6-6: Grading system used for BPGs

Sufficiency of evidence		**Strength of recommendation for implementation**	
Definitely sufficient evidence (Supporting evidence from stage 1 and one more source from stage 2)	A	*High priority* (Implementation is essential for NDSC operationalisation to be feasible, appropriate, meaningful and effective in SA)	1
Probably sufficient quality (Supporting evidence from stage 1 only or at least two other sources – stage 2(a), (b) or (c))	B	*Recommended* (Implementation would definitely improve NDSC operationalisation in SA)	2
Sufficiency of evidence not guaranteed (Supporting evidence from at least one source from stage 2, excluding stage 1)	C	*Low priority* (Implementation would probably improve NDSC operationalisation in SA)	3

6.13 GUIDELINES FOR OPERATIONALISATION OF NEURODEVELOPMENTAL SUPPORTIVE CARE IN THE PUBLIC SECTOR NEONATAL INTENSIVE CARE UNITS IN SOUTH AFRICA

DIRECT PRETERM INFANT ENVIRONMENT

BEST PRACTICE GUIDELINE 1 - ENVIRONMENT

Environmental design implies creating an environment conducive for preterm infant development, similar to the intra-uterine environment.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 1, 8, 20

Stage 2 (a): Conclusion statements 26, 44, 45, 46, 48, 49

Strength of recommendation for implementation: 1

If this BPG is implemented, the environment for the preterm infant in the neonatal unit will be adapted to be similar to the environment in the womb, and this would be more conducive to preterm infant development.

Implementation recommendations

Auditory stimulation

- Reduce the overall noise level in the NICU.
- The combination between background and transient sound should not exceed an hourly mean of 50 dB.
- Maximum transient sound should not exceed 70dB.
- Keep noise level below 45 dB.
- Measure the sound levels in the NICU and inside the incubator.
- Evaluate the auditory impact on each preterm infant (such as conversation, phones, doors, dustbin lids closing and intercoms) and keep it to the minimum.

- Use incubator covers to decrease noise levels inside the incubator.
- Use soft ear plugs or ear covers.
- Promote a NICU environment in which the preterm infant can pick out the mother's voice.
- Take architectural features into account when adapting the physical environment, such as sound absorbing materials to reduce sound in the NICU.
- Pad doors and trash can bottoms with felt stripping to cushion the sound of closing.
- Do not tap with fingers or place charts on incubators.
- Avoid the use of stereo equipment, radios and telephones in the nursery and move it to the nurses' lounge or station.
- Provide a boundary around an open incubator to remind staff to speak softly and avoid unnecessary disturbance. Place the preterm infant in a closed incubator as soon as possible.
- Arrange traffic away from the incubators.
- Close incubator portholes quietly by depressing the button latch until after the porthole is closed.
- Ensure good maintenance of all equipment surrounding the preterm infant's bed space.
- Closely monitor all humidification devices to ensure no build-up of excess water causing gurgles.
- Keep alarm monitors at a level loud enough to be heard, but low enough not to startle the preterm infant.
- Respond quickly to alarms.
- Move conversations away from the preterm infant's bedside.

Visual stimulation

- Note each preterm infant's level of threshold for light via behavioural signals for disorganisation or stress.
- Decrease ambient light (range of 10-600 lux) and use incubator covers to shield individual beds from light.

- The light in the NICU should not be brighter than 100 foot-candles for adequate visualisation of NICU patients.
- Use natural light whenever possible. At least one source with shading devices.
- Know light equipment lux levels of brightness and adjust to reduce preterm infant exposure (i.e., warming lights during bath time should be directed from back of preterm infant, not side or front facing head on).
- Augment bright overhead lighting with individual bedside-controlled lighting.
- Ensure dimmer capability for overhead room lights.
- Ensure adequate lighting to observe the preterm infant, but balance the degree of lighting in the room between the amount needed for critical care of a preterm infant without impinging on the needs of other preterm infants.
- Avoid direct light of preterm infant care space except for procedures.
- Direct spotlights away from the preterm infant's head.
- Individualise light exposure by providing shields, incubator covers, etc.
- Have separate procedural lighting available at each preterm infant's bedside.
- Ensure a calm and relaxing visual environment that enhances developmental maturation by ensuring pictures and toys that are not overstimulating.
- Protect and facilitate REM sleep.
- Provide periods of reduced lighting of about two hours without interruption, 'quiet times'.
- Hold preterm infant in an upright position with lights dimmed to encourage eye opening with social interaction times.
- Ensure eye protection for preterm infants receiving phototherapy and during interventions that necessitate bright lights.

Cycled light and quiet times

- Provide cycled light from 32 weeks gestation or when the preterm infant begins to differentiate between sleep and wake cycles, to help develop diurnal rhythms.
- Implement quiet times of 2-3 hours during day-time and 12 hours during the evening.

- Close window blinds during daylight quiet time, dim overhead lights and cover incubators and cribs. Lower voices and minimise conversation, while keeping routine procedures to the minimum.

Olfactory inputs

- Prevent noxious odours in the immediate preterm infant environment by removing strong odours from the preterm infants face, drying alcohol on hands before putting them in the incubator and refrain from using strongly scented toiletries.
- Provide comforting olfactory inputs when the preterm infant is in the incubator by providing the mother's breast pad, a blanket cloth, or piece of clothing the mother or father have worn or held on their body, or provide skin-to-skin care.

DIRECT PRETERM INFANT CARE

BEST PRACTICE GUIDELINE 2 – POSITIONING

Anatomical positioning mimics positioning provided intra-uterine

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 6, 7, 16

Stage 2 (b): Conclusion statements 35, 36

Strength of recommendation for implementation: 1

Anatomical positioning mimics the positioning provided intra-uterine and supports normal muscle development.

Implementation recommendations

- Anatomical position means the preterm infant is positioned with her neck in a neutral position, protracted shoulders, the body symmetric, knees flexed and the hips and arms in midline. This state is reached with the use of containment or snug firm boundaries.
- Limbs and shoulders should be flexed during positioning. This is attained with postural support using firm boundaries.
- The head should be positioned in midline and in line with the body – especially the acutely ill preterm infants in supine position to encourage hands to face. Maintain a rounded back.
- The hips should be in a neutral position with some adduction with hip and knee flexion.
- Prone or side-lying positions should be used rather than a supine position, especially in the case of lung diseases.
- Change the nappy while the preterm infant is in prone or side-lying position to avoid often turning.

- Avoid sudden positional changes.
- Provide containment during and after position changes.
- Encourage parents to play with preterm infants in a prone position on a firm mattress when the preterm infant is awake.
- Individualised bedding and support should be used with positioning. The caregiver or parent's hands can provide containment during care and procedures.
- Use positioning aids such as blanket rolls, support wedges, stuffed toys, nappies, or loose swaddling to stabilise the preterm infant's position and contain the preterm infants in flexion and neutral hips to reduce stress.
- Use bedding that is comfortable to position the baby, providing gentle resistance for bracing, but flexible enough to allow room for manoeuvre. Positioning is effective when the preterm infant can curl up with limbs tucked in, and movements can be made for comforting such as hands-to-mouth, hands together and hands and feet pressing against bedding.

BEST PRACTICE GUIDELINE 3 – HANDLING

Handling supports flexion, containment and self-regulation.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 2, 3, 10, 11, 12, 13, 14, 15, 18, 19, 20

Stage 2 (a): Conclusion statements 28, 29, 37, 38

Stage 2 (b): Conclusion statements 41, 42

Strength of recommendation for implementation: 1

If this BPG is implemented the preterm infant will continuously experience the benefits of flexion and containment, which contributes to the development of self-regulatory behaviour.

Implementation recommendations

Skin-to-skin care

- Start skin-to-skin care within 24-48 hours after delivery for the stable preterm infant.
- Provide continuous skin-to-skin care as soon as possible.
- Provide intermittent skin-to-skin care for periods of 90 minutes to 3 hours at a time as often as possible when continuous skin-to-skin care is not possible.
- Provide skin-to-skin care by the mother or father or a primary caregiver if neither parent is available.

Skin-to-skin care of the ventilated preterm infant

- Ventilate the preterm infant for 24 hours before the first session of KMC. Start KMC once the preterm infant is stable on ventilator at low settings (intermittent mandatory ventilation < 35 bpm, FiO2 < 50%), shows stable vital signs, is not on vasopressors and do not have any chest tubes. Oxygen saturation is not a limitation, nor broviac, umbilical, arterial and IV lines as long as it is well secured.

Movement

- Soothe the preterm infant with still hand to help make the transition for handling.
- Change the diaper in the side-lying or even prone position for a preterm infant that is easily stressed.
- Contain the lower extremities to facilitate both motoric and autonomic stabilisation, for example by enclosing the preterm infant's legs, flexed within a diaper. Plan position change carefully and support the preterm infant to avoid dramatic limb and hand extensions.
- Handle preterm infant gently and avoid sudden posture changes to promote tactile and vestibular development.

Cluster care

- Provide hands-on care as the preterm infant becomes more alert, rather than interrupting sleep. Coordinate interventions such as blood sampling, X-rays and mutli-disciplinary activities to allow adequate rest periods of at least 2-3 hours. Use wakeful states for nursing care and stimulation and interaction opportunities.

Transitional support

- Avoid interruption of the preterm infant in deep sleep by postponing interventions until the preterm infant is in light sleep or a drowsy state. Prepare the preterm infant before carrying out a procedure and assess readiness and availability for interaction by checking the environment, position, behavioural reactions and monitors and reduce lighting and noise. Rouse the preterm infant gently from light sleep or drowsiness, using mild stimulus initially, then gradually increasing the stimuli as the baby responds. Introduce one stimulus at a time such as talking softly, and then gently touching the preterm infant. Assist the preterm infant to reach a calm and regulated state before beginning an intervention to improve tolerance and help with easy recovery.
- Stay at the preterm infant's bedside after interventions until the preterm infant has returned to drowsy or light sleep states. Provide containment, repositioning and support such as non-nutritive sucking, and boundaries to help the preterm infant transition to a calm sleep or quiet awake state.

Time-out

- Provide 'time-out' for the preterm infant to recover during stressful interventions. Carry out procedures in stages when autonomic changes are observed in the preterm infant during handling, and allow for periods of rest and recovery during support. Provide opportunities for the preterm infant to suck on a pacifier or finger, experience containment or to hold a finger and grasp.

Containment

- Use containment, grasping opportunities and non-nutritive sucking interventions to calm preterm infants and enhance self-regulation during interventions.
- Provide additional increased oxygen temporarily for the ventilated preterm infant if needed.

