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THE SELF-REPORTED PERCEPTIONS OF THE MULTI-DISCIPLINARY TEAM REGARDING STANDARDS OF NEURODEVELOPMENTAL SUPPORTIVE CARE IN THE NEONATAL INTENSIVE CARE UNIT



WITS
UNIVERSITY

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of

Master of Science in Occupational Therapy

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PLAGIARISM DECLARATION

WITS UNIVERSITY

I, Meghan Butler (1269823), am a student registered for M.Sc. (Neuroscience applied to Occupational Therapy) in the year 2018.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above course is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
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Signature: Date: 01/06/2018

DEDICATION

To my family and friends and supervisor, thank you for all your love and support. Without you this would not have been possible.

ABSTRACT

Premature infant mortality and poor neurodevelopmental outcomes are great concerns worldwide as well as in South African Neonatal Intensive Care Units (NICUs). The Neurodevelopmental Supportive Care (NDSC) approach focuses on the improvement of neurodevelopmental outcomes by promoting a uterine-like environment by limiting noxious stimuli provided by the NICU environment. It is evident that developmental outcomes in the NICU need to be optimised and this can occur through further education and training of the multi-disciplinary team (MDT) on the application of NDSC guidelines in these units.

In order to develop and implement such a programme, it is vital to first determine the perceptions of the MDT on the current standards of NDSC before a training programme can be developed and implemented. The aim of this study was to determine the self-reported perceptions of the MDT regarding the current standards of developmental care in two public-sector NICUs in Gauteng.

A quantitative, cross sectional survey design was used to describe the self-reported perceptions of the MDT (qualified specialists, doctors, nurses and all therapists) working in the NICUs. Data was collected by making use of an existing checklist, the Instrument for Neurodevelopmental Supportive Care.

The quantitative data gained from the questionnaire was studied manually, ultimately portraying a great deal of optimal as well as high-risk practices. The prevalence of high-risk practices for both hospitals was found to be evidently higher compared to the optimally applied elements. It included the categories of NICU design, family-centred philosophy, environmental stimulation, pain management, knowledge of preterm infant development as well as feeding. Very few significant differences were identified between the two participating hospitals, thus making it apparent that the participating MDT members perceive that a lot of room for improvement is present regarding the application of NDSC in the NICUs of the two participating hospitals.

Key words:

South Africa, NICU, Neurodevelopmental Supportive Care, developmental care, preterm infant, Multi-disciplinary team

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OPERATIONAL DEFINITIONS

Premature/preterm birth:

Birth that occurs before 37 weeks' gestation (three weeks or more before the infant is due) (1).

Extra-uterine setting:

The setting/environment outside the uterus/womb, presenting stressors such as noise, light and odours to which the premature infant is exposed (2).

Neonatal Intensive Care Unit (NICU):

The intensive care unit is designed specifically for ill and premature new-born infants (3).

Neurodevelopmental Supportive Care (NDSC):

An approach aimed at minimising harmful stimuli from the extra-uterine environment by individualising infant stimulation and care. The approach is based on the observation of behavioural cues and physiological responses of the premature infant (4,5).

Best Practice Guideline (BPG):

BPGs are scientifically developed declarations, founded on the best existing evidence. These declarations are to assist clients and practitioners in making decisions regarding proper healthcare in specific clinical conditions (3,6).

Multi-disciplinary Team (MDT):

MDT is defined as activities and actions involving efforts of individuals from a variety of disciplines. Each individual's efforts are primarily disciplinary-orientated. It is further reported that, although these efforts influence different client- or activity domains usually apportioned to another discipline, the disciplines' focus primarily remains on its own activities (7).

LIST OF ABBREVIATIONS

BPG: Best Practice Guidelines

INDeSC: Instrument of Neurodevelopmental Supportive Care

MDT: Multi-disciplinary Team

NDSC: Neurodevelopmental Supportive Care

NICU: Neonatal Intensive Care Unit

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

In 2010, a total of 11.1% of worldwide live births were born prematurely. This percentage estimates to approximately 14.9 million infants, with these rates still snowballing in most countries around the world. Premature birth results in complications that account for over one million infant deaths each year and it is important to note that preterm birth is one of the major risk factors in more than 50% of infant deaths (8).

In the same year, it was estimated that approximately 9 million babies were born prematurely in Asia and sub-Saharan Africa (8,9). In India and China, deaths related to preterm births averaged at 14·1% (1·078 million) (10).

The extra-uterine setting in the neonatal intensive care unit (NICU) does not encourage normal development and growth, but it in fact counteracts it by increasing the preterm infants' susceptibility to brain injury as unattended crying and lengthy diffuse sleep states, ambient noise, supine positioning, excessive handling, lack of sucking opportunities and poorly timed caregiving and social interactions present in the NICU (3).

Neurodevelopmental Supportive Care (NDSC), a multi-disciplinary team (MDT) approach, has been developed to counteract the NICU stressors. It is an approach based on the observation of an infant's efforts at self-regulation and the indication of behavioural cues (11). When efficiently implemented by the multi-disciplinary team (MDT) consisting of doctors, nurses, occupational-, physio- and speech therapists and dieticians, Neurodevelopmental Supportive Care (NDSC) counteracts the effect of the NICU environment by promoting the creation of a NICU environment that presents as similar as can be to an intra-uterine environment. The NDSC approach encourages the premature new-born to continue its development after birth (3). The NICU MDT thus plays a crucial role in the provision of neurodevelopmental supportive care to infants as well as their families (11).

A study by Lubbe, reported that a poor understanding of the NDSC concept is an obstacle to the implementation of NDSC in public sector NICUs in South Africa. The study identified the absence of NDSC components, such as the NICU designs simulating an intra-uterine environment and self-regulation being intentionally supported (3). Lubbe also indicates that the knowledge on premature infant behaviour and cues are not sufficiently carried over to staff members and that care is illness related, rather than intentionally modified to suit the premature infant's developmental maturity. Further, sibling visitation and parental privacy is not always provided, and no working communication systems are implemented between the caring parties. Other crucial NDSC components like the prioritisation of positional orientation were also identified as absent (3).

This phenomenon supports the necessity for the implementation of an evidence-based approach such as NDSC suitable in a harshly challenged context with little resources like South Africa (3).

1.2 PROBLEM STATEMENT

Current research indicates limited understanding of the NDSC approach, which hinders the implementation of NDSC in the NICU (3). This supports the phenomenon that premature infant mortality and poor neurodevelopmental outcomes are concerns in South African NICUs (3,12).

Literature indicates that skilled and competent health care providers are essential in caring for both the preterm infant and its mother, in order to combat the occurrence of preterm infant related morbidity and deaths (13). There is currently a paucity in the literature on how the MDT view the quality of care provided to preterm infants and their families in NICUs in South Africa. With this in mind, it is recognised that education and training of the multi-disciplinary team members working in South African NICUs, regarding neurodevelopmental supportive care and its application is possibly needed (3).

1.3 THE PURPOSE OF THE RESEARCH

Literature states that the developmental outcomes in the neonatal intensive care unit need to be optimised (5). Further education and training of the MDT regarding the provision of neurodevelopmental supportive care, to preterm infants as well as their families, through a tailor made education-training programme can contribute to the optimisation of these outcomes.

According to Robinson, it is vital to determine the current standards of care before evidence can be implemented (14).

The purpose of this study was thus to determine how the MDT, currently working in NICUs in South Africa, view the application of the standards of developmental care in their NICUs.

1.4 THE RESEARCH QUESTION

What are the self-reported perceptions of the MDT regarding the standards of NDSC in the NICU unit in two academic hospitals in Gauteng?

1.5 THE AIM OF THE RESEARCH

The aim of the study is to determine the self-reported perceptions of the MDT on the standards of NDSC in the NICUs at two academic hospitals in Gauteng. (necessary before the development and implementation of a training programme can commence).

1.6 THE OBJECTIVES OF THE STUDY

Objective 1	To determine the MDT's self-reported perceptions of the standards of NDSC (nine categories) in the NICUs at two academic hospitals in Gauteng based on the Instrument of Neurodevelopmental Supportive Care (INDeSC).
Objective 2	To compare the self-reported perceptions of the standards of NDSC (nine categories) in the NICUs for the two hospitals in Gauteng

1.7 THE SIGNIFICANCE OF THE STUDY

The Paediatric Neonatal Work Group of South Africa suggested in a government document that the development of neurodevelopmental services should receive more attention and that ultimately, the developmental outcomes in the NICUs need to be improved. One way to improve these outcomes can be by optimising the knowledge and training of the MDT on the implementation of NDSC (5). This study could thus be of great significance, as the current standards of care will need to be determined prior to the implementation of a training programme. The results of this study will aid in the development of a MDT NDSC training programme, which will ultimately aim to improve the application of the NDSC approach in the NICUs. The scope of the study includes doctors, nurses, occupational therapists, physiotherapist, speech therapists and dieticians. With specific reference to occupational therapists, the study holds great significance as it sets the groundwork for a training programme that will establish the role of the occupational therapist working in the NICU. This will result in effective caseload distribution, optimising knowledge as well as addressing current limitations that prevent efficient multi-disciplinary team functioning and neurodevelopmental care. The Occupational Therapist forms a vital part of the MDT in providing services to preterm infants and their families.

CHAPTER 2 – LITERATURE REVIEW

2.1 INTRODUCTION

Preterm births encompass 12.4% of the births occurring in South Africa (15). These preterm infants are usually cared for and nurtured to term by specialists in a NICU that is equipped with advanced medical technology (16). Despite this, the prevalence of neurodevelopmental problems and disability among these little survivors remain problematic (16,17) and usually can be contributed to the fact that the NICU environment differs greatly from the intra-uterine environment, in which the preterm infant is still supposed to exist (18).

In this literature review, aspects related to Neurodevelopmental supportive care (NDSC) will be discussed. Firstly, the role of the intra-uterine environment/uterus will be portrayed along with the importance of foetal development (sensory and subsystems). Thereafter, the challenges that are faced by the growing preterm infant in the NICU will be discussed. Following this, NDSC will be defined where after, standards of NDSC care according to the nine BPG categories and current standards of NDSC in South Africa will be debated. Lastly, the current training needs of the multi-disciplinary team (MDT) as well as their perceptions of NDSC in the NICU will be discussed.

2.2 THE ROLE OF THE INTRA-UTERINE ENVIRONMENT

From the moment of conception to the birth of an infant, the uterus along with the placenta (that serves as a connection between the mother and the foetus) aids as an incubator, supporting the unborn infant until it reaches maturity (19) that is crucial for extra-uterine survival (6,20). Seeing as the uterus is designed to stimulate, support and protect the unborn infant, it is the ideal environment for a foetus to develop and grow (20). Apart from serving as an incubator, the uterus offers a gravity-free environment with temperature control and room for movement that aids the development of the vestibular system (21). Furthermore, the uterus provides nutrients as well as protection against infections and harmful sound and light stimuli. It also serves as cushioning to protect the foetus from outside impact (21).

Although the NICU environment, is evidently crucial for survival, it may not be the most fitting environment to promote normal neurological and sensory development (6,22,23) as it appears that infants who start their life in the NICU environment present with higher morbidity and medical care issues (16,24-27). This might be contributed to the fact that preterm birth interrupts the normal development of brain structures and ultimately the sensory system (16).

2.3 THE IMPORTANCE OF FOETAL NEUROLOGICAL DEVELOPMENT

During pregnancy, all the various body systems develop to become mature enough for the infant to cope and thrive outside of the uterus. In order for efficient sensory development to occur, there are subsystems that need to be developed (28).

2.3.1 SUBSYSTEM DEVELOPMENT

From the moment of conception, a process begins where five separate (but interrelated) subsystems are developed and organised (28). These subsystems include:

1. The autonomic system that directs basic physiological functioning; 2. The motor system that yields movement and posture; 3. The state system that controls levels of consciousness ranging from asleep to awake; 4. The attention/interaction system, which manages interaction and attention abilities; 5. The self-regulation system that is responsible for our ability to sustain balance and keep calm and ultimately integrate the functioning of the above-mentioned subsystems. These subsystems are labelled “synactive” as they continuously influence and intertwine with each other (6,18).

Stress reactions are often visible through these subsystems as stress is brought about by environmental stimuli of noise, light or even caregiving actions such as changing a diaper or turning the infant, which might be overwhelming (16).

2.3.1.1 Subsystem stress signs

The first system’s functioning is displayed in the rate and quality of an infant’s breathing, visceral stability and colour fluctuation. Thus, autonomic system stress signals such as breathing disorders, skin discolouration (red, marble,

pale, cyanotic), an unstable heartbeat, gastrointestinal difficulties (regurgitation, reflux, hiccups) and other neurological signs (yawning, tremors, sighing, convulsions) can be observed when the subsystem is out of balance (16,21,29).

The second system projects muscle tone, position and movement sequences and patterns of the extremities, trunk and face. Motor stress signs that can be observed include arching, which is defined as excessive extension of the trunk, the presence of muscle hypotonia, splaying of the extremities, saluting and sitting on air. Tongue extensions may also be present (16,21,29).

The third system presents itself in transitions from sleep state to state, levels of consciousness and an infant's range of available levels of consciousness and the infant's modulating of the various states. Stress is observed as sleep-wake cycles not being differentiated properly in this system (16,21,29).

The fourth system is observable in the infant's facial expressions, look and ability to interact (16,21,29). Stress signs will present themselves as lack of visual focus and concentration and the infant avoiding eye contact and visual stimulation.

The firth system can be seen in the way an infant is able to bring balance and harmonise the systems that are out of balance (25).

Furthermore, the infant tends to spend energy that is needed to maintain homeostasis on these signs in an attempt to overcome such stressful situations, ultimately hindering growth and health progression (16,29).

2.3.2 SENSORY SYSTEM DEVELOPMENT

As part of the neurological system, the sensory systems also develops throughout pregnancy, continuing to mature after birth. The importance of the specific sequence of sensory development becomes apparent after birth as, for example, the maturation of the visual system is delayed in order for the olfactory- and the auditory system to develop. The sensory development sequence (18) starts with the tactile system in the eighth week of pregnancy. This system includes the awareness of touch, temperature and pain and is followed by the development of the vestibular system and the proprioceptive

system. The olfactory system (smell) and the gustatory system (taste) follows next and are crucial for survival, as the infant is dependent on smell and taste to locate its mother's breast to feed (30). The auditory system follows and develops fully at 24 weeks of pregnancy while the visual system is the last to develop at eight months of pregnancy (30).

2.4 THE CHALLENGES FACED BY THE GROWING PRETERM INFANT IN THE NICU

A preterm infant is brought into this world with an undeveloped and not yet matured sensory system. The NICU is a harsh, unsupportive and stressful environment, differing greatly from the intra-uterine environment (21,31,32).

Unlike the uterus, the NICU environment is often equipped with bright lights and medical machines like loud mechanical ventilators. Along with this, the incubator motor and warmer also produce sounds, making it even noisier. Furthermore, routine procedures like heel sticks, suctioning, imaging, IV-line placements and diaper changes are vital to ensure infant health progression, although they are also stressful to the preterm infant (4,33).

In the NICU, pain is perceived along with movement and thermal changes. Vestibular-, auditory-, visual- and olfactory stimuli are also experienced by the not yet fully developed sensory system of the infant (34,35), thus presenting unforeseen challenges to the preterm infant while it is at a delicate period of brain development (16,21,22,36).

Challenges brought about by the NICU environment can ultimately disrupt the developmental maturation of brain structures (16,37), influencing the brain growth areas of synaptogenesis, cell migration, brain organisation and myelination (16). It is during this time that the infant brain is growing more swiftly than any other period in the human lifespan (16). Exposure to NICU stressors is associated with further alterations in brain function and structure (35,38,39). It is evident that stressed infants present with decreased frontal and parietal cerebral width, while the presence of altered functional connectivity and diffusion of the temporal lobes as well as motor behaviour abnormalities can be observed (34,35,40).

Ultimately, the effects of the NICU (41) on a developing premature infant manifest in several ways. Physiological parameters that include decreased oxygen saturation and increased heart rate are the first autonomic markers of stress observable in a premature infant (35,42). Often increased arterial blood pressure, possible intracranial haemorrhage and disturbed sleep (4,19) can also be observed. Furthermore, these challenges cause the preterm infant stress in the form of poor thermoregulation and poor digestive and respiratory functioning (18).

Along with the NICU environment, routine nursery care may also elicit increased energy expenditure that affects the growth of the infant in a negative way (35).

It is evident that the premature infant is thus deprived of a safe and warm environment as it is now mismatched with a very different NICU environment (31). The NICU can thus be seen as a hazardous environment for the rapidly developing preterm infant's brain, which is defenceless against the strenuous environment it is facing (5,16,22,31,37,42-44).

Combatting these challenges, various studies have reported that the application of Neurodevelopmental Supportive Care (NDSC) in the NICU evidently enhanced the short- and long-term outcomes of preterm infants. Furthermore, improvements on medical, development and growth as well as cost level were also noted (45).

2.5 NEURODEVELOPMENTAL SUPPORTIVE CARE (NDSC)

Although preterm infant survival rates have increased over the past couple of decades, the infants are still conflicted with challenges due to the above-mentioned difference between the extra-uterine and intra-uterine environment to which they are exposed (32,42). In order to oppose these challenges, the Neurodevelopmental Supportive Care (NDSC) approach was developed, ultimately improving the preterm infant's short- and long-term neurodevelopmental outcomes (3,16,46).

The synactive theory (38), currently recognised as the basis for neurodevelopmental supportive care, states that preterm infants present with

behavioural disorganisation when they are incapable of coping (both neurodevelopmentally and physiologically) with the NICUs environmental demands (39).

NDSC is thus a comprehensive approach with set principles that attempts to encompass several interventions that aim to facilitate the preterm infant with the ability to modulate sensory experiences in order to cope with the demands its immediate environment set (17,39,42).

NDSC interventions involve modifications to the NICU environment along with multi-modal sensory experiences such as still hold, massage and kangaroo mother care (KMC) that are techniques that assist in the avoidance of overstimulation (42,47,48).

The above-mentioned synactive theory also views preterm infants as active associates that participate in their personal care and continuously interact with their NICU environment (39). The interaction with the NICU environment is further influenced by the preterm infant's interaction with the caregiver (parent/staff member) in a dynamic system (39,49). Neurodevelopmental supportive care should thus be viewed as a framework that not only encompasses the preterm infant's NICU environment but the caregivers (in the way care is provided) as well. With this in mind, collaboration of all the caregivers, including the health care professionals who interact or come in contact with the preterm infants, is needed to promote distribution of knowledge between these entities involved in the care of the preterm infants (3).

NDSC is thus a multi-disciplinary approach that involves the health care professionals working in the NICU as well as the primary caregiver in its application to promote physiological stability, improved behavioural organisation and advancing the abilities of the preterm infant to preserve its energy and prevent agitation with better self-regulation (16,39). For the successful implementation of the NDSC approach and consistency in the care provided, everyone involved with the care of a preterm infant in the NICU should be aware of the preterm infant's changing needs, and should participate actively in the application of the approach (3). It is thus important for the whole team to

implement and adhere to the principles of NDSC to ensure its successful operationalisation.

2.5.1 CURRENT SET STANDARDS OF NEURODEVELOPMENTAL SUPPORTIVE CARE: BEST PRACTICE GUIDELINES

To make NDSC applicable to the South African context, reviewers, researchers and clinical practitioners contributed to the development of guidelines based on the results of an extensive integrative literature review, containing both empirical and theoretical studies' findings (3,5). The integrative literature review included articles defining the essentials of NDSC and concluding them into 25 statements and 18 guidelines, which were later grouped into 9 categories through the method of synthesis (5).

The NDSC categories identified, represent the major sensory modalities that stimulate the preterm infant and include the following: NICU Design, Individualised care, Family-centred care Philosophy, Positioning, Handling techniques, Management of the external environment, Management of pain, Knowledge of preterm infant development as well as Feeding (3,5).

In South Africa, it is evident that the implementation of the NDSC categories do not occur (6). In a study, done on the success of implementation of the guidelines developed by Dr Lubbe in a hospital in the South African setting (Free State) (6), it was reported that even though healthcare professionals knew of NDSC (some even received training on the topic), the implementation of the model of care was not evident (6).

2.5.2 THE NINE CATEGORIES OF NEURODEVELOPMENTAL SUPPORTIVE CARE

2.5.2.1 The neonatal intensive care unit design

Many infants are born into the extra-uterine environment before reaching optimal maturity (50) and therefore require extensive care in the NICU. Despite the fact that this is the best place of care for these premature infants (18), this environment remains challenging as it is so different from the safe and supportive intra-uterine environment that the infant is used to (18).

During a study in 2007, White tried to create guidelines for an extra-uterine environment that is ideal, optimising positive sensory stimuli (2). The same effort was attempted by Lubbe in 2010 in order to develop best practice guidelines (BPGs) regarding the NICU and its environmental design (3). During both studies, Lubbe and White stated that the NICU environment should simulate the intra-uterine environment that is supportive and calming, ultimately promoting optimal development and growth and decreasing stresses to the preterm infant (2,3).

Since the development of NDSC in the 1980s, several NICUs have been required to review their physical design in order to align with this model of intervention (38). When looking at original designs, NICUs had several cots arranged in an open room without fixed walls or dividers between them (51). This design is still often evident in South African NICUs (3).

In the United states of America and Australia, the NICU environment has transformed greatly since the 1970s where it was noisy, bright and congested (39,52). In conjunction with this, the planning and design of the NICU space has evolved from open-bay areas to pods. In some cases, divided bed spaces that are open on the one side or even completely isolated patient rooms have been established for preterm infants and their families (51,53).

In 2007, White proposed single-family rooms that serve as an extension of the intra-uterine environment the preterm infant is used to. This environment, being rich in natural stimuli sources, provide the preterm infant with natural scents of the mother's breast milk, individualised lighting and sleep and sound preservation (2). Furthermore, current NICU designs, as suggested by the 2013 Consensus Committee on Recommended Design Standards for Advanced Neonatal Care, highlight light and noise suppression and promote room for intimate parental contact with the infant (39). The prescribed designs promote patient and parent friendly care with increased floor space. The design also aims to limit stimulation of the infant by reducing sound exposure, noise as well as sleep interruptions. The ultimate aim of the NDSC NICU design is to simulate the intra-uterine environment making it darker and quieter, minimising contact with staff to reduce disturbance of the preterm infant (39,52).

These completely isolated rooms are further stated to be better for preterm infants (53,54) as they promote privacy (55-57), enable parental involvement in care (58) and decrease length of hospitalisation (58).

In contrast to this, Shahheidara and Homer are of meaning that while isolated rooms are increasing in popularity in hospitals over the world, the physical seclusion of the premature infant and its parents from other families and staff members could potentially lead to the absence of social and moral support. Along with this, the study highlights staff working in the isolated room design NICUs reporting feelings of becoming isolated from colleagues. They also experience increased total walking distances as this kind of NICU is generally larger to accommodate isolated or private rooms. Staff also report that it is challenging to monitor and give support to more than one preterm infant with this design, ultimately decreasing the quality of care provided (52).

In the process of developing best practice guidelines for creating the ideal NICU environment, a situational analysis was conducted of the operationalisation of NDSC in public-sector hospitals in South Africa (3). A total of three hospitals were used, with 12 units observed in total. The units consisted of three NICUs, three growing premature infant units, four high care units and two Kangaroo Mother Care units (3). The findings showed that almost none of the units had the facilities or the physical appearance that supports NDSC.

Despite the availability of evidence promoting the ideal NICU environment and research portraying standard guidelines that need to be adhered to (2) (3), it is evident that the environment indicated in South African NICUs differs greatly from the ideal NICU environment encouraged by literature. Dr. Lubbe supports this finding with her statement that South African NICU designs do not simulate or promote an intra-uterine environment (3).

With further investigation, possible reasons for the lack of the implementation of NDSC regarding the NICU environment were identified. Aspects such as insufficient funds, limited space, poor facility maintenance, faulty and/or lack of equipment and shortage of staff are some of the challenges for the implementation of the NDSC NICU design in the South African context (2,59).

2.5.2.2 Individualised care

Individualised care was initially presented in the 1980s by Heidelise Als (38,60). The aim of individualising care is to structure care so that it supports each individual preterm infant's competencies and strengths and to simulate the intra-uterine environment, so that fewer discrepancies occur between the NICU environment and the womb. This is done by looking for the individual preterm infant's present threshold of behavioural organisation (39).

It is of great importance that, in response to the preterm infant's behaviours, cues, state transitions and maturity, care and interventions need to be individualised for each preterm infant by multi-professionals in the NICU (16, 60). Along with this the readiness and availability for intervention should be determined by doing an individualised systematic assessment (3). To promote the sustainability of individualised care, a bedside sign can be used to indicate the infant's dislikes and likes and will serve as a reminder to the parents and staff (3,5,16,17,43).

NDSC also recommends that a 'primary caregiver' be assigned to each individual preterm infant to make sure these individuals needs are met (3). The primary caregiver assigned to the infant can encourage a rewarding and nurturing relationship between the preterm infant and its family as well as the nurse. This elicits nurse satisfaction and motivates parents to participate in care (3).

In the USA, the success of individualised care in the NICU is evident as several studies showed preterm infants that received individualised care had significantly shorter durations of supplemental oxygen and mechanical ventilation, earlier oral feeding, reduction in the incidence of pneumothorax and intraventricular haemorrhage. They also had better daily weight gain, younger discharge ages and shorter hospital stays as well as reduced hospital charges (61,62). Individualised care allowed for the behaviour of the preterm infants to be systematically evaluated and individualised care plans were implemented that were developmentally orientated to promote stability (61,62).

In the South African context, it is noted that knowledge concerning preterm infant behaviours and cues is limited. The multi-disciplinary staff members that participated in a situational analysis of the implementation of NDSC in South African public-sector hospitals felt that they were not efficiently skilled in the observation of these cues and behaviours. The study also indicated that care is not necessarily individualised but done routinely with staff members that seem inflexible regarding care interventions. It was found that in most of the units, no immediate reaction was displayed to stress cues from the preterm infants (3).

2.5.2.3 Family-centred care philosophy

The admission of a preterm infant to a NICU is an overwhelming and scary experience for a parent (63,64). Literature emphasises how difficult, emotional and stressful this time can end up being (65-69). The implementation of family-centred care combats the consequences of a NICU admission as it results in parents being more empowered and supported (3,64,65,70). Supporting the parents of preterm infants in the NICU, leads to better involvement with the preterm infant and its care while admitted to the hospital (3,65). The family-centred care philosophy (FCCP) further promotes the fact that parents should be granted the opportunity to touch and see their baby immediately after birth even before being transferred to the NICU (3) as holding their preterm new-born can result in great comfort to both the infant and the mother (71). The period directly after birth is a very important time for bonding and connection, as a preterm infant is usually in a quiet alert state. This state is ideal for bonding as both the preterm infant and the mother are calm and open to bonding (72). They should also be given the chance to visit, hold and talk to their baby and to participate in basic care activities to assist them during the taxing time in the NICU (65,71,72).

Apart from this, FCCP also motivates engagement in basic care activities. These basic care activities include aspects such as nipple feeding, breastfeeding/expressing breast milk, bathing, decoration of bed spaces and time for skin-to-skin care. When planning times for feeds and caring, family needs should be considered as this reinforces parenting skills (3,65,73).

FCCP further encourages all day visiting policies, sibling visitation, facilities that provide a calming and comfortable atmosphere, parent support groups and privacy (3,65,73).

Literature indicates a gap in the implementation of the FCCP in the South African context (3,74). It is stated that South African hospitals have made very little effort in humanising the hospital stay for infants, children (74,75) and their parents. No privacy is provided for parents, ineffective information sharing occurs, visiting hours are limited and discharge training often only occurs right before discharge (3,76). Research also highlights the fact that the physical needs of children are catered for, while the psychological and emotional needs are often unnoticed (75).

It is recommended that the FCCP be re-evaluated as a practice for South African hospitalised infants, working towards consolidating the role of family in the provision of care (74).

2.5.2.4 Positioning

The in-utero position of the foetus should be used as a guideline for the positioning of the preterm infant in the NICU. The intra-uterine environment promotes a tightly flexed posture, constricting foetal movement (3,16,72).

Positioning is highlighted as an essential part of caring for the preterm infant in the NICU, as shaping and alignment of the musculoskeletal system is promoted by the body positions that the preterm infant experiences in this time (77). The lack of tone and muscle strength in preterm infants result in the infant assuming a position over a prolonged period of time (72). This, along with gravitational effects ultimately leads to abnormal tone and delays in motor development (72) (16).

Inefficient muscle tone further results in the preterm infant struggling to use its extremities in midline (5) as well as presenting with difficulties regarding the sustaining of the necessary symmetrical flexion posture. The infant's inability to maintain the symmetrical flexion posture may lead to the development of contractures of the hip abductors and external rotators (frog-leg posture). This

phenomenon often restricts further neuromotor development that is yet to come (72).

Ideal preterm infant positioning promotes positioning in a flexed posture, while contained with firm boundaries. The neck should be positioned in neutral while the shoulders are protracted. Furthermore, the body should be symmetric with the hands positioned in midline (3). The use of positioning aids, like nests and small stuffed animals, (78) is also promoted to assist the infant in maintaining the tightly flexed position. Furthermore, side-lying or prone positions with suitable support are seen to be more beneficial, and the position of choice compared to supine positioning (3,72).

Literature indicates that positioning, similar to the intra-uterine position, can counteract abnormal posturing as it promotes the development of physiological flexion that helps the preterm infant maintain better posturing, access to the midline as well as improve temperature and oxygenation (5,16,17).

Further benefits of the correct anatomical positioning of the preterm infant include less movement and prolonged sleep states, decreased periods of crying and a less incidences of reflux (79). Literature also indicates that improved abilities to co-ordinate movements are present in preterm infants when the body and head are aligned and flexion is accomplished (80).

In the South African context, no preference to a specific position of the preterm infant in the NICU is evident. (3). Factors influencing the application of tactics to improve the well-being of preterm infants in South African NICUs include shortages of staff and lack of resources (6).

2.5.2.5 Handling techniques

Handling of the preterm infant comprises of a few techniques that include care according to maturation, clustered care, time-out periods, contained touch and tactile stimulation, caregiving to encourage rest, skin-to-skin care (KMC), swaddling, slow and rhythmic movement, supporting self-regulation and co-bedding (3).

In the womb, a foetus receives a great amount of tactile sensory input as it is surrounded by amniotic fluid. The development of the tactile system takes place from the eighth week of gestation to approximately the fourteenth week and is an important system as it narrates temperature regulation, bonding between the preterm infant and its mother and feeding- and self-regulation skills (3,60).

After birth, the preterm infant is deprived of the constant tactile input that is provided by the womb and at the same time exposed to various other touch stimuli resulting from inappropriate handling techniques (mostly from handling during routine procedures) (16,17).

Appropriate handling of the preterm infant is crucial as literature states that infants in the NICU are required to be handled to a minimum, often leading to physical activity deprivation. One of the most important handling components identified is thus positive touch and movement. Positive touch and movement activities, relating to range of motion and passive weight bearing of extremities can serve as techniques to combat physical activity deprivation, ultimately leading to improved gains in weight, bone mineral density and bone width (17). Further positive handling techniques that are highlighted by the NDSC approach include, swaddling, infant massage and KMC, being techniques used to counteract the above-mentioned deprivation and over-stimulation of the preterm infants' underdeveloped sensory system (3).

