

The implementation of a multidisciplinary neurodevelopmental supportive care training programme related to preterm infants in the South African public health sector

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A thesis submitted to the Faculty of Health Sciences, University of the
Witwatersrand, Johannesburg,
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Doctor in Philosophy

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DECLARATION

I, Lizelle Jacobs, declare that the work contained in this thesis is my own work. This thesis is being submitted for the degree of Doctor of Philosophy, at the University of the Witwatersrand, Johannesburg, South Africa. This work has not been submitted for any other degree or examination at this or any other university.

A handwritten signature in black ink, appearing to read 'Lizelle Jacobs', is written over a horizontal line.

Lizelle Jacobs

10 November 2020

In loving memory of my Dad
(1953-2020)
Bittersweet

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To God who gave me the strength and perseverance to complete this study (one set of footprints).

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ABSTRACT

Background: Preterm infants are at great risk for a variety of health and developmental problems. The Neurodevelopmental Supportive Care (NDSC) Approach aims to minimise the stress of the neonatal intensive care unit (NICU) environment. Neurodevelopmental supportive care is a well-studied area internationally but despite the evidence, this approach is not currently applied in South African public sector NICUs, as standard practice. The training of the multidisciplinary team (MDT), on NDSC, seems too limited to equip them for their work in the NICU environment.

Aims: 1) To assess the current state of the neonatal intensive care unit with regard to neurodevelopmental supportive care in the two public sector hospitals, 2) To develop a structure for implementation and prepare for implementation, and 3) To implement the training programme intervention and evaluate the process of implementation. The aims were aligned with three phases and each aim had a number of objectives.

Methods: This was an implementation study using a multiphase design and the Quality Implementation Framework (QIF) to guide the implementation process. The intervention which was implemented was a multidisciplinary, NDSC training programme related to preterm infants in the NICU. The study was based on the four phases of the QIF and consisted of nine distinct steps. Total population sampling was used and participants included the MDTs who provide services in two public sector academic hospital NICUs in South Africa.

Results: In Phase 1 of the study, the training needs of the MDT and the operationalisation of the NDSC approach confirmed the MDTs did not adhere to the NDSC approach and all nine NDSC categories needed to be included in the training programme. During Phase 2 the implementation plan was developed. The implementation and evaluation of the NDSC training programme in Phase 3 revealed implementation facilitators and barriers. Small changes in practice were identified and participants were positive about the training.

Conclusion: The training programme was perceived as positive and small changes in individual NDSC practice were noticed. Changing practice is a complex and lengthy process and the implementation of the NDSC training programme was only the beginning of this process. Recommendations from this study were made and can guide future implementation of training on NDSC in the public sector NICUs.

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ABBREVIATIONS

CANN	Canadian Association of Neonatal Nurses
CAPWHN	Canadian Association of Perinatal and Women's Health Nurses
COINN	Council of International Neonatal Nurses
CPD	Continuing Professional Development
CRISP	Center for Research in Implementation Science and Prevention
EBP	Evidence-based Practice
EFCNI	European Foundation for the Care of Newborn Infants
ERIC	Expert Recommendations for Implementing Change
FINE	Family and Infant Neurodevelopmental Education
GREET	Guideline for Reporting Evidence-based practice Educational interventions and Teaching
HOD	Head of department
INDeSC	Implementation of Neurodevelopmental Supportive Care
KFC	Kangaroo Father Care
KMC	Kangaroo Mother Care
MDT	Multidisciplinary team
NANN	National Association of Neonatal Nurses
NDSC	Neurodevelopmental Supportive Care
NICU	Neonatal Intensive Care Unit
NIDCAP	Newborn Individualized Developmental Care and Assessment Program
ORIC	Organizational Readiness for Implementation Change

PICU	Paediatric intensive care unit
QIF	Quality Implementation Framework
REDCap	Research Electronic Data Capture
SAMA	South African Medical Association
TIDieR	Template for Intervention Description and Replication
Wee Care	Wee Care Neuroprotective Neonatal Intensive Care Programme
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Champions	Individuals who are motivated to drive the implementation process and support others to participate in the process (Burke, Morris, & McGarrigle, 2012).
Change commitment	Change commitment refers to the members of an organisation's shared decision to implement change (Shea, Jacobs, Esserman, Bruce, & Weiner, 2014).
Change efficacy	Change efficacy refers to the members of an organisation's shared belief in their combined ability to implement change (Shea et al., 2014).
Community service	Compulsory service for all healthcare professionals in South Africa for a period of 1 year (Reid, Peacocke, Kornik, & Wolvaardt, 2018).
Context	Context is described as the environment, setting, or circumstances where an intervention is due to be implemented (Pfadenhauer et al., 2015).
Contextual factors	Factors related to the context where the intervention is due to be implemented which can influence the implementation process (Damschroder et al., 2009; Damschroder, 2020).
Critical stakeholders	A person who will be involved in the implementation study or who can influence the implementation study (Gopichandran et al., 2016). In this study the critical stakeholders were the neonatal intensive care unit managers and heads of departments.

Evidence-based practice	Evidence-based practice (EBP) is defined as the integration of the best available research evidence, clinical expertise and patient needs to optimise clinical decision making and patient care (Albarqouni, Glasziou, & Hoffmann, 2018).
Frameworks	Frameworks provide a broad set of constructs that organise concepts and data descriptively without specifying causal relationships (Bauer et al., 2015).
Implementation	Implementation is the planned process of bringing an intervention into practice (Pfadenhauer et al., 2015).
Implementation strategies	Implementation strategies are defined as the methods or techniques which are used to support the implementation of an intervention (Proctor, Powell, & McMillen, 2013).
Intervention/innovation	An idea, practice, intervention or object which is perceived as new by an individual or an organisation. The intervention does not have to be new but the 'newness' can also relate to knowledge, opinion or choice to implement the intervention (Rogers, 2010).
Models	A simplified depiction of a more complex world with relatively precise assumptions about cause and effect (Bauer et al., 2015).
Multidisciplinary team	In the context of this study the multidisciplinary team consisted of the doctors, nurses, physiotherapists, speech therapists and audiologists, dietitians and occupational therapists.