Co-bedding of multiples

- Flexibility and preplanning is important when co-bedding multiples.
- Bed-stable multiples together.
- Lightly swaddle multiples with one blanket. Leave hands free to reach their own face and the face/body of sibling to facilitate touching and impact motor organisation.
- Provide cluster care.
- Keep multiples lightly swaddled together in the same bed until they are ready for discharge. Encourage co-bedding at home after discharge.
- Separate multiples if one or more becomes unstable and resume bedding together when they are stable again.
- Managed the administration of medication by colour-coding of equipment, medicine charts, IV-tubing, medication, nappies and everything in the bed with a single colour per preterm infant.
- Place a clear ID-band on each preterm infant and maintain at all times.
- Control the incubator temperature by placing the skin probe on the smallest preterm infant and adjust the incubator to a constant air temperature.

- Separate preterm infants if they show responses that indicate that they do not like co-bedding.

BEST PRACTICE GUIDELINE 4 - INDIVIDUALISED CARE

Care is individualised in response to preterm infant cues, behaviour and maturity and support state transition.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 9, 10, 17, 20, 24

Stage 2 (a): Conclusion statements 30, 39, 40, 48, 52

Strength of recommendation for implementation: 1

Individualisation of care in response to preterm infant cues and behaviour ensures stimulation appropriate to preterm infant maturity and supports transition into different sleep and wakeful states.

Implementation recommendations

- Caregiving interventions by neonatal nurses and other health care professionals that is part of the NICU team should be adapted according to the preterm infant's gestational age, preterm infant's adaptation to interventions and preterm infant's cues and behaviours communicated during interventions to provide appropriate developmental care.
- Do a systematic assessment to determine readiness for intervention.
- Put signs on the baby's bed to indicate his unique behaviours, including likes and dislikes, and remind staff and parents of his individuality.
- Identifying a 'primary caregiver' who is consistently assigned to a preterm infant, can promote a very nurturing and rewarding relationship between nurse, preterm infant and family. It provides nurses with satisfaction and contributes to parent participation in care.

BEST PRACTICE GUIDELINE 5 - SELF-REGULATION

Opportunities for self-regulation are provided to support stress management, physiological stability, self-regulation and feeding support.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 16, 20, 21

Stage 2 (a): Conclusion statements 43, 50, 56

Strength of recommendation for implementation: 1

Provision of opportunities for self-regulation contributes to the reduction of stress, supports physiological stability, the ability to self-regulate without help and the development of feeding.

Implementation recommendations

- Provide NNS with a pacifier during painful procedures, such as heel pricks and intravenous lines insertions.
- Provide self-regulatory opportunities with towel rolls to grasp on, positioning preterm infant with hands close to the face or encouraging parents to provide a finger to hold on to.
- Provide non-nutritive sucking for at least 10 minutes per day in a wakeful state to support the sucking reflex.
- Provide the preterm infant with self-regulation opportunities through sucking by providing a pacifier or place her hands near her mouth to increase self-soothing.

BEST PRACTICE GUIDELINE 6 - FEEDING

Feeding success is supported by a suitable and supportive environment.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 21, 22

Stage 2 (a): Conclusion statements 50, 53, 54, 55, 56

Strength of recommendation for implementation: 1

An environment that prepares the infant for feeding supports the success of preterm infant feeding.

Implementation recommendations

- Provide NNS with a pacifier during gavage feeding.
- Prepare the preterm infant for feeding by wrapping and positioning her inside the incubator in a manner that will decrease the need for repositioning after the feed. When holding the preterm infant during feeding, place the monitor leads beneath the swaddling so as to not disturb the preterm infant when pacing her back.
- Identify readiness cues before introducing a feed (semi-demand feed).
- Follow protocol for advancing from gavage to oral feeding.
- Cradle the preterm infant in the arms with the face approximately 20cm away from the caregiver to provide containment and visual stimulation.
- Reduce light and noise during feeding time to promote optimal interaction.
- Ensure a contained, flexed position with hands and head in midline when feeding.

FAMILY UNIT

BEST PRACTICE GUIDELINE 7 - FAMILY-CENTERED CARE

Family-centered care approach support parental empowerment and family involvement.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 4, 5, 24

Stage 2 (a): Conclusion statements 33, 34

Stage 2 (c): Conclusion statements 66, 67

Strength of recommendation for implementation: 1

If this BPG is implemented, parents would be better supported and empowered as well as more involved with preterm infant care while their preterm infants are admitted to hospital.

Implementation recommendations

- Parents should be allowed to see and touch their preterm infants immediately after birth, before transferral to the NICU. Parents should be provided with opportunities that promote parent-preterm infant interaction such as visiting, holding, talking to their preterm infant and taking part in basic care to help them cope with the stressful time in the NICU.
- Family-centred care is facilitated by twenty-four hour visiting policies for parents, encouraging sibling visitation, a warm and comfortable atmosphere and facilities, privacy, parental support groups and attempts to arrange specific child care activities for parents such as breastfeeding and/or expressing breast milk, nipple feeding, bathing, time for kangaroo care, decoration of preterm infant bed spaces and early discharge training. These activities should be arranged around parent schedules.
- Consider family needs when planning care and feed times.

- Reinforce parenting skills by encourage parental suggestions for, and participation in, planning and implementing care strategies for their preterm infant. This may also include posting notes in the chart and the presence of parents at daily rounds.
- Share information in a timely and supportive manner.
- Foster a non-judgemental atmosphere in which parents can openly express feelings and concerns.
- Help parents to interpret preterm infant cues and model developmental interventions.

BEST PRACTICE GUIDELINE 8 - FAMILY EDUCATION

Parent education is provided to support parent-infant interaction.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 24

Stage 2 (a): Conclusion statements 30, 52

Strength of recommendation for implementation: 1

Educating parents regarding their preterm infant improves parent-infant interaction.

Implementation recommendations

- Focus parental attention on the preterm infant and not the condition.
- Teach parents to recognise early stress signs in their preterm infant.
- Teach parents appropriate touch to 'tune in' to the preterm infant and provide or assist with care.
- Start a structured parenting support program, such as Little Steps™ Premmie Parenting Workshops.

BEST PRACTICE GUIDELINE 9 - PARENT PROFILE

Parent profiles are compiled to identify and address high-risk profiles.

Sufficiency of evidence: C

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements - none

Stage 2 (c): Conclusion statements 65

Strength of recommendation for implementation: 2

Identification of parents with high-risk profiles is an indicator of parental involvement (or the lack thereof).

Implementation recommendations

- Involve social workers to identify parents with high-risk profiles.
- Implement programs to involve high-risk parents with care of preterm infants to ensure bonding.

STAFF

BEST PRACTICE GUIDELINE 10 - STAFF EDUCATION

Staff education regarding preterm infant development is used to integrate knowledge into practice.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 25

Stage 2 (a): Conclusion statements 27, 47, 51

Stage 2 (b): Conclusion statements 57, 78

Strength of recommendation for implementation: 1

Structured staff education programs regarding preterm infant development support the integration of knowledge into practice.

Implementation recommendations

- Teaching about developmental care should be expanded to non-nursing professionals as well.
- Professional knowledge should include the ability to read facial expression and motoric cues and behaviours during interactions to determine whether the preterm infant is calm or stressed.
- Familiarity with any materials to provide developmental care in the NICU is essential.
- Developmental care training should be offered in advanced practice courses in neonatal care.
- Adopt a continuous education program for NDSC training.

BEST PRACTICE GUIDELINE 11 - MULTI-DISCIPLINARY TEAM

A multi-disciplinary team approach is used to ensure consistency in care.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements 23

Stage 2 (c): Conclusion statements 58

Strength of recommendation for implementation: 2

Consistency in care is ensured when a multi-disciplinary team approach is used and all members of the team are well informed on care for each preterm infant.

Implementation recommendations

- Set clear criteria for situations or complications that necessitates the consultation of a therapist.

BEST PRACTICE GUIDELINE 12 - STAFF ATTITUDE

Positive staff attitude is encouraged.

Sufficiency of evidence: B

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements - none

Stage 2 (b): Conclusion statements 61

Stage 2 (c): Conclusion statements 69, 70, 71, 72, 73, 74

Strength of recommendation for implementation: 1

A positive attitude from nursing and medical staff supports NDSC implementation, parental involvement and sustainable operationalisation.

Implementation recommendations:

- Identify a NDSC champion to drive operasionalisation.
- Respect parent cultures, beliefs, dignity, needs and the parenting role.
- Be open to change in line with the best available evidence.
- Respect preterm infant needs by adapting attitude to support preterm infant development.

SYSTEMS

BEST PRACTICE GUIDELINE 13 - COMMUNICATION

Effective communication systems are in place between health care professionals and health care professionals and parents.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements - none

Stage 2 (a): Conclusion statements 32

Stage 2 (c): Conclusion statements 64

Strength of recommendation for implementation: 1

If this BPG is implemented, staff as well as parents will be well informed regarding each preterm infant's health and behavioural status assisting the provision of care appropriate for each preterm infant's development.

Implementation recommendations

- Share knowledge between professionals and follow a multi-disciplinary team method in the NICU. All familiar with preterm infant's developmental care plan, and participating in its application should communicate with each other.
- Promote and practice open, honest communication among all members of the health care team and parents.
- Design a suitable and functional communication system to parents.

BEST PRACTICE GUIDELINE 14 – PROTOCOLS

Protocols are in use to support implementation of NDSC interventions.

Sufficiency of evidence: B

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements - none

Stage 2 (a): Conclusion statements 39, 48

Stage 2 (c): Conclusion statements 76

Strength of recommendation for implementation: 2

Nursing and medical staff in South Africa rely on protocols to guide practice, therefore protocols will support the implementation of NDSC interventions.

Implementation recommendations

- Develop protocols on the different BPGs regarding NDSC.

BEST PRACTICE GUIDELINE 15 - MANAGEMENT SUPPORT

Management of different levels support the operationalisation of NDSC.

Sufficiency of evidence: A

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements - none

Stage 2 (b): Conclusion statements 60

Stage 2 (c): Conclusion statements 77

Strength of recommendation for implementation: 1

The support from hospital, medical and nursing management is a strong indicator of the success of NDSC operationalisation.

Implementation recommendations

- Hospital management should undertake support of NDSC operationalisation in writing.
- Medical and nursing management should be supportive of implementation and operationalisation.
- Allocate staff to a dedicated unit and ensure sufficient NDSC training.

BEST PRACTICE GUIDELINE 16 – RESOURCES

Resources are available to ensure NDSC operationalisation.

Sufficiency of evidence: B

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements - none

Stage 2 (a): Conclusion statements 31

Stage 2 (b): Conclusion statements 59, 62

Stage 2 (c): Conclusion statements 68, 75

Strength of recommendation for implementation: 1

Financial, facility and equipment resources, as well as support from the community contribute to the operationalisation of NDSC.

Implementation recommendations

- Ensure sufficient funding by involving the community.
- Appoint a project management team to generate funds.
- Maintain equipment and facilities.
- Upgrade facilities as needed, according to new guidelines.
- Identify private areas or parents to rest, consult with professionals and interact with their preterm infant.

BEST PRACTICE GUIDELINE 17 - IMPLEMENTATION TIME

An extended implementation time is used to ensure sustainable NDSC operationalisation.