Swaddling is a technique that involves the infant being wrapped with sheets of blanket or cloth prior to positioning (5). Further positive results arising from swaddling are that the swaddled infant is less susceptive to noxious stimuli, engages in longer periods of sleep and presents with improvements regarding physiological and behavioural states. Swaddling also improves motor organisation and neuromuscular development (17).

Kangaroo mother care constitutes of recurrent extended periods of skin-to-skin contact of the mother with the infant along with exclusive breast feeding. KMC offers kinaesthetic-proprioceptive stimulation (positioning of the infant), infant tactile stimulation (extended periods of skin-to-skin contact), olfactory-gustatory stimulation (mother's scent and breastfeeding), oro-motor stimulation (sucking

the nipple) and auditory stimulation (maternal voice), ultimately promoting better self-regulation and smoother state changes. Further benefits of KMC include improved neurobehavioral organisation and the prevention of hypothermia as preterm infants present with poor thermoregulation. Improved interaction, attachment and bonding (with the mother) that is essential for social and emotional development and ultimately the improvement of neurodevelopmental outcomes with better sleep organisation, improved breast feeding, decreased crying, increased attention/alertness and reduction in probability of neurodevelopmental delay are also among the benefits (5,17,81,82).

Infant massage is also acknowledged as it involves gentle touch and rubbing or stroking of the infant using moderate pressure (83). This type of massage has been reported to improve physiological and behavioural states, improve weight gain and pain alleviation and decrease stress behaviours (17,83). Although there is a lack of compelling evidence, it is stated that the effect of gentle touch ultimately leads to improved developmental scores and shorter hospital stays. The Gentle Human Touch approach (GHT) is one of the techniques used and involves the placement of one hand over the head of the infant and the other on the lower back (extending all the way to the buttocks) for 10-20 minutes (17). Furthermore, literature indicates that a period of light touch results in decreased behavioural distress, an improvement of motor activity, sleep cycles and increased respiratory regularity (17). Another gentle touch technique called Tender In Care (TIC) has also been reported to enhance behavioural reactions, mental development and to improve sucking, cognitive performance and physiological states during the neonatal period (17).

When it comes to the vestibular system, vestibular stimulation is indicated to also be a contributory component as it has a positive effect on visual exploratory behaviour, the arousal level, reflex integration and the motor development of an infant (17). Thus, when moving the infant, NDSC encourages the use of still hands to soothe the infant and ease it into the handling transition while containing the infant's lower extremities. This facilitates autonomic and motoric stabilisation (for example by flexing the infant's legs and enclosing them within a diaper). By avoiding sudden changes

in posture and gently handling the infant, NDSC further promotes vestibular and tactile development (3).

From another angle, appropriate handling has been identified as a factor bringing about better self-regulation. For the preterm infant, self-regulation is largely promoted by and dependent on the caregiver as they fight together to maintain stable in the stimuli-filled NICU environment. Caregivers assist the preterm infant in remaining in the calm and alert condition as most learning occurs during these states (84). To assist in this, NDSC further encourages cluster care as it suggests attempting hands-on care when the infant is more alert, rather than disturbing sleep. The ideal would be to allow 2-3 hour resting periods by coordinating multi-disciplinary interventions and using awake states for stimulation, nursing care and interaction opportunities (3).

Inappropriate handling can be devastating to the preterm infant and may cause behavioural and physiological stress, which can include bradycardia, tachycardia, apnoea, tachypnoea, colour changes, behavioural agitation and increased intracranial pressure, desaturation and visceral responses (5,17).

Furthermore, inappropriate handling compromises self-regulation and ultimately learning opportunities. The effects of negative handling are evident throughout the preterm infant's life. Effective self-regulation (brought about by appropriate handling) is essential for guiding or gaining attention and thus promoting better emotional, cognitive and social functioning that continues beyond the preterm, toddler and kindergarten or preschool period (84). This is further supported by the fact that preterm infants are at higher risk for presenting with attention-deficit/hyperactivity disorder (ADHD) as school-aged children (85,86).

In the South African context, care, stimulation and handling does not necessarily change as a preterm infant matures. Care is provided as it suits the staff and infants. When bedded in the same area. The infants tend to receive the same sensory stimulation, regardless of their maturity. No specific time-out periods are evident, care occurs routinely, no support is provided during infant state changes and no policies seem to exist for the promotion of

rest and sleep in the NICU. Positive tactile stimulation, in the form of KMC or swaddling, is acknowledged but not necessarily applied, while movement of the infant, supported in flexion and co-bedding are also not evident in the South African NICUs (3).

2.5.2.6 The management of the external environment

The extra-uterine environment that a preterm infant is born into is an unsupportive, over-stimulating and stressful environment that differs greatly from the warm, safe and calming environment of a mother's uterus (21,28,31,32).

Sharp or loud sounds can be devastating to the preterm infant as it may result in physiological changes such as tachycardia, apnoea, tachypnoea, sudden increase in arterial blood pressure, oxygen desaturation. It may disturb sleep patterns and even cause intracranial haemorrhage (5).

Along with the cochlea, the human peripheral sensory-end organs are only completely developed by 24 weeks gestation (87), whereas the auditory pathways might only mature at 40 weeks gestation, making it one of the last systems to fully mature. It is evident that this system will still be developing in the premature infant and that auditory stimulations during this time play a big role in the development of auditory perception. Seeing as auditory stimulation inaugurates communication and social attachment during early development, it supports emotional development as well (6).

The NICU exposes the preterm infant to greater noise levels (arising from equipment as well as staff) acting as a massive stressor (52). Behavioural and structural changes could decrease sound levels in the NICU (3).

Behavioural changes include sensitising staff to the noise levels recommended and informing them on the impact it has on the infant. Sensitisation to reduce noise levels involves the encouragement of nurses to use quieter alarms, promptly silencing alarms and for staff to converse a distance from the preterm infants and not right next to the infant's bedside. Structural changes (incubator covers, relocation of the nurses' station, individual rooms etc.) serve as a long-

term approach in noise abatement. It is recommended that the sound be regulated at a maximum of 50 decibels similar to the sound of light traffic or a running refrigerator (17).

Despite the availability of compelling evidence regarding the negative effects of sound and noise on the developing preterm infant, it is reported that the NDSC guidelines regarding limiting noise and sound in the NICU was not adhered to in the South African context (3,59). Sounds and noise mostly arose from ward routines, sonars, x-ray machines, telephones, suctioning and nurses' and visitors' voices. No evidence of sound controlling devices were reported and monitor volumes were not titrated, as staff numbers are low. The prevalence of high patient-nurse ratios seemingly results in the alarm noise levels remaining high. Staff talking loudly heard throughout the NICU was evident as well (3,6). Noises were also reported from closing incubators as well as performance procedures and multi-disciplinary teams' ward rounds (6).

Similar to the auditory system the visual system also develops late. The visual pathway is the last sensory modality to develop and only matures at about 39 to 40 weeks after birth (3). Healthy visual development requires indirect light and colour but only after the age of 2 to 3 months. Bright light might be harmful to the preterm infant's developing retinas (2).

Furthermore, constant light can disturb body rhythm, leading to disturbance in sleep-awake cycles and ultimately sleep deprivation. Bright light decreases attention, as it prevents the eyes from opening. A sudden light increase can lead to oxygen desaturation, which could have damaging effects on the neurodevelopment of an immature visual system. Bright light can further prolong rapid eye movement sleep. This ultimately increases physiological instability, bradycardia and apnoea (5).

The visual care mediations for the preterm infant (until 40 weeks) includes exposure to low level indirect light in order to prevent the eyes from being exposed to direct light as well as facilitation of necessary sleep cycles and diurnal rhythms. It is recommended that procedure lights be equipped with adjustable field size, direction and intensity that could assist in the protection

from direct exposure of light to the infant's eyes (2). Cycled lightings, as a source of visual stimulation, can be used to form diurnal rhythms in preterm infants. Diurnally (daylight) cycled lighting presents the following results in the development of the preterm infant: early transition to bottle/oral feeding, improved weight gain as well as shorter hospital stay (17).

In the South African context, it is evident that fixed florescent lights are situated in panels right above the infant bed spaces. These lights cannot be dimmed although it is reported that the lights are often switched off, except during procedures or when the multi-disciplinary team rounds are underway. In cases where preterm infants were under phototherapy lights, their eyes were covered with eye shields. Incubator covers, used to shield the infant from direct light, are not always present (6).

Furthermore, challenges that hindered the staff in the South African context from complying with best practice guidelines were identified. These challenges included ineffective equipment maintenance, staff shortages and fixed physical structuring, resulting in the infants being sleep deprived and over stimulated (6).

Apart from the overstimulation of the visual and auditory systems in the NICU, this environment is often filled with noxious and unpleasant odours from hospital disinfectants and antibacterial solutions, which could have a negative effect on the preterm infant's taste and smell sensations (17,88).

The olfactory system starts developing at six weeks of pregnancy with the foetus able to smell around 28 weeks of pregnancy (30). The olfactory system proposes the preterm infant with the mother's scent, thus making it one of crucial senses that is needed for survival after birth. This sense reinforces bonding between the mother and her infant and empowers the preterm infant to locate the mother's nipple to feed (6,30).

The system of taste, the gustatory system, develops from eight weeks gestation to mature around twelve weeks gestation. This is also the time during which the development of swallowing and sucking reflexes occur (3,6). Amniotic fluid swallowed by a foetus aids early chemosensory experiences. In the postnatal period, these experiences (along with the sucking reflex) enable nutrition

seeking behaviour as well as tactile necessities of the infants (feeling secured and relaxed with the mother and exploration of the surrounding environment) (3,6).

Preterm infants are often unable to manage sucking, breathing and swallowing, making them dependent on alternative methods for feeding (cup feeding, tube feeding, bottle feeding or dropper or syringe feeding with expressed breast milk). These feeding methods keep the infant from experiencing the normal sensory input that comes from smell and taste resulting in sensory deprivation and possibly oral sensitivity in the future (17).

The presence of strong smells in the South African NICUs are reported and include the use of alcohol-based disinfectant for the staff's hands and surface cleaning products that offer a noxious odour. On the positive side, staff accommodates the infants by using gauze and water instead of wipes during the hygiene routine (3,6). Seeing as no evidence of positive olfactory stimulation (e.g. mother's scent on a piece of her clothing/breast milk with the infant) is present (3,6), it is clear that South African NICUs are not fully adhering to the guidelines for optimal olfactory circumstances in the NICU.

2.5.2.7 Management of pain

Preterm infants undergo a massive amount of invasive procedures, which are routinely repeated in the NICU. These procedures result in pain caused during a development period where it is unexpected (89).

Painful procedures often underwent by preterm infants include nasal aspiration, adhesive removal, tracheal aspiration, gastric tube insertion, heel sticks, arterial- and venepuncture, intravenous cannula, IV-line removal, chest physiotherapy, tracheal extubating, wound treatment, central catheters, venous umbilical catheters, finger sticks, bladder compressing, subcutaneous injections and chest tube drainage, only to name a few (90).

When compared to older infants and children, preterm infants are much more sensitive to pain (91), with hypersensitivity being exacerbated in these infants (92). Reasons for this phenomenon include the amount of nociceptors in the

skin of the preterm infant being the same or even more than in adults; pain fibres not being efficiently myelinated, not hindering pain transmission; the abundant presence of neurotransmitters that transmit pain in the foetus; and the large receptive field of neurons in the somatosensory cortex (91,93).

When looking at normal development of pain, an increase in endorphin and cortisol production when amniotic infusion occurs, is evident at around 23 weeks gestation when the nociceptive/pain pathways begin to develop. Despite this phenomenon, the neurotransmitters responsible for pain modulation only develop at a later stage in postnatal life. This also explains why preterm infants experience an increased sensitivity to pain when compared to adults (3,72). It is therefore also important to note that increased sensitivity to pain is present in preterm infants, because modulatory mechanisms have not yet matured fully, ultimately hindering the infant from managing incoming pain impulses (93).

Numerous studies indicate that recurrent and extended exposure to pain alters an infant's pain processing behaviour as well as long-term development (94,95), ultimately resulting in the damage to the central nervous system. This then often leads to changes in pain perception, thresholds and tolerance of pain perceived in the infant's lifetime (93). Furthermore, recurrent and prolonged exposure to pain can lead to the infant creating a chronic pain response and hypersensitivity to local injury (95).

It is thus essential to treat or prevent pain in preterm infants. A variety of treatments that include pharmacological and nonpharmacological strategies can ease pain caused by procedures in preterm infants (96).

The NDSC approach promotes nonpharmaceutical strategies for pain management. These strategies include kangaroo mother care, swaddling interventions, non-nutritive sucking and rocking/holding as interventions for reducing pain reactivity. These interventions elicit immediate pain-related regulation and promotes positive neurobehavioural states (17,97). Research further highlights the positive outcome of administering oral sucrose and glucose (98-103).

While the mechanism of oral sucrose and glucose is still being investigated, literature indicates that the administering of oral sucrose may stimulate endogenous opioid systems in the body (99) and induce endorphin production (104). Numerous studies have identified glucose and sucrose as sweet-taste-induced comforting analgesia in preterm infants (98-103,105).

Literature indicates that 2 ml of a 25% glucose solution can be administered to an infant prior to a painful procedure (104,106).

The effects of oral sucrose and glucose have been proven to relieve pain and can be observed in various result, including a decrease in heart rate, crying and pain scores (72,99-103).

2.5.2.8 Knowledge of preterm infant development

When working with preterm infants, it is crucial to have knowledge regarding the neurological development. Literature highlighted the importance of professionals having accurate knowledge on preterm infant development as it is essential for reading the behaviours and cues that a preterm infant portrays during procedures and interactions (65). Adequate knowledge on preterm infant development will assist the caregiver, being parent or member of the staff, in identifying whether an infant is portraying attention-seeking behaviour like eye contact or over-stimulated behaviour like little eye contact or splaying of the fingers and crying (3).

Accurate knowledge of infant development is necessary in order to individualise care (61) and adjust handling and care according to maturation (3,61). Dr. Lubbe reports that handling and care in the South African context is currently changed and adapted based on the health and illness of the preterm infant, instead of according to maturation, resulting in physiological stress to the infant (3).

2.5.2.9 Feeding methods

The success of the preterm infant's feeding is promoted by an environment that effectively prepares the preterm infant for feeding (17).

According to NDSC, the noise, light and odours as discussed above need to be regulated and managed to simulate the intra-uterine environment that the preterm infant is used to (16). Furthermore, the infant needs to be prepared for a feed by positioning and wrapping it in a flexed position that simulates the in-utero position, ultimately reducing the necessity for repositioning afterwards (3,16). This position also provides containment and firm boundaries that is comforting and relaxing to a stressed out infant. Carefully tucking the monitor leads under the swaddling should also be prioritised when holding the preterm infant while feeding. This ensures that the preterm infant is not disturbed when placed back in the incubator (16). Ideally, the infant should be positioned at a distance of about 20 cm from the caregiver's face to ensure visual stimulation and containment (16).

Literature further indicates that semi-demand feeds should be promoted. This is where the caregiver needs to be aware of readiness cues, thus actively involving the infant in the feeding process and promoting routine formation (16).

When the environment proposes challenges, the preterm infant might not feed properly (3,16). This then leads to another major concern regarding feeding in the NICU – whether the nutritional intake of the infant meets its nutritional requirements (107). With this in mind, growth restrictions are labelled as a significant problem. Insufficient feeds further result in undernutrition of especially protein during crucial development stages and can ultimately result in organs failing to grow, short-stature and deficits in neuronal growth and dendritic connections. This can contribute negative cognitive and behavioural outcomes later in life (108).

Another element of feeding highlighted in literature is the transition from assisted feeding to normal feeding (17). In cases where infants are unable to manage sucking, breathing or swallowing, they are dependent on alternative methods for feeding (cup feeding, tube feeding, bottle feeding, dropper or syringe feeding with expressed breast milk or gavage feeds). These feeding methods keep the infant from experiencing the normal sensory input that comes from smell and taste resulting in sensory deprivation and possibly oral sensitivity in the future (17). In order to promote better feeding, limit sensory

deprivation and elicit smoother transition to normal feeding, NDSC encourages the provision of non-nutritive sucking (pacifier) during these type of feeds (3,17).

Non-nutritive sucking involves sucking on a physiologically designed nipple (pacifier) or emptied breast. This method aids in improved digestion of the feeds by promoting the secretion of digestive enzymes interceded by oral mucosa or vagal innervations (3).

Furthermore, nutritive sucking/breastfeeding should be the goal and promoted in the form of sucking on the mother's breast, since breast milk is the favoured exclusive form of nutrition for the preterm infant. Literature indicates that breast milk has a positive effect on weight gain, cognitive development and immune status of the infant (5,109-111) and also promotes mother-infant interaction and bonding, maternal confidence as well as active involvement in feeding of both the infant and the mother. Ideally, exclusive breast feeding should continue for a minimum of 6 months after birth (17).

2.6 THE IMPORTANCE OF GOOD STANDARDS OF NEURO-DEVELOPMENTAL SUPPORTIVE CARE

As mentioned above, NDSC is a wide-ranging category of interventions designed to limit stressors in the NICU. The standard of care in the NICU are influenced greatly by the implementation of the components of NDSC. These components include limiting external stimuli (visual, vestibular, tactile, auditory), swaddling and positioning of the preterm infant, clustering medical or nursing interventions and providing containment ultimately simulating the intra-uterine environment (60).

Maintaining a good standard of care in the NICU is important and promoted by the implementation of NDSC. NDSC promotes short- and long-term benefits for not only the infant, but also the parents and staff (17).

2.7 THE MULTI-DISCIPLINARY TEAM AND THE ROLE OF THE OCCUPATIONAL THERAPIST

Teamwork is defined as the method by which members of a team function and organise to produce effective and efficient performance (112).

Team effectiveness is influenced by leadership, communication, decision making and coordination (113,114). Literature emphasises the importance of efficient collaboration, communication and coordination of a multi-disciplinary team due to the complex treatment a preterm infant in the NICU requires (115-117).

The presence of multi-disciplinary teams has progressed and has become more evident in NICUs. This phenomenon is in response to evidence that this approach is proven to improve outcomes of preterm infants and decrease the costs involved in caring for them (118).

NDSC is a MDT approach that requires the alliance of all the health care professionals who interact with the preterm infant in the NICU. The team approach requires the professionals to share knowledge and information regarding the preterm infant. This ensures that all the disciplines involved are familiar with the treatment plan at hand as well as their role in the application of the developmental care plan (3,65,72,119).

The importance of the multi-disciplinary team in applying developmental care is emphasised as literature highlights the correlation between positive short- and long-term patient outcomes and effective teamwork in the intensive care unit (3,60).

Although NDSC is an MDT approach, it is still important that each discipline still has their specific role within the team. The role of OT for instance is essential to the application of the NDSC approach in the NICU as the OT promotes a better match between the physical environment and the infant's capabilities. As discussed above, this match is often a challenge as the hospital setting's primary focus is on the health care and the infant's medical status. The OT's knowledge of activity analysis (social, physical, biologic, sensory and psychosocial) and adaptation (compensatory strategies, modifications and enhancing functional participation) assists her in optimising the connection between the infant's social and physical environment and its capabilities to

ultimately foster optimal development (120). Furthermore, the OT provides other comprehensive services, which include the evaluation and treatment of the preterm infant and parent education on behavioural signs and handling of their infant. The OT also specialises in further family support that aids in the strengthening of the relationship with their infant, the enhancing of the quality of communication and interaction between them. The OT also assists with discharge planning, contributing to stress relief and better quality of life for both the infant and the caregiver involved (120,121).

2.8 THE CURRENT PERCEPTIONS OF STANDARDS OF NEURO-DEVELOPMENTAL SUPPORTIVE CARE IN THE NEONATAL INTENSIVE CARE UNIT BASED ON THE MULTI-DISCIPLINARY TEAM

Perception is defined as “the way in which something is regarded, understood or interpreted.” A study was conducted in South Africa to determine the training needs of the multi-disciplinary team regarding NDSC in the NICU (3). It was reported that not all the staff members that participated in the study were informed regarding the NDSC approach. Interviews with a variety of health care professionals provided inside information on the perception of the use of NDSC in public-sector hospitals in the South African context. The interview consisted of 3 questions, which covered what the participants understood under NDSC, the elements that aided the implementation of NDSC and the barriers to its implementation (3).

The study revealed that the participants had limited knowledge regarding NDSC and that it was the doctors and maybe one other member of the NICU rehabilitation team (a therapist) that were aware of NDSC and responsible for its implementation (3). Other than this study, it was observed that limited research is available on the MDT’s current training needs as well as further perceptions of NDSC in the NICU (3).

2.9 SUMMARY

It is evident that the extra-uterine environment presents harmful to the premature infant and can greatly affect neurodevelopmental outcomes (5,16,43).

The NICU environment's effects on the preterm infant manifests in various ways ranging from physiological parameters to increased energy expenditure, which affects the growth of the infant in a negative way. Furthermore, extended recovery from preterm illnesses occur due to the hostile effects of the NICU environment, resulting in longer hospital stays and an increase in the cost of care (35).

Neurodevelopmental supportive care, being an approach that practices a variety of evidence-based medical and nursing interventions, aims to decrease stress experienced by the preterm infant in the NICU (3).The NDSC approach promotes modifications to the NICU environment along with multi-modal sensory experiences (3,17). Nine categories of NDSC that present as major sensory modalities that over-stimulate the preterm infant have been identified. They include the NICU design, individualised care, family-centred care philosophy, positioning, handling techniques, the management of the external environment, management of pain, feeding methods as well as knowledge of preterm infant development.

The NDSC approach requires the partnership of all the health care professionals who interact with the preterm infant in the NICU and requires the professionals to share knowledge and information regarding the preterm. Current literature indicates that the implementation of this approach is hindered greatly by the MDT's limited knowledge on the implementation of NDSC in the NICU (43,60,122).

Therefore, this study will aim to determine the self-reported perceptions of the MDT on the NDSC standards of care in public-sector NICUs in Gauteng.

CHAPTER 3: METHODOLOGY

In this chapter, the research design, study population, the selection of participants, the research site, inclusion criteria, the research instrument, the research procedure and the ethical considerations will be discussed.

3.1 RESEARCH DESIGN

A quantitative, cross-sectional, descriptive survey design was used during this study.

The quantitative approach allowed the researcher to use post positivist claims to develop knowledge and employ strategies of investigation. A pre-set instrument that produced statistical data was used to collect data (123) on the self-reported perceptions of the multi-disciplinary team regarding NDSC in the NICUs of two Gauteng academic hospitals. The quantitative approach is also an official social science method that is explicitly controlled. This results in more precise data collection and is closer related to physical sciences (124).

The cross-sectional design allowed the study to be carried out at a specific point in time. It aimed at estimating the prevalence of the interested outcome of a specific population, in this case the self-reported perceptions of MDT members in the NICUs at two Gauteng academic hospitals (125).

The study was descriptive of nature because it attempted to investigate and describe present conditions, as reported by the MDT, related to the implementation of NDSC in NICUs at the two participating hospitals. Information was gathered with the use of an electronic questionnaire, which enabled the researcher to gain more information on the characteristics of NDSC applied in the NICUs and examine and describe its implementation at a specific time and place (126).

3.2 THE POPULATION

The population used in this study consisted of the managers and staff (qualified specialists, doctors, nurses, occupational, physio- and speech therapists and

dieticians) working with premature infants in the NICUs of two academic hospitals in Gauteng.

3.3 THE SELECTION OF PARTICIPANTS AND RESEARCH SITES

The participants for this study were selected purposively with non-probability sampling (127), as they were viewed to be characteristic of the population under review and educated regarding the provision of services to the preterm infant in the NICU. Total population sampling allowed the researcher to gain data from participants at the two academic hospitals who were opportunely open and willing to take part in the study (128). The total population was indicated to be 135 staff members from both hospitals.

The total population size ended up being 61 participants (45.19% of the total sample): 28 participants from Hospital 1 and 29 participants from Hospital 2. Four participants did not indicating their place of work and these results were excluded from the study resulting in the sample amount of 57 participants (42.22% of the total population). The participants were chosen based on their availability as well as convenience (126). Although both these hospitals have a functional NICU with standard equipment, the units differ greatly when it comes to size and physical layout. Hospital 1 has a big floor space and is situated with a central nurses' station. Hospital 2's floor space is smaller with the nurses' station fitted centrally to one side, overlooking the whole ward.

3.4 INCLUSION CRITERIA

The inclusion criteria for this study consisted of

- managers and staff working in the field of neonatology at Hospital 1 and Hospital 2;
- managers and staff working in the NICUs of Hospital 1 and Hospital 2;
- MDT members: doctor, nurse, physiotherapist, dietician, speech therapist or occupational therapist.

3.5 THE RESEARCH INSTRUMENT

The collection of data was done by using an existing audit tool, the Instrument of Neurodevelopmental Supportive Care (INDeSC) (Appendix A), currently the only tool available that assess all aspects of the neurodevelopmental supportive care approach. The tool was converted into an electronic questionnaire (Appendix B and C) to aid in the data collection on the perceptions of the multi-disciplinary team regarding NDSC in the NICUs of Hospital 1 and Hospital 2. The questionnaire consisted of two sections with the first part aiming at the collection of demographic information and the second part requesting information regarding the application of NDSC in the NICUs of the two Gauteng Hospitals.

3.5.1 DEMOGRAPHIC QUESTIONNAIRE

The demographic section of the questionnaire (Appendix B) included the place of work (Hospital 1 or 2) and the profession of the participant. It also required the participant to indicate the year they qualified along with the number of years working in current NICU and then the number of years' experience in a NICU and/or with preterm infants. Furthermore, undergraduate training and postgraduate training on NDSC needed to be indicated.

3.5.2 QUESTIONNAIRE FOR NEURODEVELOPMENTAL SUPPORTIVE CARE

For this section of the instrument, an existing audit tool, the Instrument for Neurodevelopmental Supportive Care (INDeSC) audit tool (Appendix A) was used to collect information regarding the implementation of NDSC in the two NICUs. The questionnaire was developed by Dr Lubbe in her study on best practice guidelines for neurodevelopmental supportive care of the preterm infant (3). The questionnaire was adapted into an electronic questionnaire using Research Electronic Data Capture (REDCap), a web-based software program (Appendices B & C) so that it could be completed on an iPad and was handed out face-to-face to counteract the poor response rate often associated with this type of data collection (126).

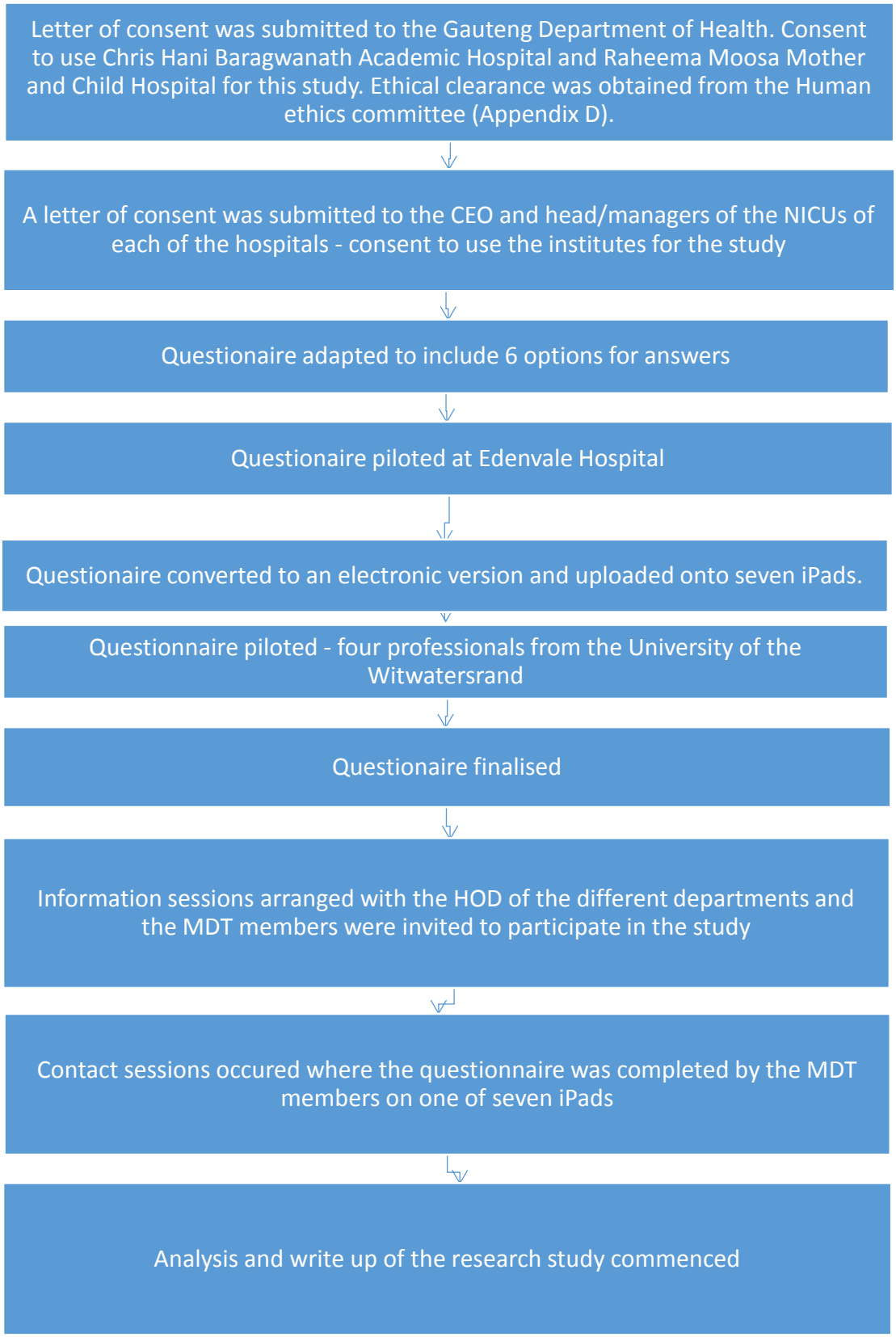
The original audit tool (Appendix A) consisted of a series of items and statements with 4 options for answers. A score of 4 is given if all the criteria for a certain item are met and it is deemed to be highly relevant to the criteria. If most of the requirements are met, but there presents room for improvement, it is quite relevant and a score of 3 is given. A score of 2 is applicable where very little criteria is met, and the statement is somewhat relevant. If no criteria are relevant it is given a score of 1. A comment section is provided if specific scoring is less than 4. This audit tool was adapted to include 6 response categories. The response categories included NEVER, if no criteria are relevant; 25% OF THE TIME; 50% OF THE TIME; 75% OF THE TIME; and ALWAYS if all the criteria for a certain item is met and is deemed to be highly relevant to the criteria. A response, stating NO KNOWLEGDE ON THIS GUIDELINE, is also available in case the participant has no knowledge on the statement provided. Furthermore, a comment section is provided for further elaboration or input regarding the statements but was not analysed as part of this study.

In a previous study, the original audit tool underwent pre- and pilot testing and the validity of the questionnaire was ensured as it was verified for face, construct and content validity by experts, piloted and is in the process of final validation (3,129).

After the researcher converted the audit tool to an electronic questionnaire (Appendix B & C), it underwent pre-testing as it was completed by 4 professionals from the University of Witwatersrand to ensure the clarity, appropriateness, flow, salience and acceptability of the questions as well as the accessibility and user-friendliness of the questionnaire (130). Then, it was piloted at Edenvale Hospital where it was completed by two therapists and a nurse in the NICU.