Neurodevelopmental supportive care/ neurodevelopmental care/ developmental care/ neuroprotection

These terms are often used interchangeably in the literature and refer to strategies used to decrease the stress on preterm infants in the NICU. It includes aspects such as individualised care, handling, positioning, family-centred care, feeding, pain management and manipulation of the environment.

Premature or preterm infant

An infant born before 37 weeks gestation (World Health Organization, 2015)

CHAPTER 1: INTRODUCTION

1.1. AN INTRODUCTORY VIGNETTE

The researcher always had a keen interest in the development of infants and children and has been involved in the assessment and treatment of children for many years. Clients included children with developmental delay, perceptual deficits, school-related problems but also children with neurological conditions such as cerebral palsy. The lifetime impact of a condition such as cerebral palsy, on a child and his/her family is undeniable. As occupational therapists, we provide treatment, equipment, stimulation, assistive devices, emotional support, advice and much more, but the day-to-day struggle for the child and the parents is ongoing and persistent. This is a huge leap but prevention is better than cure and if there is a way to prevent a debilitating condition such as cerebral palsy, surely, this should be investigated. One of the possible causes of cerebral palsy is prematurity. The premature infant's brain is immature and susceptible to injury which can result in cerebral palsy. These physiologically fragile infants require specialised, developmentally appropriate care while they are in the neonatal intensive care unit.

In 2014 the researcher attended the four-day Little Steps® training programme on neurodevelopmental supportive care (NDSC) for preterm infants. The course included theory on the development of the fetus, a comparison between the intrauterine environment and the neonatal intensive care unit (NICU) environment, and how to manage and support the preterm infant and the family in the NICU. The training further included a practical session at one of the academic, training hospitals in Gauteng. This was an eye-opener as the NDSC approach was non-existent in this public hospital NICU. As an academic hospital, linked to a university, staff should have access to the best available evidence, both locally and internationally. Yet the NDSC approach, which has been well researched from the 1960s and applied in international NICUs, was not visible in our hospitals. This prompted the researcher to embark on a study to facilitate change in South African public sector NICUs.

1.2. BACKGROUND INFORMATION

Mortality and morbidity of the preterm infant (born < 37 weeks gestation) is an ongoing concern worldwide (Howson, Kinney, & Lawn, 2012; Rhoda, Velaphi, Gebhardt, Kauchali, & Barron, 2018; Chawanpaiboon et al., 2019). In 2016 it was determined one of the main causes of childhood mortality in children under the age of 5 was complications due to prematurity (UNICEF, 2017). Similarly, in South Africa almost 50% of all neonatal deaths were due to preterm birth complications (Rhoda et al., 2018).

Globally emphasis is placed, not only on reducing child deaths, but also on improving the quality of care for neonates including preterm infants (Lawn, Davidge, Paul, von Xylander, Johnson, et al., 2013; Chawanpaiboon et al., 2019). In the safety of the intrauterine environment, the unborn fetus would have been protected from bright lights, noise, noxious smells, excessive handling, poor positioning as well as pain (Goldstein, 2012; Altimier & Phillips, 2013). Instead these preterm infants are cared for in the neonatal intensive care unit (NICU) where they are subjected, on a daily basis, to a variety of unpleasant and often harmful stimuli.

In the 1970-1980's it was determined that the NICU environment was not conducive to the neuro-behavioural development of the preterm infant and that this environment often caused preterm infant stress (Symington & Pinelli, 2006). The NICU environment should, as far as possible, mimic the intrauterine environment to decrease the stress levels of preterm infants. This realisation led to the development of the Developmental Supportive Care Approach which is described as "a broad category of interventions that is designed to minimise the stress of the neonatal intensive care unit environment"(Symington & Pinelli, 2006, p. 3).

The neurodevelopmental supportive care approach has been studied in-depth and results confirmed that this is the best approach to use when caring for the preterm infant in the NICU (Robison, 2003; McAnulty et al., 2010; Montirosso, Del Prete, Bellù, Tronick, & Borgatti, 2012; Altimier & Phillips, 2016; Milette, Martel, da Silva, & Coughlin McNeil, 2017). More recently, an interprofessional group of experts, the Consensus Committee of the Standards, Competencies, and Best Practices for Infant and Family-Centered Developmental Care in the Intensive Care Unit (2020), published the Developmental Care Standards for Infants in Intensive Care. These

standards are based on the best available evidence and it is recommended for these standards of care to be integrated in the medical care of preterm infants and their families.

Neurodevelopmental supportive care is a shared, multidisciplinary approach (Legendre, Burtner, Martinez, & Crowe, 2011; Lubbe, Van der Walt, & Kloppe, 2012; Barbosa, 2013; Phillips et al., 2013; Sturdivant, 2013). It is therefore essential for all medical, nursing, allied health professional and support staff, providing services in the NICU, to have sufficient knowledge of the care preterm infants need, as this can contribute to the successful adoption of the NDSC approach in the NICU environment (Lubbe, 2009; Lawn, Davidge, Paul, von Xylander, de Graft Johnson, et al., 2013). The most recent study which investigated NDSC in the public sector in South Africa, was conducted in 2009 (Lubbe, 2009). In this study a situational analysis was performed in 12 selected NICUs. The study revealed limited evidence of the application of NDSC principles which was associated with the staff's knowledge and training on this approach. Staff who attended training on developmental care, were better able to apply basic NDSC principles such as reading preterm infant cues (Lubbe, 2009). Another South African study conducted in private sector NICUs in 2017, also identified the staff lacked knowledge of developmental care (Rheeder, Lubbe, & Pretorius, 2017).