Sufficiency of evidence: C

Evidence from stage 1 and 2 supports this BPG.

Stage 1: Conclusion statements - none

Stage 2 (b): Conclusion statements 63

Strength of recommendation for implementation: 3

The longer the unit has been implementing NDSC principles the better the operationalisation.

Implementation recommendations

- Change the care approach to one supporting NDSC to ensure sustainability.

6.14 SUMMARY

In Chapter 6 the process followed to formulate the best practice guidelines for this study was discussed. 17 BPGs were identified and formulated from the synthesis of conclusion statements derived in stages 1 and 2. Chapter 7 discusses the evaluation, limitations and recommendations of this research study.

CHAPTER 7
EVALUATION OF THE STUDY, LIMITATIONS AND RECOMMENDATION FOR PRACTICE, EDUCATION AND RESEARCH

7.1 INTRODUCTION

Chapter 7 is the final chapter of the research study and entails a discussion of the BPGs, an evaluation the study, the achievement of objectives as well as the rigour of the study. It further describes the limitations of the study and concludes with the recommendations for practice, education and research.

7.2 BPGS

The research question was stated in Chapter 1 as: What should Best Practice Guidelines (BPGs) for NDSC in public sector hospitals in South Africa entail? Three stages were implemented to address these questions in 4 objectives. During stage one an ILR was performed and the results suggested 9 components of NDSC that was clearly described in the literature. These results were used to design a checklist to be used in the situational analysis performed in stage 2. Results gathered from the situational analysis indicated that South African public sector hospitals in general have a poor operationalisation of NDSC, except for one unit. Stage 3 involved the formulation of the BPGs formulated by synthesis of the results from stages 1 and 2.

No BPGs for the operationalisation of NDSC of the preterm infant in public sector hospitals in South Africa were available, and the Paediatric Neonatal Work Group as well as a government document stated that: “Planning of neurodevelopmental services to get more attention” (Paediatric Neonatal Work Group, S.a. Section 6 & 8.3 [online]) and Als, *et al*. (2003:405) and Goldberg-Hamblin *et al.* (2007:167) stated that: developmental care will make the biggest difference and be most successful in the most challenged settings with little resources. Therefore, if the BPGs formulated in this study are implemented, evidence based practice will be realised to the benefit of the preterm infant and his/her parents, and the health care professionals caring for them. The recommendations are made in Paragraph 6.13.

7.3 EVALUATION OF THE STUDY

The study is evaluated on achievement of the objectives as well as the rigour for the entire study.

7.3.1 EVALUATION OF ACHIEVEMENT OF OBJECTIVES

Chapter 1 provided an overview of the study, starting with the background to the study, which served as an introduction to the research problem. The study aim and objectives were stated, and this was followed by the researcher's assumptions, including the meta-theoretical and theoretical perspective, methodological perspective and the research design. The chapter was concluded with a discussion on the strategies to ensure rigour, followed by a discussion of the ethical considerations and measures to address it.

The aim of this research study was to develop Best Practice Guidelines for Neurodevelopmental Supportive Care of the preterm infant in public sector hospitals in South Africa.

In order to achieve this aim, 4 objectives were set:

- OBJECTIVE 1: To describe the components of NDSC by means of an ILR.
- OBJECTIVE 2: To develop a checklist (based on the description of the components) to assess the operationalisation of NDSC.
- OBJECTIVE 3: To conduct a situational analysis of the operationalisation of NDSC in public sector hospitals in South Africa.
- OBJECTIVE 4: To formulate BPGs for NDSC in the public sector hospitals in South Africa.

The process to develop the Best Practice Guidelines was performed in 3 stages, addressing each of the objectives (see Figure 7-1).

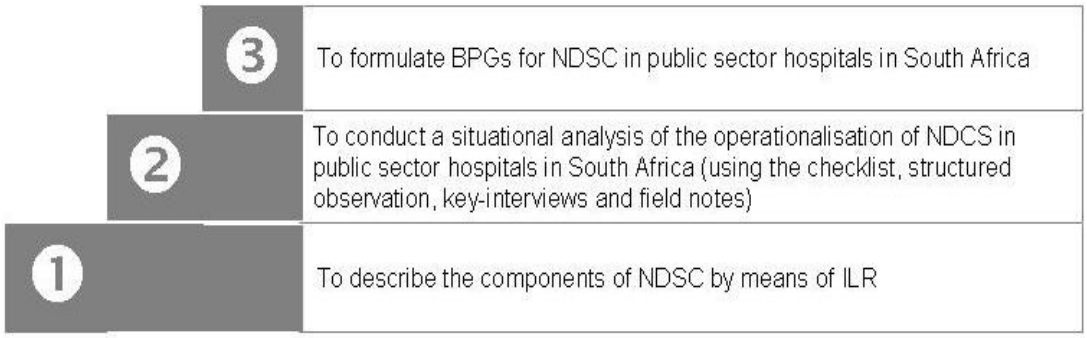

Figure 7-1: Schematic explanation of all three stages of the study

Each objective is now briefly discussed.

7.3.1.1 Objective 1

The first objective was to describe the components of NDSC by means of an ILR. Chapter 2 discussed the method and Chapter 3 the results of this first stage to reach the first objective.

A 5-stage process (see Figure 7-3) was followed to identify documents that described the components of NDSC. During this stage a sample of 176 documents was selected for critical appraisal and 16 of these documents were selected to identify 42 NDSC concepts. Stage 1 resulted in 25 conclusion statements, which were grouped together in nine preliminary components of NDSC (refer to Chapter 3). The preliminary components are given in Figure 7-3 below.

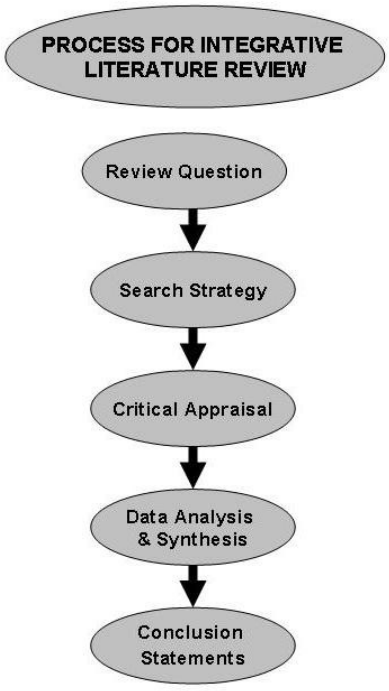

Figure 7-2: Process for ILR

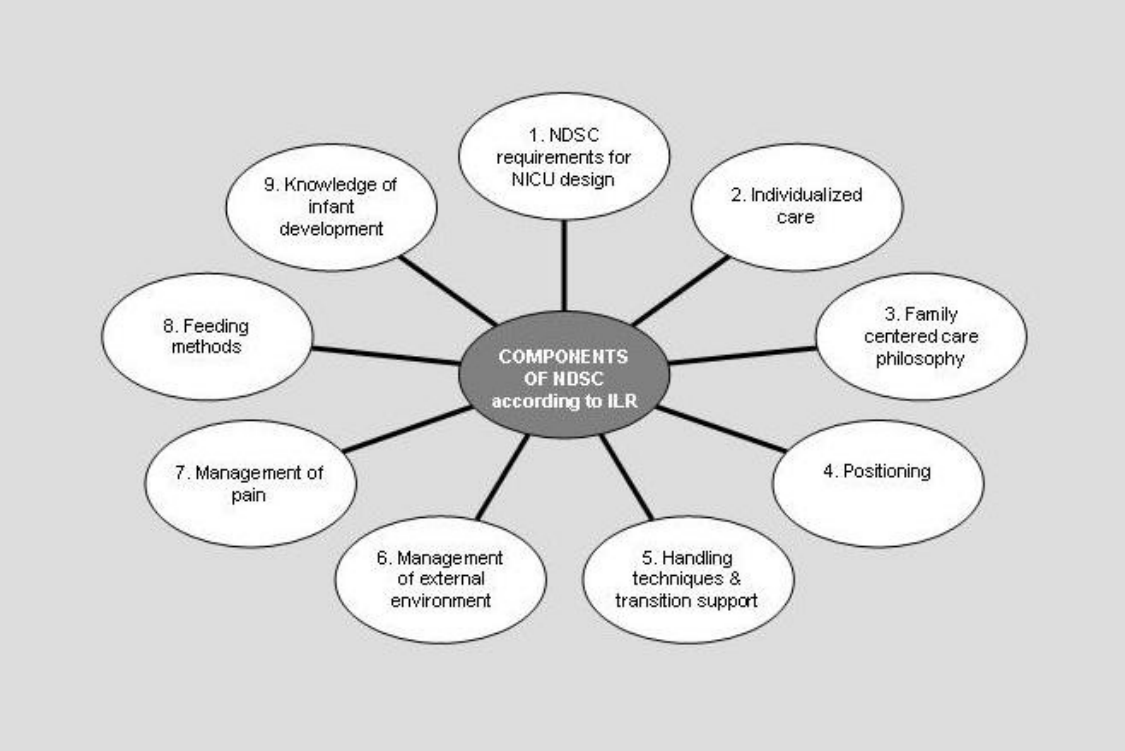

Figure 7-3: Nine Preliminary components of NDSC derived from the ILR in stage 1

These components and statements served as the basis for the checklist used for the observation in stage 2 of the study.

7.3.1.2 Objective 2

The second objective involved the development of a checklist to assess the operationalisation of NDSC.

Chapter 4 discussed the design of the checklist for the situational analysis. The statements from stage 2 were translated into items on a scaled questionnaire and validated by an independent reviewer and a statistician of the North-West University. The scaling contributed to determining a compliance percentage for each unit regarding their operationalisation of NDSC.

The results were discussed in conjunction with the rest of the results from the situational analysis (objective 3). The observation of the operasionalisation of NICU in selected neonatal units was followed by interviews with key-informants from the selected units and field notes by the researcher. This was addressed in objective 3 of the study.

7.3.1.3 Objective 3

To conduct a situational analysis of the operationalisation of NDSC in public sector hospitals in South Africa.

The observational analysis included three sources of data gathering, namely the observation of the units using the checklist design previously, followed by interviews with purposively selected key-informants supplemented with the field notes by the researcher.

Observation results: Only three units had positive values indicating that their level of NDSC implementation could be classified as fair where the remainder of the units had negative values, which indicated that they had a high-risk practice in terms of NDSC. This classification refers to the value given in the checklist to indicate compliance with NDSC components. From these observations combined with the field notes conclusion statements 26 to 57 were derived (refer to Chapter 5). The interviews followed and barriers and support factors towards the operationalisation of NDSC in the neonatal units were identified, contributing to 21 conclusion statements. These results were used as basis for the BPG development in stage 3 of the study.

7.3.1.4 Objective 4

To formulate BPGs for NDSC in the public sector hospitals in South Africa.