The questionnaire was cost efficient as the electronic copies could be completed on an iPad. This allowed for data to be collected from the specific population (managers and staff working in the NICU and with preterm infants at Hospital 1 and Hospital 2) at a specific point in time (131).

3.5.3 THE RESEARCH PROCEDURE



Permission was obtained from the Gauteng Department of Health (Appendix F) and final ethical clearance was obtained from the ethical committee at the University of Witwatersrand. Hereafter, a letter of consent was submitted to the CEO and head/managers of each department involved in the NICUs of the two hospitals requesting consent to invite the staff working in the NICUs and in the field of Neonatology to participate in the study (Appendix G).

The existing questionnaire was adapted as mentioned above, piloted at Edenvale Hospital and filled out by a nursing staff member. After this, the questionnaire was converted to an electronic version and uploaded onto seven iPads. It was piloted again as four professionals from the University of Witwatersrand completed an electronic copy to ensure the clarity, appropriateness, flow, salience and acceptability of the questions as well as the accessibility and user-friendliness of the questionnaire. Next, the questionnaire was finalised, and information sessions were arranged with the HODs (head of department) of the different departments and the MDT members were invited to participate in the study.

Contact sessions were arranged with the different MDT departments where an information letter (Appendix H) was handed out describing what the research entails, and the questionnaire was completed by the various MDT members on one of seven iPads. Following the data collection, analysis of the data occurred and write up of the research study commenced.

3.5.4 DATA ANALYSIS

The quantitative data gained from the questionnaire was put into frequency tables to demonstrate the self-reported perceptions of the MDTs on the current standards of care. The results of the INDeSC questionnaire were then clustered into 4 groups:

- High-risk of application (reflecting the combination of option 1 and 2 indicating that the NDSC element was applied less than 50% of the time)
- Fair risk of application (reflecting option 3 indicating that the NDSC element was applied 50% of the time)
- Optimal application (reflecting the combination of option 4 and 5

indicating that the NDSC element was applied more than 75% of the time)

- No knowledge on the topic

The median scores from these options were further used to determine how well the perceived standards of care in the NICUs align with standards indicated by NDSC, thus indicating whether high-risk, fair-risk or optimal practice of NDSC is evident in the NICUs.

The self-reported perceptions of the MDT members on NDSC standards of care of the two hospitals were further compared using the non-parametric Chi-square tool that is designed to analyse group differences when the dependent variable is measured at a nominal level.

3.6 ETHICAL CONSIDERATIONS

To gain permission to conduct the study, the researcher applied to the Human Research Ethics Committee of the University of Witwatersrand (Appendix D). The electronic questionnaire (on iPad) accompanied by an information sheet (Appendix H) containing information regarding the purpose and intent of the research study was handed to the participants. Participants' consent was assumed through the completion of the questionnaire. Participants who did not want to participate in the study could choose not to complete the questionnaire. Confidentiality was ensured throughout the study (by using a participant code for each participant) and all participants remained anonymous (132). The data will be stored on the researcher's computer and the files are password protected. Only the researcher and the supervisor have access to the data.

CHAPTER 4: RESULTS

In this chapter, the results of the study are presented and include the demographic information of the MDT members currently working in the NICUs of Hospital 1 and Hospital 2. Furthermore, the results of the (INDeSC questionnaire are presented under the nine NDSC categories as discussed in the literature review. These results indicate the self-reported perceptions of the MDT on the standard of NDSC in their units. The NDSC questionnaire is lengthy and for ease of reading, only NDSC categories, subcategories and elements with at least 50% consensus on the elements is presented. The total number of participants vary for each question as the total amount is dependent on the number of participants that answered each question. Differences in the perceptions of the standards of care between the two hospitals is also to be presented.

4.1 DEMOGRAPHICS

4.1.1 PLACE OF WORK, PROFESSION AND TRAINING

A total of 61 MDT members took part in this study, 28 MDT members from Hospital 1 and 29 MDT members from Hospital 2. Four participants did not indicate their place of work and these results were excluded from the study.

The two groups, Hospital 1 and Hospital 2, are comparable as there are no significant differences between the groups in terms of their profession (Chi-Square=0.84, df=2, **p=0.66**) or post-graduate training (Chi-Square=1.14, df=2, **p=0.57**) (Table 1). There is however, a significant difference between the two hospitals' undergraduate training, where a greater percentage of the participants from Hospital 1 (79%, n=22) indicated that they did not receive undergraduate training involving NDSC compared to Hospital 2 (41%, n=12) (Chi-Square=8.17; df=2; **p=0.02**).

Table 1: Demographics: Profession and training

Variable		Total no. participants n= 57	Hospital 1 n= 28	Hospital 2 n= 29	p-value
	Doctor	19% n=11	18% n=5	21% n=6	

Profession	Nurse	35% n=20	36% n=10	35% n=10	0.66
	Occupational Therapist	12% n=7	18% n=5	7% n=2	
	Physiotherapist	9% n=5	4% n=1	14% n=4	
	Speech therapist	14% n=8	18% n=5	10% n=3	
	Dietician	11% n=6	7% n=2	14% n=4	
No undergraduate training on NDSC	Yes	60% n=34	79% n=22	41% n=12	0.017*
	No	35% n=20	14% n=4	55% n=16	
No postgraduate training on NDSC	Yes	81% n=46	86% n=24	76% n=22	0.57
	No	19% n=11	14% n=4	24% n=7	

Significance p≤ 0.05*; Significance p≤ 0.01**

4.1.2 YEAR OF QUALIFICATION AND YEARS OF EXPERIENCE

A total of 79% participants (n=45) answered the question regarding years of experience in the NICU/with preterm infants. These participants qualified between the years of 1992 and 2016 (Chi-Square=1.90; df=2; **p=0.39**) with a range of 24 year in their years of experience (Chi-Square=0.25; df=2; **p=1**). The least experienced participants indicated their experience to be only a few months, whereas the most experienced participants reported up to 24 years of experience. It is indicated that 58% (n=26) of the 45 participants have been working in the NICU setting/with preterm infants for a period of 5 years or less, while 80% (n=36) of the 45 participants have been working in the NICU setting/with preterm infants for 10 years or less.

The two groups (Hospital 1 and Hospital 2) are comparable as there is no significant differences between the two groups in terms of the years of experience (Chi-Square=0.25, df=2; **p=1**).

4.2 THE INSTRUMENT FOR NEURODEVELOPMENTAL SUPPORTIVE CARE (INDeSC) QUESTIONNAIRE RESULTS

The results from the INDeSC questionnaire are discussed under the nine categories of NDSC and their 31 individual elements. The combined INDeSC elements consist of a total of 96 individual elements. As mentioned above, only the NDSC categories and elements with elements where there was at least 50% consensus is presented. Furthermore, each element and category will be defined briefly prior to the results presented to facilitate optimal understanding of the results.

The five response categories as described in the methodology were collapsed into four categories to simplify the results and to define the standards of NDSC practice.

- High-risk NDSC practice (responses for never and 25% of the time were combined)
- Fair risk/ fair application of NDSC (responses for 50% of the time remained unchanged)
- Optimal NDSC application (NDSC element was applied more than 75% of the time).
- No knowledge on the topic

No consensus of 50% or more was achieved for the response category of No Knowledge on the Topic; therefore, the results involving this response category is not presented (see Appendix I for full results).

The total number of participants vary for each question as the total amount is dependent on the number of participants that answered each question.

4.2.1 NEONATAL INTENSIVE CARE UNIT DESIGN

This category of NDSC states that the NICU should create a quiet, dim and warm impression. This requires that the lights be dimmed, and individual incubators be shielded or covered. Low ambient noise and minimal activity in general is the ideal, with infant spaces positioned away from traffic (3).

A total of 57 participants from both hospitals, 28 from Hospital 1 and 29 from Hospital 2, answered the question regarding the first impression on entering the NICU.

Of the 57 participants, 60% (n=34) participants from both hospitals and 71% (n=20) participants from Hospital 1, perceived the standard of NDSC practice as high-risk as the implementation of a uterine-like environment (that is conducive to growth and optimum development) is present less than 50% of the time (Figure 4.1).

No consensus of 50% or more was achieved by the participants from Hospital 2, thus the NDSC standard for Hospital 2 regarding the NICU design is not presented.

There is no statistical significant difference between the two hospitals (Chi-Square=3.86; df = 2; **p = 0.15**).

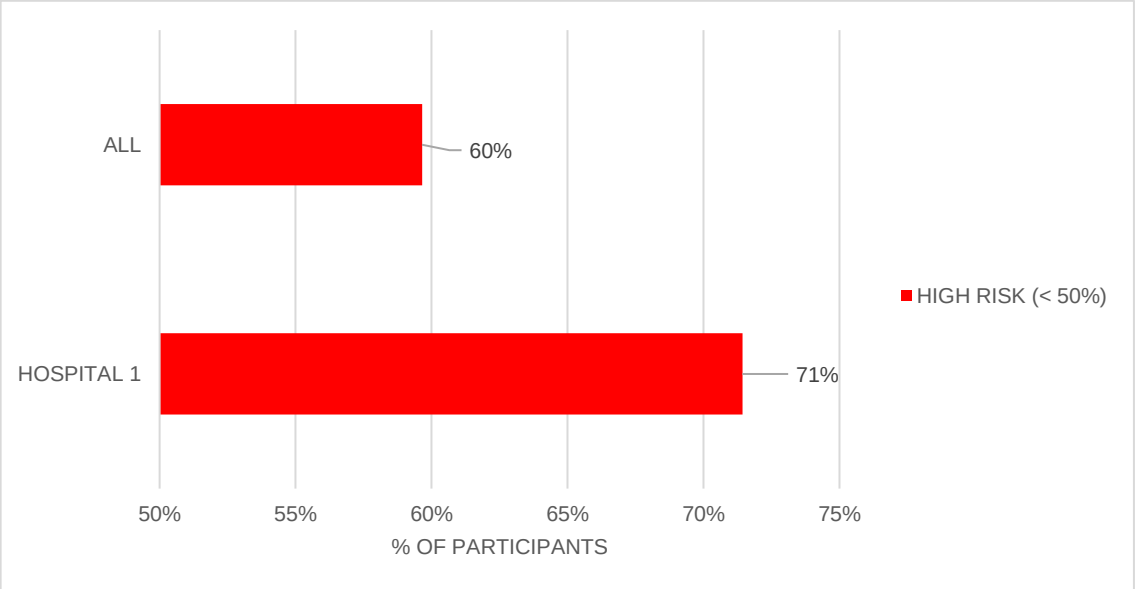


Figure 4.1: Neonatal intensive care unit design

4.2.2 INDIVIDUALISED CARE

This category of NDSC consists of two subcategories: Observation and Care.

4.2.2.1 Observation

Observation requires the observation of the interaction between caregivers and infants.

The subcategory of Observation consists of 4 elements:

- The caregiver reads the infant's cues and behaviours.
- The staff responds to infant cues and behaviours.
- The caregiver continuously and systematically assesses and evaluates infant's needs.
- Care is adapted according to cues and behaviours.

No consensus of 50% or more was achieved for Hospital 2 on any of the elements for the Observation or Care subcategories and results are therefore not presented for Hospital 2.

4.2.2.1.1 The staff responds to infant cues and behaviours

A total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this question regarding the second element of Observation.

Only the participants from Hospital 1 reached a 50% consensus as 50% (n=14) of the 28 participants perceived the standard of NDSC practice as high-risk (staff responds to infant cues and behaviours less than 50% of the time) (Figure 4.2).

There was no statistical significant difference between the two hospitals (Chi-Square=2.23; df=2; **p=0.33**).

4.2.2.1.2 The caregiver continuously and systematically assesses and evaluates infant's needs

A total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered the question regarding the third element of the NDSC category of Observation.

Again, only the participants from Hospital 1 reached a 50% consensus as 50% (n=14) of the 28 participants perceived their unit as a high-risk practice (the caregiver continuously & systematically assesses and evaluates infant's needs less than 50% of the time).

No statistical significant difference was evident between the two hospitals (Chi-Square=0.94; df=2; **p=0.62**).

4.2.2.1.3 Care is adapted according to cues and behaviours

With the last element of the category of Observation, a total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this question.

Only Hospital 1 reached 50% consensus as 61% participants perceived their unit as high-risk practice as care is adapted according to cues and behaviours less than 50% of the time (Figure 4.2).

No statistical significant difference was evident between the two hospitals (Chi-Square=5.57; df=2; **p=0.06**).

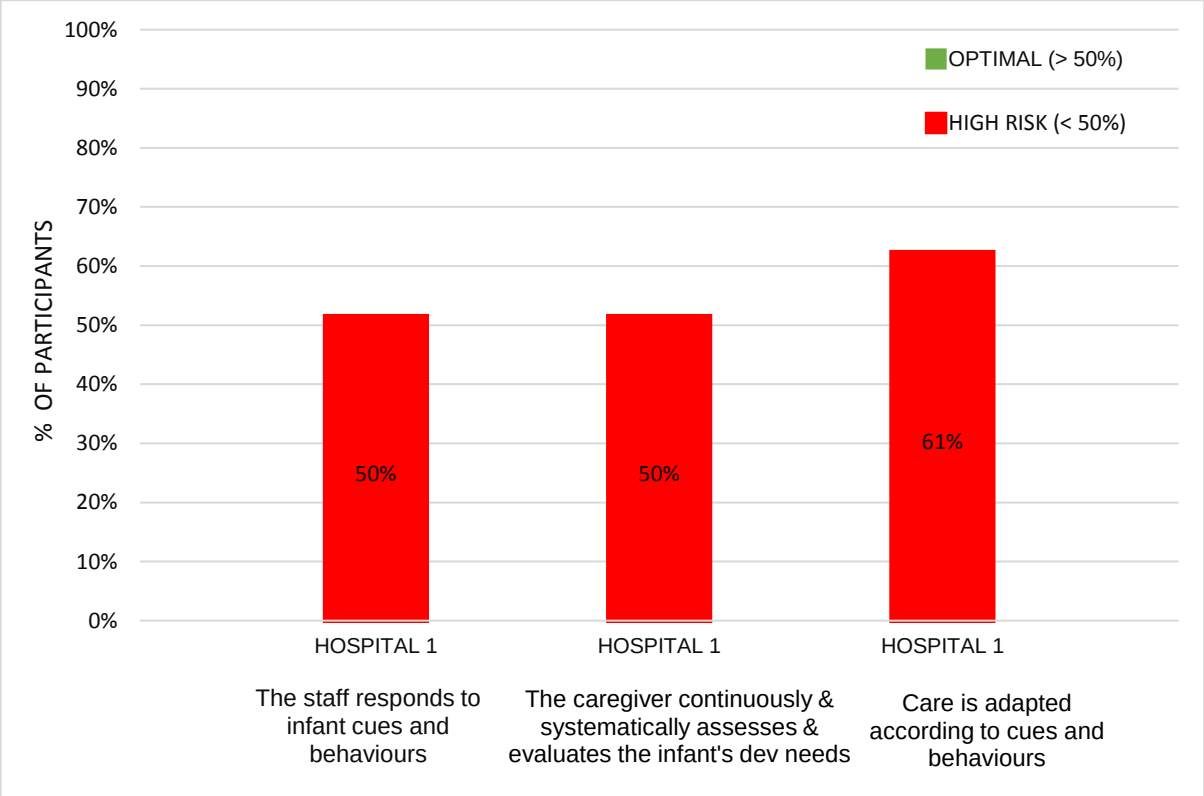


Figure 4.2: Individualised care – Observation

4.2.2.2 Care

The NDSC Care subcategory requires staff to individualise their caregiving interventions, including acting on the infant's cues (3).

The subcategory of the Care consists of two elements:

- Care is provided according to the infant's individual developmental maturity.
- Autonomic, motor, and behavioural cues are identified and used to support individualised caregiving.

4.2.2.2.1 Care is provided according to the infant's individual developmental maturity

A total of 55 participants from both hospitals, 28 from Hospital 1 and 27 from Hospital 2 answered the question regarding the first element of the NDSC category of Care – Care Is Provided According to The Infant's Individual Developmental Maturity.

Of the 28 participants from Hospital 1, 64% (n=18), perceived their unit as high-risk as the care is provided according to the infant's individual developmental maturity less than 50% of the time. In contrast to this, 52% (n=14) of the 27 participants from Hospital 2 stated that optimal application of this element occurs in their unit and that care is provided according to the infant's individual developmental maturity more than 50% of the time (Figure 4.3).

There was however no statistical significant difference between the two hospitals (Chi-Square=4.84; df=2; **p=0.09**).

4.2.2.2.2 Autonomic, motor, and behavioural cues are identified and used to support individualised caregiving

With the second element of the category of Care, Autonomic, Motor And Behavioural Cues Are Identified and Used to Support Individualised Caregiving, a total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this question.

64% (n=18) of the participants from Hospital 1 (n=28) stated that their unit can be perceived as high-risk as autonomic, motor and behavioural cues are identified and used to support individualised caregiving less than 50% of the time (Figure 4.3).

With this element, a clear statistically significant difference is evident between the two hospitals (Chi-Square=6.81; df=2; **p=0.03**) as the findings from Hospital

2 indicate only 32% (n=9) consensus that their NICU is perceived as high-risk practice.

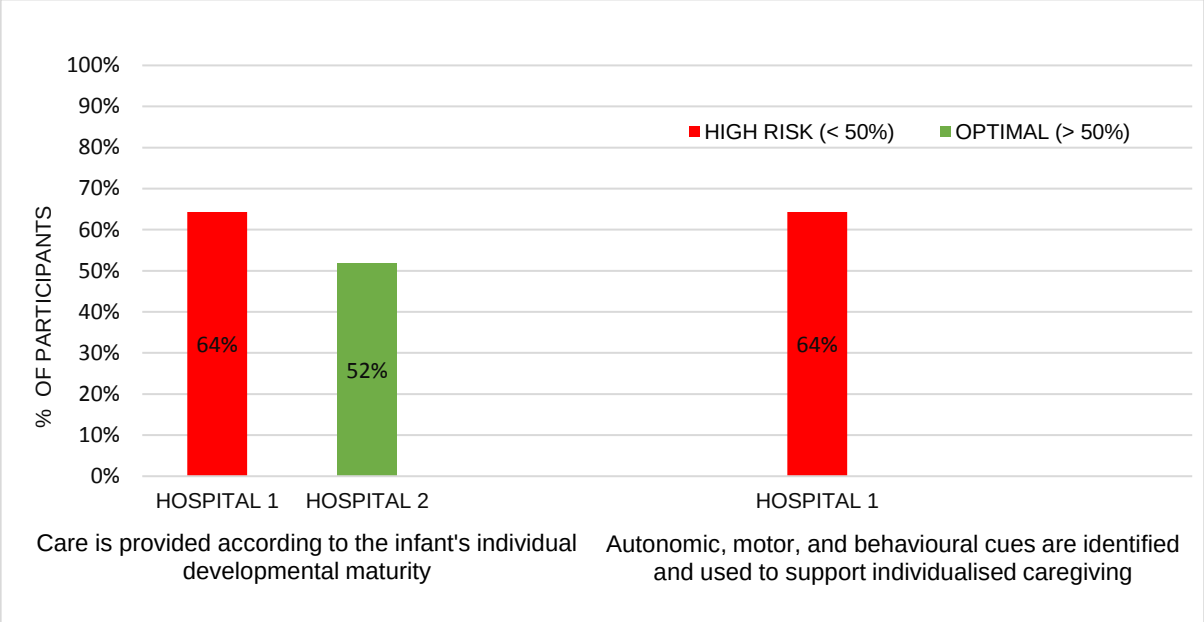


Figure 4.3: Individual care – Care

4.2.3 FAMILY-CENTRED CARE PHILOSOPHY

Family centeredness emphasises the individuality of the infant, reduced maternal stress with increased self-esteem of the parent involvement of parents as active participants as well as privacy and comfort for parents and their infants (3).

This category of NDSC is made up of four subcategories: Parents as Active Participants, Privacy and Comfort, Visitation, Parent Support Groups.

4.2.3.1 Parents as active participants

This subcategory required the participants to comment on parent involvement, parent interaction with their infants and parent visits (3).

This NDSC subcategory further consists of seven elements:

- Parents see their infant immediately after birth.
- Parents touch their infant immediately after birth.
- Parents hold their infant.
- Parents are involved with care, e.g. feeding, bath, Kangaroo Mother Care (KMC).

- Parents may personalise their infant's bed space.
- Mothers are encouraged to express milk for their infant or to breastfeed.
- The commencement of discharge training.

4.2.3.1.1 Parents see their infant immediately after birth

A total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered the question regarding the first element of the NDSC subcategory of Parents as Active Participants – Parents See Their Infant Immediately After Birth (3).

Of the 56 participants, 63% (n=35) participants, stated that optimal application of this component occurs in the units and that parents see their infant immediately after birth more than 50% of the time (Figure 4.4).

No consensus of 50% or more was achieved by the individual participating hospitals on this element and therefore, standards of practice for Hospital 1 and 2 are not presented individually. There was also no statistical significant difference between the two hospitals (Chi-Square = 0.22; df = 2; **p = 0.9**).

4.2.3.1.2 Parents touch their infant immediately after birth

With the second element of the subcategory of Parents as Active Participants – Parents Touch Their Infant Immediately After Birth, a total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 28 participants from Hospital 2, 54% (n=15) participants stated that optimal application of this component occurs in their unit and that parents touch their infant immediately after birth more than 50% of the time (Figure 4.4).

No consensus of 50% or more was achieved for both hospitals as well as Hospital 1 on this element and therefore, standards of practice for both hospitals and Hospital 1 are not presented.

Furthermore, a clear statistically significant difference was noted between the two hospitals (Chi-Square=8.07; df=2; **p=0.02**) as only 29% (n=8) participants

from Hospital 1 agreed that their NICU applies this element optimally (parents touch their infant immediately after birth).

4.2.3.1.3 Parents hold their infant

A total of 55 participants from both hospitals, 28 from Hospital 1 and 27 from Hospital 2 answered this question regarding the third element of the NDSC subcategory of Parents as Active Participants – Parents Hold Their Infant.

52% (n=14) of the 27 participants from Hospital 2 stated that optimal application of this component occurs in the units and that parents hold their infant more than 50% of the time (Figure 4.4).

No consensus of 50% or more was achieved for both hospitals as well as Hospital 1, on this element and therefore, standards of practice for both hospitals and Hospital 1 are not presented.

Again, a clear statistically significant difference was noted between the two hospitals (Chi-Square=8.90; df=2; **p=0.01**) as only 21% (n=6) of the participants from Hospital 1 agreed that their NICU applies this element optimally.

4.2.3.1.4 Parents are involved with care, e.g. feeding, bath, Kangaroo Mother Care

With the fourth element of the subcategory of Parents as Active Participants – Parents Are Involved with Care, e.g. Feeding, Bath, Kangaroo Mother Care (KMC), a total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this question.

From both hospitals, 59% (n=33) of the participants, 54% (n=15) participants from Hospital 1 (n=28) and 64% (n=18) participants from Hospital 2 (n=28), stated that optimal application of this component occurs in the units as parents are involved with care, e.g. feeding, bath, KMC more than 50% of the time (Figure 4.4).

There was no statistical significant difference between the two hospitals (Chi-Square =1.80; df=2; **p=0.41**).

4.2.3.1.5 Parents are allowed to personalise their infant's bed space

A total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this question regarding the fifth element of the NDSC subcategory of Parents as Active Participants – Parents Are Allowed to Personalise Their Infant's Bed Space.

75% (n=42) participants from both hospitals (n=56), 89% (n=25) participants from Hospital 1 and 61% (n=17) participants from Hospital 2 perceived their units as high-risk practices as parents can personalise their infant's bed space less than 50% of the time (Figure 4.4).

There was no statistical significant difference between the two hospitals (Chi-Square=1.80; df=2; **p=0.41**).

4.2.3.1.6 Mothers are encouraged to express milk for their infant

With the sixth element of the subcategory of Parents as Active Participants – Mothers Are Encouraged to Express Milk for Their Infant, Or to Breastfeed, a total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 56 participants, 98% (n=55) from both hospitals, 96% (n=27) participants from Hospital 1 (n=28) and 100% (n=28) of the participants from Hospital 2, stated that optimal application of this component occurs in the units and that mothers are encouraged to express milk for their infant, or to breastfeed more than 50% of the time (Figure 4.4).

There was no statistical significant difference between the two hospitals (Chi-Square =0.00; df=2; **p=1.0**).

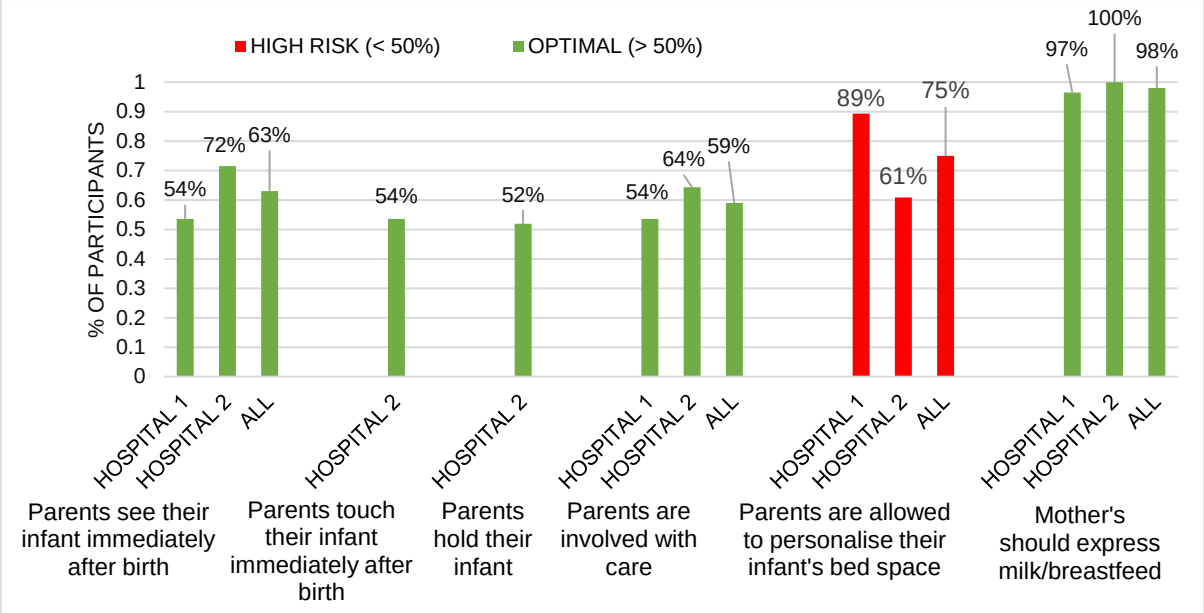


Figure 4.4: Family-centred care philosophy – parents as active participants

4.2.3.2 Privacy and comfort

This subcategory of the Family-centred care philosophy states that the NICU should provide a warm, homelike atmosphere where parents feel welcome; information sharing between professionals and parents should be promoted; and parents' privacy should be respected and catered for. Information supplied to parents should be relevant to their infant's developmental needs. The information should not be generic but tailored to their infant's gestational age, development and clinical condition (3).

Furthermore, this subcategory of FCC consists of 3 elements:

- Nursery atmosphere is warm, comfortable and soothing with a homelike appearance.
- Privacy is provided for parents.
- Information is shared between professionals and parents regarding their infant's developmental needs.

4.2.3.2.1 Nursery atmosphere is warm, comfortable and soothing with a homelike appearance

A total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this question regarding the first element of the NDSC

subcategory of Privacy and Comfort – The Nursery Atmosphere Is Warm, Comfortable and Soothing with A Homelike Appearance.

Of the 56 participants, 55% (n=31) participants from both hospitals and 64% (n=18) participants from Hospital 1 (n=28) stated that optimal application of this element occurs in the units and that the nursery atmosphere is warm, comfortable and soothing with a homelike appearance more than 50% of the time (Figure 4.5).

No consensus of 50% or more was achieved by Hospital 2 on this element and therefore, standard of practice for Hospital 2 is not presented. Furthermore, there was no statistical significant difference between the two hospitals (Chi-Square=2.61; df=2; **p=0.27**).

4.2.3.2.2 Privacy is provided for parents

With the second element of the subcategory of Privacy and Comport – Privacy Is Provided for Parents, a total of 55 participants from both hospitals, 28 from Hospital 1 and 27 from Hospital 2 answered this question.

64% (n=35) participants from both hospitals (n=55) and 79% (n=22) of the participants from Hospital 1 (n=28) perceived that their units as high-risk as privacy is provided for parents less than 50% of the time (Figure 4.5).

No consensus of 50% or more was achieved by Hospital 2 on this element and therefore, standard of practice for Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=6.11; df=2; **p=0.05**) as only 48% (n=13) participants from Hospital 2 agreed that their NICU is at risk, applying this element less than 50% of the time.

4.2.3.2.3 Information is shared between professionals and parents regarding their infant's developmental needs

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the third element of the NDSC

subcategory of Privacy and Comfort – Information Is Shared Between Professionals and Parents Regarding Their Infant's Developmental Needs.

56% (n=31) of the participants from both hospitals (n=55), and 75% (n=21) of the participants from Hospital 2 (n=28) perceived that their units apply this element optimally as information is shared between professionals and parents regarding their infant's developmental needs more than 50% of the time (Figure 4.5).

No consensus of 50% or more was achieved by Hospital 1 on this element and therefore, standard of practice for Hospital 1 is not presented. There was no statistical significant difference between the two hospitals (Chi-Square=1.06; df=2; **p=0.59**).

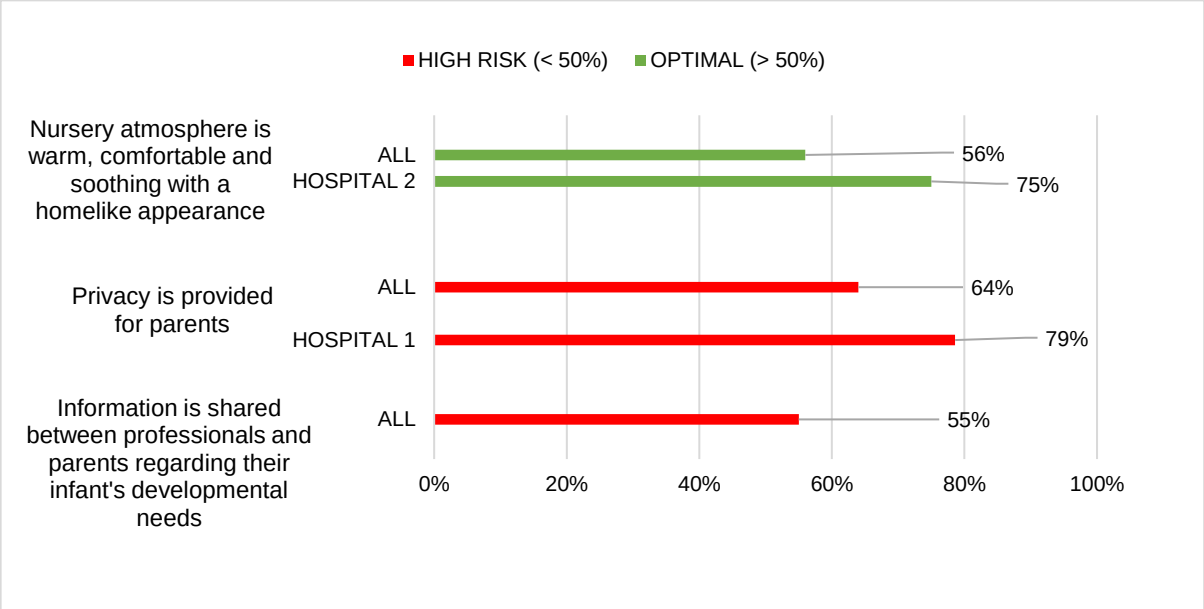


Figure 4.5: Family-centred care philosophy – Privacy and comfort

4.2.3.3 Visitation

This subcategory of Family-centred care philosophy requires that 24-hour visitation for parents and sibling visitation is encouraged. Furthermore, parents should be allowed to visit any time of the day (3).