These results are confirmed by international studies which also found that inadequate staff training was one of the main reasons for poor implementation of developmental care in the NICU (Galarza-Winton, Dicky, O'Leary, Lee, & O'Brien, 2013; Zhang, Lee, Chen, & Liu, 2014). It can be concluded that staff who provide services in the NICU often do not have sufficient knowledge of neurodevelopmental supportive care to provide the best evidence-based service to preterm infants and their families.

1.3. PROBLEM STATEMENT

Competent and skilled health care workers are essential in caring for both mother and newborn infant, especially the preterm infant (WHO, 2010). Developmental supportive care is a well-studied area internationally but this approach is only in the beginning phases of implementation in the private and public sector NICUs in South Africa (Lubbe, 2009; Lubbe et al., 2012; Rheeder et al., 2017). The training of the

multidisciplinary team members, with regard to neurodevelopmental supportive care of the preterm infant, seems too limited to provide these professionals with sufficient knowledge and skills to equip them for their work in the NICU environment. This highlights the need for the implementation of a multidisciplinary training programme on neurodevelopmental supportive care.

1.4. PURPOSE OF THE RESEARCH

The purpose of this study was to increase the knowledge of healthcare professionals, who provide services in public sector NICUs in South Africa. Qualified, skilled health care workers are needed to counter the incidence of preterm infant morbidity (Victora & Rubens, 2010; Lawn, Davidge, Paul, von Xylander, Johnson, et al., 2013) and they can be equipped through training programmes. A NDSC training programme had to be implemented to increase knowledge and skill of health care professionals, who deliver services in the NICU. The NDSC approach was deemed the most appropriate and the training programme selected, was a South African developed programme, namely the Little Steps® training programme developed by Lubbe.

The process of implementation is just as important as the implementation itself and needs to be considered as part of any implementation study. It was therefore necessary to identify contextual factors (facilitators and barriers) which could have affected the successful implementation of a training intervention. These identified contextual factors can guide future implementation of training interventions in public sector hospitals in South Africa.

1.5. RESEARCH QUESTION

What is the process of implementing a multidisciplinary training programme to improve neurodevelopmental supportive care in the public sector NICU and what are the contextual factors affecting implementation?

1.6. RESEARCH AIMS

Using a framework can assist in the interpretation and reporting of implementation research and ultimately contribute to effective interventions and increased knowledge or change of practice (Flottorp et al., 2013). It has been recommended that a good place to start with implementation research is with a process model or

framework. The Quality Implementation Framework (QIF) was used to guide this implementation study (Meyers, Durlak, & Wandersman, 2012) and will be discussed in more detail in Chapter 3. This study was based on the four phases of the QIF. The aims and objectives for each phase are presented below.

1.6.1 Phase 1 Aims and objectives

The aim of Phase 1 of the study was to assess the current state of the neonatal intensive care unit with regard to neurodevelopmental supportive care in the two public sector hospitals.

Objective 1.1

To determine the neurodevelopmental supportive care training needs of the multidisciplinary team, working in two selected neonatal intensive care units in Gauteng, South Africa.

Objective 1.2

To investigate the current neurodevelopmental supportive care operationalisation in the neonatal intensive care unit of the two selected public hospitals.

Objective 1.3

To conduct an intervention fit assessment for the selected hospitals.

Objective 1.4

To determine the readiness of the multidisciplinary team for implementation of the neurodevelopmental supportive care training programme.

Objective 1.5

To develop a pre-innovation session for the critical stakeholders.

1.6.2 Phase 2 Aims and objectives

Phase 2 entailed the development of a structure for implementation and preparing for implementation.

Objective 2.1

To develop a plan for implementing the training programme.

1.6.3 Phase 3 Aims and objectives

In Phase 3 of the study the researcher aimed to implement the training programme intervention and evaluate the process of implementation.

Objective 3.1

To implement the neurodevelopmental supportive care training intervention.

Objective 3.2

To identify facilitators and barriers to change practice.