The 78 conclusion statements from stage 2 of the study were synthesised to derive 20 themes grouped under 17 sub-themes (refer to Table 6-5 and 7-1). Table 7-1 provides the results that crystallised during the data-analysis of stage 3. These final components were used as the formulated BPGs.

Table 7-2: Results of stage 3

CATEGORY	COMPONENT	SUB-THEME
Direct preterm infant environment	Environment	1. Create an environmental design similar to the intra-uterine environment 2. Provide a supportive environment for sleep 3. Create a micro environment conducive to preterm infant development
Direct preterm infant care	Positioning	4. Provide anatomical positioning that mimics the intra-uterine conditions
	Handling	5. Provide handling that supports flexion, containment and self-regulation
	Individualised care	6. Individualise handling and care in response to preterm infant cues, behaviour and maturity 7. Support transition into different states
	Self-regulation	8. Provide opportunities for self-regulation to support stress management, physiological stability, self-regulation and feeding support
	Feeding	9. Create a suitable environment to support feeding success
Family unit	Family-centred care	10. Provide family-centred care to support parental empowerment and family involvement
	Family education	11. Provide family education to support parental interaction with their preterm infants
	Parent profile	12. Identify parent profile to address high-risk profiles
Staff	Staff education	13. Ensure staff education regarding preterm infant development
	Multi-disciplinary team	14. Ensure a multi-disciplinary team approach to contribute to successful operationalisation of NDSC
	Staff attitude	15. Create a positive staff attitude
Systems	Communication	16. Ensure effective communication systems between health care professionals and health care professionals and parents
	Protocols	17. Develop protocols to support the implementation of interventions
	Management support	18. Ensure management support on different levels to contribute to successful NDSC operationalisation
	Resources	19. Ensure availability of resources
	Implementation time	20. Ensure implementation over extended period of time

From the 79 conclusion statements from stages 1 and 2, 17 components of NDSC were identified according to themes. Seventeen BPGs with recommendations for implementation were formulated under the following headings:

- Direct preterm infant environment,
- direct preterm infant care,
- family unit,
- staff and
- systems.

The uniqueness of this study is situated in the development of a checklist to assess the operationalisation of NDSC in the South African public sector context, since no such instrument is available nationally or internationally. In addition no BPGs for NDSC for the preterm infant is available nationally or internationally and this study contributed these BPGs to build the body of knowledge in nursing. Furthermore, a unique process was developed on checklist design, performing of an ILR as well as BPG formulation.

7.3.2 EVALUATION OF RIGOUR

The Lincoln and Guba criteria (1985:289-311) for trustworthiness was used in this study and the researcher also used it for self-assessment of the research study.

7.3.2.1 Credibility/truth value

Credibility criteria involve establishing that the results of qualitative research are credible and believable from the perspective of the participant, researcher and reader of the research (Klopper & Knobloch, 2009:14; Creswell, 2003:195; Denzin & Lincoln, 2003:69; Miles & Huberman, 1994:278, 279; Trochim, 2006 [Online]).

In this study credibility was reach though various techniques, which included:

- Prolonged engagement with the subject field as evident by the researcher's expertise and extended time working in the field of NDSC. She also spent sufficient time with the key informants to build a trusting relationship, presents national training on NDSC, is the president of SANITSA and acts as consultant for various universities (Lincoln & Guba, 1985:301,303), (refer to Table 1-7).

- Persistent observation during stage 2 of the study provided depth of data, and a further contributing factor was the different level of evidence of data gathered, i.e. triangulation.
- Triangulation of data sources was done using different data sources, such as journals, studies, policies and guideline documents, patient files, staff and parent comments. Independent coding of qualitative data could also be considered triangulation. Different data collection methods included literature review, observation, interviews and field notes. Triangulation of methods was done using multiple methods to address a single problem including ILR, checklist design, observation, interviews and field notes. Finally, investigator triangulation was employed when the researcher used independent reviewers in different stages of the study, the statistician from the university and an expert panel (Klopper & Knobloch, 2008:5; Lincoln & Guba, 1985:301, 305; Denzin & Lincoln, 2003, 66, 67; Miles & Huberman, 1994:266; 267).
- Thick description by means of providing rich and meaningful descriptions throughout the study that also provided an extensive audit trail. Evidence together with levels of evidence of data was described in addendums 3-4 and 3-5.
- Peer review was conducted by means of meetings with the study leaders, doctoral seminars and doctoral committee meetings. Peer review contributed to the exploration of bias, methods, ethical matters and any other questions that arose.
- Lastly the researcher strived to explain any inconsistencies in the data and interpretation and also stated negative findings. This was ensured by a well-documented thought process, especially when drawing conclusions, and combining conclusion statements to formulate the best practice guidelines.

7.3.2.2 Transferability/applicability

Transferability/applicability refers to the extent to which the process can be applied in other contexts or with other respondents (Miles & Huberman, 1994:279; Schurink *et al.,* 2000:331,349). It was not the intent of this study to generalise findings. However, a detailed and thick description of data, including methods, processes and results was provided throughout the study, which places the obligation for assessing transferability on the reader of the research (Klopper & Knobloch, 2008:7; Babbie & Mouton, 2002:274; Miles & Huberman, 1994:279). Samples were described in detail

for each stage. Findings were congruent with the theoretical assumption of the 'Synactive Theory of Infant Development.

Transferability was provided for in this study.

7.3.2.3 Confirmability

Confirmability refers to the degree to which the findings of an inquiry could be confirmed by others and does not present the biases of the researcher, other motivations and perspectives (Lincoln & Guba, 1985:290; Miles & Huberman, 1994:278; Schurink *et al*., 2000:331; Poggenpoel, 2000:350). The researcher stated her assumptions and personal observations that could not be explicitly confirmed by other sources (refer to Paragraph 1-5). An audit trail was provided with a thick description of the theoretical foundation, methods, findings, interpretation and recommendations, allowing the reader to decide how the personal beliefs of the researcher influenced the study findings. Confirmability was achieved when credibility and transferability of these findings to other settings were established.

7.3.2.4 Dependability/consistency

Dependability reflect the extent towards which the findings of a study are consistent, remain stable over time, across researcher and methods and whether the findings of the study would be repeated if the inquiry was replicated with the same participants (Miles & Huberman, 1994:278; Schurink, *et al*., 2000:331, 350). Methods to ensure dependability in this study included a thick description of the context, clearly stating the research question (refer to Paragraph 1.3) and the researcher's assumptions. Data collection was appropriate to the research question and the use of independent reviewers ensured adequate agreement regarding the results. Finally, peer review was constantly provided by the supervisors, independent reviewers, a statistician and consensus from experts in the field of research, the subject of NDSC and knowledge of the public hospital sector in South Africa.

7.3.2.5 Validity

Validity of the checklist was also important to ensure that the same instrument would provide similar results if used in a comparable situation. This content validity was ensured by using a second reviewer to confirm the translation of conclusion statements from stage one into the checklist, as well as confirming this with the

statistician who also confirmed that the instrument actually measures the components identified from the ILR.

Validity of the checklist as an instrument indicated that it is 'measuring what it is supposed to measure'. Content validity was ensured with the help of a statistician to compile the checklist and ensure that it represents the categories identified during the ILR. An independent reviewer and expert in the field of NDSC and the public sector also confirmed this (De Vos & Fouche, 2000:84). The checklist was piloted first to exclude internal threats to validity, such as changing the instrument during the research and it being used by a single fieldworker (the researcher herself). To prevent threats to construct validity all concepts were clearly defined from the ILR (see Chapter 4) and an independent reviewer, content expert, as well as a statistician were used to validate the final checklist (Creswell, 2003:171).

Concerns regarding external validity may arise when generalising findings. This was prevented when it was stated that the aim of the study was not to generalise the findings to other populations.

Validity was ensured in this study.

7.4 LIMITATIONS

During the course of this research study a number of limitations were identified during the different stages of the study.

7.4.1 LIMITATIONS OF THE IINTEGRATIVE LITERATURE REVIEW

An individual who was a novice to the process did the review. This might have led to data being missed during the process. As an individual and not a team developed the best practice guidelines, since it formed part of the researcher's doctoral study, additional insights might have produced improved BPGs. Being a novice regarding systematic literature reviews, the researcher found it extremely difficult to understand the process and ensure rigour throughout the process, even though it seemed very simple at the start. Many unforeseen complications/questions arose as the process developed, such as getting different search result with similar searches performed on different days (refer to 3.2.2.2 – sample 1).

7.4.2 SITUATIONAL ANALYSIS LIMITATIONS

Literature on what a situational analysis should entail and which methods to used are very limited. However, it was done to the best of the researcher's ability and provided the opportunity for contributing to the body of knowledge of nursing research in that a new process could be designed and piloted.

7.5 RECOMMENDATIONS

Recommendations are provided for the implementation of Best Practice Guidelines for NDSC for the preterm infant in the public sector hospitals in South Africa. These are discussed under recommendations for practice, education and research.

7.5.1 RECOMMENDATIONS FOR PRACTICE

- The refined BPGs should be implemented in South Africa. Strategies for implementation, as identified by the researcher, must be used. Implementation should be well-planned and additional implementation guidelines need to be developed. These could include guidelines on content for training workshops for the different role-players (management and clinicians), brochures, and educational material such as posters. Practice champions should be identified for the implementation and they should be well trained and supported.
- Best Practice Guidelines should be reviewed and updated regularly to ensure that it remains based on the best available research evidence.
- Regular evaluation of the impact of these guidelines is essential after implementation to ensure high compliance and sustainable implementation. Measurable indicators on the outcomes should be identified and used and provided to the hospitals and their staff (as part of a post-doctoral study). Evaluation results should be presented schematically and posted on notice boards and annual reports as constant reminder, but also to encourage good performance. Incentives could include rewarding sustained performance at a certain level.
- Managers can be held accountable for compliance with NDSC guidelines that occur in their institutions by evaluating institutions on a regular basis by an independent body.
- Buy-in from policy makers on Best Practice Guidelines is essential to ensure wider implementation. This can be done by means of presentations at

meetings or workshops, sending reports to key persons, electronic communication and follow-up of initial communication.

- Since NDSC was identified as an area that needs to be addressed, funding should be made available for its implementation on regional and national level.
- Dissemination of the BPG should be done as soon as possible. Some interventions based on the passive receipt of information, such as publication in professional journals, influences professionals' awareness and knowledge of the guidelines. Improved compliance was found after targeted mailing. However, these approaches are usually insufficient to change professional behaviour. Educational interventions, such as seminars, where more active participation is required from professionals, are more likely to lead to changes in behaviour (Grimshaw *et al.*, 1995:60-61).

7.5.2 RECOMMENDATIONS FOR EDUCATION

- Education on NDSC should be included at undergraduate level of all health professional curricula, but also for all postgraduate midwifery and neonatology curricula, including nursing and the rest of the multi-disciplinary team members.
- A continuous education program should be developed and implemented were staff can self-evaluate their practice, but also to ensure training of new staff, and update training of more senior staff.
- Health care professionals working with preterm infants should receive formal education on the implementation of NDSC. This education should be available in a modular format as well as contribute to a formal postgraduate qualification as incentive to professionals to attend education (this differs from the continuous education mentioned in the second bullet above).
- The need for the use of best available evidence and the accompanying responsibility to update protocols frequently should be included in all basic and advanced nursing education. Students, practitioners and policy makers should understand the importance of testing all nursing interventions against this research.