This NDSC subcategory consists of 2 elements:

- Parents are allowed to visit most of the time.
- Siblings may visit.

4.2.3.3.1 Parents are allowed to visit most of the time

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the first element of the NDSC subcategory of Visitation: Parents Are Allowed Most of The Time to Visit.

Of the 55 participants, 58% (n=32) from both hospitals, and 68% (n=19) of the participants from Hospital 2 (n=28), perceived that their units are high-risk practices as parents are not allowed to visit their infants most of the time. For Hospital 1, 52% (n=14) of the participants indicated fair application/fair risk of this component in their NICU (n=27) (Figure 4.6).

There was no statistical significant difference between the two hospitals (Chi-Square =3.54; df=2; **p=0.17**).

4.2.3.3.2 Siblings may visit

With the second element of the subcategory of Visitation – Siblings May Visit, a total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

82% (n=45) of the participants from both hospitals (n=55), 93% (n=25) participants from Hospital 1 (n=27) and 71% (n=20) participants from Hospital 2 (n=28), stated that their units are high-risk practices as siblings may visit less than 50% of the time (Figure 4.6).

A statistically significant difference was noted between the two hospitals (Chi-Square=8.14; df=2; **p=0.02**). 93% (n=25) of the participants from Hospital 1 in comparison to 72% (n=20) from Hospital 2 indicated that their units are high-risk practices.

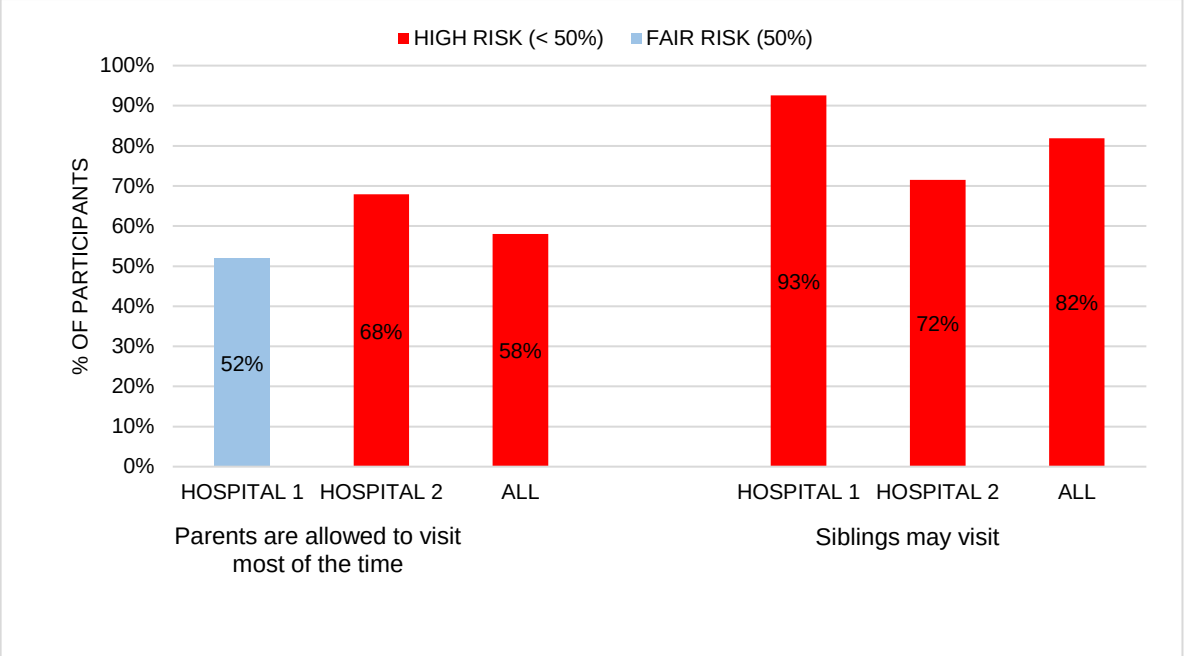


Figure 4.6: Family-centred care philosophy – Visitation

4.2.4 POSITIONING

The category of positioning consists of the following subcategories:

- Containment
- Midline
- Flexion
- Orientation
- Individualised bedding

4.2.4.1 Orientation

This subcategory requires that prone or side-lying positions are used rather than supine, especially in acutely ill infants (3).

A total of 56 participants from both hospitals, 28 from Hospital 1 and 28 from Hospital 2 answered this questions for the subcategory of orientation.

Of the 56 participants, 57% (n=16) of the participants from Hospital 1 (n=28) stated that their units are high-risk practices as prone or side-lying positions are used rather than supine, especially in acutely ill infants less than 50% of the time (Figure 4.7).

No consensus of 50% or more was by both hospitals and Hospital 2 for this subcategory of anatomical positioning, thus the standard of practice for both hospitals and Hospital 2 are not presented.

There was no statistical significant difference between the two hospitals (Chi-Square=4.14; df=2; **p=0.13**).

4.2.4.2 Individualised bedding

This subcategory requires that individualised bedding is used to position infants (3).

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this questions for the subcategory of orientation.

52% (n=14) of the participants from Hospital 1 (n=27) stated that their units are high-risk practices as individualised bedding is used to position infants less than 50% of the time (Figure 4.7).

No consensus of 50% or more was by both hospitals and Hospital 2 for this subcategory of anatomical positioning, thus the standard of practice for both hospitals and Hospital 2 are not presented.

There was no statistical significant difference between the two hospitals (Chi-Square=1.21; df=2; **p=0.55**).

Furthermore, no consensus of 50% or more was achieved for any of the other subcategories of anatomical positioning by any of the hospitals. Therefore, the standard of practice for these subcategories are not presented.

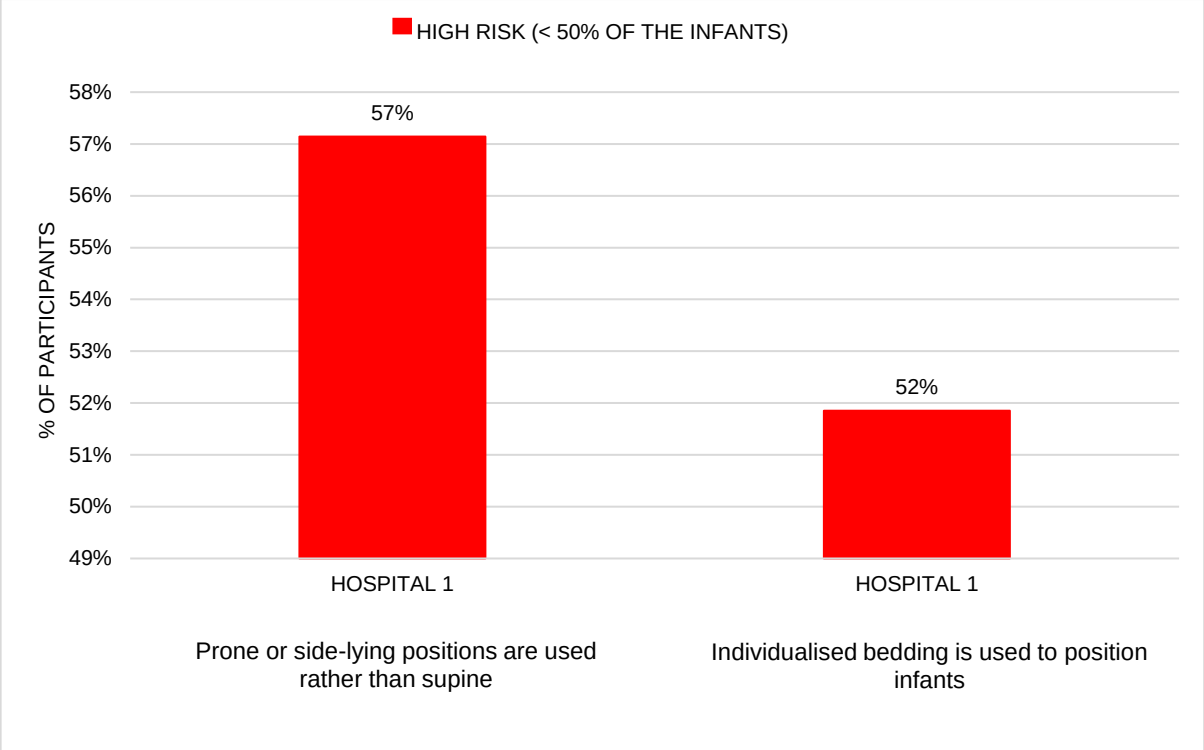


Figure 4.7: Positioning – Containment and individualised bedding

4.2.5 HANDLING

The category of handling consists of seven subcategories that include: Care According to Maturation; State Changes; Promotion of Rest and Sleep; Modified Hands-on Caregiving; Positive Tactile Stimulation; Movement; and Self-regulation (3).

4.2.5.1 Care according to maturation

This subcategory requires caregiving interventions by healthcare providers to be adapted according to the preterm infant's gestational age and maturation (3).

With the subcategory of Care According to Maturation, a total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 27 participants from Hospital 1, 52% (n=14) perceived their unit as high-risk practices as care is adapted according to the infant's maturation less than 50% of the time. In contrast to this, a total of 50% (n=14) of the participants from

Hospital 2 (n=28) stated that optimal application of this subcategory occurs in the units and that care is adapted according to the infant's maturation more than 50% of the time (Figure 4.8).

On this subcategory, no consensus of 50% or more was achieved by the hospitals together, and therefore, standards of practice for both hospitals are not presented.

A statistically significant difference was thus noted between the two hospitals (Chi-Square=6.51; df=2; **p=0.04**).

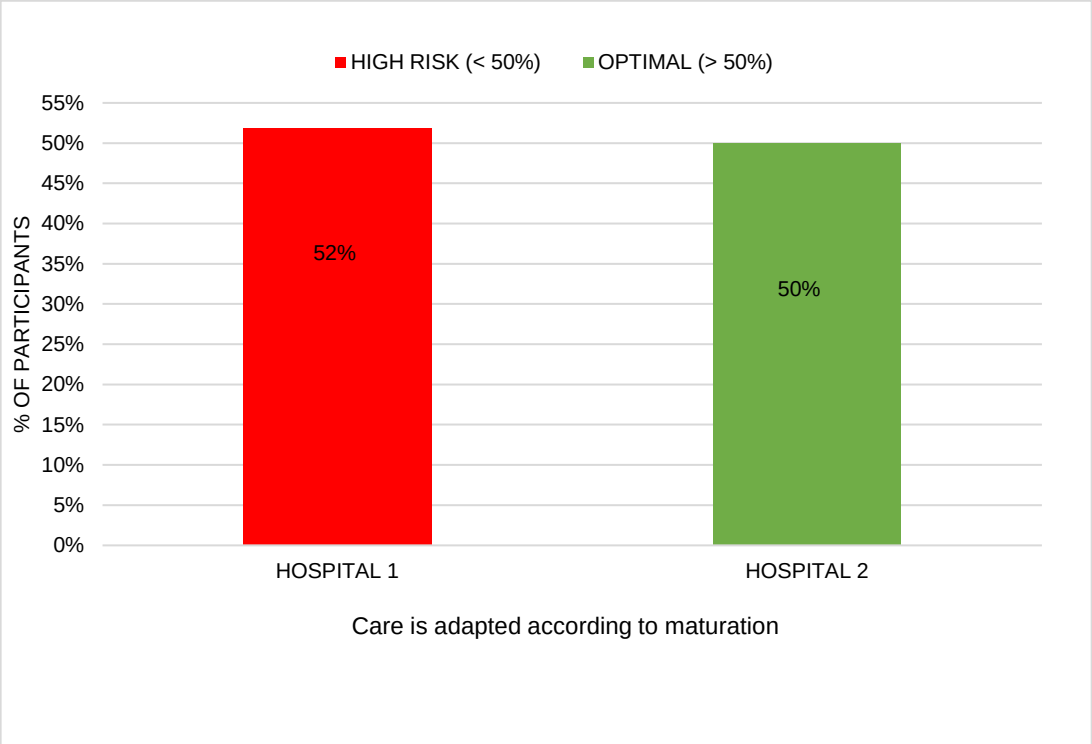


Figure 4.8: Handling – Care according to infant maturation

4.2.5.2 State changes

This subcategory of NDSC involves infants being prepared before procedures. Infants should be aroused gently using mild stimuli initially that gradually increases as the infants respond. Ultimately, the infants should be assisted to reach a calm and regulated state before beginning an intervention (3).

With the subcategory of Handling – State Changes, a total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 55 participants from both hospitals, 55% (n=30) participants along with 74% (n=20) participants from Hospital 1 (n=27) perceived their units as high-risk practices as infants are assisted to reach a calm and regulated state before beginning an intervention less than 50% of the time (Figure 4.9).

4.2.5.3 Promotion of sleep

Infants are required to be asleep between routine care for 2-3 hours at a time. Scheduled quiet times or rest periods should be evident in the units (3).

This NDSC subcategory consists of two elements:

- The infants receive at least 2-3 hours uninterrupted sleep.
- The unit has quiet times where all routine care and interventions are delayed.

4.2.5.3.1 The infants receive at least 2-3 hours uninterrupted sleep

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the first element of the NDSC subcategory of Promotion of Sleep – The Infants Receive At Least 2-3 Hours Uninterrupted Sleep (3).

51% (n=28) of the participants from both hospitals (n=55), and 74% (n=20) participants from Hospital 1 (n=27) perceived their units as high-risk practices as infants receive 2-3 hours uninterrupted sleep less than 50% of the time (Figure 4.9).

No consensus of 50% or more was achieved by Hospital 2 on this subcategory and therefore, this standard of practice for Hospital 2 is not presented.

A clear statistically significant difference was noted between the two hospitals (Chi-Square=12.35; df=2; **p=0.002**) as only 29% (n=8) of participants from Hospital 1 perceived their NICU to be at risk, applying this element less than 50% of the time.

4.2.5.3.2 The unit has quiet times where all routine care and interventions are delayed

With the second element of the subcategory of Promotion of Sleep – The Unit Has Quiet Times Where All Routine Care and Interventions Are Delayed, a total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 55 participants, 60% (n=33) participants from both hospitals and 74% (n=20) participants from Hospital 1 (n=27) perceived their units as high-risk practices as the unit has quiet times less than 50% of the time (Figure 4.9).

No consensus of 50% or more was achieved for Hospital 2 on this subcategory and therefore, standard of practice for Hospital 2 is not presented.

A statistically significant difference was identified between the two hospitals (Chi-Square=6.24; df=2; **p=0.04**) as only 46% (n=13) participants of Hospital 2 perceived their NICU to be at risk, applying this element less than 50% of the time.

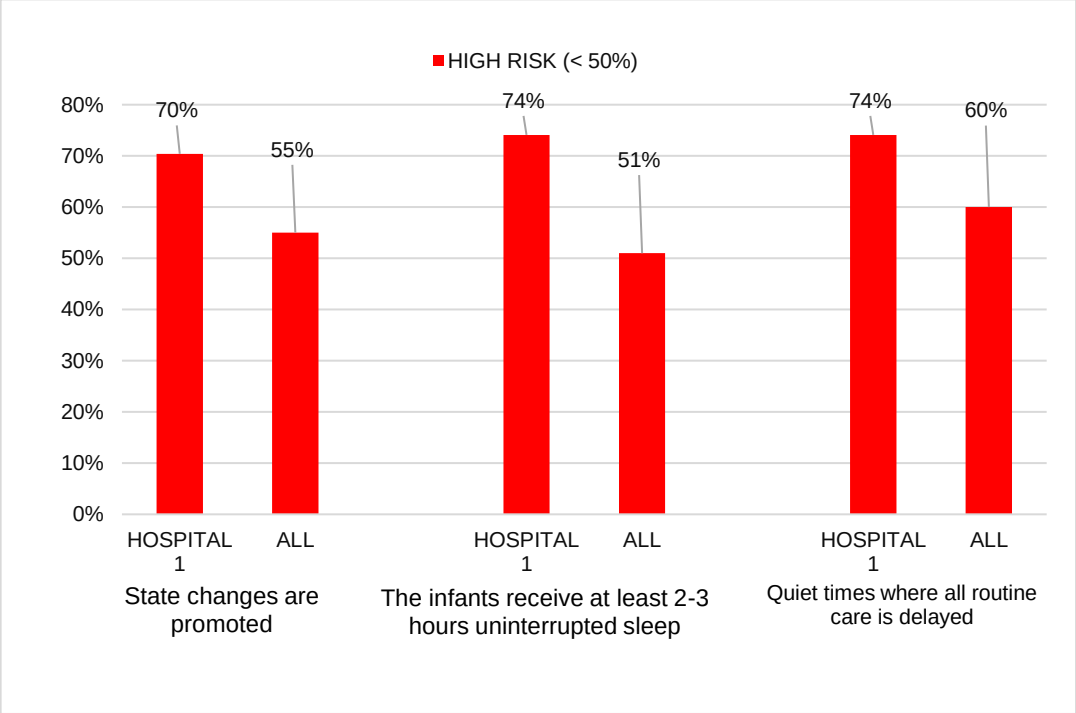


Figure 4.9: Handling – State changes and promotion of rest and sleep

4.2.5.3.3 Modified hands-on care giving

This subcategory of handling promotes the provision of hands-on care as the infant becomes more alert, rather than interrupting sleep. Minimal handling should be evident and routine care delayed. Containment should be provided after intervention to help infants transition to a sleep state, and “time out” periods should be provided to the infant based on correct interpretation of stress cues. Furthermore, opportunities should be provided for sucking on a finger or pacifier, and gentle touch as positive tactile stimulation should be considered to calm the infant (3).

This NDSC subcategory comprises of the following elements:

- Care interventions are clustered around sleep.
- Calm, gentle containment and facilitation is provided during handling procedures to support flexion.
- The infant is provided with "time-out" or rest periods according to his/her cues.
- Direct hands-on caregiving is modified by providing positive tactile stimulation.

4.2.5.3.3.1 Care interventions are clustered around sleep

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

A total of 64% (n=35) participants from both hospitals (n=55), 74% (n=20) of the participants from Hospital 1 (n=27) and 54% (n=15) of the participants from Hospital 2 (n=28), perceived their units as high-risk practices as care interventions were clustered around sleep less than 50% of the time (Figure 4.10).

A clear statistically significant difference was noted between the two hospitals (Chi-Square=10.62; df=2; **p=0.005**) as only 54% (n=15) of participants from Hospital 2 perceived their NICU to be at risk in terms of this element in comparison to 74% (n=20) from Hospital 1.

4.2.5.3.3.2 Calm, gentle containment and facilitation is provided during handling procedures to support flexion

With the second element of the subcategory of Modified Hands-on Care Giving – Calm, Gentle Containment and Facilitation Is Provided during Handling Procedures to Support Flexion, 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 27 participants from Hospital 1, 67% (n=18) participants perceived their units as high-risk practices as calm, gentle containment and facilitation is provided during handling procedures less than 50% of the time (Figure 4.10).

No consensus of 50% or more was achieved by the two hospitals together as well as Hospital 2 on this subcategory and therefore, standards of practice for the two hospitals together as well as Hospital 2 are not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=14.76; df=2; **p=0.001**) as only 29% (n=8) of participants from Hospital 2 perceived their NICU to be at risk.

4.2.5.3.3.3 The infant is provided with "time-out" or rest periods

55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the third element of the NDSC subcategory of Modified Hands-On Care Giving – The Infant Is Provided With "Time-Out" Or Rest Periods According to His/her Cues.

A total of 62% (n=34) participants from both hospitals (n=55) and 85% (n=23) of the participants from Hospital 1 (n=27) perceived their units as high-risk practices as the infant is provided with "time-out" or rest periods according to his/her cues less than 50% of the time (Figure 4.10).

No consensus of 50% or more was achieved by Hospital 2 on this subcategory and therefore, this standard of practice for Hospital 1 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=12.97; df=2; **p=0.002**) as only 39% (n=11) of participants of Hospital 2

perceived their NICU to be at risk, applying this element less than 50% of the time.

4.2.5.3.3.4 Direct hands-on caregiving is modified by providing positive tactile stimulation

With the fourth element of the subcategory of Modified Hands-On Care Giving – Direct Hands-On Caregiving Is Modified by Providing Positive Tactile Stimulation, 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 27 participants, 70% (n=19) participants from Hospital 1, perceived their units as high-risk practices as direct hands-on caregiving is modified by providing positive tactile stimulation, less than 50% of the time (Figure 4.10).

No consensus of 50% or more was achieved by the two hospitals together as well as Hospital 2 on this subcategory and therefore, standard of practice for the two hospitals together as well as Hospital 2 are not presented.

A statistically significant difference was identified between the two hospitals (Chi-Square=18.75; df=2; **p=0.0001**) as only 21% (n=6) of participants from Hospital 2 perceived their NICU to be at risk, applying this element less than 50% of the time.

4.2.5.3.4 Positive tactile stimulation

This subcategory includes the still hold or containment hold that can be described as the cupping of the infant's head or resting a still hand on the body. Positive tactile stimulation further incorporates aspects such as gentle massage, skin-to-skin care and swaddling. (3).

This subcategory includes the following elements:

- Positive tactile stimulation is provided, including stroking or gentle massage if applicable.
- Containment or still hold is provided.
- Parents are allowed to do skin-to skin care with their infants.
- Preterm infants are swaddled.

4.2.5.3.4.1 Positive tactile stimulation is provided

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the first element of the NDSC subcategory of Positive Tactile Stimulation – Positive Tactile Stimulation is Provided, Including Stroking or Gentle Massage if Applicable.

A total of 63% (n=17) participants from Hospital 1 (n=27) perceive that their units as high-risk practices as positive tactile stimulation is provided less than 50% of the time (Figure 4.10).

No consensus of 50% or more was achieved for the two hospitals together as well as Hospital 2 on this subcategory and therefore, standards of practice for the two hospitals together as well as Hospital 2 are not presented. No statistically significant difference was noted between the two hospitals (Chi-Square=5.10; df=2; **p=0.08**).

4.2.5.3.4.2 Containment and still hold

With the second element of the subcategory of Positive Tactile Stimulation – Containment or Still Hold is Provided, a total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 27 participants from Hospital 1, 56% (n=15) perceived their units as high-risk practices as containment or still hold is provided less than 50% of the time (Figure 4.10).

No consensus of 50% or more was achieved for the two hospitals together as well as Hospital 2 on this element and therefore, standards of practice for the two hospitals together as well as Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=6.37; df=2; **p=0.04**) as only 36% (n=10) of participants of Hospital 2 perceived their NICU to be at risk, applying this element less than 50% of the time.

4.2.5.3.4.3 Parents are allowed to do skin-to-skin

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the third element of the NDSC subcategory of Positive Tactile Stimulation – Parents Are Allowed to Do Skin-To Skin Care with Their Infants.

A total of 56% (n=31) of the participants from both hospitals (n=55) and 74% (n=20) of the participants from Hospital 1 (n=27) perceived their units as high-risk practices as parents are not always allowed to do skin-to skin care with their infants (Figure 4.10).

No consensus of 50% or more was achieved for Hospital 2 on this subcategory and therefore, this standard of practice for Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=7.56; df=2; **p=0.02**) as only 39% (n=11) of participants of Hospital 2 perceived their NICU to be at risk, applying this element less than 50% of the time.

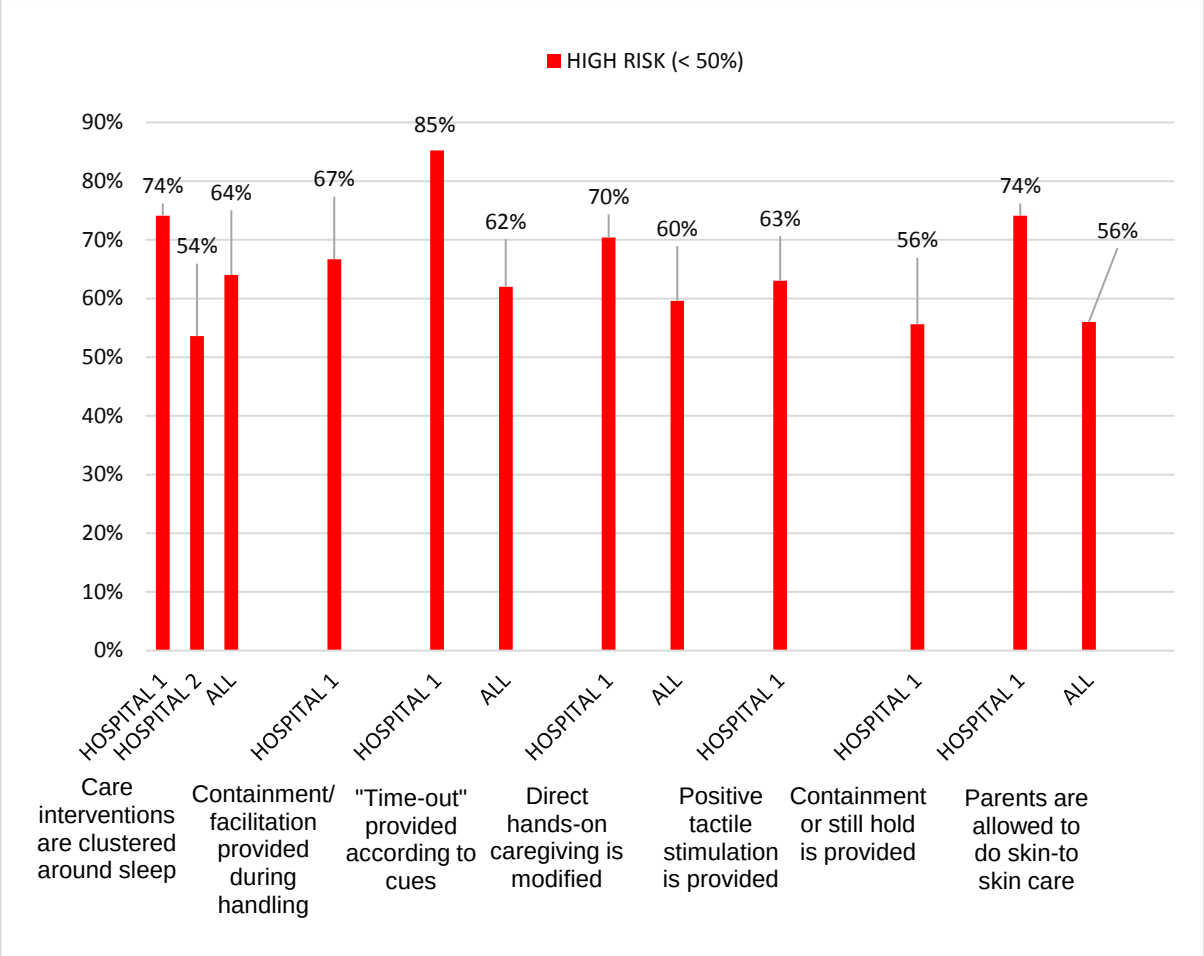


Figure 4.10: Handling – Modified hands-of care giving and positive tactile stimulation

4.2.5.3.5 Movement

This subcategory of handling focuses on movement of the infants. It is recommended that no abrupt stimulation or quick turning should take place and infants should be moved slowly. This subcategory further includes appropriate bedding that does not over-stimulate the vestibular system as well as co-bedding of multiple infants as they direct motor activities at their siblings (3).

This NDSC subcategory consists of the following elements:

- Preterm infants are moved slowly and as a whole, keeping the body and head aligned and limbs tucked in.
- Appropriate soft bedding is used.
- Multiples are co-bedded.

4.2.5.3.5.1 Preterm infants are moved slowly and as a whole, keeping the body and head aligned and limbs tucked in

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the first element of the NDSC subcategory of Movement – Preterm Infants Are Moved Slowly and As a Whole, Keeping the Body and Head Aligned and Limbs Tucked In (3).

A total of 56% (n=15) of the participants from Hospital 1 (n=27), perceived their units as high-risk practices as preterm infants are not always moved slowly and as a whole (Figure 4.11).

No consensus of 50% or more was achieved for both hospitals together as well as Hospital 2 on this element and therefore, standards of practice for these are not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=6.22; df=2; **p=0.04**) as only mere 32% (n=9) of participants of Hospital 2 perceived their NICU to be at risk, applying this element less than 50% of the time.

4.2.5.3.5.2 Appropriate soft bedding is used

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding this element.

Of the 55 participants, 56% (n=31) participants from both hospitals, 57% (n=15) participants from Hospital 1 (n=27) and 56% (n=16) participants from Hospital 2 (n=28) perceived that the units apply this element optimally (Figure 4.11).

No statistically significant difference was noted between the two hospitals (Chi-Square=3.05; df=2; **p=0.22**).

4.2.5.3.5.3 Multiples are co-bedded

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding this element.

A total of 84% (n=46) of the participants from both hospitals (n=55), 93% (n=25) of the participants from Hospital 1 (n=27) and 75% (n=21) participants from Hospital 2 (n=28), perceived their units as high-risk practices (Figure 4.11).

No statistically significant difference was noted between the two hospitals (Chi-Square=2.90; df= 2; **p=0.23**).

4.2.5.3.6 Self-regulation

This NDSC subcategory focuses on self-regulation by providing support to the infant before, during and after routine cares. The infant should be provided with opportunities for grasping (fingers or bedding). Furthermore, state regulation should be promoted by gentle touch, decreasing stimulation and providing non-nutritive sucking with an appropriate pacifier (3).

This NDSC subcategory comprises of the following elements:

- Self-regulation of infants is promoted.
- Infants are provided with opportunities for grasping.
- State regulation is promoted.
- Non-nutritive sucking is provided to support self-regulation.

4.2.5.3.6.1 Self-regulation of infants is promoted

A total of 54 participants from both hospitals, 26 from Hospital 1 and 28 from Hospital 2 answered this question regarding the first element of the NDSC subcategory of Self-Regulation – Self-regulation of Infants Is Promoted.

A total of 50% (n=27) participants from both hospitals (n=54) and 69% (n=18) of the participants from Hospital 1 (n=26), perceived their units as high-risk practices as self-regulation of infants is promoted less than 50% of the time (Figure 4.11).

No consensus of 50% or more was achieved for Hospital 2 on this subcategory and therefore, standard of practice for Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square =8.40; df =2; **p=0.02**) as only 36% (n=10) of participants from Hospital

2 perceived their NICU to be at risk, applying this element less than 50% of the time.

4.2.5.3.6.2 Infants are provided with opportunities for grasping

With the second element of the subcategory of Self-Regulation – Infants Are Provided with Opportunities for Grasping, a total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

A total of 56% (n=31) participants from both hospitals (n=55) and 78% (n=21) of the participants from Hospital 1(n=27) perceived their units as high-risk practices as infants are provided with opportunities for grasping less than 50% of the time (Figure 4.11).

No consensus of 50% or more was achieved by Hospital 2 on this element and therefore, the standard of practice for Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=10.69; df=2; **p=0.005**) as only 36% (n=10) of participants from Hospital 2 perceived their NICU to be at risk, applying this element less than 50% of the time.