Objective 3.3

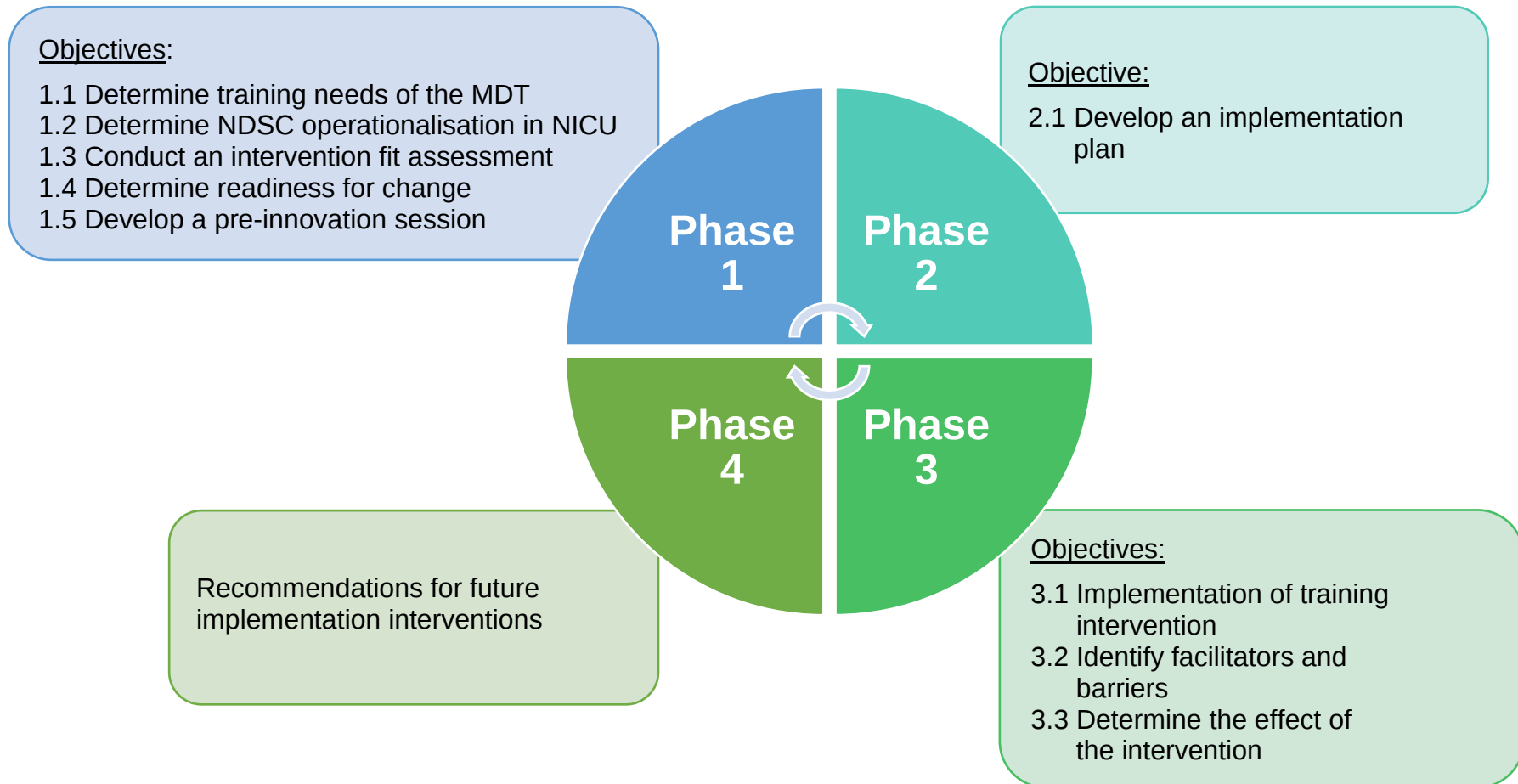
To determine the effect of implementing a multidisciplinary neurodevelopmental supportive care training programme.

1.6.4 Phase 4

Phase 4 of the QIF focuses on the process of improving future applications: learning from experience. The purpose of this phase is to retrospectively and critically analyse the implementation process and to learn from experience. This PhD study did not include a fourth phase but rather concluded with recommendations, limitations and a reflection of the implementation process which was included in Chapter 11.

As mentioned above and discussed in more detail in Chapter 3, this study used the QIF as a structure. Figure 1.1 provides a diagrammatic overview of this study's phases and objectives based on the QIF while Table 1.1 depicts how the aims and objectives of the study align with the phases of the QIF (first and second columns). The third column describes the strategies used while the fourth column shows the chapters of the thesis.

Figure 1.1: Adapted Quality Implementation Framework (QIF) for this implementation study



* Multidisciplinary team (MDT); Neurodevelopmental supportive care (NDSC); Neonatal intensive care unit (NICU)

Table 1.1: Overview of this PhD study using the Quality Implementation Framework (QIF) as a guide

QUALITY IMPLEMENTATION FRAMEWORK (QIF)	PHD STUDY PHASES, AIMS AND OBJECTIVES	PHD STUDY RESEARCH STRATEGIES	ORGANISATION OF THE PHD THESIS
PHASES AND STEPS			Chapter 1: Introduction Chapter 2: Literature review on neurodevelopmental supportive care Chapter 3: Review of implementation research Chapter 4: Outline of the methodology for the study
QIF PHASE 1	PHASE 1		
Initial considerations regarding the host setting	AIM 1: To assess the current state of the neonatal intensive care unit with regard to neurodevelopmental supportive care in two public sector hospitals		
<u>Assessment strategies</u> 1. Conducting a needs and resources assessment	<u>Objective 1.1</u> To determine the neurodevelopmental supportive care training needs of the multidisciplinary team, working in two selected neonatal intensive care units in Gauteng, South Africa	<u>Strategy 1.1</u> Multidisciplinary self-reported adherence survey	Chapter 5: Training needs of the multidisciplinary team <u><i>Manuscript 1:</i></u> Adherence to neurodevelopmental supportive care in the neonatal intensive care unit: A survey among the multidisciplinary team Qualitative results of the multidisciplinary survey
	<u>Objective 1.2</u> To investigate the current neurodevelopmental supportive care operationalisation in the neonatal intensive care unit of the two selected public hospitals	<u>Strategy 1.2</u> Pre-implementation survey	
2. Conducting a fit assessment	<u>Objective 1.3:</u> To conduct an intervention fit assessment for the selected hospitals	<u>Strategy 1.3</u> Description of how the Little Steps® training intervention fits the organisation setting and identified training needs	Chapter 6: Neurodevelopmental supportive care in the neonatal care unit

QUALITY IMPLEMENTATION FRAMEWORK (QIF)	PHD STUDY PHASES, AIMS AND OBJECTIVES	PHD STUDY RESEARCH STRATEGIES	ORGANISATION OF THE PHD THESIS
3. Conducting a capacity/readiness assessment <u>Decisions about adaptation</u> 4. Possibility for adaptation * Addressed as part of Step 2 of the QIF in this PhD study	<u>Objective 1.4:</u> To determine the readiness of the multidisciplinary team for implementation of the neurodevelopmental supportive care training programme	<u>Strategy 1.4</u> Multidisciplinary team readiness to change survey	The current operationalisation of neurodevelopmental supportive care in the neonatal intensive care unit Description of the Intervention Fit Assessment <i><u>Manuscript 2:</u></i> A readiness for change assessment of two tertiary hospitals in preparation for a neurodevelopmental supportive care training intervention.
<u>Capacity-building strategies</u> 5. Obtaining explicit buy-in from critical stakeholders and fostering a supportive community/ organisational climate * Obtained through the pre-innovation session in this PhD study 6. Building general/organisational capacity * Not applicable in this PhD study 7. Staff recruitment/maintenance * Not applicable in this PhD study 8. Effective pre-innovation staff training	<u>Objective 1.5:</u> To develop a pre-innovation session for the critical stakeholders	<u>Strategy 1.5</u> Presentation of planned intervention to critical stakeholders	Description of the Pre-innovation Session