7.5.2.1 Recommendation for education specific to the ILR process

Recommendations regarding education on the ILR process are offered because it is a review type not very often used in nursing. Therefore recommendations include the following:

- When deciding on using the ILR process as methodology (types of questions, population, sampling, unit of analysis), researchers/students should attend an orientation workshop on reviews, what kinds of reviews are available, how it should be done to ensure rigour, planning the process, resources needed, planning the time table, the actual process (search plan, findings, appraisal instruments, check findings, appraisal, re-search and appraise if needed, etc). A workbook directing a pilot study of the actual research may be very helpful to get an idea of the process, identify gaps in knowledge and direct reading (getting to know the review experts).
- Students should read well-directed literature on the methodologies and processes of reviews available, for example summary type literature that orientates the reader to the concept rather than argument different methodologies and processes.

7.5.2.2 Recommendations for education specific to BPG development

In the case where the development of BPGs is a new methodology for the student, attending a workshop on BPG design and the IDLE-method™ before embarking on using this method should be a pre-requisite and should include the background to BPG development, samples of BPGs in use in different nursing disciplines and discussing the characteristics of BPGs.

7.5.3 RECOMMENDATIONS FOR RESEARCH

The following recommendations are made with regard to BPGs:

- The grading system adapted from Minnie (2007:192,193) and used to indicate the sufficiency of evidence (based on quality and quantity of evidence sources) as well as the strength of the recommendation for implementation of the BPGs, has not yet been validated. This should be done as follow-up project.
- The usefulness and impact of the guidelines should be evaluated.
- The BPGs should be implemented, utilising best practices for implementation.
- Guideline development should include a dissemination and implementation plan.
- Indicators to assess impact and outcomes should be identified to support the evaluation of implementation success of the BPGs.

- Research on the effects of different formats and styles of guidelines on their adoption and of barriers to adopting guidelines.

7.6 SUMMARY

Chapter 7 was the final chapter of this research study, and in this chapter the final conclusions were stated. The aim and all the different objectives were achieved and described in the various chapters followed by a self-assessment of the rigour of the study.

The evidence was gathered and reported on according to the four stages of the study and the conclusion statements from these stages were used to develop the Best Practice Guidelines. Limitations of the study were discussed according to the different stages and personally experienced limitations such as administrative challenges were discussed in addition. This was followed by recommendations for practice, education and research, including methodological recommendations.

BIBLIOGRAPHY

AAGAARD, H. & HALL, E.O.C. 2008. Mothers' experiences of having a preterm infant in the neonatal care unit: a meta-synthesis. *Journal of paediatric nursing,* 23(3):e26-e36, June.

ACOG (American College of Obstetricians and Gynaecologists). 2002. Preterm infant education pamphlet–If your baby is breech. [Online]. http://www.acog.org/publications/preterm infant_education/bp079.cfm. Date of access: 20 February 2008.

AITA, M. & SNIDER, L. 2003. The art of developmental care in the NICU: a concept analysis. *Journal of Advanced Nursing*. 41(3), 223-232.

ALLAN, H., BADENOCH, D., BEXON, N., CARLSSON, C., DEARNESS, K., MIHAILOVA, B. & WEST, J. s.a. Update software: an introduction to evidence-based health care. Critical appraisal skills programme (CASP). [CD-ROM]. Oxford, UK.: NHS

ALLISON, L. s.a. Political dictionary. Oxford University Press. [Online]. http://www.answers.com/society&r=67. Date of access: 19 April 2008.

ALS, H., Co-investigator and collaborator (NICHD-funded project). 2006 3 DVD series: Focus on the brain, (DVD-1) Part 1: The science of preterm infant development. (DVD-2) Principal investigator; Allie Hamenuk. Producer; Katherine Rose. Co-producer. VIDA-Health communications, Cambridge M. A,.

ALS, H. s.a. [Online]. http://www.childrenshospital.org/cfapps/research/data_admin/Site2265/mainpageS2265P0.html. Date of access: 17 December 2007.

ALS, H. 2001. Program guide. Newborn individualised developmental care and assessment program (NIDCAP)–an education and training program for health care professionals. June. NIDCAP Federation International. [Online]. http://www.nidcap.com/index.html. Accessed on 4 September 2006.

ALS, H. 1999. Reading the premature infant. (*In* Goldson, E., *ed*. Developmental interventions in the neonatal intensive care nursery. New York: Oxford University Press 1999: 18-85.)

ALS, H. 1992. Individualized, Family-Focused Developmental Care for the Very Low-Birthweight Preterm Infant in the NICU. (*In* Friedman, S.L. & Sigman, M.D., eds. The Psychological Development of Low Birthweight Children. Advances in Applied Developmental Psychology, Vol 6. Norwood: Ablex Publishing, p. 431-388.)

ALS, H. 1982. Toward a synactive theory of development: promise for the assessment and support of infant individuality. *Infant mental health journal,* 3(4):229-243.

ALS H., BUEHLER D., KERR D., FEINBERG E. & GILKERSON L. 2006. Profile of the nursery environment and of care components: template manual, Part I. NIDCAP Federation International. Chicago: Erikson Institute.

ALS, H., & GILKERSON, L.. 1997. The role of relationship-based developmentally supportive newborn intensive care in strengthening outcomes of preterm infants. *Seminars in perinatology*, 21(3):178-189, June.

ALS, H., GILKERSON, L., McANULTY, G.B., BUEHLER, D.M., VAN DEN BERG, K., SWEET, N., SELL, E., PARAD, R.B., RINGER, S.A., BUTLER, S.C., BLICKMAN, J. G. & JONES, K..J. 2003. A three-centred, randomised, controlled trial of individualized developmental care for very low birth weight preterm infants: medical, neurodevelopmental, parenting, and care giving effects. *Developmental and behavioral paediatrics,* 24(6):399-408.

ALS H. & McANULTY, G. 2001. Developmental care guidelines for use in the newborn intensive care unit (NICU). NIDCAP Federation International. Boston.

ALS, H., LAWHON, G., FRANK, H.D., McANULTY, G.B., GIBES-GROWWMAN, R., BLICKMAN, J.G. 1994. Individualised developmental care for the very low-birth-weight preterm infant – Medical and Neurofunctional Effects. *JAMA.* 272(11): 853-858. September.

ALS, H., LESTER, B.M., TRONICK, E.Z. & BRAZELTON, B. 1982. Toward a Research Instrument for the Assessment of Preterm Infant's Behavior (APIB). (*In* Fitzgerald, B., Lester, M. & Yogman, *eds.* Theory and Research in Behavioral Pediatrics, Vol I. New York: Plenum 1982: 35-63.)

ADA see also AMERICAN DIETETIC ASSOCIATION

AMERICAN DIETETIC ASSOCIATION (ADA) –scientific affairs & research. 2005. ADA evidence analysis manual. Edition IV. Chicago. November.

ASHBAUGH, J.B., LEICK-RUDE, M.K. & KILLBRIDE, H.W. 1999. Developmental care teams in the neonatal intensive care unit: survey on current status. *Journal of perinatology,* 19(1):48-52.

AUCOTT, S., DONOHUE, P.K., ATKINS, E. & ALLEN, M.C. 2002. Neurodevelopmental Care in the NICU. *Mental Retardation and Developmental Disabilities.* 8: 298-308.

BABBIE, E. & MOUTON, J. 2002. The practice of social research. Cape Town: Oxford University Press Southern Africa.

BAILEY, C.A. 1996. A guide to field research. Thousand Oaks, CA: Pine Forge.

BENETAR, S.R., BHOOLA K.D., CLEATON-JONES, P.E., DE KLERK, W.A., DU TOIT, D., HERMAN, A., LABUSCHAGNE, A., LEIBOWITZ, M., LOUW, D.J., MATSILIZA, N., MBEWU, A.D., ORR, W., POGGENPOEL, M., ROBERTS, C., VAN NIEKERK, A.A., VAN OOSTEN, F.F.W. & VAN WYK, C.W. 1993. Guidelines on ethics for medical research. Book 1. General principles. 3rd ed. Parowvallei: Medical Research Council.

BERMAN, N.G. & PARKER, R.A. 2002. Meta-analysis: neither quick nor easy.

BioMed Cental medical research methodology. 2(10). [Online]. http://www.biomedcentral.com/content/pdf/1471-2288-2-10.pdf. Date of access: 28 April 2008.

BOND, C. 2000. Positive Touch and massage in the neonatal unit: a British approach. *Seminars in Neonatolology.* 7:477-486.

BOTES, A.C. 1995a. A model for research in nursing. Rand Afrikaans University. 22p. (Unpublished).

BOTES, A.C. 1995b. The operationalisation of a research model in a qualitative methodology. *RAUCur*, 1(1):4-9.

BREMMER, P., BYERS, J.F. & KIEHL, E. 2003. Noise and the Premature Infant: Physiological Effects and Practice Implications. *Journal of Obstetric, Gynegologic and Neonatal Nursing.* 32:447-454, July/August.

BRINK, H.I., VAN DER WALT, C. & VAN RENSBURG, G. 2006. Fundamentals of research methodology for health care professionals. 2nd ed. Cape Town : Juta. 226 p.

BURNS, N. & GROVE, S.K. 2005. The practice of Nursing Research: conduct, critique and utilization. 5th ed. St Louis : Elsevier. 780 p.

BURNS, N. & GROVE, S.K. 2001. The practice of nursing research. Conduct, critique and utilisation. 4th ed. Philadelphia: W.B. Saunders.

BYERS, J.F. 2003. Components of Developmental Care and the Evidence for Their Use in the NICU. *Maternal and Child Nursing*. 28(3): 174-180 May/June.

CARRIER, C T. 2002. Individualized family-centred developmental care: reflections on implementation. *Newborn and infant nursing reviews*, 2(1):27-34, March.

CASTLE, N.G. 2009. An instrument to measure job satisfaction of certified nurse assistants. *Applied Nursing Research*. In Press.

CINAHL. 2009. xxxxxx. http://www.ebscohost.com/cinahl. Date of access: 05 March 2009. Titel van artikel

COCHRANE LIBRARY. Literature search. http://www.puk.ac.za:2119/cgi-bin/mrwhome/106568753/ProductDescriptions.html. Date of access: 9 November 2009.

COOPER, H. 1982a. Scientific guidelines for conducting ILRs. (*In* American educational research association. Meta-analysis and the synthesis of research finding: a paper read at the 66th annual meeting of the American educational research Association held in New York on 19–23 March 1982. New York, NY. P.1-22.)