4.2.5.3.6.3 State regulation is promoted

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the third element of the NDSC subcategory of Self-Regulation – State regulation is promoted.

A total of 51% (n=28) participants from both hospitals (n=55) and 70% (n=19) of the participants from Hospital 1 (n=27), perceived their units as high-risk practices as state regulation is promoted less than 50% of the time (Figure 4.11).

No consensus of 50% or more was achieved by Hospital 2 on this element and therefore, the standard of practice for Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=8.99; df=2; **p=0.011**) as only 32% (n=9) of participants from Hospital 2

perceived their NICU to be at high-risk, applying this element less than 50% of the time.

4.2.5.3.6.4 Non-nutritive sucking is provided to support self-regulation

With the fourth element of the subcategory of Self-Regulation – Non-nutritive Sucking Is Provided to Support Self-regulation, a total of 54 participants from both hospitals, 27 from Hospital 1 and 27 from Hospital 2 answered this question.

Of the 54 participants, 74% (n=40) participants from both hospitals, 78% (n=21) of the participants from Hospital 1 (n=27) and 70% (n=19) of the participants from Hospital 2 (n=27) perceived their units as high-risk practices as non-nutritive sucking is not provided to support self-regulation No statistically significant difference was noted between the two hospitals (Chi-Square=0.74; df=2; **p=0.69**).

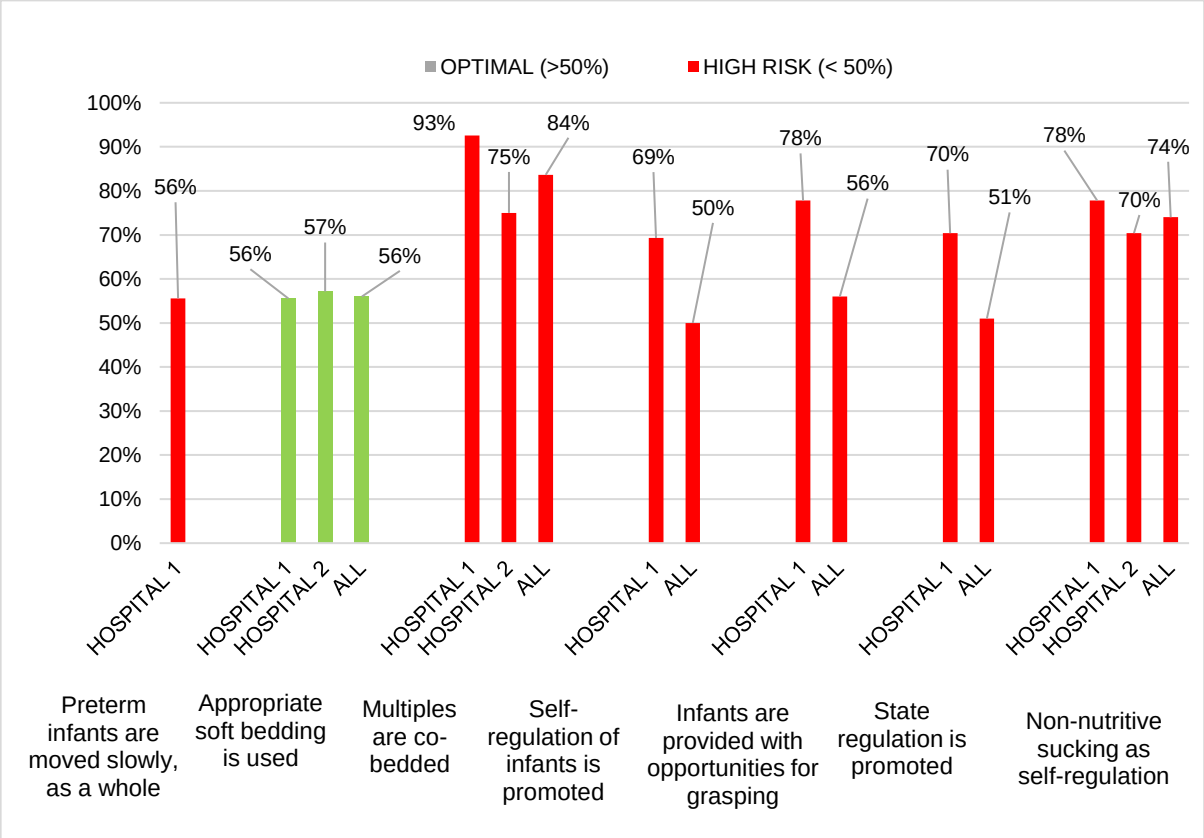


Figure 4.11: Handling – Movement and self-regulation

4.2.6 ENVIRONMENTAL MANIPULATION

This category of NDSC includes the management auditory visual and olfactory stimulation.

4.2.6.1 Reduction of noise

4.2.6.1.1 Reduction of noise in the ambient environment

NDSC guidelines state that noise levels should not exceed 45dB, with a maximum transient sound not exceeding 70dB. Staff generated noise should further be kept to a minimum (3).

This NDSC subcategory states that the infant's space should not be noisy, and that sound reduction equipment should be used and consists of the following elements:

- No radio or stereo equipment / telephone away from infants.
- Doors and drawers are padded to reduce noise.
- Bottoms of trash cans are padded/lids with peddle bins padded.
- Sound levels are measured and kept below 45dB (e.g. refrigerator humming).
- Soft music is used where appropriate.
- Infant beds are placed away from traffic in the unit.
- There is effective sound absorption in infant spaces e.g. curtains, wall hangings or padding.
- Monitor alarms are kept at a safe minimum volume or set to vibrate/flashing.
- Staff responds to alarms quickly.

4.2.6.1.1.1 No radio/stereo equipment and telephones away from infants

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC category of Ambient Environment Reduction of Noise – No radio/stereo equipment / telephone away from the infant.

63% (n=17) of the participants from Hospital 1 perceive that the units can be declared as high-risk practices as this noise reduction strategy is used less than 50% of the time (Figure 4.12).

No consensus of 50% or more was achieved by the two hospitals together as well as Hospital 2 on this subcategory and therefore standards of practice for these are not presented. No statistically significant difference was noted between the two hospitals (Chi-Square=3.12; df=2; **p=0.21**).

4.2.6.1.1.2 Padded doors and drawers to reduce noise

A total of 69% (n=37) participants from both hospitals (n=54), 74% (n=20) of the participants from Hospital 1 (n=27) and 63% (n=17) participants from Hospital 2 (n=27) perceive that the units can be declared as high-risk practices as this noise reduction strategy is used less than 50% of the time. No statistically significant difference was noted between the two hospitals (Chi-Square = 2.59; df = 2; **p = 0.27**).

4.2.6.1.1.3 Padded trashcan bottoms and lids

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC category of Ambient Environment Reduction of Noise – Bottoms and lids of trashcans are padded.

56% (n=31) of participants from both hospitals and 67% (n=18) of the participants from Hospital 1, perceive that the units can be declared as high-risk practices as this noise reduction strategy is used less than 50% of the time (Figure 4.12).

No consensus of 50% or more was achieved for Hospital 2 on this subcategory and therefore the standard of practice for Hospital 2 is not presented.

No statistically significant difference was noted between the two hospitals (Chi-Square = 2.69; df = 2; **p = 0.26**).

4.2.6.1.1.4 Measurement of sound levels

A total of 72% (n=39) participants from both hospitals (n=54), 89% (n=24) of the participants from Hospital 1 (n=27) and 56% (n=15) participants from Hospital 2 (n=27) perceive that the units can be declared as high-risk practices as this noise reduction strategy is used less than 50% of the time (Figure 4.12).

A statistically significant difference was noted between the two hospitals (Chi-Square=9.40; df=2; **p=0.01**) as 56% (n=15) of participants from Hospital 2 perceived their NICU to be at risk in comparison to 89% (n=24) of participants from Hospital 1.

4.2.6.1.1.5 Using soft music

Of the 52 participants 77% (n=40) from both hospitals, 63% (n=17) of the participants from Hospital 1 (n=27) and 92% (n=23) participants from Hospital 2 (n=25) perceive that the units can be declared as high-risk practices as this noise reduction strategy is used less than 50% of the time (Figure 4.12).

No statistically significant difference was noted between the two hospitals (Chi-Square=0.73; df=2; **p=0.69**).

4.2.6.1.1.6 Infant beds placed away from traffic

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC category of Ambient Environment Reduction of Noise – Infant beds Are Placed Away from Traffic.

51% (n= 28) of participants from both hospitals and 63% (n=17) of participants from Hospital 1 perceive that the units can be declared as high-risk practices as this noise reduction strategy is used less than 50% of the time (Figure 4.12).

No consensus of 50% or more was achieved for Hospital 2 on this subcategory and therefore this standard of practice for Hospital 2 is not presented. No statistically significant difference was noted between the two hospitals (Chi-Square=4.03; df=2; **p=0.13**).

4.2.6.1.1.7 Effective sound absorption in infant bed spaces

A total of 80% (n=44) participants from both hospitals (n=55), 89% (n=24) of the participants from Hospital 1 (n=27) and 71% (n=20) participants from Hospital 2 (n=28), perceive that the units can be declared as high-risk practices as this noise reduction strategy is used less than 50% of the time (Figure 4.12).

A statistically significant difference was noted between the two hospitals (Chi-Square=7.44; df=2; **p=0.02**) as the findings from Hospital 2 contrasts the findings from Hospital 1 as a mere 71% (n=20) of participants perceive their NICU to be at high-risk, applying this element less than 50% of the time.

4.2.6.1.1.8 Noise from monitor alarms

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC category of Ambient Environment Reduction of Noise – Monitor Alarms Are Kept at a Safe Minimum.

46% (n=31) of participants from both hospitals and 67% (n=18) of participants from Hospital 1 perceive that the units can be declared as high-risk practices as this noise reduction strategy is used less than 50% of the time (Figure 4.12).

No consensus of 50% or more was achieved for Hospital 2 on this subcategory and therefore, this standard of practice for Hospital 2 is not presented. No statistically significant difference was noted between the two hospitals (Chi-Square=3.21; df=2; **p=0.20**).

4.2.6.1.1.9 Staff respond to alarms quickly

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC category of Ambient Environment Reduction of Noise – Staff respond to alarms quickly.

Of the 28 participants of Hospital 2, 50% (n=14) indicated optimal application of this noise reduction strategy (Figure 4.12).

No consensus of 50% or more was achieved by both hospitals together as well as Hospital 1 on this subcategory and therefore, these standards of practice are not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=6.20; df=2; **p=0.045**) as only 26% (n=7) of participants from Hospital 1 perceived their NICU to optimally apply this noise reduction strategy.

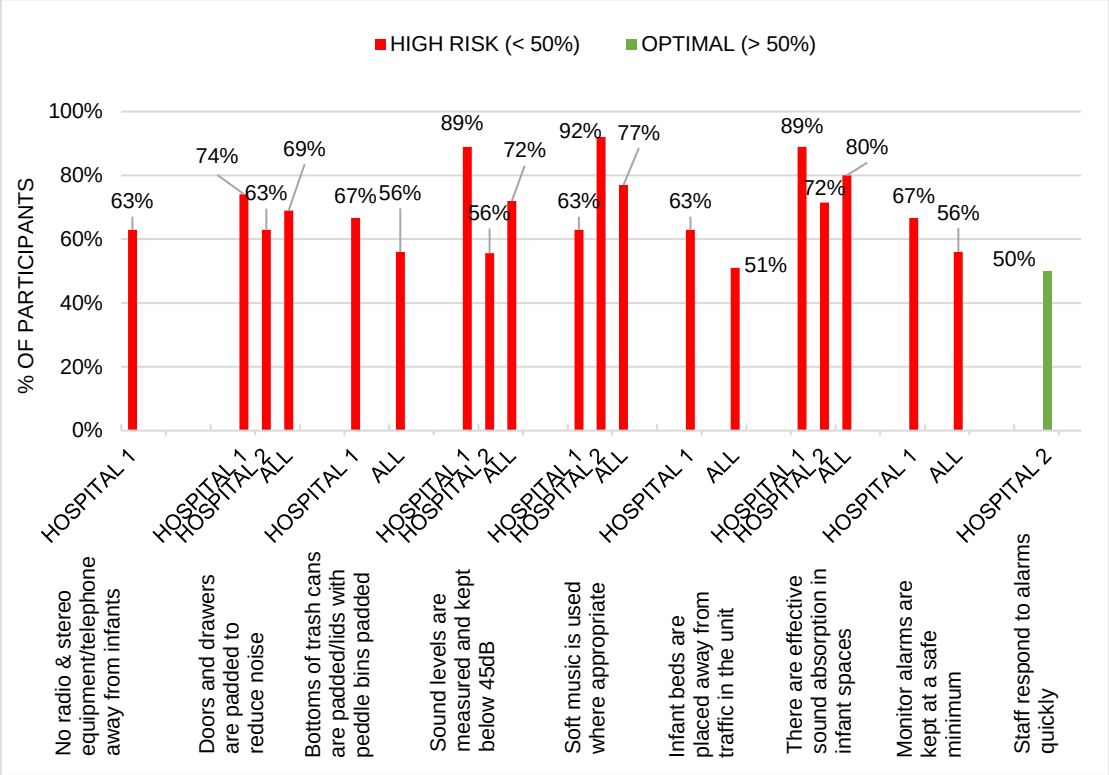


Figure 4.12: Reduction of noise from the ambient environment

4.2.6.1.2 Reduction of noise in the immediate environment

This subcategory of the category of environmental manipulation consists of the following elements:

- Noise reduction incubator covers
- Soft ear plugs or covers
- Incubator portholes closed quietly
- Sound levels are measured inside incubator
- Minimal background noise
- Charts and stock items are placed next to incubator
- Staff keep their voices down

4.2.6.1.2.1 Noise reduction incubator covers are used

A total of 63% (n=34) participants from both hospitals (n=54), 70% (n=19) of the participants from Hospital 1 (n=27) and 56% (n=15) of the participants from Hospital 2 (n=27) perceived their units as high-risk practices as noise reduction incubators are used less than 50% of the time (Figure 4.13). No statistically significant difference was noted between the two hospitals (Chi-Square=4.46; df=2; **p=0.11**).

4.2.6.1.2.2 Soft ear plugs or covers

Of the 54 participants, 91% (n=49) participants from both hospitals, 100% (n=27) participants from Hospital 1 and 81% (n=22) participants from Hospital 2 (n=27) perceived that the units can be declared as high-risk practices as soft earplugs/covers are used less than 50% of the time (Figure 4.13). No statistically significant difference was noted between the two hospitals (Chi-Square = 5.70; df = 2; **p=0.06**).

4.2.6.1.2.3 Closing of incubator portholes

55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC subcategory of Reduction of Noise – Incubator portholes are closed quietly.

A total of 56% (n=15) participants from Hospital 1, perceived that the units can be declared as high-risk practices as incubator portholes are closed quietly less than 50% of the time (Figure 4.13).

No consensus of 50% or more was achieved for the two hospitals together as well as Hospital 2 on this subcategory and therefore, standards of practice for these are not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=7.52; df=2; **p=0.02**) as only 14% (n=4) of participants from Hospital 2 contrasts the findings from Hospital 1 as a mere perceive their NICU to be at risk in terms of this guideline.

4.2.6.1.2.4 Measuring of sound levels inside incubators

Of the 55 participants, 76% (n=42) participants from both hospitals, 89% (n=24) of the participants from Hospital 1 (n=27) and 64% (n=18) of the participants from Hospital 2 (n=28) perceive that the units can be declared as high-risk practices as sound levels are measured less than 50% of the time. No statistically significant difference was noted between the two hospitals (Chi-Square=3.54; df=2; **p=0.17**).

4.2.6.1.2.5 Minimal background noise

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC subcategory of Reduction of Noise – Minimal Background Noise.

A total of 51% (n=28) participants from both hospitals (n=55) and 67% (n=18) of the participants from Hospital 1 (n=27), perceive that the units can be declared as high-risk practices as minimal background noise is promoted less than 50% of the time (Figure 4.13).

No consensus of 50% or more was achieved by Hospital 2 on this subcategory and therefore, standard of practice for Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square=6.22; df=2; **p=0.04**) as only 36% (n=10) of participants from Hospital 2 perceived their NICU to be at risk, applying this guideline less than 50% of the time.

4.2.6.1.2.6 Charts and stock items are placed next to incubators

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC category of Reduction of Noise – Charts and stock items are placed next to the incubators and not on top.

55% (n=30) of participants from both hospitals and 63% (n=17) of participants from Hospital 1 (n=27) perceived their units as high-risk practices as charts and stock items are not always placed next to the incubators (Figure 4.13).

No consensus of 50% or more was achieved by Hospital 2 on this subcategory and therefore standard of practice for Hospital 2 is not presented. No statistically significant difference was noted between the two hospitals (Chi-Square=2.34; df=2; **p=0.31**).

4.2.6.1.2.7 Staff keep their voices down

A total of 62% (n=34) participants from both hospitals (n=55), 70% (n=19) of the participants from Hospital 1 (n=27) and 54% (n=15) of the participants from Hospital 2 (n=28), perceive that the units can be declared as high-risk practices as staff keeping their voices down is promoted less than 50% of the time. No statistically significant difference was noted between the two hospitals (Chi-Square=2.27; df=2; **p=0.32**).

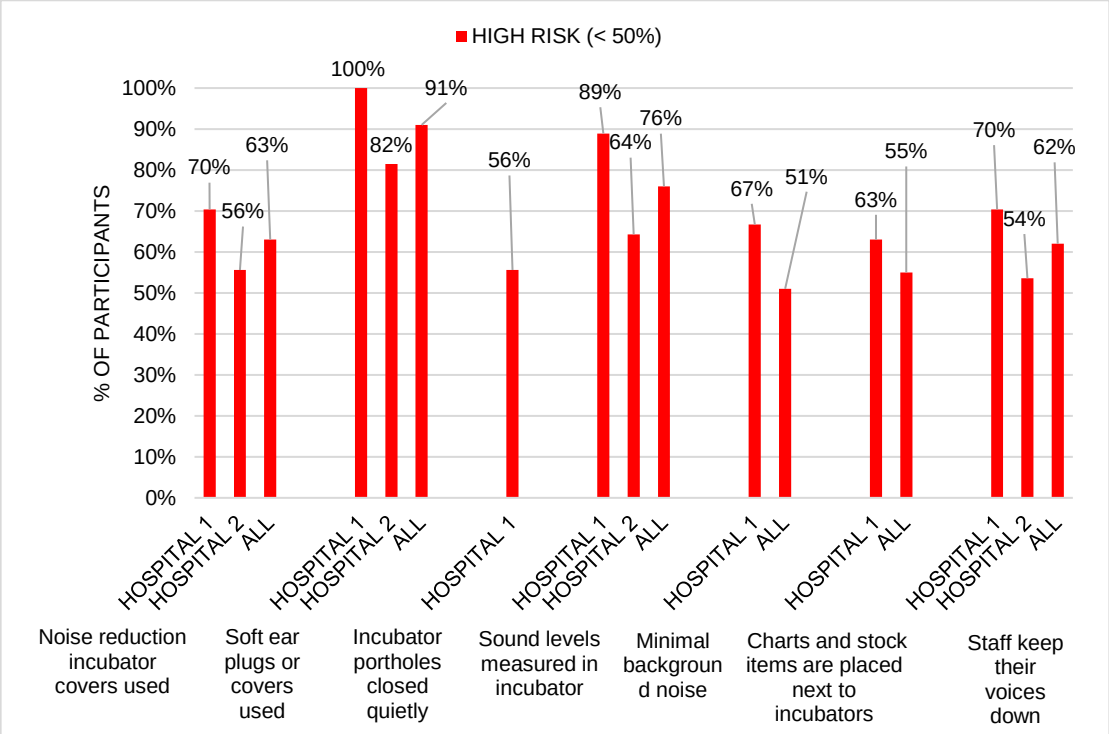


Figure 4.13: Reduction of noise in the immediate environment and staff-generated noise

4.2.6.2 Reduction of light

This subcategory of Environmental Manipulation relates to the reduction of ambient light, reduction of light in the immediate infant bed space as well as the management of cycled light in the NICU (3).

4.2.6.2.1 Reduction of ambient light

4.2.6.2.1.1 Ambient light is reduced/dimmed

A total of 67% (n=37) participants from both hospitals (n=55), 81% (n=22) of participants from Hospital 1 (n=27) and 54% (n=15) of participants from Hospital 2 (n=28) feel that the units can be declared as high-risk practices as the dimming and reduction of ambient light is promoted less than 50% of the time (Figure 4.14).

A statistically significant difference was noted between the two hospitals (Chi-Square = 12.35; df = 2; **p=0.002**) as only 54% (n=15) of participants from Hospital 2 highlighted their unit as at-risk in comparison to 81% (n=22) of participants from Hospital 1.

4.2.6.2.1.2 Blinds are closed during daylight

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

A total of 69% (n=38) participants from both hospitals, 85% (n=23) of the participants from Hospital 1 and 54% (n=15) of the participants from Hospital 2 perceive that the units can be declared as high-risk practices as the closing of blinds during daylight is promoted less than 50% of the time (Figure 4.14).

A statistically significant difference was noted between the two hospitals (Chi-Square = 6.60; df = 2; **p=0.04**) as the findings from Hospital 1 contrasts the findings from Hospital 2 as a mere 54% (n=15) of participants perceive their NICU to be at high-risk, not applying this light reduction strategy.

4.2.6.2.1.3 Activity levels are kept as low as possible

A total of 54 participants from both hospitals, 27 from Hospital 1 and 27 from Hospital 2 answered this question.

A total of 54% (n=29) participants from both hospitals, 74% (n=20) of the participants from Hospital 1 perceive that the units can be declared as high-risk practices as activity levels are kept as low as possible less than 50% of the time (Figure 4.14).

No consensus of 50% or more was achieved by Hospital 2 on this subcategory and therefore, standard of practice for Hospital 2 not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square = 9.89; df = 2; **p=0.01**) as the findings from Hospital 1 contrasts the findings from Hospital 2 as a mere 33% (n=9) of participants perceive their NICU to be at high-risk, not applying this light reduction strategy.

4.2.6.2.2 Cycled light

This subcategory of Reduction of light requires the provision of cycled lights from 32 weeks or when the infant begins to differentiate sleep and wake cycles. Quiet times should be scheduled for at least 2 hours in the day, and a 12-hour sleep period at night with low voices and limited activities (3).

4.2.6.2.2.1 The units provide cycled light

A total of 54 participants from both hospitals, 26 from Hospital 1 and 28 from Hospital 2 answered this question regarding the element of the NDSC category of Cycled light – The unit provides cycled light.

A total of 59% (n=32) participants from both hospitals, 69% (n=18) of the participants from Hospital 1 and 50% (n=14) of the participants from Hospital 2, feel that the units can be declared as high-risk practices as the units providing cycled light is promoted less than 50% of the time (Figure 4.14).

No statistically significant difference was noted between the two hospitals (Chi-Square = 3.61; df = 2; **p=0.16**).

4.2.6.2.2.2 Day/night cycles are provided with 12 hours low light and sound at night

A total of 53 participants from both hospitals, 25 from Hospital 1 and 28 from Hospital 2 answered this question.

A total of 60% (n=15) of the participants from Hospital 1 perceive that the units can be declared as high-risk practices as State regulation is promoted less than 50% of the time (Figure 4.14).

No consensus of 50% or more was achieved by the two hospitals together as well as Hospital 2 on this subcategory and therefore, standard of practice for them are not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square = 7.87; df = 2; **p=0.02**) as the findings from Hospital 1 contrasts the findings from Hospital 2 as a mere 29% (n=8) of participants perceive their NICU to be at high-risk, not applying this light reduction strategy.

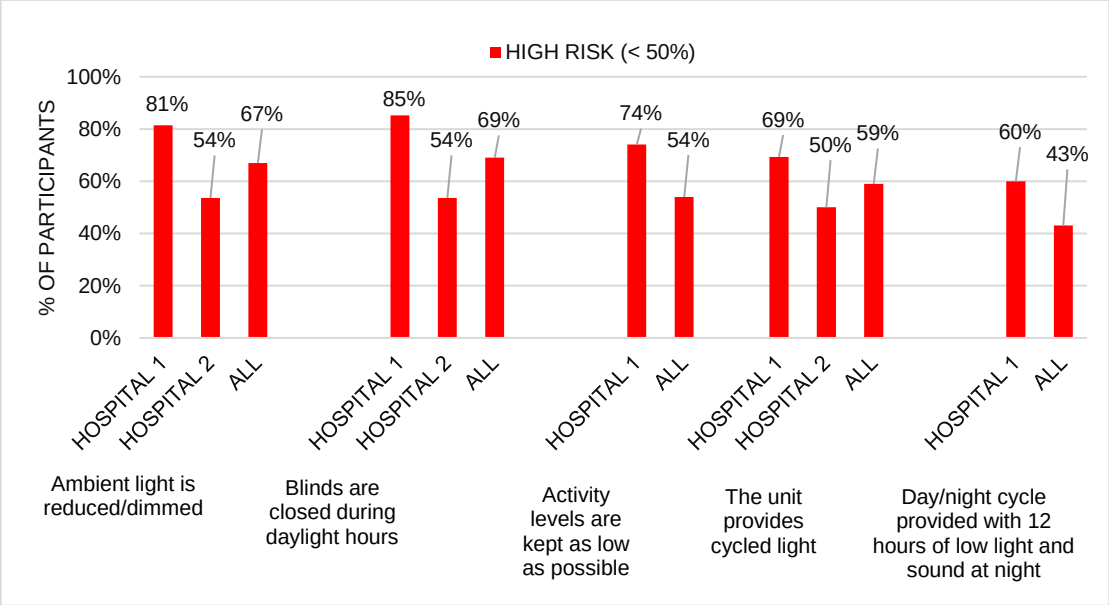


Figure 4.14: Ambient light reduction and cycled light

4.2.6.2.3 Light reduction strategies

4.2.6.2.3.1 Use of incubator covers

A total of 80% (n=44) participants from both hospitals (n=55), 89% (n=24) of the participants from Hospital 1 (n=27) and 71% (n=20) of the participants from Hospital 2 (n=28) observe that the units can be declared as high-risk practices as the use of incubator covers is promoted less than 50% of the time. No statistically significant difference was noted between the two hospitals (Chi-Square = 2.45; df = 2; **p=0.29**).

4.2.6.2.3.2 Avoiding direct bright light

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

59% (n=16) of the participants from Hospital 1 perceive that their unit can be declared as high-risk practices as the use of incubator covers is promoted less than 50% of the time. In contrast to this, 50% (n=14) of participants from Hospital 2 indicate optimal application of this strategy in their NICU (Figure 4.15).

No consensus of 50% or more was achieved by the two hospitals together on this subcategory and therefore, standard of practice for them are not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square = 7.92; df = 2; **p=0.02**). explain here as with the others.

4.2.6.2.3.3 Titrated bedside lights

A total of 51% (n=28) participants from both hospitals (n=55), 67% (n=18) of the participants from Hospital 1 (27), perceive that the units can be declared as high-risk practices as bedside lights are titrated less than 50% of the time (Figure 4.15).

No consensus of 50% or more was achieved by Hospital 2 on this subcategory and therefore, the standard of practice for Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square = 6.22; df = 2; **p=0.05**) as the findings from Hospital 1 contrasts the findings from Hospital 2 as a mere 36% (n=10) of participants perceive their NICU to be at high-risk, not applying this light reduction strategy.

4.2.6.2.3.4 Measuring light levels inside incubators

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

Of the 55 participants 76% (n=42) from both hospitals, 85% (n=23) from Hospital 1 and 68% (n=19) from Hospital 2 observe that the units can be

declared as high-risk practices as light is measured inside the incubators less than 50% of the time (Figure 4.15).

No statistically significant difference was noted between the two hospitals (Chi-Square = 2.62; df = 2; **p=0.27**).

4.2.6.2.3.5 Eye protection used for phototherapy

A total of 93% (n=51) participants from both hospitals (n=55), 93% (n=25) of the participants from Hospital 1 (n=27) and 93% (n=26) from Hospital 2 (n=28) perceived that the units apply this strategy optimally as the use of eye protection during phototherapy is promoted more than 50% of the time.

No statistically significant difference was noted between the two hospitals (Chi-Square = 0.46; df = 2; **p=0.80**).

4.2.6.2.3.6 One source of daylight

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question.

58% (n=31) of participants from both hospitals, 81% (n=22) of the participants from Hospital 1 perceived that the units can be declared as high-risk practices as the use of one source of daylight is promoted less than 50% of the time (Figure 4.15).

No consensus of 50% or more was achieved by Hospital 2 on this subcategory and therefore, the standard of practice for Hospital 2 is not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square = 13.11; df = 2; **p=0.001**) as the findings from Hospital 1 contrasts the findings from Hospital 2 as a mere 36% (n=10) of participants perceive their NICU to be at high-risk, not applying this light reduction strategy.

4.2.6.2.3.7 Dimming overhead lights

A total of 71% (n=39) participants from both hospitals (n=55), 81% (n=22) of the participants from Hospital 1 (n=27) and 61% (n=17) from Hospital 2 (n=28),

feel that the units can be declared as high-risk practices as overhead lights being dimmed is promoted less than 50% of the time (Figure 4.15).

No statistically significant difference was noted between the two hospitals (Chi-Square = 3.08; df = 2; **p=0.21**).

4.2.6.2.3.8 Procedures are kept to a minimum

A total of 54 participants from both hospitals, 27 from Hospital 1 and 27 from Hospital 2 answered this question. 59% (n=16) of the participants from Hospital 1, perceived that the units can be declared as high-risk practices as the use of incubator covers is promoted less than 50% of the time (Figure 4.15).

No consensus of 50% or more was achieved by the two hospitals together as well as Hospital 2 on this subcategory and therefore, these standards of practice for them are not presented. A statistically significant difference was noted between the two hospitals (Chi-Square = 8.40; df = 2; **p=0.02**) as the findings from Hospital 1 contrasts the findings from Hospital 2 as a mere 22% (n=6) of participants perceive their NICU to be at high-risk, not applying this light reduction strategy.

4.2.6.2.3.9 The use of toys, pictures and music

Of the 55 participants 87% (n=48) from both hospitals, 93% (n=25) of the participants from Hospital 1 (n=27) and 82% (n=23) from Hospital 2 (n=28), perceived their units as high-risk practices as no toys, pictures or appropriate music are used in their NICUs (Figure 4.15).

No statistically significant difference was noted between the two hospitals (Chi-Square = 0.62; df = 2; **p=0.73**).