QUALITY IMPLEMENTATION FRAMEWORK (QIF)	PHD STUDY PHASES, AIMS AND OBJECTIVES	PHD STUDY RESEARCH STRATEGIES	ORGANISATION OF THE PHD THESIS
QIF PHASE 2	PHASE 2		
Creating a Structure for Implementation	AIM 2: To Create a Structure for Implementation and Preparing for Implementation		
<u>Structural features for implementation</u> 9. Creating implementation teams <i>* Not relevant in this PhD study</i> 10. Developing an implementation plan	<u>Objective 2.1:</u> To develop a plan for implementing the training programme	<u>Strategy 2.1</u> Description of the plan for implementation	Chapter 7: Preparation for implementation Development of an implementation plan
QIF PHASE 3	PHASE 3		
Ongoing Structure Once Implementation Begins	AIM: Implementation of the Training Programme Intervention and Process Evaluation		
<u>Ongoing implementation support strategies</u> 11. Technical assistance/ coaching/ supervision <i>* Outside the scope of this PhD study</i> 12. Process evaluation 13. Supportive feedback Mechanism <i>* Outside the scope of this PhD study</i>	<u>Objective 3.1:</u> To implement the neurodevelopmental supportive care training intervention	<u>Strategy 3.1</u> Using the Guideline for Reporting Evidence-based practice Educational interventions and Teaching (GREET) to describe the implementation of the intervention	Chapter 8: Implementation of the intervention Implementation of the training programme Chapter 9: Implementation process evaluation <u><i>Manuscript 3:</i></u> Facilitators and barriers in the implementation of a neurodevelopmental supportive care training programme in the South African public sector hospitals
	<u>Objective 3.2:</u> To identify facilitators and barriers to change practice	<u>Strategy 3.2</u> Focus groups to determine: • implementation facilitators and barriers • if the training resulted in a change in practice	

QUALITY IMPLEMENTATION FRAMEWORK (QIF)	PHD STUDY PHASES, AIMS AND OBJECTIVES	PHD STUDY RESEARCH STRATEGIES	ORGANISATION OF THE PHD THESIS
	Objective 3.3: To determine the effect of implementing a multidisciplinary neurodevelopmental supportive care training programme	Strategy: 3.3 Post-implementation survey	<i>Manuscript 4:</i> A change in practice following the implementation of a neurodevelopmental supportive care training programme in the South African public healthcare sector Chapter 10: The effect of the implementation of a training programme
QIF PHASE 4			
Improving Future Applications	Recommendations for Future Implementation Initiatives		
14. Learning from experience	Not an objective in this study. Will be included in the final chapter as a reflection on the implementation process	<u>N/A</u>	Chapter 11: Summary of findings, recommendations, limitations and reflection

1.7. SIGNIFICANCE AND CONTRIBUTION OF THIS STUDY

In implementing an evidence-based training programme for the MDT, who provides services to preterm infants in the NICU, this study fits with the WHO's commitment to reduce health problems and mortality of the preterm infant, with specific emphasis on the development of tools to improve healthcare professionals' skills (WHO, 2012; Gaffey, Das, & Bhutta, 2015; Kumar, Kumar, & Vivekadhish, 2016). The researcher envisions a difference in the day-to-day operationalisation of the NICU but also that this study will contribute to future training and implementation initiatives in the public sector NICU.

Through the use of implementation research as a methodology, the aim was to bridge the gap between research and implementation of evidence in a much shorter time (Peters, Tran, & Adam, 2013). It is often difficult for MDT members to attend training due to excessive workload and financial constraint. By providing training, as part of a research project, it made it possible for a much larger group of healthcare professionals to gain knowledge of NDSC in a short period of time.

International research indicates the long-term medical and educational costs related to the management of the preterm infant are enormous as these infants often are at risk of chronic illness, rehospitalisation and developmental delay (Beck, et al., 2010; Blencowe, et al., 2012; Johnson, et al., 2013). In South Africa preterm infants are especially vulnerable due to limited resources and insufficient specialist care in the public healthcare sector (Van der Westhuyzen & Kenner, 2013). Additionally, when considering the socioeconomic status of the majority of public health users in South Africa (Harris, et al., 2011), it is vital for the preterm infant in the public healthcare sector to receive the best possible care, to prevent further physical and psychological deficits that could lead to long-term excess medical and educational expenditure.

1.8. WORLDVIEW OF THE RESEARCHER

The words *worldview* and *paradigms* are often used interchangeable in research (Shannon-Baker, 2016). Worldviews or paradigms refer to the way we think and feel about the world. Morgan (2007, p. 49) defined worldviews as: "Systems of beliefs and practices that influence how researchers select both the questions they study and methods that they use to study them".

Shannon-Baker (2016) suggested four main paradigms which can direct and support researchers in combination quantitative and qualitative studies: pragmatism, transformative-emancipation, dialectics, and critical realism (Shannon-Baker, 2016). For the purpose of this implementation study a multiphase design was used which fits within the pragmatism paradigm. This paradigm entails using the method best suited to address the research question or aim; it is fluid and not limited to one specific study design. It can include a variety of methods, techniques and procedures from both quantitative as well as qualitative research (Morgan, 2007; Creswell, Klassen, Plano Clark, & Smith, 2011; Shannon-Baker, 2016). In this study every phase and step in the implementation process required an individual approach and methodology.

With the pragmatic approach researchers do not have to be completely objective nor subjective and are instead described as being intersubjective (Morgan, 2007; Shannon-Baker, 2016). This means that for the pragmatic researcher there is a single 'real world' but this real world can be experienced differently by everyone involved (Morgan, 2007). In this study the single real world can be seen as the NICU environment which is differently understood or interpreted by the different multidisciplinary team members providing services in this environment.