COOPER, H.M. 1982b. Scientific guidelines for conducting integrative research reviews. *Review of educational research.* 52(2):291-302. Summer. [Online]. http://www.jstor.org/stable/1170314. Date of access: 05 May 2008.

CORBIN, J.M. 2003. The body in health and illness. *Qualitative health research*. 13(2):256-267, February.

CRESWELL, J.W. 2003. Research design: qualitative, quantitative, and mixed methods approaches. 2nd ed. California: Sage.

CRESWELL, J.W. 1998. Qualitative inquiry and research design: choosing among five traditions. Thousand Oaks. California: Sage.

CROMIE, W.J. 2004. Early experiences alter the baby's brain-preemies must be brought up to date. *Harvard university gazette,* 20 May. [Online]. http://www.hno.harvard.edu/gazette/2004/05.20/01-preemies.html. Date of access: 20 February 2008.

DAWSON, J. & THOMAS, E. 1999. From literature review to guidelines – a model for practice. *British Journal of Clinical Governance,* 4(1):11-13.

DENZIN, N.K. & LINCOLN, Y.S. *eds*. 2005. The Sage Handbook of Qualitative Research. 3rd ed. Thousand Oaks. Sage.

DENZIN, N.K. & LINCOLN, Y.S. *eds*. 2003. Strategies of Qualitative enquiry. 2nd ed. Thousand Oaks. Sage Publications. 45 p.

DENZIN, N.K. & LINCOLN, Y.S. 1994. Competing paradigms in qualitative research. (*In* GUBA, E.G. & LINCOLN, Y.S. *eds*. Handbook of qualitative research. Sage: Thousand Oaks, London p. 105-117.)

DE VOS, A.S. & FOUCHÉ, C.B. 2000. Writing the research proposal. (*In* De Vos, A.S. *ed*. Research at grass roots: a primer for the caring profession. 2nd ed. Pretoria: Van Schaik. p. 419-430.)

DE VOS, A.S. & V ZYL 2000. Writing the research proposal (*In* De Vos, A.S. *ed*. Research at grass roots: a primer for the caring profession. 2nd ed. Pretoria: Van Schaik. p. 95-109.)

DIRECTORATE: CHILD AND YOUTH HEALTH, NATIONAL DEPARTMENT OF HEALTH. 2008. Guidelines for neonatal care. Department of Health. Pretoria. 59p.

DIXON-WOODS, M., AGARWAL, S., YOUNG, B., JONES, D. & SUTTON, A. 2004 Integrative approaches to qualitative and quantitative evidence. Health development agency. [Online]. www.hda.nhs.uk. Date of access: 16 May 2008.

DOBROW, M.J., GOEL, V. & UPSHUR, R.E.G. 2004. Evidence-based health policy: context and utilisation. *Social Science & Medicine.* 58: 207-217.

ELLIS, S. (suria.ellis@nwu.ac.za) 28-10-2008. Re : Checklist. E-mail to : Lubbe, W. (info@littlesteps.co.za).

ERIC. 2009. Literature search. http://www.eric.ed.gov/ERICWebPortal/resources/ html/ collection/about_collection.html. Date of access: 04 March 2009.

EUROPEAN SCIENCE FOUNDATION SCIENTIFIC NETWORK. 2002-2004 Research on early developmental care for extremely premature babies in neonatal intensive care Units (EDC).

EVANS, D. 2001. Evidence based practice information sheets for health professionals. An introduction to systematic reviews. *Changing Practic, s*upplement 1. 1-6.

EVANS, D. & PEARSON, A. 2001. Systematic reviews of qualitative research. *Clinical Effectiveness in Nursing*. 5, 111-119.

EVIDENCE-BASED MEDICINE WORKING GROUP. 1992. Evidence-based medicine. A new approach to the teaching of medicine. *Journal of the American Medical Association,* 268:2420-5.

FARLEX. 2003-2008. The Free Dictionary by Farlex. [Online]. http://www.thefreedictionary.com/society. Date of access: 19 March 2008.

FIELD, M.J. & LOHR, K.N. ed. 1992. Guidelines for Clinical Practice: From Development to Use. Washington D.C. National Academies Press. 440p.

FONTANA, A. & FREY, J.H. 1994. Interviewing: the art of science. (*In* Denzin, N.K. & Lincoln, Y.S., *ed.* Handbook of qualitative research. Sage: Thousand Oaks, Calif.: Sage. p. 361-376.).

FORBES, A. & GRIFFITHS, P. 2002. Methodological strategies for the identification and synthesis of 'evidence' to support decision-making in relation to complex health care systems and practices. *Nursing Inquiry*, 9(3):141-155.

FOUCHE, C.B. 2000. Data collection methods. (*In* De Vos, A.S. *ed*. Research at grass roots: a primer for caring professions. 2nd ed. Pretoria: Van Schaik. p. 152-177.)

FRITSHE, L., EINECKE, G., FLEINER, F., DRAGUN, D., NEURMAYER, H. & BUDDE, K. 2004. Reports of large immunosuppression transplantation: room for improvement. *American journal of transplantation*, 4:738–743.

FROESE, A.D., GANTZ, B.S. & HENRY, A.L. 1998. Teaching students to write literature reviews: a meta-analytic model. *Teaching of psychology,* 25(2):102-105.

FULBROOK, P. 2003. Developing best practice in critical care nursing: knowledge, evidence and practice. *Nursing in critical care,* 8(3):96-102.

GANONG, L.H. 1987. Integrative reviews of nursing research. *Research in nursing & health,* 10:1-11.

GARDNER, M.R. 2005. Outcomes in children experiencing neurologic insults as preterm neonates. *Paediatric nursing,* 31(6): 448-456 Nov-Dec.

GLASS, G., McGAW, B. & SMITH, M. 1981. Meta-analysis in social research. Berverley Hills: Sage.

GLASS, G.V. 1976. Primary, secondary, and meta-analysis of research. *Educational researcher,* 4(10):3-8. [Online]. http://www.jstor.org/stable/1174772. Date of access: 05 May 2008.

GOLDBERG-HAMBLIN, S., SINGER, J., SINGER, G.H.S. & DENNEY, M.K. 2007. Early Intervention in Neonatal Nurseries. The Promising Practice of Developmental Care. *Infants & Young Children*. 20(2), 163-171.

GOTTLICH, E. (errolg@discovery.co.za) 06-02-2009. Help. E-mail to: Lubbe, W. (info@littlesteps.co.za).

GOVERNMENT GAZETTE, 2000. Promotion of Access to Information Act, No 2 of 2000.

GRAY, K., DOSTAL, S., TERNULLO-RETTA, C. & ARMSTRONG, M.A. 1998. Developmentally Supportive Care in a Neonatal Intensive Care Unit: A Research Utilization Project. *Neonatal Network.* 17(2), 33-38.

GRIMSHAW, J., FREEMANTLE, N., WALLACE, S., RUSSELL, I., HURWITZ, B., WATT, I., LONG, A. & SHELDON, T. 1995. Developing and implementing clinical practice guidelines. *Quality in health care,* 4:55-64.

GROENEWALD, T. 2004. A phenomenological research design illustrated. *International journal of qualitative methods, 3*(1). Article 4. [Online]. http://www.ualberta.ca/~iiqm/backissues/3_1/pdf/groenewald.pdf. Accessed on: 22 January 2009.

GUBA, E.G. & LINCOLN, Y.S. 2005. Paradigmatic controversies, contradictions and emerging confluences. (*In* Denzin, N.K. & Lincoln, Y.S., *eds*. The Sage handbook of qualitative research. 3rd ed. London: Sage Publications. p. 191-216.

GUBA, E.G. & LINCOLN, Y.S. 1994. Competing paradigms in qualitative research. (*In* Denzin, N.K. &. Lincoln, Y.S. *eds.* Handbook of Qualitative Research. Sage: Thousand Oaks, London. p. 105-117.)

HAYNES R.B., DEVEREAUX P.J. & GUYATT G.H. 2002. Clinical expertise in the era of evidence-based medicine and patient choice (editorial). *Vox sanguinis*, 83, Suppl 1: 383-386.

HEALTH SYSTEMS TRUST. 2006 [Online] http://www.hst.org.za/healthstats/ 153/data Date of access: 22 December 2006.

HEESE, H. & POWER, M. 1992. Definitions of important terms. (*In* Heese, H., *ed*. The paediatric handbook. 3rd ed. Cape Town: Oxford University Press. p. 163-173.)

HENNESSY, A.C. 2002. Developmentally supportive care: the effects of positioning on stress levels in the preterm infant. Pretoria. University of Pretoria (M Cur Thesis).

HENNESSY, A.C. 2006. Facilitation of developmental care for high-risk neonates: an intervention study. Pretoria: University of Pretoria. (Thesis-PhD).

HENNING, E., VAN RENSBURG, W. & SMIT, B. 2005. Finding your way in qualitative research. Paarl: Van Schaik. 179 p.

HIGGINS, J.P.T. & GREEN, S., *eds*. 2008. Cochrane handbook for systematic reviews of interventions. Version 5.0.1 [Updated: September 2008]. The Cochrane Collaboration. www.cochrane-handbook.org. Date of access: 3 February 2008.

JBI see THE JOANNA BRIGGS INSTITUTE

Joanna Briggs Institute for Evidence Based Nursing and Midwifery (JBIEBNM). 2001. An introduction to systematic reviews: *changing practice.* Sup. 1. [Online]. http://www.joannabriggs.edu.au/CP2.pdf. Date of access: 15 May 2008.

JACOBS, S.E., SEKOLO, J. & OHLSSON, A. 2002. The Newborn individualized Development Care and Assessment Program is not supported by meta-analysis of the data. *The Journal of pediatrics*. 140(6): 699-709, Jun.

JORDAAN, E. (estelle.jordaan@mediclinic.co.za) 06-02-2009. PhD study: Best practice guidelines for neurodevelopmental supportive care of the prematurely born infant in South African public hospitals. E-mail to: Lubbe, W. (info@littlesteps.co.za).

KEMERLING, G. 2001. Arguments and Inference. http://www.philosophypages.com. Accessed 30 November 2009.

KENNER, C & McGRATH, J.M. 2004. Developmental care of newborns & infants–a guide for health professionals. USA: Elsevier: 590 p.

KHAN, Z. 2003. Individualised developmental supportive care in the NICU. *Journal of Neonatal Nursing*. 9(5), 4p.

KING, I.M. & FAWCETT, J. eds. 1997. The language of nursing theory and metatheory. Indianapolis, Indiana: STTI. P98.

KLOPPER, H.C. 2010. The application of the IDLE-method™ in research. NWU: Potchefstroom. (Submitted for publication).

KLOPPER, H. 2008. The qualitative research proposal. *Curationis*, 31(4): 62-72, December.

KLOPPER, H.C. & KNOBLOCH, S. 2009. Validity, reliability, and trustworthiness. NWU: Potchefstroom: North-West University. 16 p.

KREFTING, L. 1991. Rigor in qualitative research: the assessment of trustworthiness. *The American journal occupational therapy*, 45(3):214-22, March.