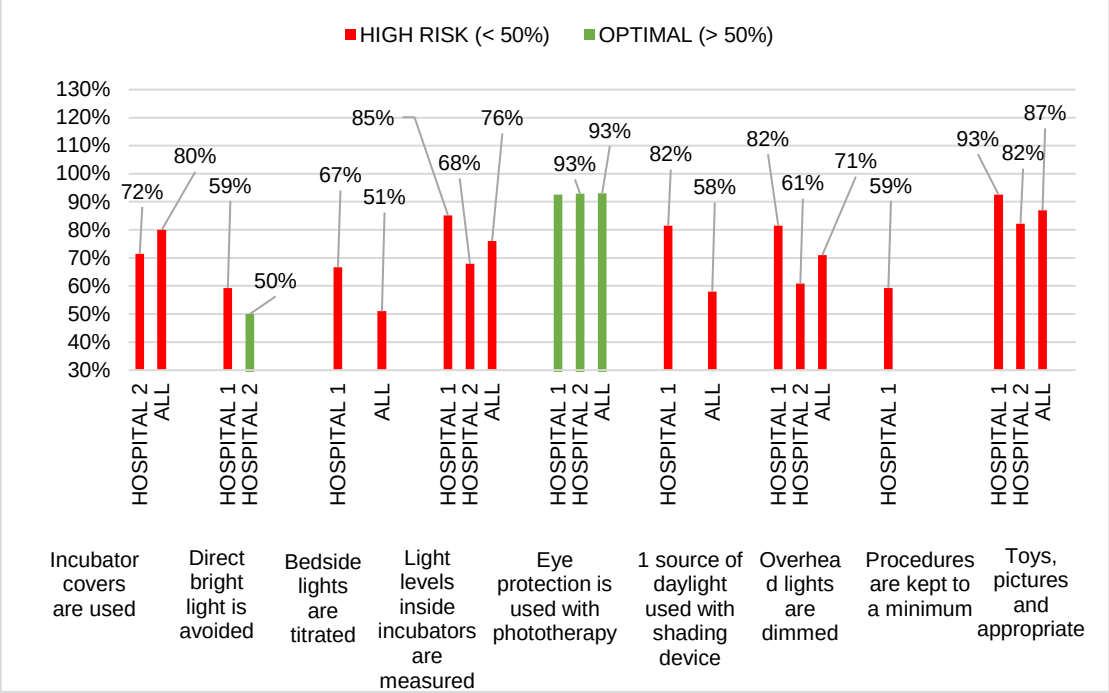


Figure 4.15: Light reduction strategies

This NDSC category elicits that positive olfactory stimulation is provided, such as mom's smell inside the incubator.

4.2.6.3 Olfactory stimulation

This NDSC category elicits that positive olfactory stimulation is provided, such as mom's smell inside the incubator.

4.2.6.3.1 Olfactory stimulation

A total of 74% (n=40) of the participants from both hospitals (n=54), 81% (n=21) participants from Hospital 1 (n=26) and 68% (n=19) participants from Hospital 2 (n=28) perceived that the units can be declared as high-risk practices as positive olfactory stimulation is provided less than 50% of the time (Figure 4.16).

No statistically significant difference was noted between the two hospitals (Chi-Square = 2.11; df = 2; **p=0.35**).

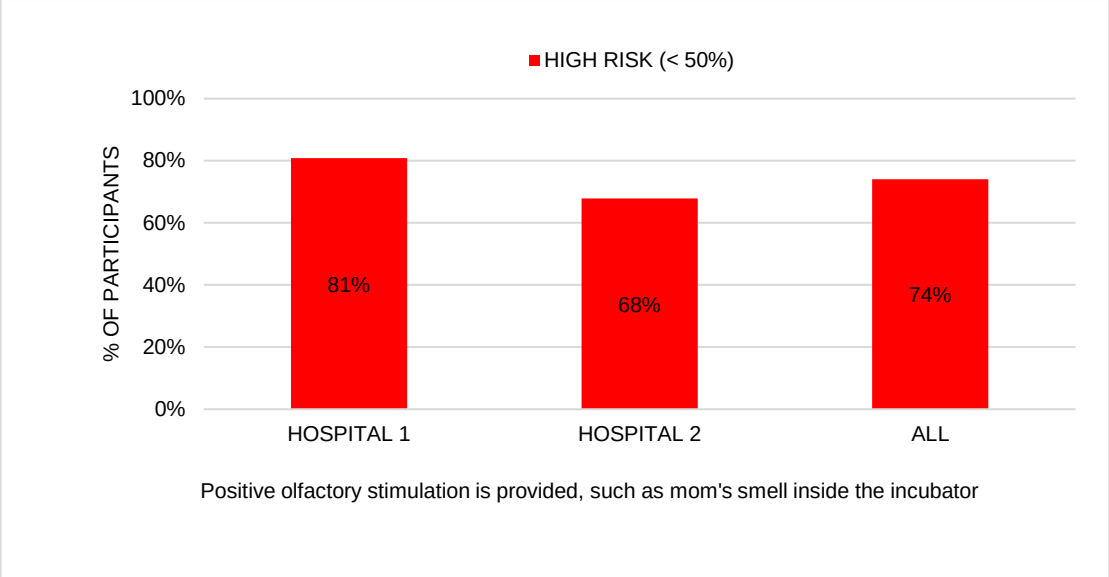


Figure 4.16: Olfactory stimulation

4.2.7 PAIN MANAGEMENT

4.2.7.1 Non-Pharmaceutical pain reduction strategies

This category of NDSC required the participants to comment on the use of non-pharmaceutical pain reduction strategies such as oral sucrose, non-nutritive sucking, swaddling and containment. The participants were also required to comment on the appropriate use of sucrose at the correct dose and route (3).

Furthermore, this NDSC subcategory consists of two elements:

- Oral glucose is effectively and correctly administered as pain management option.
- Non-nutritive sucking is provided during painful minor procedures.

4.2.7.1.1 Oral glucose is effectively and correctly administered as pain management option

A total of 56 participants from both hospitals, 27 from Hospital 1 and 29 from Hospital 2 answered this question regarding the first element of the NDSC subcategory of Pain Management – Oral glucose is effectively and correctly administered as pain management option.

Of the 56 participants from both hospitals, 52% (n=29) participants, 59% (n=16) participants from Hospital 1 (n=27) perceive that the units are high-risk

practices as oral glucose is effectively and correctly administered as pain management less than 50% of the time (Figure 4.17).

No consensus of 50% or more was achieved by Hospital 2 on this element and therefore standard of practice for Hospital 2 is not presented. No statistically significant difference was noted between the two hospitals (Chi-Square=2.08; df=2; **p=0.35**).

4.2.7.1.2 Non-nutritive sucking is provided during painful minor procedures

With the second element of the category of Pain Management – Non-nutritive sucking is Provided During Painful Minor Procedures, a total of 56 participants from both hospitals, 27 from Hospital 1 and 29 from Hospital 2 answered this question.

Of the 56 participants from both hospitals, 66% (n=37) participants, 70% (n=19) participants from Hospital 1 (n=27) and 62% (n=18) participants from Hospital 2 (n=29) perceived that their units are high-risk practices as non-nutritive sucking is provided during painful minor procedures less than 50% of the time (Figure 4.17). No statistically significant difference was noted between the two hospitals (Chi-Square=1.19; df=2; **p=0.55**).

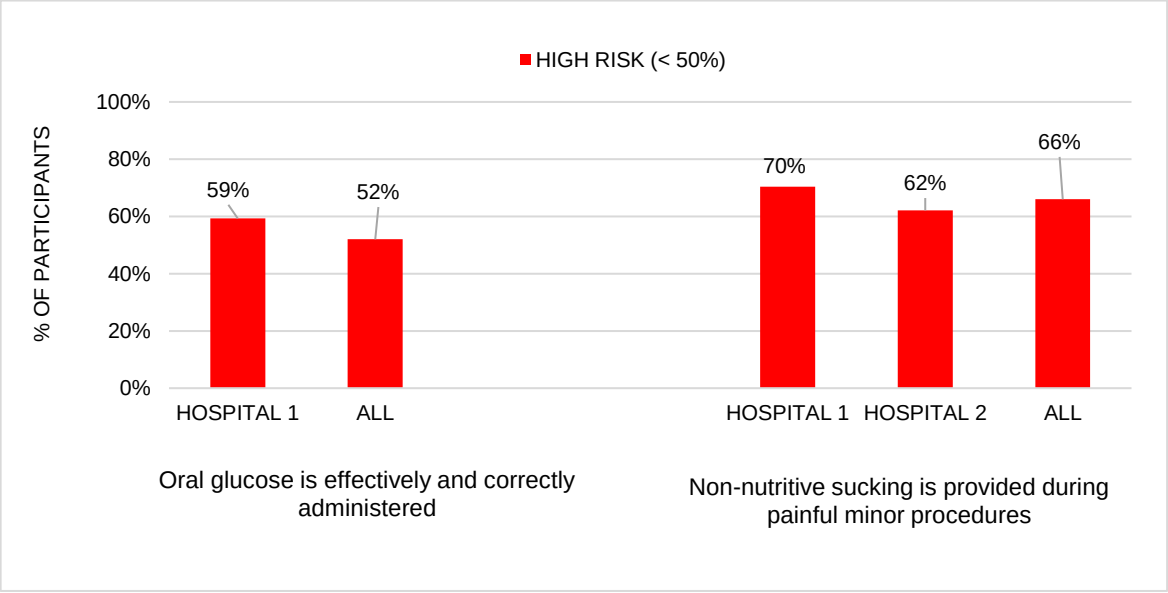


Figure 4.17: Pain management

4.2.8 KNOWLEDGE OF INFANT DEVELOPMENT

The category of Knowledge of Infant Development consists of two subcategories: Staff Knowledge and Parental Education.

The guideline on Staff Knowledge indicates that all professionals should have accurate knowledge on the development of the preterm infant. Furthermore, collaboration between all health care professionals in the NICU should be evident and should include knowledge sharing sessions (3).

Parental education requires that parents are taught the stress cues of their infants and that information be shared with parents. This could include verbal information, hand-outs or training sessions (3).

These two NDSC subcategories comprise of the following elements:

- Staff attended training and are able to read infant cues and behaviours.
- Knowledge is shared between professionals.
- The unit applies a multi-disciplinary team approach.
- Parents are taught preterm infant behavioural cues and stress signs.

4.2.8.1 Staff attended training and are able to read infant cues and behaviours

A total of 56 participants from both hospitals, 27 from Hospital 1 and 29 from Hospital 2 answered this question regarding the first element of the NDSC category of Staff Knowledge on Infant Development – Staff attended training and are able to read infant cues and behaviours.

50% (n=28) of the participants from both hospitals, 63% (n=17) participants from Hospital 1 and 50% (n=15) perceive that the units can be declared as high-risk practices as staff attended training and are able to read infant cues and behaviours less than 50% of the time (Figure 4.18).

No consensus of 50% or more was achieved by Hospital 2 on this element and therefore standard of practice for Hospital 2 is not presented.

No statistically significant difference was noted between the two hospitals (Chi-Square = 4.20; df = 2; **p=0.12**).

4.2.8.2 Knowledge is shared between professionals

With the second element of the category of Staff Knowledge on Infant Development – Knowledge is shared between professionals, a total of 56 participants from both hospitals, 27 from Hospital 1 and 29 from Hospital 2 answered this question.

66% (n=19) of the participants from Hospital 2 stated that optimal application of this component occurs in their unit and that knowledge is shared between professionals more than 50% of the time (Figure 4.18).

No consensus of 50% or more was achieved by the two hospitals together as well as Hospital 1 on this element and therefore, standard of practice for them are not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square = 9.64; df = 2; **p=0.01**) as the findings from Hospital 2 contrasts the findings from Hospital 1 as only 30% (n=8) of participants perceive their NICU to be functioning optimally regarding this element.

4.2.8.3 The unit applies a multidisciplinary team approach

A total of 55 participants from both hospitals, 27 from Hospital 1 and 28 from Hospital 2 answered this question regarding the third element of the NDSC category of Staff Knowledge on Infant Development – The unit applies a multi-disciplinary team approach.

A total of 69% (n=38) of the participants from both hospitals, 67% (n=18) of the participants from Hospital 1 and 71% (n=20) of the participants from Hospital 2, stated that optimal application of this component occurs in the units and that the unit applies a multidisciplinary team approach more than 50% of the time (Figure 4.18).

No statistically significant difference was noted between the two hospitals (Chi-Square = 1.09; df = 2; **p=0.58**).

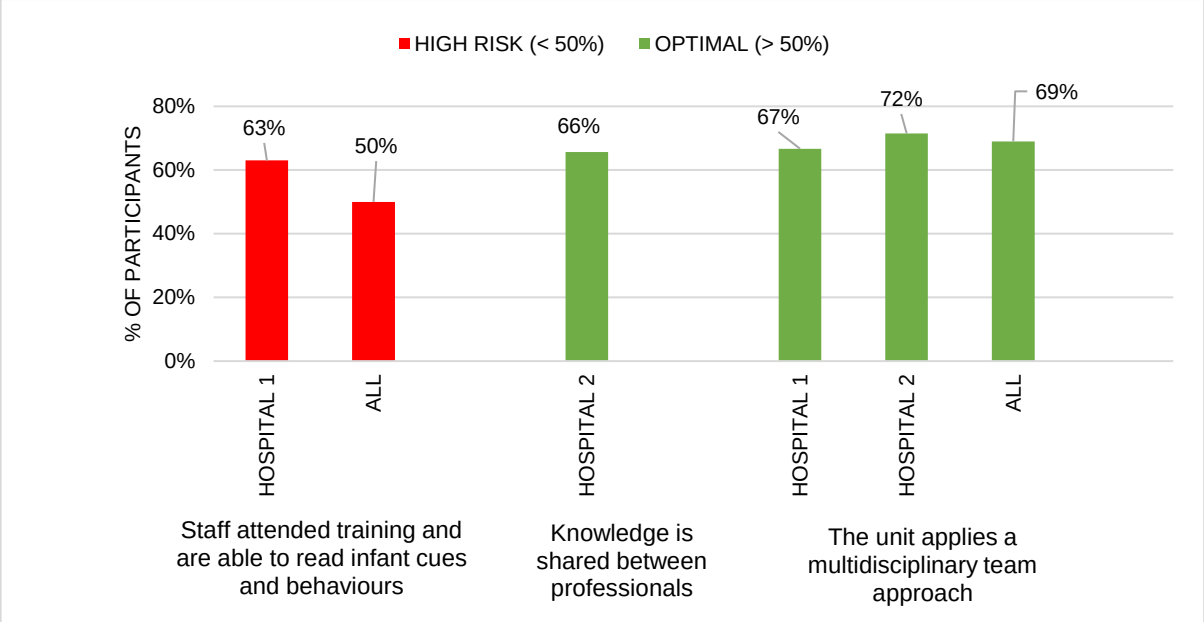


Figure 4.18: Staff knowledge on infant development

4.2.9 FEEDING

This NDSC category requires observing whether infants are prepared for feeding by wrapping and positioning them inside the incubator in a manner that will decrease the need for repositioning after the feed (gavage feeds). The reduction of light and noise should also be evident during oral feeding along with cradling of the infant in arms with face approximately 20 cm away from the caregiver to provide containment and visual stimulation (3).

The NDSC category of Feeding consists of 3 elements:

- Preterm infants are prepared for feeding.
- Preterm infants are positioned in a way that prevents the need for repositioning after a gavage feed.
- Non-nutritive sucking is provided during gavage feeding.

4.2.9.1 Preterm infants are prepared for feeding

A total of 56 participants from both hospitals, 27 from Hospital 1 and 29 from Hospital 2 answered this question regarding the first element of the NDSC category of Feeding – Preterm infants are prepared for feeding.

59% (n=16) participants from Hospital 1 observe that the units can be declared as high-risk practices as preterm infants are prepared for feeding less than 50% of the time (Figure 4.19).

No consensus of 50% or more was achieved by the two hospitals together as well as Hospital 2 on this element and therefore, standard of practice for them are not presented.

A statistically significant difference was noted between the two hospitals (Chi-Square = 8.14; df = 2; **p=0.02**) as the findings from Hospital 2 contrasts the findings from Hospital 1 as only 31% (n=9) of participants perceive their NICU to be at high-risk, not applying this element of feeding.

4.2.9.2 Non-nutritive sucking is provided during gavage feeding

A total of 56 participants from both hospitals, 27 from Hospital 1 and 29 from Hospital 2 answered this question regarding the third element of the NDSC category of Feeding – Non-nutritive sucking is provided during gavage feeding.

73% (n=41) of the participants from both hospitals, 74% (n=20) participants from Hospital 1 and 73% (n=21) participants from Hospital 2 perceived that the units can be declared as high-risk practices as non-nutritive sucking is provided during gavage feeding less than 50% of the time (Figure 4.19).

No statistically significant difference was noted between the two hospitals (Chi-Square = 1.90; df = 2; **p=0.39**).

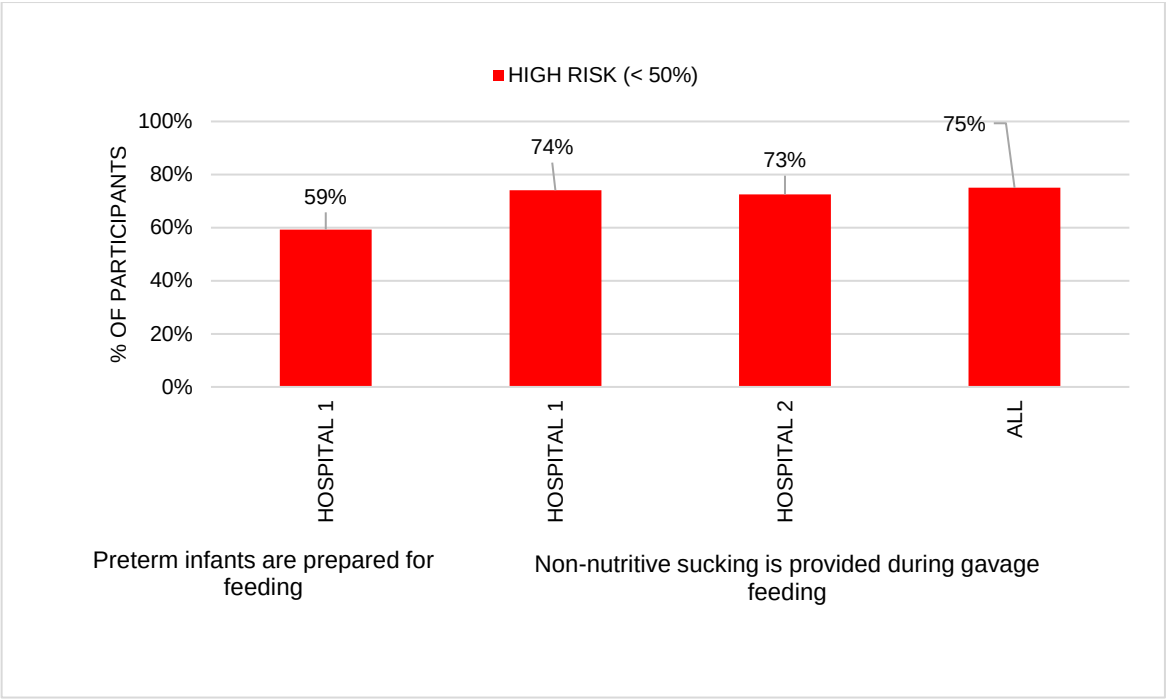


Figure 4.19: Feeding

Table 2: Statistically significant differences summarised

NDSC CATEGORY/SUBCATEGORY/ELEMENT	P-VALUE
INDIVIDUALISED CARE – Care	
Care is adapted according to cues and behaviours	p=0.06
Autonomic, motor, and behavioural cues are identified and used to support individualised caregiving	p=0.03*
FAMILY CENTRED CARE PHILOSOPHY – Parents as active participants	
Parents touch their infant immediately after birth	p=0.02*
Parents hold their infant	p=0.01**
FAMILY CENTRED CARE PHILOSOPHY – Privacy & Comfort	
Privacy is provided for parents	p=0.05*
FAMILY CENTRED CARE PHILOSOPHY – Visitation	
Siblings may visit	p=0.02*
HANDLING – Care according to maturation	
Care according to maturation	p=0.04*
STATE CHANGES – Promotion of sleep	
The infants receive at least 2-3 hours uninterrupted sleep	p=0.002**
The unit has quiet times where all routine care and interventions are delayed	p=0.04*
STATE CHANGES - Modified hands-on care giving	
Care interventions are clustered around sleep	p=0.005**
Calm, gentle containment and facilitation is provided during handling procedures to support flexion	p=0.001**
The infant is provided with "time-out" or rest periods	p=0.002**
Direct hands-on caregiving is modified by providing positive tactile stimulation	p=0.0001**

Positive tactile stimulation	
Containment and still hold	p=0.04*
Parents are allowed to do skin-to-skin	p=0.02*
Movement	
Preterm infants are moved slowly and as a whole, keeping the body and head aligned and limbs tucked in	p=0.04*
Self-regulation	
Self-regulation of infants is promoted	p=0.02*
Infants are provided with opportunities for grasping	p=0.005**
State regulation is promoted	p=0.01**
ENVIRONMENTAL MANIPULATION - Reduction of ambient noise	
Measurement of sound levels	p=0.01**
Effective sound absorption in infant bed spaces	p=0.02*
Staff respond to alarms quickly	p=0.045**
Reduction of noise in the immediate environment	
Closing of incubator portholes	p=0.02*
Minimal background noise	p=0.04*
Reduction of light	
Ambient light is reduced/dimmed	p=0.002**
Blinds are closed during daylight	p=0.04*
Activity levels are kept as low as possible	p=0.01**
Cycled light	
Day/night cycles are provided with 12 hours low light and sound at night	p=0.02*
Light reduction strategies	
Avoiding direct bright light	p=0.02*
Titrated bedside lights	p=0.05*
One source of daylight	p=0.001**
Procedures are kept to a minimum	p=0.02*
KNOWLEDGE OF INFANT DEVELOPMENT	
Knowledge is shared between professionals	p=0.01**
FEEDING	
Preterm infants are prepared for feeding	p=0.02*

Significance p≤ 0.05*; Significance p≤ 0.01**

CHAPTER 5: DISCUSSION

In this chapter, the results of the study are discussed according to the nine categories of NDSC. The most essential information gained from both participating hospitals is highlighted and debated, linking the findings to current literature. The two individual hospitals' results are then compared and discussed where significant differences are evident.

As mentioned in Chapter 4, the results are clustered into four groups, which include a high-risk practice category (non-compliance where the NDSC subcategories and elements were applied less than 50% of the time), a fair application/fair risk category (NDSC element was applied 50% of the time), an optimal application category (NDSC element was applied 75% of the time or more) and a no knowledge on the topic category.

For the purpose of this study, the NDSC categories and subcategories where there was at least 50% consensus on the elements are discussed.

5.1 DEMOGRAPHICS

A total of 61 multi-disciplinary team members participated in the study with 28 participants originating from Hospital 1, and 29 participants from Hospital 2 (four participants did not indicate their place of work and were excluded from the study). The total number of participants consisted of 19% doctors, 35% nurses, 12% OTs, 9 % physios, 14 % speech therapists and 11% dieticians.

The participants qualified between the years of 1992 and 2016 with a range of 24 years in their years of experience. The least experienced participants indicated their experience to be only a few months, whereas the most experienced participants reported up to 24 years of experience.

In terms of training related to NDSC, the majority of participants from Hospital 1 indicated they received no undergraduate training on NDSC compared to the less than half of the participants from Hospital 2 (Table 1). Most of the participants from both hospitals further indicated they received no postgraduate training on the topic (Table 1).

5.2 THE NINE CATEGORIES OF NEURODEVELOPMENTAL SUPPORTIVE CARE

5.2.1 NEONATAL INTENSIVE CARE UNIT DESIGN

This category, being the first category of NDSC, focuses on the initial impression when entering the NICU. Despite the NDSC approach describing the ideal NICU atmosphere to be warm, dim and quiet to create a uterine-like environment for the growing preterm infant to flourish in (3), more than half of all the participants perceived their NICUs to be high-risk practices – not practicing the guidelines for creating this ideal environment (Figure 4.1). While collecting data at the hospitals, the researcher observed this to be true, as the NICUs were fitted with fixed florescent lights that cannot be dimmed. It was also detected that none of the incubators were covered or shielded and that the NICUs were noisy. A high volume of activity was observed in general and infant spaces were not necessarily positioned away from traffic.

To contrast this, about a third of the participants from Hospital 1 indicated that their NICU optimally applies the NDSC principles needed to create the appropriate NICU environment. Along with this, Hospital 2's results displayed no consensus between participants on whether the NICU was a high-risk practice or an optimal practice related to the NICU design category.

A possible reason for the lack of consensus could be that the participants do not have sufficient knowledge regarding NDSC and what this environment should look like (3). Current literature states that the design of the NICU should aim at limiting stimulation of the infant by reducing sound exposure, noise and sleep interruptions by making it darker and quieter, minimising contact with staff to reduce disturbance of the preterm infant (39,52).

The possibility that the participants have limited access to evidence-based research on the positive and negative effects of the NICU environment on the growing preterm infant (4,16,36,133,134) also exists as well as the fact that the participants might have different views on what a quiet, dim and warm environment is. Furthermore, the possibility of the participants sensing that they have no control over the fixed physical NICU design (lights, position of

nurses' station, etc.) could also have influenced the answers given. This is in line with literature as it states that aspects such as insufficient funds, limited space, poor facility maintenance, faulty and/or lack of equipment and shortage of staff are possible reasons for the implementation of the NDSC NICU design not being evident in the South African context (2,59).

In summary, more than half of the participants from both hospitals perceived that their NICUs do not adhere to the standards of NDSC when it comes to the category of NICU design. This is not in line with recommendations from the literature, which states that a positive health care setting is a healing environment, benefiting the well-being of not only infants, but parents and staff as well (52).

5.2.2 INDIVIDUALISED CARE

This NDSC category of Individualised Care consists of two elements that include Observation and Care. To adhere to the NDSC standards regarding the element of Observation, literature states that it should be clearly observable that caregivers' interventions are individualised and relevant to the infant's gestational age (3). This element also requires that the infant's cues and behaviours are communicated during interventions and that adaptations to interventions are made accordingly (3).

Furthermore, the element of Care requires the caregiver to individualise their caregiving interventions (including acting on infant's cues), because individualised interventions respect the individuality of the infant (16,60). To adhere to the NDSC standards regarding the element of Care, appropriate actions that include engaging in eye contact with the infant, gentle touch, and respectful communication should occur (3,39).

The responses from Hospitals 1 indicate that at least half of the participants believe their NICU is a high-risk practice in terms of individualised care (Figure 4.2 and Figure 4.3). While collecting data at the hospitals, the researcher observed that the caregivers' interventions were not always relevant to the infant's gestational age and that infant's cues and behaviours were not observed for interventions to be adapted accordingly. Staff numbers in general

were limited and it was noted that care occurred routinely and not individualised for each infant.

In contrast to this, more than half of the participants from Hospital 2 perceived that one of the Individualised Care guidelines were optimally applied. This guideline related to care being adapted according to the infant's developmental maturity (Figure 4.3). A likely reason for the discrepancy between the participants' perceptions and observations made by the researcher could be contributed to limited knowledge on what exactly individualised care entails. The participants could possibly perceive that attending to a single baby at a time counts as individualised care. According to the literature, however, individualised care encompasses more than this. The MDT should be looking for the individual preterm infant's present threshold of behavioural organisation and care should be structured to support each individual preterm infant's competencies and strengths and ultimately simulate the intra-uterine environment as required by NDSC (39).

Furthermore, some of the participants could be feeling that they are doing what they can, taking into consideration their institutional limitations and the limited man-power they have. Shortages in staff is a reality in the South African context (2,59), which could most definitely impact on the application of individualised care in the NICU.

When comparing the two hospitals, the only statistically significant difference between the two hospitals were related to the element of autonomic, motor and behavioural cues being identified and used to support individualised caregiving.

This phenomenon could again be the result of limited knowledge regarding the category of Individualised Care or the influence of the NICU design, seeing as NICU 1 is much bigger than NICU 2. NICU 2 has less floor surface and infants to cover with the amount of staff that they have compared to Hospital 1, making the management of multiple infants in the NICU setting easier.

In conclusion, the results indicate that more than half of the participants from Hospital 1 perceive that their NICUs do not adhere to the standards of NDSC when it comes to the majority of the guidelines for the two elements of Individualised Care.

5.2.3 FAMILY-CENTRED CARE PHILOSOPHY

Family-centred care (FCC) is an approach that empowers and supports parents, leading to better involvement with their preterm infant and its care while admitted to the hospital (3). Literature also states that involving families has a variety of benefits that include economic benefits (shorter hospital stays), bonding, the improvement of long-term infant- and child development (135,136) as well as parental stress relief (137).

The NDSC category of Family-centred care philosophy is divided into 4 elements: Parents as Active Participants, Privacy and Comfort, Visitation and Parent Support Groups (3). Results from this study showed that both hospitals had both optimally applied elements as well as high-risk practices regarding the 4 elements of the Family-centred care philosophy.

Optimally applied elements that stood out in the results from either both or the two hospitals individually, include parents being allowed to see their infants immediately after birth, parents being able to touch their infants immediately after birth, parents being able to hold their infants, the nursery atmosphere being warm, information shared between professionals and parents actively participating in the care of their infant (involved in aspects such as feeding, KMC and bathing). Furthermore, breastfeeding, and the expressing of milk is also promoted (Figure 4.4 – 4.6).

Literature indicates that supporting the parents of preterm infants in the NICU leads to better involvement with the preterm infant and its care while admitted to the hospital (3,65). The FCCP further promotes the fact that parents should be granted the opportunity to touch and see their baby immediately after birth even before the alteration to the NICU (3), as holding their preterm new-born can result in great comfort (71). The period directly after birth is a very important time for bonding and connection, as a preterm infant is usually in a quiet alert

state. This state is ideal for bonding as both the preterm infant and the mother are calm and open to bonding (72). They should also be given the chance to visit, hold and talk to their baby and to participate in basic care activities to assist them during the taxing time in the NICU (65,71,72). These optimally applied elements of FCC are thus in line with the standards of NDSC (3) and are positive elements to build from.

In contrast to the optimally applied elements highlighted above, participants from both hospitals indicated elements of FCC that are not currently applied in their NICUs. The high-risk elements that stood out included the guidelines for Parent's Being Allowed to Individualise Their Infant's Bed Space and Privacy provided for parents. Participants from both hospitals perceived that their NICUs are not practicing these guidelines. Further high-risk practice elements included limited parent and sibling involvement, possibly due to strict visiting hours and policies indicating no sibling visitation. Although NDSC standards require parents to be allowed to visit at any time and promote sibling visitation (3), it is not always practical and realistic due to infection control policies as well as structural barriers like limited space inside the wards resulting in the NICU not being able to accommodate all the parents. The limited space also supports the element of providing privacy for parents, being flagged as a high-risk element.

When comparing the two hospitals, the only statistically significant difference between the two hospitals were related to the elements of parents being able to touch their infants immediately after birth, parents being able to hold their infants immediately after birth, privacy being provided for the parents as well as siblings being allowed to visit.

This phenomenon could be contributed to the possibility of a lack of knowledge as literature indicates that NDSC standards require parents being allowed see, touch and hold their infants immediately after birth and be allowed to individualise their infant's bed spaces with cards, toys and personal items (3). Furthermore, literature supports sibling visitation (3). The ward's strict infection control policies could also be a factor influencing the answers provided.

In summary, the category of FCCP stood out as the category with more optimally applied elements highlighted, compared to high-risk practice elements. This indicates that more than half of the participants perceive that their NICUs adhere to the standards of NDSC when it comes to most of the elements for the category of family-centred care philosophy.

5.2.4 INFANT POSITIONING

Positioning is an intricate part of caring for the preterm infant in the NICU as infants do not have the required muscle tone to uphold the necessary flexed position (5,16,138,139). Positioning, similar to the intra-uterine position, promotes the development of physiological flexion that helps the preterm infant maintain better temperature and oxygenation (5,16). NDSC promotes anatomical positioning, requiring that the preterm infant is positioned with the neck in a neutral position, shoulders protracted, body symmetrical, knees flexed with hips and arms in midline. NDSC also promotes this state being reached with the use of containment and firm boundaries (3,140). Only the elements of prone or side-lying positions are used rather than supine, especially in acutely ill infants and individualised bedding was perceived as a high-risk element, thus applied less than 50% of the time (Figure 4.7). Furthermore, no consensus of 50% or more was achieved for the category of anatomical positioning by any of the hospitals. While collecting data at the hospitals, the researcher observed that some of the infant bed spaces had containment nests and individualised bedding was evident. However, these nests were not always optimally enforced, resulting most of the infants not having tight and snug boundaries and therefore, not being positioned in a flexed position. It is clear that the participants had some training regarding positioning although reinforcement of the correct positioning would be beneficial.