Pragmatism further focuses on an intervention that will make a difference (Shannon-Baker, 2016) and in this study the researcher firmly believed the implementation of a training programme, related to NDSC, would make a difference in the application of this approach in the public sector NICU. Transferability is an important aspect in any research and also applies to the pragmatic approach (Morgan, 2007). In implementation research the context needs to be described in detail as contextual factors can influence the successful implementation of an intervention (Peters et al., 2013; Bauer, Damschroder, Hagedorn, Smith, & Kilbourne, 2015; Pfadenhauer et al., 2015). By being explicit about the context of the study, other practitioners can potentially use the findings in their settings or researchers can replicate the study.

1.9. ORGANISATION OF THE CHAPTERS

This thesis consists of eleven chapters and is a hybrid format which includes both traditional chapters such as the literature review and methodology chapters as well as research manuscripts in the publication format. Due to the inclusion of manuscripts, some repetition across chapters is inevitable. The organisation of the chapters is described in Table 1.1 (last column): Overview of this PhD study using the Quality Implementation Framework (QIF) as a guide. In the next chapter a review of the literature on neurodevelopmental supportive care will be presented.

CHAPTER 2: LITERATURE REVIEW ON NEURODEVELOPMENTAL SUPPORTIVE CARE

*“Developmental care will make the biggest difference
and be most successful in the most challenged settings”*

(Als et al., 2003, p. 406)

2.1 INTRODUCTION

In this chapter the literature is reviewed on prematurity, morbidity associated with prematurity, the importance of the neurodevelopmental supportive care (NDSC) approach when caring for preterm infants in the neonatal intensive care unit (NICU) and the multiple benefits of this approach. The researcher considered the implementation of NDSC in the NICU and the importance of training as part of the implementation process. Available training programmes on neurodevelopmental supportive care, both internationally and nationally, were explored. Literature on the implementation of the international training programmes was critiqued and the paucity of studies on the implementation of training programmes in South Africa was highlighted.

The following databases were used with the publication date limit set from 2000 to 2020: Science Direct, Biomedical Central, Elsevier, Google Scholar, Cochrane Library, Pubmed and CINAHL. The key words included: developmental care, neurodevelopment, preterm, premature, neonatal intensive care, training, guidelines and implementation.

2.2 PRETERM INFANTS AND MORBIDITY

The premature birth of infants, before 37 weeks gestation, remains a global concern (Howson et al., 2012). In 2010 it was estimated almost nine million babies were born preterm in sub-Saharan Africa and Asia (Blencowe et al., 2012) while the preterm birth rate in South Africa was an estimated 12.4 per 1000 live births in 2014 (Chawanpaiboon et al., 2019). Although accurate national incidences are unknown, the impact of preterm birth cannot be ignored in the light of the sustainable development goals (Ramokolo, Mlaba, Rhoda, Kauchali, & Goga, 2019). Prematurity can cause a variety of health and developmental problems. These infants find themselves in the NICU, a medical environment with fluorescent lights,

noise, noxious smells, inappropriate handling and poor positioning (Post & Maree, 2009; Goldstein, 2012). The infant's immature brain is unable to effectively deal with the excessive sensory input which can cause a neurological overload or permanent neurological changes (Sizun & Westrup, 2004; Post & Maree, 2009; McGrath, Cone, & Samra, 2011; Smith et al., 2011).

Preterm birth is a major determinant for neonatal morbidity with adverse short-term and long-term effects. In comparison to children born after 37 weeks gestation, premature infants often present with neurological conditions such as cerebral palsy, sensory deficits (hearing loss and blindness), language deficits, learning disabilities, cognitive deficits, emotional disorders, behavioural deficits and respiratory illnesses (Beck et al., 2010; Aylward, 2014; Grunewaldt et al., 2014; Vohr, 2014; Chang, 2015; Altimier & Phillips, 2016; Coughlin, 2017; Johnson & Marlow, 2017).

At the moment the only effective intervention for preterm birth is prevention but even with the adoption of a variety of prevention strategies, it only slightly reduces the preterm birth rate (Chang et al., 2013). It is therefore essential to focus on prenatal as well as postnatal interventions to prevent the complications associated with preterm birth (Chang, 2015). Prenatal interventions most often focus on the medical care of the mother where the postnatal interventions focus on the care of the infant. One such postnatal intervention is neurodevelopmental supportive care, an evidence-based intervention aiming to provide the best care for preterm infants and their families while in the NICU.

2.3 NEURODEVELOPMENTAL SUPPORTIVE CARE

Internationally developmental care has been investigated in depth since the early 1960's. It was determined the NICU environment was too stressful for preterm infants and it affected their health and neuro-behavioural development. The preterm infant has specific care needs and the NICU environment should, as far as possible, mimic the intrauterine environment (Symington & Pinelli, 2006). This realisation led to the development of the Developmental Supportive Care Approach which was based on Als' Synactive Theory (Als, 1986). Developmental care is described as a group of interventions aiming to decrease the stress of the NICU environment (Symington & Pinelli, 2006). This approach entailed a preemie-friendly

model of care which was family-centred and infant-focused, moving away from the medical model of care (Post & Maree, 2009; Phillips, 2015; Altimier & Phillips, 2016; Milette et al., 2017).