LAWHON, G. & HEDLUND, R.E. 2008. Newborn individualized developmental care and assessment program training and education. *Journal of Perinatal and Neonatal Nursing*., 22(2):133-144.

LAWHON, G. & MELZAR, A. 1998. Developmental care of the very low birth weight infant. *The Journal of perinatal & neonatal nursing.* 2(1): 56-65.

LEE, B.K. & GEGORY, D. 2008. Not alone in the field: distance collaboration via the internet in a focused ethnography. *International journal of qualitative methods*, 7(3):30-46.

LINCOLN, Y.S. & GUBA, E.G. 1985. Naturalistic inquiry. Chapter 11: Establishing trustworthiness. Newbury Park, Calif: Sage. P73-84.

LOFLAND, J., & LOFLAND, L. H. 1999. Data logging in observation: Fieldnotes. (*In* Bryman, A. & Burgess, R.G., *eds.* Qualitative research, v. 3. Sage: London. p. 3-12)

LOTAS, M.J. & WALDEN, M. 1996. Individualized developmental care for very low-birth-weight infants: a critical review. *Journal of Obstetric, Gynegologic and Neonatal Nursing,* 25(8):681-687, October.

LOTT, J.W. 1989. Developmental care of the preterm infant. *Neonatal Network*. 7(4): 21-28, Feb.

LUDINGTON-HOE, S.M., FERREIRA, C., SWINTH, J. & CECCARDI J.J. 2003. Safe criteria and procedure for kangaroo care with incubated preterm infants. *Journal of Obstetric, Gynegologic and Neonatal Nursing*, 32:579-588, September/October.

LUDINGTON-HOE, S.M., MORGAN, K. & ABOUELFETTOH, A. 2008. A clinical guideline for implementation of kangaroo care with premature infants of 30 or more weeks' postmenstrual age. *Advances in neonatal care*, 8(3S):S3-S23.

LUTES, L. 1996. Developmental care: Bedding twins/multiples together. *Neonatal Network.* 15(7), 61-2.

MAHONEY, M.C. & COHEN, M.I. 2005. Effectiveness of developmental intervention in the neonatal intensive care unit: implications for neonatal physical therapy. *Paediatric physical therapy,* 17:194-208.

MARTINEZ, G. s.a. Kangaroo mother care presentation. (Unpublished).

McLEOD, A.M. & SPARLING, E.A. 1993. The development of foetal behaviours and their relationship to neonatal behavioural organization. (*In* Sparling J.W., *ed*. Concepts in foetal movement research. Haworth Press. p. 236.)

MEDPAGES. http://www.medpages.co.za/. Date of access : 05 March 2009.

MEDLINE. 2009. Literature search. http://medline.cos.com/docs/abmedl.shtml. Date of access: 05 March 2009.

MELNYK, B.M. & FINEOUT-OVERHOLT, E. 2005. Evidence-based practice in nursing & health care: a guide to best practice. Philidephia: Lippincott, William & Wilkins. [CD-ROM].

MILES, M.B. & HUBERMAN, A.M. 1994. Data Management and Analysis Methods (*In* Denzin, N.K. & Lincoln, Y.S. *ed.* Handbook of Qualitative research. Thousand Oaks: Sage. p. 482-444.)

MILKOWSKI, A. & BLANCETT, S.S. (*ed*) & DOMINICK, L, F. 1998. Starting small: outcomes management design for the extremely low-birth weight infant. (*In* Health Care Outcomes. Maryland, Md.: Aspen. p. 405.)

MINNIE, C.S. 2007. Best Practice Guidelines for Counselling for HIV Testing During Pregnancy. Potchefstroom: North-West University. (Thesis-PhD). 292p.

MORAG. I. & OHLSSON, A. 2008. Cycled light in the intensive care unit for preterm/low birth weight infants. (Protocol) *Cochrane Database of Systematic Reviews* 2008, Issue 1.

MOUTON, J. & MARAIS, H.C. 1996. Basic concepts in the methodology of the social sciences. Pretoria: HSRC Publishers.

MOUTON, J. 1996. Basic concepts in the methodology of the social sciences. (*In* Mouton, J. & Marais, H.C. Understanding social research. 5th ed. Pretoria: HSRC Publishers. p. 269.)

MOUTON, J. 2001. How to succeed in your master's & doctoral studies–a South African guide and resource book. Goodwood, Western Cape: Van Schaik.

MPHAHLELE, R. 2007. Caring for premature babies–a clinical guide for nurses. *Professional nursing today*, 11(1):40-46, January/February.

NAIR, M.N.G., GUPTA, C. & JATANA, S.K. 2003. NICU environment: can we be ignorant? *Medical Journal Armed Forces India.* 95(2):93-95. [Online]. http://medind.nic.in/maa/t03/i2/maat03i2p93.pdf. Date of access: 02 September 2007.

NANN. 2001. National Association of Neonatal Nurses. http://www.nann.org/ Date of access: 29 March 2009.

NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL (NHNRC). 2000. Clinical practice guidelines: care around preterm birth. Commonwealth of Australia. [Online]. http://www.nhmrc.gov.au/guidelines/index.htm. Date of access: 28 November 2009.

NATIONAL INSTITUTES OF HEALTH (NIH) 2006. The Nation's Medical Research Agency. http://www.nih.gov/. Date of access: 28 April 2006.

NEILL, J. 2006. Meta-analysis: research methodology–quantitative research methods. 10 May. [Online]. http://wilderdom.com/research/meta-analysis.html. Date of access: 28 April 2008.

NEW ZEALAND GUIDELINES GROUP (NZGG). 2001. Handbook for the preparation of explicit evidence-based clinical practice guidelines. Wellington, New Zealand. [Online]. http://www.nzgg.org.nz/download/files/nzgg_guideline_handbook.pdf.

Date of access: 7 November 2008.

NEWHOUSE, R.P., DEARHOLT, S.L., POE, S.S., PUGH, L.C. & WHITE, K.M. 2007. Johns Hopkins nursing evidence-based practice model and guidelines. Honor society of nursing, Sigma Theta Tau International. Printing Partners, Indianapolis, Ind.

NORTH EAST NEONATAL BENCHMARKING GROUP. 2003. Developmentally Supportive Care of the Neonate. http://www.yorkshireneonet.org.uk/guidelines_folder/guidelines_files/developmental_care_benchmark.DOC. Date of access: 12 December 2007.

NORTH-WEST UNIVERSITY. Library website. www.nwu.ac.za/library.

NZGG see also NEW ZEALAND GUIDELINES GROUP

O'REILLY, D. 2007. Premature infant. *Medline Plus,* [Online]. http://www.nlm.nih.gov/medlineplus/ency/article/001562.htm Date of access: 20 February 2008.

PAEDIATRIC NEONATAL WORK GROUP. Working document. http://www.doh.gov.za/mts/reports/neonatology.html. Date of access: 18 September 2007.

PATTINSON, R.C. 2000. Saving Babies: a perinatal care survey of South Africa, Executive Summary. [Online]. http://www.scienceinafrica.co.za/2001/july/babies.htm#Top. Date of access: 18 September 2007.

PATTINSON, R.C. 2005. Saving babies: fifth perinatal care survey of South Africa 2003-2005. [Online]. http://www.ppip.co.za/Downloads/Saving%20babies%202003-5.pdf. Date of access: 30 January 2009.

PEARSON, A., WIECHULA, R., COURT, A. & LOCKWOOD, C. 2005. The JBI model of evidence-based health care. *International Journal of Evidence-Based Healthcare*, 3: 207-215.

PENNER, J.L. & McCLEMENT, S.E. 2008. Using phenomenology to examine the experiences of family caregiver of patients with advanced head and neck cancer: reflections of a novice researcher. *International journal of qualitative methods*, 7(2):92-101.

PERLMAN, J.M. 2007. Neurobehavioural deficits in premature graduates of intensive care–potential medical and neonatal environmental risk factors. *Paediatric.* 108: 1339-1348. [Online]. http://www.pediatrics.org/cgi/content/full/108/6/1339. Date of access: 10 January 2008.

PHILOSOPHY DICTIONARY. Keyword search. Oxford, N.Y.: Oxford University Press. http://www.answers.com/society&r=67. Date of access: 19 April 2008.

POGGENPOEL, M. 2000. Data analysis in qualitative research. (*In* De Vos, A.S. *ed*. Research at grass roots: a primer for the caring profession. 2nd ed. Pretoria: Van Schaik. p.334-356.)

REGAN, J.A. 1998. Will current clinical effectiveness initiatives encourage and facilitate practitioners to use evidence-based practice for the benefit of their clients? *Journal of clinical nursing*, 7: 244-258.

REGISTERED NURSES' ASSOCIATION OF ONTARIO. 2002. Toolkit. Implementation of clinical practice guidelines. March. [Online]. http://www.rnao.org/bestpractices/PDF/BPG_Toolkit.pdf. Date of access:19 March 2008.

REGISTERED NURSES' ASSOCIATION OF ONTARIO. 2003a. Best practice guidelines for nurses. Nursing best practice guideline–shaping the future of nursing.

September. [Online]. http://www.rnao.org/bestpractices/PDF/BPG_Breastfeeding.pdf. Date of access: 12 December 2007.

REGISTERED NURSES' ASSOCIATION OF ONTARIO. 2003b. Best practice guidelines for nurses. Nursing best practice guideline–Shaping the future of nursing. September. [Online]. http://www.rnao.org/Page.asp?PageID=1212&SiteNodeID=155. Date of access: 12 December 2007.

REGISTERED NURSES' ASSOCIATION OF ONTARIO. 2003c. Best practice guidelines for nurses. Nursing best practice guideline–Shaping the future of nursing. September. [Online]. http://www.rnao.org/Page.asp?PageID=1110&SiteNodeID=190&BL_ExpandID. Date of access: 12 December 2007.

REGISTERED NURSES' ASSOCIATION OF ONTARIO. 2003d. Best practice guidelines for nurses. Nursing best practice guideline–Shaping the future of nursing. September. [Online]. http://www.rnao.org/Page.asp?PageID=1224&SiteNodeID=34. Date of access: 12 December 2007.

REGISTERED NURSES' ASSOCIATION OF ONTARIO. Introduction to RNAO best practice guideline. [Online]. rnao.org/Storage/12/666_Introduction_to_RNAO_Best_Practice_Guidelines.ppt. Date of access: 29 March 2008.

REGISTERED NURSES' ASSOCIATION OF ONTARIO (RNAO). 2006. Registered nurses' association of Ontario guideline development methodology. Nursing best practice research unit. June. Canada.

REGISTERED NURSES' ASSOCIATION OF ONTARIO (RNOA). 2006. Nursing best practice research unit: Registered nurses' association of Ontario guideline development methodology-report. June. Canada. [Online]. http://www.nbpru.ca/. Date of access: 29 March 2008.