5.2.5 HANDLING TECHNIQUES

This category of NDSC comprises of different subcategories that include, Care According to Maturation, State Changes, Promotion of Rest and Sleep,

Modified Hands-on Care-giving, Positive Tactile Stimulation Movement and Self-regulation**.**

More than half of the participants from both hospitals together and Hospital 1 individually perceived that their NICUs are at risk as they are not practicing majority of these handling guidelines, thus not adhering to the NDSC standards of care. This raises concerns as inappropriate handling can be devastating to the preterm infant. It can cause behavioural and physiological stress, which can include bradycardia, tachycardia, apnoea, tachypnoea, colour changes, behavioural agitation and increased intracranial pressure, desaturation and visceral responses (5,17).

The elements of handling that were flagged by more than half of the participants from Hospital 1 include Care According to Maturation, Care being Clustered Around Sleep, and the promotion of Non-nutritive Sucking.

Furthermore, the element of Self-regulation stood out as more than half of the participants from the two hospitals indicated that self-regulation along with opportunities for grasping and non-nutritive sucking does not occur. This is currently in-line with literature as it is indicated that self-regulation is largely promoted by and dependent on the caregivers' handling as they fight together to maintain stable in the stimuli-filled NICU environment. Caregivers assist the preterm infant in remaining in the calm and alert condition as most learning occurs during these states (84).

Literature thus supports that inappropriate handling compromises self-regulation and learning opportunities. The effects of negative handling are evident throughout the preterm infant's life and can affect attention along with emotional, cognitive and social functioning that continues beyond the preterm, toddler and kindergarten or preschool period (84). This is further supported by the fact that it has been identified that preterm infants are at higher risk for presenting with attention-deficit/hyperactivity disorder (ADHD) as school-aged children (85,86).

While collecting data at the hospitals, the researcher observed the phenomena flagged by Hospital 1, at both hospitals as they had routines where care occurs periodically without accommodation for the state of the infant. No “time out” or quiet times were evident, with care occurring regardless of the infant’s state or behavioural cues.

The element of compromised self-regulation is further supported by the evidence of poor positioning of the infants as they are not able to convey their hands to midline to suck on their hand to regulate themselves (3) and further restricted by the restriction of non-nutritive sucking (possibly due to strict infection control policies in the NICUs that prohibit foreign object inside the incubators).

When comparing the individual hospitals, Hospital 1 identified every element (seven elements) and every subcategory (19 subcategories) of the handling NDSC category as risk practice. The only subcategory that was not highlighted as a risk area was the use of soft bedding for these infants. Hospital 2, however, only identified three of the 19 elements as risk areas. This is further supported by the significant difference between the results of the two hospitals on 14 of the 19 subcategories.

The reasons for the differences in results from the two participating hospitals are not clear and will require further investigation.

To summarise, it is evident that more than half of participants from Hospital 1 perceive that their NICU does not adhere to the standards of NDSC set for the majority of the categories of handling techniques, while Hospital 2 stands in contrast to this, not agreeing regarding the application of the elements for the NDSC category of handling (Figures 4.8 – 4.11).

5.2.6 ENVIRONMENTAL MANIPULATION

Environmental manipulation is made up of subcategories that include the management of noise, light as well as olfactory stimulation. These subcategories are further divided into the elements of Reduction of Ambient Noise, Reduction of Noise from the Immediate Infant Environment, Reduction

of Staff Generated Noise, Reduction of Ambient Light, Reduction of Light from the Immediate Environment and Reduction/promotion of Olfactory Stimuli.

When looking at noise, literature indicates that noise mostly arises from ward routines, sonars, x-ray machines, telephones, suctioning and nurses' and visitors' voices. The prevalence of high patient-nurse ratios result in high alarm noise levels along with staff talking loudly to be heard throughout the NICU (3) (6). Noises also arise from closing incubators as well the performing of procedures and multi-disciplinary teams' ward rounds (6).

More than half of the participants from both hospitals together perceived their NICUs to be at risk and not practicing any of the NDSC guidelines to limit noise in this environment, despite literature indicating that the NICU exposes the infant to greater noise levels (arising from staff and equipment) acting as a massive stressor to the infants (52) (Figures 4.12 – 4.13).

This is alarming when taking into consideration the fact that the cochlea and auditory pathways are still developing in a preterm infant (87). It is evident that auditory stimulation during this time can play a big role in the development of auditory perception (6) and thus vital that noise reduction strategies are implemented to limit noise stimuli in the NICU. To further support the negative effect of noise on a preterm infant, literature states that loud sounds can be devastating to the preterm infant as it may result in physiological changes such as tachycardia, apnoea, tachypnoea, sudden increase in arterial blood pressure, oxygen desaturation, disturb sleep patterns and even intracranial haemorrhage (5).

The visual system also develops late as the visual pathway is the last sensory modality to develop (3). Bright light might be harmful to the preterm infant's developing retinas (2).

The same findings are evident when it comes to light reduction guidelines. More than half of the participants from both hospitals as well as Hospital 1 individually perceived their NICUs to be at considerable risk, not practicing majority of the NDSC guidelines to limit the light in these NICUs (Figure 4.14 – 4.15). Literature indicates that the visual development of the preterm infant

requires indirect light/low light exposure until 40 weeks of age to prevent the eyes from being exposed to direct harmful light as well as facilitation of necessary sleep cycles and diurnal rhythms (17). While collecting data at the hospitals, the researcher also observed this at both participating hospitals. The NICUs were both bright with no attention given to limiting bright light. In contrast to the results from both hospitals and Hospital 1, Hospital 2 only had consensus in terms of risk practice on half of the NDSC light elements. This also supports the fact that a significant difference between the two hospitals were only identified for half of the NDSC light elements. Possible reasons for this – or state similar as with noise if the reasons are not clear and further study on the possible reasons for this is recommended.

The only optimally applied light reduction guideline identified by more than half of the participants from both hospitals together, as well as the two hospitals individually, were the element of Eye Protection with Phototherapy. Phototherapy is an evidence-based regime and is taken seriously. Similar evidence is available for the effects of excess noise and light, yet these guidelines are not adhered to. This supports the idea that the above-mentioned phenomenon can probably be contributed to a lack of knowledge on the topic of noise and light.

The only other optimally applied guideline was identified by Hospital 2 – direct light is avoided. This could possibly be due to the windows being fitted with blinds that are permanently closed.

When it comes to olfactory stimulation, more than half of the participants from both hospitals as well as the two hospitals individually perceived their NICUs to be at risk, not allowing positive olfactory stimulation such as the mom's smell inside the incubator (breastmilk or a shirt with her scent) (Figure 4.16). The literature highlights the positive effects of this stimulation on the preterm infant in the NICU. This calms the infant and reinforces bonding between the mother and her infant. It further empowers the preterm infant to locate the mother's nipple to feed as it knows its mother's scent (6,30). The poor application of this guideline can probably be due to the strict infection control

protocols that are in place, or again, the lack of knowledge regarding this element of NDSC.

In summary, the majority of participants from both hospitals perceived their NICUs to be at considerable high risk, not practicing the majority of the NDSC guidelines for the category of Environmental Manipulation: Noise, Light and Olfactory Stimulation, except for the guideline for eye-protection during phototherapy.

5.2.7 PAIN MANAGEMENT

In the NICU, pain is often elicited by daily nursing and medical procedure, such as heel sticks and removal of plasters (141). These painful procedures can result in adverse neurodevelopmental outcomes and it is thus important to alleviate pain as far as possible (17,97).

Although pharmaceutical interventions are often needed to manage pain during procedures, NDSC promotes non-pharmaceutical pain reduction strategies such as breastfeeding (142), oral sucrose (143), non-nutritive sucking (144), swaddling and KMC (145) and containment (3).

Despite evidence promoting non-pharmaceutical pain reduction strategies, the majority of the participants from both hospitals perceived their NICUs to be at risk, not practicing non-pharmaceutical pain reduction strategies (Figure 4.17).

While collecting data at the hospitals, the researcher observed restriction regarding non-nutritive sucking, possibly due to strict infection control policies in the NICUs that prohibit foreign object inside the incubators. This could possibly be contributed to a lack of knowledge regarding the non-pharmaceutical options available for pain management as well as the stigma that pain management is mostly associated with pharmaceutical intervention strategies rather than non-pharmaceutical interventions.

To conclude, the majority of participants from both hospitals perceived their NICUs to be at risk, not practicing any of the NDSC guidelines in the category of Pain Management.

5.2.8 KNOWLEDGE OF INFANT DEVELOPMENT

This category of NDSC involves both the MDT members as well as parents participating in the care of the preterm infant. This category requires MDT members to have accurate knowledge on the development of preterm infant development, behaviours and cues as well as sharing knowledge between the different disciplines in the NICU (3). Information sharing between the different disciplines and the parents is also required by this category as parents need to be taught the behavioural/stress cues of their infants (3).

Half of the participants form both hospitals indicated optimal application of the element regarding the attendance of training and being able to read infant cues and behaviours. To support this finding, it was noted that more than half of the participants from both hospitals stated that no training was attended on the topic of infant cues and behaviours.

Furthermore, more than half of the participants from both hospitals perceive that knowledge is shared between professionals, and that a MDT approach is followed (Figure 4.18).

While collecting data in the NICUs, the researcher observed that the doctors and nurses communicate and share information, while the other disciplines do not necessarily share information due to busy schedules not overlapping with the other professions.

The fact that most of the participants indicated that knowledge sharing occurs optimally, can most likely be contributed to different views on what sharing of information between professionals is. The perception on who the key members in the team is, what their roles entail and who needs to know what kind of information can also play a role.

Again, the above-mentioned findings can be contributed to possible limited knowledge on preterm infant development. This phenomenon has an impact on all the other categories of NDSC. The improvement of knowledge on the preterm infant would ultimately support the effective implementation of NDSC categories

like individualised care, FFC, handling and positioning, environmental stimulation as well as pain management and feeding.

To conclude, high-risk practice was identified with the element of the attendance of training on infant cues and behaviours, while most participants from both hospitals perceived that their NICUs optimally apply the elements of a multi-disciplinary team approach as well as knowledge sharing between professionals.

5.2.9 FEEDING

Feeding is the last category of NDSC and requires infants to be prepared for feeding by wrapping and positioning them inside the incubator in a manner that will decrease the need for repositioning after the feed (16). The reduction of light and noise during oral feeding by cradling the infant with its face approximately 20 cm away from the caregiver to provide containment and visual stimulation, is an example of how this can be done (16).

More than half of the participants from both hospitals perceived their NICUs to be at considerable high-risk, not practicing any of the NDSC guidelines to prepare an infant for feeding. While collecting data in the NICUs, the researcher observed this phenomenon as feeding and gavage feeds occur as part of a strict routine. With limited staff, thus limited time, feeding is done in the fastest and most efficient way – thus no preparation occurs (Figure 4.19).

Furthermore, almost all the participants from both hospitals indicated their NICUs to be at high-risk, as there is no evidence of non-nutritive sucking (NNS) during gavage feeds despite literature promoting it. NNS improves digestion of feeds by promoting the secretion of digestive enzymes interceded by oral mucosa or vagal innervations (3). Non-nutritive suckling also encourages smooth transition to bottle/breast feeds and improved feeding performance (17).

This phenomenon can most probably be contributed to the fact that feeding is most often viewed as speech therapy’s or dietetics’ domain and that no further intervention is needed by other MDT members when these disciplines are on

board. The fact that the wards are understaffed, and feeds and gavage feeds occur as part of a strict routine that leaves little time for deviations also contributes to the reality portrayed above.

To summarise, most participants from both hospitals perceived their NICUs to be at considerable (high) risk – not practicing any of the NDSC guidelines required by the category of feeding.

5.2.10 THE MULTI-DISCIPLINARY TEAM AND THE ROLE OF THE OCCUPATIONAL THERAPIST

Although the results portray that the multi-disciplinary approach is applied in the participating NICU's (Figure 4.18), the researcher observed this as possibly not being the case during data collection. It was observed that nurses and doctors often communicate regarding the medical aspects of intervention, neglecting the neurodevelopment elements as seen above. This raises concern as literature indicates that the presence of multi-disciplinary teams has progressed and become more evident in NICUs and that this approach is proven to improve outcomes of preterm infants and decrease the costs involved in caring for them (118).

Taking this into consideration, it is important that multi-disciplinary team members efficiently collaborate and support each other in the application of NDSC elements.

The team approach requires the professionals that work in the NICU to share knowledge and information regarding the preterm infant between the various disciplines, ensuring that all the disciplines are involved and are familiar with the treatment plan at hand. This approach also clarifies their role in the application of the developmental care plan (3,65,72,119).

Although NDSC is a MDT approach, it is still important that each discipline still has their specific role within the team.

The role of OT for instance, is essential to the application of the NDSC approach

in the NICU as the OT promotes a better match between the physical environment and the infant's capabilities. The OT's knowledge of activity analysis (social, physical, biologic, sensory and psychosocial) and adaptation (compensatory strategies, modifications and enhancing functional participation) assists her in optimising the connection between the infant's social and physical environment and its capabilities to ultimately foster optimal development (120). This was not observed in the NICUs of the two participating hospitals.

Furthermore, the OT provides other comprehensive services such as evaluation and treatment of the preterm infant, parent education on behavioural signs and handling, the strengthening of the relationship between the parents and their infant as well as enhancing the quality of communication and interaction between them (120,121).

5.3 SUMMARY

Both positive and negative elements of NDSC were identified in this study. The positive elements that stood out in the results include parents actively participating in the care of their infant, parents being allowed to see their infants immediately after birth and parents being allowed touch their infant right after birth. Breastfeeding and the expressing of milk is also promoted along with the use of eye protection during phototherapy. The application of the elements of a multi-disciplinary team approach as well as knowledge sharing between professionals was also indicated by the majority of the participants. Other positive aspects that were highlighted by only Hospital 2 included the adaptation of care according to maturation. These positive elements are well in line with the current standards of NDSC (3).

Furthermore, negative elements were evident as high-risk application was indicated for more than half of the elements for the all the categories of NDSC, which include the NICU design, Individualised care, Family-centred care philosophy, Infant positioning, Handling techniques, Environmental manipulation, Pain management, Knowledge on infant development as well as Feeding.

The prevalence of high-risk practices related to the elements of the categories of NDSC is evidently much higher compared to the highlighted optimally applied elements, ultimately supporting the lack of and thus need for the application of NDSC in the South African context.

When comparting the two participating hospitals and their participants' perceptions, it is evident that Hospital 1 perceive their NICU to be at high-risk practice for more than 50% of the categories of NDSC, while Hospital 2's participants indicated this for far less than half of the categories, despite the researcher observing the same conditions at both of the participating hospitals. Possible reasons for this phenomenon include differences in views regarding the application of the elements from the categories of NDSC, limited knowledge on the actual application of NDSC or the incidence where participants feel that they are doing the best they can with what they have (taking staff shortages and physical environment into consideration). Ultimately, it is safe to recommend that the possible reasons need further investigation.

Taking into consideration the results gained from the study, it is important to note that research indicates the prevalence of potential bias related to survey research (146). It is possible that participants wanted to provide the sociably acceptable answers to the questions, which can appear that the MDT adhere to the NDSC principles mimicking an optimal environment in the NICU.

CHAPTER 6: LIMITATIONS, RECOMMENDATIONS AND CONCLUSION

6.1 LIMITATIONS

During the execution of this study limitations were identified.

One of the limitations was the fact that a statistically significant difference was evident between the two participation hospitals regarding the demographic factor of Undergraduate Training. This could have possibly resulted in the differences noted when comparing the results obtained from the two hospitals.

The poor response rate associated with survey research is also identified as a limitation. Literature predicted this as it is stated that a response estimate of only 52.7% of the sample population can be expected with survey research (147). To optimise the responses rate, the researcher pre-arranging appointments to conduct the survey and being physically present and available for questions as the participants filled out an electronic version of the questionnaire. Despite multiple efforts, it was not possible to arrange appointments with some of the disciplines from both hospitals as these disciplines are on very tight schedules. This ultimately resulted in the questionnaires being emailed to the participants. Despite the email being sent out repeatedly, a substantial number of these MDT members chose not to participate, ultimately reducing the total number of participants (42.22% in the study.

Furthermore, potential bias related to the method of surveys in research, could have had an effect on the participants' answers. According to the literature participants often have the tendency to answer questions based on social acceptability rather than their true feelings 146). Thus, it is possible that participants wanted to provide the sociably acceptable answers to the questions which can appear that the MDT adhere to the NDSC principles mimicking an optimal environment in the NICU.

The questionnaire used in this study was developed as an audit tool. The researcher obtained the necessary permission from the author to adapt and use the tool as a questionnaire. It was however noted that it often took participants

a long time to complete especially when participants provided further detail in the comments boxes. It is the opinion of the researcher that the tool is too lengthy and detailed to be used as a questionnaire and should rather be used as an audit tool.

6.2 RECOMMENDATIONS

The findings from this study are based on the perceptions of the MDT regarding the standards of NDSC currently present in the NICUs of the two participating hospitals. Due to this, the possibility exists that these perceptions are not a real reflection of the level of NDSC operationalisation in the NICUs. It is therefore recommended that a situational analysis be conducted to determine whether the perceptions of the MDT members correspond/agree with the activities, strategies, structural settings and regimes occurring in the NICUs of these two hospitals.

The INDeSC questionnaire included comment boxes for participants to provide additional information. This additional information needs to be analysed qualitatively as it was not part of the scope of this study. It is recommended that these comments be analysed to gain additional information on the MDT's perceptions and to further identify possible reasons for non-application of the NDSC guidelines in the NICUs.

It is also recommended that the results from this study as well as the results from the recommended qualitative analysis and the situational analysis inform the development of an individualised training programme on NDSC for each of the two participating hospitals. This would hopefully result in better standards of care for preterm infants and their families.

6.3 CONCLUSION

In the NICU, the premature infant receives highly specialized care with advanced medical technology (5,17). Neurodevelopmental supportive care plays an intricate part in the NICU as this multi-disciplinary approach provides guidelines that involve the health care professionals as well as the infant's

primary caregiver. The NDSC care approach consist of 9 categories: NICU Design, Individualised care, Family-centred care Philosophy, Positioning, Handling techniques, Management of the external environment, Management of pain, Knowledge of preterm infant development as well as Feeding (3,5). These developmental care categories with elements as guidelines, promote physiological stability, improved behavioural organization, and advance the abilities of the preterm infant to preserve its energy, prevent agitation and promote better self-regulation (5,39).

Even though it is evident that preterm infant care is a highly specialized and the importance of NDSC is emphasized in literature, this approach is not always applied in the NICUs. The aim of the study was thus to determine the current self-reported perceptions of the MDT on the standards of care in the neonatal intensive care unit related to NDSC in two academic hospitals in Gauteng, South Africa. This was done by first determining both hospitals perceptions of the standards of NDSC currently present in their NICUs and then comparing the two hospitals in order to identify if there were any differences between the two hospitals.

The perceptions from the MDT working in the 2 participating hospitals, portrayed a great deal of optimally applied elements as well as NDSC elements that show room for improvement. The optimally applied elements, currently in-line with NDSC standards, include the application of the MDT approach, parent's involvement in caring for their preterm infant as well as the importance of eye protection for phototherapy and breastfeeding. These elements of NDSC are all guidelines with compelling evidence to back them and it is evident that the participants in this study have some degree of knowledge on these evidence-based topics.

Furthermore, the elements of information sharing between the different disciplines and the parents is also required by this category as parents need to be taught the behavioural/stress cues of their infants (3). The majority of the participants form both hospitals indicated optimal application of the guideline

regarding knowledge shared between professionals, while most of the participants from both hospitals perceive that a MDT-approach is followed. While collecting data in the NICUs, the researcher observed that the doctors and nurses communicate and share information, while the other disciplines do not necessarily share information due to busy schedules not generally overlapping with the other professions.

NDSC categories that were identified by the MDT as areas that show room for improvement included the NICU design, Individualised care, Family-centred care philosophy, Infant positioning, Handling techniques, Environmental manipulation, Pain management, Knowledge on infant development as well as Feeding. More than half of the participating MDT members perceived that these guidelines are neglected and not adhered to in the NICUs of the two participating hospitals.

The results thus reveal the possible need for further training on the topic of NDSC to assist staff in minimising the number of NDSC elements perceived as high-risk of application in the participating NICUs. This thus supports the necessity for an evidence-based MDT neurodevelopmental supportive care training programme in public sector NICUs.

As stated above, the majority of the NDSC guidelines are perceived as risk practice indicating that the MDT recognises that these guidelines are not adhered to in these two NICUs. This is important to consider in the planning of a training programme.

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APPENDIX A – ORIGINAL QUESTIONNAIRE

Implementation of Neurodevelopmental Supportive Care : Audit tool (INDeSCa)

Evaluation of the implementation of the principles of NDSC is based on relevancy

Scoring		**Score of 4:** *All* the criteria for a certain item is met and it is deemed to be *highly relevant* to the criteria. **Score of 3:** *Most* of the requirements are met, but there are room for improvement and it is *quite relevant.* **Score of 2:** *Very little* criteria is met and it is *somewhat relevant.* **Score of 1:** *No* criteria is relevant and the item is *not relevant*.			If scoring is less than 4, please comment to why item is less relevant and recommend any possible changes to make it more relevant.				
Principle	**No**	**Guideline**	**Measurement Criteria**	4	3	2	1	**Comment**
. NICU Design	1	First impression on entering the NICU. Does the unit overall create a quiet, dim, warm, impression. Lights should be dimmed, individual incubators shielded or covered. Low ambient noise. Minimal activity in general, with infant spaces away from traffic.	Is a uterine-like environment created for each infant to support and environment conducive to growth and optimum development					
. Individualised care	2.1	**Observation**: Observe the interaction between caregivers and infants. Interventions should be relevant to the infant's gestational age, adaptations to interventions and infant's cues and behaviours communicated during interventions.	The caregiver reads the infant's cues and behaviours					
			The staff responds to infant cues and behaviours					
			The caregiver continuously and systematically assess and evaluate the infant's developmental needs					
			Care is adapted according to cues and behaviours.					
	2.2	**Care:** Staff should individualise their caregiving interventions, including acting on the infant's cues. Individualised interventions respect the individuality of the infant. Appropriate actions include engaging in eye contact, gentle touch, and respectful communication.	Care is provided according to the infant's individual developmental maturity					
			Autonomic, motoric, and behavioural cues are identified and used to support individualised caregiving.					
. Family centred philosophy	3.1	**Parents as active participants**: Family centeredness emphasises the individuality of the infant, and reduces maternal stress with increased self-esteem of the parent. Observe parent involvement and interaction with their infant. Check patient notes for entries related to parent visits and interactions. Discharge training starts on admission (2), when stable (1), just before discharge (0)	Parents see their infant immediately after birth					
			Parents touch their infant immediately after birth					
			Parents hold their infant					
			Parents are involved with care, e.g. feeding, bath, KMC.					
			Parents are allowed to personalise their infant's bed space					
			Mother's are encouraged to express milk for their infant, or to breastfeed.					
			Discharge training commenced					
	3.2	**Privacy and comfort:** The NICU should provide a warm homelike atmosphere where parents feel welcome, that promotes information sharing between professionals and parents, and parents privacy are respected and catered for. Information is supplied to patents that is relevant to their infant's developmental needs, not generic but tailored to their infant's gestational age, development and clinical condition.	Nursery atmosphere is warm, comfortable and soothing with a homelike appearance					
			Privacy is provided for parents					
			Information is shared between professionals and parents regarding their infant's developmental needs.					
	3.3	**Visitation:** Family cantered care is provided by 24 hour visitation policy for parents, and sibling visitation is encouraged. When parents are allowed any time of the day, (2), If there are times they are excluded e.g. handover or quiet times (1) if parents are required to leave the unit for more than 3 hours a day (0)	Parents are allowed to visit at any time					
			Siblings may visit					
	3.4	**Parent support groups:** Family support is provided as parent support groups. If the facility provide support groups for preemie care (2) If Parents are referred to external support groups (1), if none is available or referred to (0)	The facility has parent support groups					
	4.1	**Anatomical infant positioning:** Anatomical positioning means that the preterm infant is positioned with the neck in a neutral position, shoulders protracted, body symmetric, knees flexed with hips and arms in midline. This state is reached with the use of containment and firm boundaries. If all of the infants in the unit are positioned correctly (2) more than 50% infants positioned correctly (1) less than 50% positioned correctly (0)	Infants are positioned anatomically with the neck in a neutral position, shoulders protracted, body symmetric, knees flexed with hips and arms in midline. This state is reached with the use of containment and firm boundaries.					

Implementation of Neurodevelopmental Supportive Care : Audit tool (INDeSCa)

Evaluation of the implementation of the principles of NDSC is based on relevancy

		Containment: The infants are contained with the use of individualised bedding and positioning tools to contain the infant in flexion and the hips neutral.	The infants are contained					
			The infants have firm boundaries that fit snugly					
		Midline: The head should be positioned in midline and in line with the body - especially in acutely ill infants to promote hands to face.	The body position is symmetric					
			The neck is in neutral position with the head in midline in line with the body.					
			The shoulders are protracted					
			The arms are in midline.					
		Flexion: Limbs and shoulders should be flexed (bent) during positioning with postural support using firm boundaries.	The knees are flexed					
			The hips are flexed in a neutral position with some adduction					
			Infant is kept in flexion (limbs and shoulders) during positioning and postural support.					
	4.2	**Orientation:** Prone or side-lying positions should be used rather than the supine position. Evaluate the infants in the unit, if more than 75% of infants are prone or side lying (2) if about 50% of infants are supine (1) more than 50% positioned supine (0)	Prone or side-lying positions are rather used than supine, especially in acutely ill infants					
	4.3	**Individualised bedding:** Individualised bedding and support is used such as blanket rolls, support wedges, stuffed toys, nappies or loose swaddling that provides gentle pressure for bracing, but flexible enough to allow movement.	Individualised bedding is used to position infants.					

Scoring		**Score of 4:** *All* the criteria for a certain item is met and it is deemed to be *highly relevant* to the criteria. **Score of 3:** *Most* of the requirements are met, but there are room for improvement and it is *quite relevant.* **Score of 2:** *Very little* criteria is met and it is *somewhat relevant.* **Score of 1:** *No* criteria is relevant and the item is *not relevant*.			If scoring is less than 4, please comment to why item is less relevant and recommend any possible changes to make it more relevant.				
Principle	**No**	**Guideline**	**Measurement Criteria**	4	3	2	1	**Comment**
. Handling Techniques (transition support)	5.1	**Care according to maturation:** Caregiving interventions by healthcare providers should be adapted according to the preterm infant's gestational age, adaptation and maturation. Observe caring and handling to ensure all infants are not managed the same despite differences in age and maturation.	Care changes as infants matures.					
	5.2	**State changes:** Observe if infants are prepared before procedures, infants are aroused gently using mild stimuli initially that gradually increases as the infants respond. The infants are assisted to reach a calm and regulated state before beginning an intervention.	The care giver supports gradual state changes by using transitional touch.					
	5.3	**Promotion of rest and sleep:** Check if infants are asleep between routine cares for 2-3 hours at a time, consult the patient record for notes on interventions performed. Check if the unit has scheduled quiet times or rest periods where all routine care is delayed.	The infants receive at least 2-3 hours uninterrupted sleep					
			The unit has quiet times where all routine cares and interventions are delayed.					
	5.4	**Modified hands-on care-giving:** Hands-on care is provided as the infant becomes more alert, rather than interrupting sleep. Check nursing notes for entries such as "minimal handling' where routine care is delayed, or if notes are attached to the infant bed/incubator indicating minimal care. Containment is provided after intervention to help infants transition to a sleep state. Observe care during handling if time out periods are provided to the infant based on correct interpretation of stress cues. Opportunities are provided to suck on a finger or pacifier, and gentle touch provided as positive tactile stimulation to calm the infant.	Care interventions are clustered around sleep.					
			Calm, gentle containment and facilitation is provided during handling procedures to support flexion.					
			The infant is provided with "time-out" or rest periods according to his/her cues					
			Direct hands-on-caregiving is modified by providing positive tactile stimulation.					
	5.5	**Positive tactile stimulation:** Still holding or containment hold incorporates cupping the infant's head or resting a still hand on the body. Gentle massage can be provided, but light stroking avoided. Skin -to-skin care is provided. Infants are swaddled if applicable, with tight wrapping in a blanket with the limbs flexed, hips neutral without rotation, shoulders forward, head neutral and	Positive tactile stimulation is provided, including stroking or gentle massage if applicable.					