Various terms are used interchangeably in the literature to describe neurodevelopmental supportive care. These include: developmental care, neurodevelopmental supportive care, developmentally supportive care, neuroprotection, neonatal integrative developmental care, individualised, family-centred care or family-integrated care. In an integrative literature review, 42 elements of NDSC were identified which were further grouped into nine categories of NDSC (Lubbe et al., 2012). These nine categories constituted a comprehensive modality of care and included: the NICU design; individualised care; a family-centred care philosophy; positioning; handling techniques (transition support); management of the external environment; management of pain; feeding methods and knowledge of preterm infant development (Lubbe et al., 2012). In a similar literature review, five core concepts of developmental care were identified: protected sleep; pain and stress assessment; developmental activities of daily living; family-centred care; and the healing environment (Coughlin, Gibbins, & Hoath, 2009). These concepts, together with the Universe of Developmental Care Model, were further developed into the Neonatal Integrative Developmental Care Model which consists of seven core measures (Gibbins, Hoath, Coughlin, Gibbins, & Franck, 2008; Altimier & Phillips, 2013). The seven core measures are: partnering with families, positioning and handling, safeguarding sleep, minimising stress and pain, protecting skin, optimising nutrition and the healing environment. Despite the different terms and developmental care models, the key concepts are very similar and relate mainly to the management of the preterm infant, the involvement of the caregivers and the manipulation of the environment, in the NICU. Figure 2.1 provides a comparison between the NDSC categories (Lubbe, 2009) and the Neonatal Integrative Developmental Care Model (Altimier & Phillips, 2013).

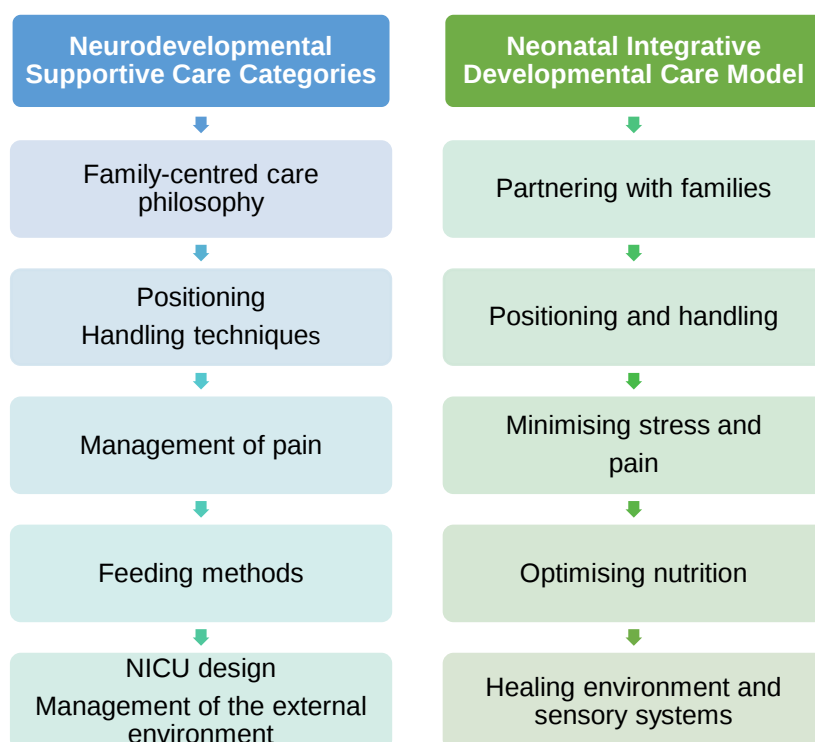


Figure 2.1: Comparison between the Neurodevelopmental Supportive Care (NDSC) categories and the Neonatal Integrative Developmental Model

2.4 BENEFITS OF NEURODEVELOPMENTAL SUPPORTIVE CARE

Over the last couple of decades there has been a plethora of studies on developmental care highlighting the positive short- and long-term effects of this approach on the development of preterm infants. Short-term benefits include improved feeding, growth and weight gain, reduced need for respiratory support and better lung function, improved reflexes, decreased motor stress signals and better self-regulation, reduction in length of stay, reduction in cost of hospitalisation and critical care costs (Symington & Pinelli, 2002; Peters et al., 2009; Als et al., 2012; O'Brien et al., 2013; Craig et al., 2015). Long-term benefits of developmental care include improved motor- and neurodevelopment, visual information processing, cognition, psychosocial and behavioural development, emotional regulation and educational outcomes (Peters et al., 2009; Ullenhag, Persson, & Nyqvist, 2009; McAnulty et al., 2010; Als et al., 2012; McAnulty et al., 2013; Craig et al., 2015).

These results confirmed NDSC as the best evidence-based approach to use when caring for the preterm infant in the NICU (Robison, 2003; McAnulty et al., 2010; Legendre et al., 2011; Montirosso, Del Prete, Bellù, Tronick, & Borgatti, 2012;

Altimier & Phillips, 2016; Macho & Zukowsky, 2017). Various guidelines and standards of best practice have been published with the latest being the Standards, Competencies and Recommended Best Practices for Infant and Family-centered Developmental Care in the Intensive Care Unit (Consensus Committee of the Standards et al., 2020).

2.5 IMPLEMENTATION OF NEURODEVELOPMENTAL SUPPORTIVE CARE IN THE NEONATAL INTENSIVE CARE UNIT

Practice guidelines can facilitate the successful implementation of evidence-based knowledge into practice by providing a road map on the specific steps to follow. In 2017 the Canadian Association of Neonatal Nurses (CANN), the Canadian Association of Perinatal and Women's Health Nurses (CAPWHN), the Council of International Neonatal Nurses (COINN), and the National Association of Neonatal Nurses (NANN) published a joint statement on the guidelines for institutional implementation of developmental care in the NICU (Milette et al., 2017). These guidelines aim to provide a framework to facilitate the implementation process (Milette et al., 2017).

This implementation framework consists of five phases: plan, educate, prioritise, evaluate and ensure sustainability. It is described as a flexible framework with phases and steps which can occur either sequentially or concurrently (Milette et al., 2017). As the context and needs of each NICU is likely to be different it will be necessary to adapt the framework accordingly (Milette et al., 2017). For the purpose of this study, the focus will be on education or training as the first phase of implementation of developmental care in the NICU.