RIORDAN, J. *ed*. 2005. Breastfeeding and human lactation. 3rd ed. Boston: Jones and Bartlett. 819 p.

RNAO see REGISTERED NURSES' ASSOCIATION OF ONTARIO (RNAO).

RUSSELL, C.L. 2005. An overview of the integrative research review. *Progress in transplantation.* March. [Online]. http://findarticles.com/p/articles/mi_qa4117/is_200503/ai_n13476203. Date of access: 23 April 2008.

SA see South Africa.

SACKETT, D.L., ROSENBERG, W.M.C, GRAY, J.A.M., HAYNES, R.B. & RICHARDSON, W.S. 1996. Evidence based medicine: what it is and what it isn't. *British Medical Journal*. 312: 71-72, Jan.

SANC see South African Nursing Council.

SANDELOWSKI, M. & BARROSO, J. 2003. Creating metasummaries of qualitative findings. *Nursing Research,* 52(4):226-223, July/Aug.

SANDELOWSKI, M., VOILS, C.I., BARROSO, J. & LEE, E. 2008. "Distorted Into Clarity": A Methodological Case Study Illustrating the Paradox of Systematic Review. *Research in Nursing & Health.* 31, 454-465.

SANDELOWSKI, M., DOCHERTY, S. & EMDEN, C. 1997. Qualitative metasynthesis: issues and techniques. *Research in Nursing & Health*, 20:365-371.

SCHüNEMANN, H.J., FREITHEIM, A. & OXMAN, A.D. 2006. Improving the use of research evidence in guideline development: 9. Grading evidence and recommendations. *Health Research Policy and Systems.* 4:21, Dec.

SCHüNEMANN, J.H., FRETHEIM, A. & OXMAN, A.D. 2006. Improving the use of research evidence in guideline development: I. Guidelines for guidelines. *Health research policy and systems,* 4(13):1-6.

SCHURINK, E.M. 2000a. Deciding to use a qualitative research approach. (*In* De Vos, A.S. *ed*. Research at grass roots: a primer for the caring profession. 2nd ed. Pretoria: Van Schaik. p. 239-251.)

SCHURINK, W.J. 2000b. Participant observation. (*In* De Vos, A.S. *ed*. Research at grass roots: a primer for the caring profession. 2nd ed. Pretoria: Van Schaik. p. 277-296.)

SCHURINK, W.J. 2000c. The methodology of unstructured face-to-face interviewing. (*In* De Vos, A.S. *ed*. Research at grass roots: a primer for the caring profession. 2nd ed. Pretoria: Van Schaik.)

SCHURINK, W.J., SCHURINK, E.M. & POGGENPOEL, M. 2000. Focus group interviewing and audio-visual methodology in qualitative research. (*In* De Vos, A.S. *ed*. Research at grass roots: a primer for the caring profession. 2nd ed. Pretoria: Van Schaik. p. 313-333.).

SEHGAL, A. & STACK, J. 2006. Developmentally supportive care and NICDAP. *Indian Journal of paediatrics*, 73(11):1007-1010.

SHEKELLE, P., WOOLF, S., ECCLES, M. & GRIMSHAW, J. 2000. Clinical guidelines: from conception to use. [Online]. http://books.google.com/books?hl=en&lr=&id=-

h8jl2Wyw10C&oi=fnd&pg=PA19&dq=guidelines+for+best+practice&ots=VSTh7H_8cf&sig=Ho0IqNle8XJEMVUPvEMOv80ot9g#PPA49,M1. Chapter 3. s.l.:Radcliffe publishers. Date of access: 21 April 2008.

SHELBY, L.B. & VASKE, J.J. 2008. Understanding meta-analysis: a review of the methodological literature. *Leisure Sciences,* 30:96-110.

SHELDON, R.E. 2007. Review of Vida. Neonatology Today, 2(7). [Online]. http://www.vida-health.com/pdf/ppd_nt_review.pdf. Date of access: 20 February 2008.

SIGN (Scottish Intercollegiate Guidelines Network). 2008. SIGN 50: a guideline developer's handbook. Scottish intercollegiate guidelines network. Edinburgh. [Online]. www.sign.ac.uk/guidelines/published/nurslist.html. Accessed: 02 February 2009.

SIZUN, J. & WESTRUP, B. 2004. Early developmental care for preterm neonates: a call for more research. *Archives of Disease in Childhood. Fetal and Neonatal Edition.* F384-F388.

SLAVIN, R.E. 1986. Best-evidence synthesis: an alternative to meta-analytic and traditional Reviews. *Educational Researcher*, 15(2):5-11, November.

SOBO, E.J., BOWMAN, C. & GIFFORD, A. 2008. Behind the scenes in health care improvement: The complex structures and emergent strategies of Implementation Science. *Social science & medicine,* 67:1530-1540.

SOUTH AFRICAN NURSING COUNCIL. 2004. South African Nursing Charter. Chapter 5 (draft document). 15 January.

SOUTH AFRICAN NURSING COUNCIL. 2005. Scope of nursing practice, draft 2 (rev). Chapter 6. 31 March.

SOUTH AFRICA. 2000. Promotion of Access to Information Act No. 2 of 2000. (Notice No. 95.) *Government gazette,* 416(20852):1-45, 3 February. Pretoria: Government Printer. http://www.info.gov.za/view/DownloadFileAction?id=68186 Date of access: February 2008.

SOUTH AFRICA.info. 2009a. Gateway to the nation. http://www.southafrica.info/about/people/popprov.htm. Date of access: 18 September 2009.

SOUTH AFRICA.info 2009b. Gateway to the nation. http://www.southafrica.info/about/health/health.htm. Date of access: 18 September 2009.

STARR, N.B & HOYE, L. 1998. An Overview of Developmentally Supportive Care of the Premature Infant. *Journal of Paediatric Health Care.* 12(1), 33-34.

STATISTICS SOUTH AFRICA. 2001. Census 2001. [Online]. http://www.statssa.gov.za/census01/html/default.asp. Date of access: 30 January 2009.

STATISTICS SOUTH AFRICA. 2008. Statistical release P0302. Mid-year population estimates, 2008. [Online]: http://www.statssa.gov.za/publications/P0302/P03022008.pdf. Date of access: 30 January 2009.

STROMSWOLD, K. & SHEFFIELD, E. 2004. NICU noise & language development. Rutgers University center for cognitive science technical report. [Online]. http://ruccs.rutgers.edu/tech_rpt/NICU_Noise_TR76.pdf. Date of access: 18 September 2007.

SURI, H. 2000. A critique of contemporary methods of research synthesis. *Post-Script,* 1(1):49-55, September.

SYMINGTON, A. & PINELLI, J. 2006 (date edited). Developmental care for promoting development and preventing morbidity in preterm infants. The Cochrane Library, 2. [Online]. http://www.nichd.nih.gov/cochrane/Symington & Pinelli/Symington & Pinelli.htm#Background. Date of access: 18 September 2007.

TECKLIN, J.S. 2007. Paediatric physical therapy. 4th ed. Philadelphia: Lippincott Williams & Wilkins. 680 p.

The AGREE Collaboration. 2001 The appraisal of guidelines for research & evaluation (AGREE) instrument. London: The AGREE Research Trust. www.agreetrust.org Date of access: 2 February 2008.

THE JOANNA BRIGGS INSTITUTE (JBI). 2008 Joanna Briggs Institute reviewer's manual. ed. Australia. [Online]. http://www.joannabriggs.edu.au/pdf/JBIReviewManual_CiP11449.pdf. Accessed: 2 February 2009.

THE JOANNA BRIGGS INSTITUTE (JBI). [Online]. www.joannagriggs.edu.au. Last modified: 21 February 2008. Date of access: 18 March 2009.

TJORA, A.H. 2006. Writing small discoveries: an exploration of fresh observers' observations. *Qualitative Research*, 6(4):429-451.

TROCHIM, W.M.K. 2006. Research methods knowledge base. Qualitative validity. [Online]. http://www.socialresearchmethods.net/kb/qualval.php. Date of access: 18 September 2007.

UCSF Children's Hospital. 2004. Very low and extremely low birthweight infants. Intensive care nursery house staff manual. [Online]. http://www.ucsfhealth.org/childrens/health_professionals/manuals/20_VLBW_ELBW.pdf. Date of access: 18 September 2007.

UNICEF. 2004. Low birth weight: Country, regional and global estimates. http://www.unicef.org/publications/files/low_birthweight_from_EY.pdf. Date of access: 22 December 2006.

VAN DEN BERG, K.A. 2007. Individualized developmental care for high risk newborns in the NICU: A practice guideline. *Early Human Development,* 83: 433-422.

VAN DEN BERG, K.A. 1997. Basic Principles of Developmental Caregiving. *Neonatal Network,* 16(7), Oct.

VAN DER WESTHUIZEN, C. 2007. The (lack) of medicine in ancient times versus modern medicine and its ethical problems. Presentation at SANITSA general meeting in Pretoria.

VOLPE, J.J. 2001. Neurobiology of periventricular leukomalacia in the premature infant. *Paediatric research*, 50(2):553-562.

WALL, S. 2008. Easier said than done: Writing an autoethnography. *International journal of qualitative methods,* 7(1):38-53.

WEBB, L.Z. 1982. Developmental care in the neonatal ICU. *Dimensions of critical care nursing.* 1:221-31, Jul-Aug.

WEBSTER, M. 2008. Online dictionary. [Online]. http://www.merriam-webster.com/dictionary/society. Date of access: 19 Mach 2008.

WHITE, R.D. 2006. Recommended standards for newborn ICU design. Report of the sixth census conference on newborn ICU design. Orlando, Florida. January 25-27.

WHITTEMORE, R. & KNAFL, K. 2005. The integrative review: updated methodology. *Journal of Advanced Nursing*, 52(5):546-553.

WHO (WORLD HEALTH ORGANIZATION). 1996. Essential Newborn Care - Care of the preterm and / or low birth weight newborn. [Web:] http://www.who.int/reproductive-health/publications/MSM_96_13/MSM_96_13_Chapter1.en.html [Date of access: 02 September 2007]

WHO (WORLD HEALTH ORGANIZATION). 2005. Summary overview and background to health promotion: globalisation, health challenges and the Bangkok Charter. 6th Global conference on health promotion in Bangkok, Thailand. 7-11 August 2005. [Online]. http://www.who.int/healthpromotion/conferences/6gchp/en/index.html Date of access: 15 February 2008.

WILSON, D.B. 1999. Practical meta-analysis. (a power point presentation). American evaluation association. Orlando, Florida, 3 October. [Online].

http://mason.gmu.edu/~dwilsonb/ma.html and http://wilderdom.com/research/meta-analysis.html. Date of access: 28 April 2008.

WOLFINGER, N.H. 2002. On writing field notes: collection strategies and background expectancies. *Qualitative Research,* 2(1):85-95.

WOODS, D.L. *ed*. 1996. Perinatal self-education program. Newborn care. Cape town: Groote Schuur.

WORLD HEALTH ORGANIZATION see WHO.