Implementation of Neurodevelopmental Supportive Care : Audit tool (INDeSCa)

Evaluation of the implementation of the principles of NDSC is based on relevancy

		hands accessible for exploration of the face.	Containment or still hold is provided.					
			Parents are allowed to do skin-to skin care with their infants within 24-48 hours (2), after 48 hours (1) never or no proof of skin-to-skin (0)					
			Preterm infants are swaddled.					
	5.6	**Movement (Kinaesthetic stimulation)** Observe movement of infants, no abrupt stimulation or quick turning takes place. Infants are moved slowly. Appropriate bedding is used that does not provide overstimulation of the vestibular system, waterbeds are not used, and knotted sheepskin is not in the beds. Multiples are co-bedded as they direct motor-activities at their siblings.	Preterm infants are moved slowly, as a whole, keeping the body and head aligned and limbs tucked in.					
			Appropriate soft bedding is used					
			Multiples are co-bedded. Always (2) if stable (1) never (0)					
	5.7	**Self-regulation:** Self regulation is promoted by providing support before, during, and after routine cares. Observe if the infant is provided with opportunities for grasping like fingers or bedding. State regulation is promoted by gentle touch and decreasing stimulation and non-nutritive sucking is provided with appropriate pacifier.	Self-regulation of infants are promoted.					
			Infants are provided with opportunities for grasping.					
			State regulation is promoted.					
			Non-nutritive sucking is provided to support self-regulation					

Scoring		**Score of 4:** *All* the criteria for a certain item is met and it is deemed to be *highly relevant* to the criteria. **Score of 3:** *Most* of the requirements are met, but there are room for improvement and it is *quite relevant.* **Score of 2:** *Very little* criteria is met and it is *somewhat relevant.* **Score of 1:** *No* criteria is relevant and the item is *not relevant*.			If scoring is less than 4, please comment to why item is less relevant and recommend any possible changes to make it more relevant.				
Principle	**No**	**Guideline**	**Measurement Criteria**	4	3	2	1	**Comment**
Environmental manipulation	6.1	**Reduction of noise:** Observe the sound of the ambient environment. Noise levels should not exceed 45dB, with a maximum transient sound not exceeding 70dB. Observe for active intervention to reduce noise levels in all areas of the unit and measurement of noise e.g. "sound ear" or other devices.	No radio or stereo equipment used in the unit, telephones away and rings softly.					
			Doors and drawers are padded to reduce noise					
			Bottoms of trash cans are padded/lids with peddle bins padded					
			Sound levels are measured and kept below 45dB					
			Soft music is used where appropriate.					
			Infant beds are placed away from traffic					
			There are effective sound absorption in infant spaces e.g. curtains, wall hangings or padding.					
			Monitor alarms are kept at a safe minimum volume or set to vibrate/flashing					
			Staff respond to alarms quickly					
		Immediate infant environment: The infant space is not noisy, sound reduction equipment is used with minimal noise around the infant.	Noise reduction incubator covers are used.					
			Soft ear plugs or covers are used.					
			Closed incubator portholes are closed quietly by using the latch					
			Sound levels are measured in the incubator					

Implementation of Neurodevelopmental Supportive Care : Audit tool (INDeSCa)

Evaluation of the implementation of the principles of NDSC is based on relevancy

			Ventilator tubes are emptied regularly, no water build-up					
			Minimal background noise at the infant					
		Staff generated noise kept to a minimum: No tapping or banging on top of closed incubators, no stock items or documents placed on top of incubators and no loud discussions next to the infants.	Charts and stock items are placed next to incubators, not on top.					
			Staff keep their voices down and away from the infant's bedside					
	6.2	**Reduction of light: Ambient light** is reduced to less than 100 foot-candles (1076 lux). Observe the unit for light reducing strategies and general brightness. Activities are kept low to prevent the need for bright light.	Ambient light is reduced/dimmed					
			Blinds are closed during daylight hours					
			Activity levels are kept as low as possible					
		Immediate infant bed space: Light reduction strategies are in place to protect the infant from direct bright light.	Incubator covers are used with closed incubators					
			Direct bright light is avoided					
			Bedside lights are titrated/controlled					
			Light levels inside incubators are measured					
			Eye protection is used with phototherapy					
			One source of daylight is used with a shading device					
			Overhead lights are dimmed					
			Procedures are kept to a minimum to ensure minimum handling					
			Toys, pictures and appropriate music used to reduce sensory monotony					
		Cycled light: Cycled light are provided from 32 weeks or when the infant begins to differentiate sleep and wake cycles. Observe if there are quiet times scheduled for at least 2 hours in the day, and a 12 hour sleep period at night with low voices and limited activities.	The unit provides cycled light					
			Day/night cycle is provided with 12 hours of low light and sound at night					
	6.3	**Olfactory stimulation:** positive smells are provided. Observe smell of cleaning materials, hand disinfectants etc.	Positive olfactory stimulation is provided, such as mom's smell inside the incubator.					
Pain	7	Observe for the use of non-pharmaceutical pain reduction strategies such as oral sucrose, non-nutritive sucking, swaddling and containment. Check for appropriate use of sucrose at the correct dose and route.	Oral glucose is effectively and correctly administered as pain management option					
7			Non-nutritive sucking is provided during painful minor procedures					
. Knowledge of infant development	8.1	**Staff:** All professionals should have accurate knowledge of the development of preterm infant development in the NICU. Ask for proof of training regarding NDSC attended by staff working in NICU. Collaboration between all health care professionals in the NICU is evident with knowledge sharing sessions.	Staff attended traing and are able to read infant cues and behaviours					
			Knowledge is shared between professionals					
			The unit applies a multidisciplinary team approach					
8	8.2	**Parental education:** Parents should be taught the stress cues of their infants. Information are shared with parents, could be verbal, hand-outs, training sessions etc.	Parents are taught preterm infant behavioural cues and stress signs.					
			Parents are taught how to interact with their preterm infant based on the cues and behaviours.					
. Feeding	9	Observe if infants are prepared for feeding by wrapping and positioning het inside the incubator in a manner that will decrease the need for repositioning after the feed. (gavage feeds) Reduce light and noise during oral feeding, the infant is cradles in arms with face approximately 20cm away from the caregiver to provide containment and visual stimulation.	Preterm infants are prepared for feeding.					
			Preterm infants are positioned in a way that prevents the need for repositioning after a gavage feed.					
			Non-nutritive sucking is provided during gavage feeding.					

APPENDIX B – REDCAP QUESTIONNAIRE (DEMOGRAPHIC SECTION)

APPENDIX C – REDCAP QUESTIONNAIRE (INDeSC SECTION)

NIDeSC questionnaire

This survey - The Implementation of Neurodevelopmental Supportive Care (INDeSC) questionnaire has been developed to determine the level of operationalisation of neurodevelopmental supportive care in the NICUs in South Africa.

Please take a few minutes to complete the survey.

Thank you!

Subject code _____

DEMOGRAPHIC INFORMATION

This section is concerned with general details with you as the respondent and this information will only be available to the research team.

Hospital

- ◯ Chris Hani Baragwanath Academic Hospital
- ◯ Rahima Moosa Mother and Child Hospital
- ◯ Charlotte Maxeke Johannesburg Academic Hospital

Profession

- ◯ Doctor
- ◯ Nurse
- ◯ Occupational Therapist
- ◯ Physiotherapist
- ◯ Speech Therapist

Dietician

Year qualified

_____

Number of years working in current Neonatal Intensive Care Unit (NICU)

_____

Number of years' experience in the Neonatal Intensive Care Unit (NICU) and/or with preterm infants

_____

Undergraduate training on Neurodevelopmental Supportive Care (NDSC) and/or preterm infants

◯ Yes ◯ No

Post graduate training on Neurodevelopmental Supportive Care (NDSC) and/or preterm infants

◯ Yes ◯ No

If yes, please state the qualification/s obtained

A champion is an individual who dedicates him/herself to supporting, marketing and driving through a new implementation.

Would you be interested to be a champion and be part of the planning and implementation process of the Neurodevelopmental Supportive Care (NDSC) training programme?

- ◯ Yes
- ◯ No

Contact details

INDeSC QUESTIONNAIRE

The following sections are concerned with nine specific areas of neurodevelopmental care.

Please answer each question based on your observations.

1.1 FIRST IMPRESSIONS ON ENTERING THE NICU

The unit overall creates a quiet, dim and warm impression. Lights should be dimmed, individual incubators shielded or covered. Low ambient noise. Minimal activity in general, with infant spaces away from traffic.

Is a uterine-like environment created for each infant to support an environment conducive to growth and optimum development

- ◯ Never
- ◯ 25% of the time or for 25% of the infants
- ◯ 50% of the time or for 50% of the infants
- ◯ 75% of the time or for 75% of the infants
- ◯ Always or for all the infants

No knowledge regarding this guideline

Comments related to first impressions on entering the NICU

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2. INDIVIDUALISED CARE

2.1 OBSERVATION

Observe the interaction between caregivers and infants. Interventions should be relevant to the infant's gestational age; adaptations to interventions and infant's cues and behaviours communicated during interventions. The caregiver reads the infant's cues and behaviours

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

The staff responds to infant cues and behaviours

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

The caregiver continuously and systematically assesses and evaluates the infant's developmental needs

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Care is adapted according to cues and behaviours

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to observations

2.2 CARE

Staff should individualise their caregiving interventions, including acting on the infant's cues. Individualised interventions respect the individuality of the infant. Appropriate actions include engaging in eye contact, gentle touch, and respectful communication.
Care is provided according to the infant's individual developmental maturity

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Autonomic, motor, and behavioural cues are identified and used to support individualised caregiving

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to individualised care

3. FAMILY CENTRED PHILOSOPHY

3.1 PARENTS AS ACTIVE PARTICIPANTS

Family centredness emphasises the individuality of the infant, and reduces maternal stress with increased self-esteem of the parent. Observe parent involvement and interaction with their infant. Check patient notes for entries related to parent visits and interactions.

Parents see their infant immediately after birth

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Parents touch their infant immediately after birth

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Parents hold their infant

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Parents are involved with care, e.g. feeding, bath, Kangaroo Mother Care (KMC)

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Parents are allowed to personalise their infant's bed space

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Mother's are encouraged to express milk for their infant, or to breastfeed

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Discharge training starts most of the time on admission, when stable or just before discharge

- ◯ On admission
- ◯ When stable
- ◯ Just before discharge
- ◯ No knowledge regarding this guideline

Comments related to parents as active participants

3.2 PRIVACY AND COMFORT

The NICU should provide a warm, homelike atmosphere where parents feel welcome; that promotes information sharing between professionals and parents; and parents' privacy is respected and catered for. Information is supplied to parents that is relevant to their infant's developmental needs; not generic but tailored to their infant's gestational age, development and clinical condition.

Nursery atmosphere is warm, comfortable and soothing with a homelike appearance

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always
- ◯ No knowledge regarding this guideline

Privacy is provided for parents

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always
- ◯ No knowledge regarding this guideline

Information is shared between professionals and parents regarding their infant's developmental needs

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always
- ◯ No knowledge regarding this guideline

Comments related to privacy and comfort

3.3 VISITATION

Family centered care is provided by 24-hour visitation policy for parents, and sibling visitation is encouraged. When parents are allowed any time of the day; if there are times they are excluded e.g. handover or quiet times; if parents are required to leave the unit for more than 3 hours a day.

Parents are allowed most of the time to visit:

- ◯ At any time of the day
- ◯ There are times they are excluded e.g. handover or quiet times
- ◯ Parents are required to leave the unit for more than 3 hours a day No

knowledge regarding this guideline

Siblings may visit

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to visitation

3.4 PARENT SUPPORT GROUPS

Family support is provided as parent support groups.

The facility provides:

- ◯ Support groups for parents with premature infants
- ◯ Parents are referred to external support groups
- ◯ No support groups or referral services are provided
- ◯ No knowledge regarding this guideline

Comments related to parent support groups

4. POSITIONING

4.1.1 ANATOMICAL INFANT POSITIONING

Anatomical positioning means that the preterm infant is positioned with the neck in a neutral position, shoulders protracted, body symmetrical, knees flexed with hips and arms in midline. This state is reached with the use of containment and firm boundaries.

Infants are positioned anatomically with the neck in a neutral position, shoulders protracted, body symmetrical, knees flexed with hips and arms in midline. This state is reached with the use of containment and firm boundaries.

- ◯ 0% No babies are positioned correctly at the time of observation
- ◯ 25% of the babies are positioned correctly at the time of observation
- ◯ 50% of the babies are positioned correctly at the time of observation
- ◯ 75% of babies are positioned correctly at the time of the observation
- ◯ 100% All babies are positioned correctly all the time No

knowledge regarding this guideline

Comments related to the anatomical infant positioning

4.1.2 CONTAINMENT

The infants are contained with the use of individualised bedding and positioning tools to contain the infant in flexion and the hips neutral.

The infants in the unit are contained

◯ 0% No infants are contained at the time of observation
◯ 25% of the infants are contained at the time of observation
◯ 50% of the infants are contained at the time of observation
◯ 75% of infants are contained at the time of the observation
◯ 100% All infants are contained all the time No
knowledge regarding this guideline

The infants have firm boundaries that fit snugly

◯ 0% of the infants
◯ 25% of the infants
◯ 50% of the infants
◯ 75% of the infants
◯ 100% All infants
No knowledge regarding this guideline

Comments related to containment

4.1.3 MIDLINE

The head should be positioned in midline and in line with the body - especially in acutely ill infants to promote hands to face.
The body position is symmetrical

◯ 0% of the infants
◯ 25% of the infants
◯ 50% of the infants
◯ 75% of the infants
◯ 100% All infants
No knowledge regarding this guideline

The shoulders are protracted

◯ 0% of the infants
◯ 25% of the infants
◯ 50% of the infants
◯ 75% of the infants
◯ 100% All infants
No knowledge regarding this guideline

The infants in the unit are positioned with their arms in midline

◯ 0% of the infants
◯ 25% of the infants
◯ 50% of the infants
◯ 75% of the infants
◯ 100% All infants
No knowledge regarding this guideline

Comments related to midline orientation

4.1.4 FLEXION

Limbs and shoulders should be flexed (bent) during positioning with postural support using firm boundaries.

The infants in the unit are positioned with flexed knees

- ◯ 0% of the infants
- ◯ 25% of the infants
- ◯ 50% of the infants
- ◯ 75% of the infants
- ◯ 100% All infants

No knowledge regarding this guideline

The infants in the unit are positioned with hips flexed in a neutral position

- ◯ 0% of the infants
- ◯ 25% of the infants
- ◯ 50% of the infants
- ◯ 75% of the infants
- ◯ 100% All infants

No knowledge regarding this guideline

Infant is kept in flexion (limbs and shoulders) during positioning and postural support.

- ◯ 0% of the infants
- ◯ 25% of the infants
- ◯ 50% of the infants
- ◯ 75% of the infants
- ◯ 100% All infants

No knowledge regarding this guideline

Comments related to flexion

4.2 ORIENTATION:

Prone or side-lying positions should be used rather than the supine position. Evaluate the position of the infants in the unit.

Prone or side-lying positions are used rather than supine, especially in acutely ill infants.

- ◯ 0% of the infants
- ◯ 25% of the infants
- ◯ 50% of the infants
- ◯ 75% of the infants
- ◯ 100% All infants

No knowledge regarding this guideline

Comments related to orientation

4.3 INDIVIDUALISED BEDDING:

Individualised bedding and support is used such as blanket rolls, support wedges, stuffed toys, nappies or loose swaddling that provide gentle pressure for bracing, but flexible enough to allow movement. Individualised bedding is used to position infants

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to individualised bedding

5. HANDLING TECHNIQUES (transition support)

5.1 CARE ACCORDING TO MATURATION:

Caregiving interventions by healthcare providers should be adapted according to the preterm infant's gestational age, adaptation and maturation. Observe caring and handling to ensure all infants are not managed the same despite differences in age and maturation.

Care changes as infants mature

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to care according to maturation

5.2 STATE CHANGES:

Observe if infants are prepared before procedures; infants are aroused gently using mild stimuli initially that gradually increases as the infants respond. The infants are assisted to reach a calm and regulated state before beginning an intervention.

Transitional touch is used to support gradual state changes

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to infant state changes

5.3 PROMOTION OF REST AND SLEEP:

Check if infants are asleep between routine cares for 2-3 hours at a time; consult the patient record for notes on interventions performed. Check if the unit has scheduled quiet times or rest periods where all routine care is delayed. The infants receive at least 2-3 hours uninterrupted sleep

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

The unit has quiet times where all routine care and interventions are delayed

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to the promotion of sleep and rest

5.4 MODIFIED HANDS-ON CAREGIVING:

Hands-on care is provided as the infant becomes more alert, rather than interrupting sleep. Check nursing notes for entries such as "minimal handling' where routine care is delayed, or if notes are attached to the infant's bed/incubator indicating minimal care.

Containment is provided after intervention to help infants transition to a sleep state. Observe care during handling if time out periods are provided to the infant based on correct interpretation of stress cues. Opportunities are provided to suck on a finger or pacifier, and gentle touch provided as positive tactile stimulation to calm the infant. Care interventions are clustered around sleep

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Calm, gentle containment and facilitation is provided during handling procedures to support flexion

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

The infant is provided with "time-out" or rest periods according to his/her cues

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Direct hands-on caregiving is modified by providing positive tactile stimulation

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to modified hands-on caregiving

5.5 POSITIVE TACTILE STIMULATION:

Still holding or containment hold incorporates cupping the infant's head or resting a still hand on the body. Gentle massage can be provided, but light stroking avoided. Skin-to-skin care is provided. Infants are swaddled if applicable, with tight wrapping in a blanket with the limbs flexed, hips neutral without rotation, shoulders forward, head neutral and hands accessible for exploration of the face.

Positive tactile stimulation is provided, including stroking or gentle massage if applicable

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Containment or still hold is provided

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Parents are allowed to do skin-to skin care with their infants within 24-48 hours after birth (Always) After 48 hours after birth (50%) Never or no proof of skin-to-skin contact after birth (Never)

- ◯ Never
- ◯ 50% of the time
- ◯ Always
- ◯ No knowledge regarding this guideline

Preterm infants are swaddled

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to positive tactile stimulation

5.6 MOVEMENT (Kinaesthetic stimulation):

Observe movement of infants, no abrupt stimulation or quick turning takes place. Infants are moved slowly.
Appropriate bedding is used that does not provide overstimulation of the vestibular system, waterbeds are not used, and knotted sheepskin is not in the beds. Multiples are co-bedded as they direct motor activities at their siblings.
Preterm infants are moved slowly, as a whole, keeping the body and head aligned and limbs tucked in

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯

Always
No knowledge regarding this guideline

Appropriate soft bedding is used

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Multiples are co-bedded. If this is the case for all the multiples in the unit (Always) If more than 50% of the multiples are co-bedded (50%) If less than 50% of the multiples are co-bedded (Never)

- ◯ Never
- ◯ 50% of the time
- ◯ Always
- ◯ No knowledge regarding this guideline

Comments related to movement of the infant

5.7 SELF-REGULATION:

Self-regulation is promoted by providing support before, during, and after routine cares. Observe if the infant is provided with opportunities for grasping like fingers or bedding. State regulation is promoted by gentle touch and decreasing stimulation and non-nutritive sucking is provided with an appropriate pacifier. Self-regulation of infants are promoted

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Infants are provided with opportunities for grasping

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline
State regulation is promoted

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Non-nutritive sucking is provided to support self-regulation

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯

Always
No knowledge regarding this guideline

Comments related to self-regulation

6. ENVIRONMENTAL MANIPULATION

6.1.1 REDUCTION OF NOISE:

Observe the sound of the ambient environment. Noise levels should not exceed 45dB, with a maximum transient sound not exceeding 70dB. Observe for active intervention to reduce noise levels in all areas of the unit and measurement of noise e.g. "sound ear" or other devices.

No radio or stereo equipment used in the unit and/or telephones are positioned away from the infants and rings softly or on silent

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Doors and drawers are padded to reduce noise

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Bottoms of trash cans are padded/lids with peddle bins padded

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline
Sound levels are measured and kept below 45dB (e.g. refrigerator humming)

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Soft music is used where appropriate

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Infant beds are placed away from traffic in the unit

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

There are effective sound absorption in infant spaces e.g. curtains, wall hangings or padding

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Monitor alarms are kept at a safe minimum volume or set to vibrate/flashing

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Staff respond to alarms quickly

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to reduction of noise

6.1.2 IMMEDIATE INFANT ENVIRONMENT:

The infant space is not noisy; sound reduction equipment is used with minimal noise around the infant.
Noise reduction incubator covers are used

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Soft ear plugs or covers are used

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Incubator portholes are closed quietly by using the latch

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Sound levels are measured in the incubator

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Ventilator tubes are emptied regularly, no water build-up

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Minimal background noise at the infant's bedside

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to noise in the immediate infant environment

6.1.3 STAFF GENERATED NOISE KEPT TO A MINIMUM:

No tapping or banging on top of closed incubators, no stock items or documents placed on top of incubators and no loud discussions next to the infants.
Charts and stock items are placed next to incubators, not on top

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Staff keep their voices down and away from the infant's bedside

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to staff generated noise

6.1.4 REDUCTION OF LIGHT:

Ambient light is reduced to less than 100 foot-candles (1076 lux). Observe the unit for light reducing strategies and general brightness. Activities are kept low to prevent the need for bright light. Ambient light is reduced/dimmed

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Blinds are closed during daylight hours

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Activity levels are kept as low as possible

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to reduction of light

6.2 IMMEDIATE INFANT BED SPACE:

6.2.1 LIGHT REDUCTION STRATEGIES are in place to protect the infant from direct bright light.

Incubator covers are used with closed incubators (or shading devices with open incubators)

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Direct bright light is avoided

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯

75% of the time
Always
No knowledge regarding this guideline

Bedside lights are titrated/controlled

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Light levels inside incubators are measured

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Eye protection is used with phototherapy

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

One source of daylight is used with a shading device

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline
Overhead lights are dimmed

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Procedures are kept to a minimum to ensure minimum handling

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Toys, pictures and appropriate music used to reduce sensory monotony

- ◯
- ◯ Never
- ◯ 25% of the time
- ◯
- ◯
- ◯

50% of the time
75% of the time
Always
No knowledge regarding this guideline

Comments related to light reduction strategies

6.2.2 CYCLED LIGHT:

Cycled light are provided from 32 weeks or when the infant begins to differentiate sleep and wake cycles. Observe if there are quiet times scheduled for at least 2 hours in the day, and a 12 hour sleep period at night with low voices and limited activities.

The unit provides cycled light

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Day/night cycle is provided with 12 hours of low light and sound at night

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to cycled light

6.3 OLFACTORY STIMULATION:

Positive smells are provided. Observe smell of cleaning materials, hand disinfectants etc.

Positive olfactory stimulation is provided, such as mom's smell inside the incubator

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to olfactory stimulation

7. PAIN MANAGEMENT

7.1 NON-PHARMACEUTICAL PAIN REDUCTION STRATEGIES:

Observe for the use of non-pharmaceutical pain reduction strategies such as oral sucrose, non-nutritive sucking, swaddling and containment. Check for appropriate use of sucrose at the correct dose and route.

Oral glucose is effectively and correctly administered as pain management option

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Non-nutritive sucking is provided during painful minor procedures

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to non-pharmaceutical pain reduction strategies

8. KNOWLEDGE OF INFANT DEVELOPMENT

8.1 STAFF:

All professionals should have accurate knowledge of the development of preterm infant development in the Neonatal Intensive Care Unit (NICU). Ask for proof of training regarding Neurodevelopmental Supportive Care (NDSC) attended by staff working in NICU. Collaboration between all health care professionals in the NICU is evident with knowledge sharing sessions.

Staff attended training and are able to read infant cues and behaviours

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Knowledge is shared between professionals

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

The unit applies a multidisciplinary team approach

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to staff knowledge of infant development

8.2 PARENTAL EDUCATION:

Parents should be taught the stress cues of their infants. Information are shared with parents, could be verbal, hand-outs, training sessions etc.

Parents are taught preterm infant behavioural cues and stress signs

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Parents are taught how to interact with their preterm infant based on the cues and behaviours

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to parental education

9. FEEDING

9.1 FEEDING PREPERATION AND REGEIME:

Observe if infants are prepared for feeding by wrapping and positioning them inside the incubator in a manner that will decrease the need for repositioning after the feed (gavage feeds). Reduce light and noise during oral feeding, the infant is cradled in arms with face approximately 20 cm away from the caregiver to provide containment and visual stimulation.

Preterm infants are prepared for feeding

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Preterm infants are positioned in a way that prevents the need for repositioning after a gavage feed

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Non-nutritive sucking is provided during gavage feeding

- ◯ Never
- ◯ 25% of the time
- ◯ 50% of the time
- ◯ 75% of the time
- ◯ Always

No knowledge regarding this guideline

Comments related to feeding

APPENDIX D – ETHICAL CLEARANCE

R14/49 Miss Meghan Leanne Butler

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M150835

NAME: (Principal Investigator)	Miss Meghan Leanne Butler
DEPARTMENT:	Occupational Therapy [redacted]
PROJECT TITLE:	Perceptions of the Mutli-Disciplinary Team regarding Standards of Neurodevelopmental Supportive Care in the Neonatal Intensive Care Unit
DATE CONSIDERED:	28/08/2015
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Lizelle Jacobs
APPROVED BY:	Professor P Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	19/09/2016

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Administrators in Room 301, 302,304,Third floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193,University of the Witwatersrand.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in August and will therefore be due in the month of August each year.

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX E – PERMISSION LETTER FROM HOSPITAL 1

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

[redacted]

PERMISSION TO CONDUCT RESEARCH

Date: 22nd March 2016

TITLE OF PROJECT:

Perceptions of the Multi-Disciplinary Team Regarding Standards of Neurodevelopmental Supprtive Care in the Neonatal Intensive Care Unit.

UNIVERSITY: Witwatersrand

Principal Investigator: Ms Megan Butler

Department: Occupational Therapy

Supervisor : Lizelle Jacobs

Permission Head Department (where research conducted): Yes

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Academic Hospital. The CEO / management of Chris Hani Baragwanath Academic Hospital is accordingly informed and the study is subject to:-

- **Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.**
- The Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- The MAC will be informed of any serious adverse events as soon as they occur
- Permission is granted for the duration of the Ethics Committee Approval.

.....
Recommended
(On behalf of the MAC)
Date: 22/03/2016.

.....
Approved/Not Approved
Hospital Management
Date: 28/03/16

APPENDIX F – PERMISSION LETTER FROM HOSPITAL 2

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

[redacted]

[redacted]

Enquiries : [redacted]
Tel : [redacted]
Fax : [redacted]
Email : [redacted]

MSc Student – 1269823
Occupational Therapy Department
University of the Witwatersrand

Dear Ms. Butler,

RE: PERCEPTIONS OF THE MULTI-DISCIPLINARY TEAM REGARDING STANDARDS OF NEURO-DEVELOPMENTAL SUPPORTIVE CARE IN THE NEONATAL INTENSIVE CARE UNIT

Permission is granted for you to conduct the research as indicated in the title above.

The terms under which this permission is granted is contained in the Researcher Declaration form that you have signed. Failure to comply with these conditions will result in the withdrawal of such permission.

It is crucial for you to inform the Research Coordinator, [redacted] of the actual start and end dates of your study. This could be done by e-mail.

Should the study commence more than 12 months after receipt of this approval letter you will have to go through the process of applying again.

You are strongly advised to keep a signed copy of the declaration form so as to ensure that the terms of this agreement are complied with at all times.

Yours sincerely,

[redacted]
Clinical Manager
2016:09:03

ADDRESS: [redacted]

APPENDIX G – LETTER TO CEO/HOD OF NICUs AT HOSPITALS

Department of Occupational Therapy
University of Witwatersrand
7 York Road
Parktown
2193
(011) 717 3701

Dear Sir/Madam

I, Meghan Butler, am currently enrolled as a Masters of Science in Occupational Therapy student at the University of Witwatersrand. I am conducting a study regarding the perceptions of standards of care of the multi-disciplinary team on neurodevelopmental supportive care in the neonatal intensive care unit and I am asking your permission to approach the managers and staff in the Neonatal intensive care units to be included in the study.

Title of the research study:

Perceptions of standards of care of the multidisciplinary team on neurodevelopmental supportive care in the neonatal intensive care unit.

The aim of the research study:

The aim of the study is to determine the perceptions of standards of care of the MDT in the neonatal intensive care unit regarding neurodevelopmental supportive care and the application of it in the NICU.

This study forms part of a PhD study that is focusing on the development of a multi-disciplinary neurodevelopmental supportive care training course that aims to fill the gaps identified by the study the researcher is conducting.

Methodology:

The research will be conducted at two Hospital Facilities: Chris Hani Baragwanath Academic Hospital and Raheema Moosa Mother and Child Hospital. The managers and staff currently working in the neonatal intensive care units will be approached to partake in the study. If the candidates agree to participate they will be requested to complete a self-administered questionnaire. This will take approximately 20 minutes. The questionnaire will gather information regarding the perceptions of standards of care of the multi-disciplinary team on neurodevelopmental supportive care in the neonatal intensive care unit. The participants will remain anonymous throughout the study and there will be no cost to be incurred by your department. The participants are free to withdraw at any time during the study.

For any enquiries or more information contact Meghan Butler at cell phone number 082 446 9440. Any ethical queries or enquiries should be made to the chairperson of the Wits Human Research Ethics Committee, Prof. P. Cleaton-Jones at telephone number (011) 717 1234.

Thank you for your time. Kind Regards

Meghan Butler
(Researcher)
butler.megs@gmail.com 082 446 9440
Lizelle Jacobs (Study leader)
LizelleJacobs@wits.ac.za 011 7173724

APPENDIX H – PARTICIPANT LETTER/INFORMATION SHEET

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Department of Occupational Therapy
Wits Education Campus

INFORMATION SHEET

Perceptions of standards of care of the multidisciplinary team on neurodevelopmental supportive care in the neonatal intensive care unit.

Good Day Sir/Madam

I, Meghan Butler, am currently enrolled as a Master's of Science in Occupational Therapy student at the University of Witwatersrand. I am inviting you to participate in the study that I am conducting "The perceptions of standards of care of the multi-disciplinary team on neurodevelopmental supportive care in the neonatal intensive care unit".

What is the purpose of the study?

Neurodevelopmental supportive care is not currently being applied in the NICUs in South Africa. It is not clear if the Multi-disciplinary team have sufficient knowledge to implement this approach. Multi-disciplinary team training courses and further education on Neurodevelopmental supportive care in the NICUs Neonatal Intensive Care Units might be necessary in order to improve neurodevelopmental outcomes of premature infants. Literature states that before a training course can be developed and implemented, the current perceptions of the standards of care followed by a training needs assessments needs to be done to identify the areas the training needs to focus on, thus this study is of great importance.

What is expected from the participants in the study?

The study will be conducted through the use of a questionnaire which will be distributed to the managers and staff of Chris Hani Baragwanath Academic Hospital and Raheema Moosa Mother and Child Hospital, currently employed in the field of neonatology and NICUs. You are kindly invited to take part in this research study by completing the questionnaire. Managers and staff of the NICUs of the above mentioned hospitals are encouraged to partake in the study in order to help determine the perceptions of standards of care with regards to neurodevelopmental supportive care.

Are there benefits in partaking?

No. This study aims to determine the perceptions of the MDT team on the topic of neurodevelopmental supportive care and the implementation of it in the NICU. This study forms part of a PhD study that is focusing on the development of a neurodevelopmental supportive care multi-disciplinary training course that aims to fill the gaps identified by the study the researcher is conducting.

All the participants will have access to the results gained from this questionnaire as soon as the study has been completed.

What about confidentiality?

Every completed questionnaire will be placed in a sealed envelope – this will ensure that confidentiality is maintained throughout the study. All participants are free to withdraw at any time during the study.

If you have any enquiries regarding the study feel free to contact Meghan Butler at cell phone number 082 446 9440. Any ethical queries or enquiries should be made to the chairperson of the Wits Human Research Ethics Committee, Prof. P. Cleaton-Jones at telephone number (011) 717 1234.

Kind regards

Meghan Butler
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082 446 9440
Lizelle Jacobs (Study leader)
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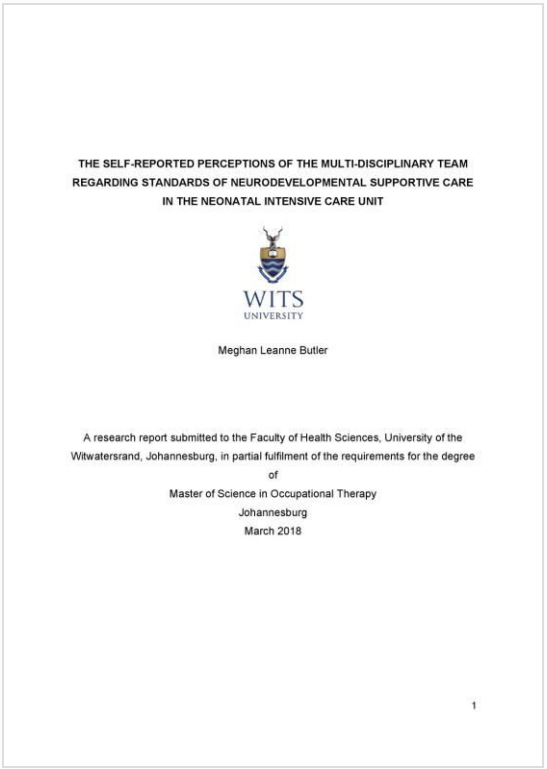
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THE SELF-REPORTED PERCEPTIONS OF THE MULTI-DISCIPLINARY TEAM REGARDING STANDARDS OF NEURODEVELOPMENTAL SUPPORTIVE CARE IN THE NEONATAL INTENSIVE CARE UNIT

WITS UNIVERSITY

Meghan Leanne Butler

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Occupational Therapy

Johannesburg

March 2018

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