Training forms an important part of the implementation process (Bertram, Blase, Shern, Shea, & Fixsen, 2011; NCEC, 2018). It is essential for healthcare professionals, providing services to preterm infants, to have sufficient knowledge of developmental care to enable them to implement this approach in the NICU. Various studies highlighted a lack of knowledge or training as a potential reason for poor implementation (Galarza-Winton et al., 2013; Lawn, Davidge, Paul, von Xylander, Johnson, et al., 2013; Zhang et al., 2014; Bauer et al., 2015). It is therefore necessary to consider the availability of developmental care training programmes internationally and nationally to support the implementation of NDSC.

2.6 INTERNATIONAL TRAINING PROGRAMMES ON NEURODEVELOPMENTAL SUPPORTIVE CARE

Internationally there are a few well recognised training programmes on developmental care, namely the Newborn Individualized Developmental Care and Assessment Program (NIDCAP); the Family and Infant Neurodevelopmental Education (FINE) programme, which is endorsed by the NIDCAP Federation International, the European Foundation for the Care of Newborn Infants (EFCNI), and participating university centres; and the Wee Care Neuroprotective NICU programme (Wee Care). Following the discussion of the various training programmes below, Table 2.1 provides an overview of these programmes.

The NIDCAP training programme is described as comprehensive, integrated and holistic family-centred developmental care while the Wee Care training is a quality and process improvement programme, designed to optimise the NICU environment and caregiving practices (Haumont, 2014; Altimier, Kenner, & Damus, 2015). The FINE programme first started in the UK NIDCAP centre as an in-service programme but has since been developed into an established course in the UK and internationally (Warren, 2017).

Training of the entire multidisciplinary team (MDT), namely doctors, nurses and allied healthcare professionals, is required for the successful implementation of developmental care in the NICU (Als, 2008; Macho & Zukowsky, 2017). This is essential as developmental care is a multidisciplinary approach and every team member should have the necessary knowledge (Barbosa, 2013; Sturdivant, 2013; Altimier et al., 2015). The three training programmes, mentioned above, are targeted at all healthcare professionals who are in contact with preterm infants or who provide services in the NICU. This even includes support staff such as secretaries and cleaners (Altimier et al., 2015; Milette et al., 2017). The NIDCAP programme initially recommended the training of 10% of the NICU staff but more recent studies recommended for at least 30% of the staff to be trained in developmental care (Als, 1997; Milette et al., 2017).

All three programmes include training on an individual level but the NIDCAP and Wee Care programmes provide additional consultations to the NICU (Als, 2008; Altimier et al., 2015). The NIDCAP consultations entail the evaluation of the unit

and providing advice on the environment, developmental team building, developmental care implementation and family inclusion. It also includes consultation provided to the developmental specialists and the MDT on the implementation of developmental care (Als, 1982, 2008; Sheldon, 2017). The Wee Care consultation process includes an assessment of the unit and care practices, determining the hospital's needs, a leadership workshop as well as ongoing support via team meetings for at least a year. It further includes on-site clinical and leadership follow-up visits during the year (Altimier et al., 2015). It is clear the NIDCAP and Wee Care training programmes are both intensive and comprehensive, ensuring implementation of developmental care in practice. These programmes cannot be compared with simple individual training programmes such as the FINE programme.

There appears to be an extensive overlap in the content of the different training programmes. All three programmes focus on the infant as an individual with unique developmental behaviour and needs, the importance of the family in the care of these infants and the impact of the environment on the development of these infants. The NIDCAP is based on Als' synactive theory of development centring around the infant's subsystem stability and environmental and care interactions (Als, 2009). The Wee Care programme is based on seven core measures: The Healing Environment, Partnering with Families, Positioning and Handling, Safeguarding Sleep, Minimizing Stress and Pain, Protecting Skin, and Optimizing Nutrition (Altimier et al., 2015) while the FINE programme consists of six core themes: Infant Development, Observation, Family, Reflection, Systems and Evidence (Warren, 2017).

The training programmes include a variety of didactic and practical sessions such as PowerPoint presentations/lectures, observations, videos, online e-learning activities, interactive workshops, bedside activities, reflective writings and consultations (Als, 2008; Altimier et al., 2015; Warren, 2017). The duration and cost of the training programmes vary greatly with individual courses ranging from ±\$264 to \$1500 per person per day. The exact cost of the NIDCAP and Wee Care consultations are unit specific and is calculated based on the needs of these units. Although the FINE programme is more accessible, flexible and affordable (Warren, 2017), it is not available in all countries. NIDCAP (including FINE) training centres

are located in North and South America, Australia, Europe and the Middle East. According to the Philips Healthcare Education website (2020), some of the learning units of the Wee Care training programme is available online. It is, however, not clear if these units are available to healthcare professionals outside the USA as the researcher was unable to access information on the Wee Care training programme.

Table 2.1: International and national developmental care training programmes

International training programmes	Target group & Individual training/ Hospital-based	Content	Format	Duration	Cost/Person (excluding travel and accommodation)	Training centres
Newborn Individualized Developmental Care and Assessment Program (NIDCAP) (Als, 2008)	Multidisciplinary healthcare professionals Hospital-based and individual training	- Assessment of the environment - Assessment of care - In-depth infant behavioural observation - Developmental care planning and implementation - Neurobehavioural assessment	Theoretical and practical components Face-to-face training	This is a 12-month in-depth individual training programme consisting of: <u>Level I</u> : Basic NIDCAP Training <u>Level II</u> : Developmental Care Specialist Training	± \$1500/day (R27 705) Cost of the certification of the unit is unit specific	United States of America, Canada, Australia, Europe and the Middle East
Family and Infant Neurodevelopmental Education (FINE) Programmes (Warren, 2017)	Multidisciplinary healthcare professionals Individual training	<u>Level 1: Foundations</u> - Models of developmental care - Brain development - Observing babies - Family participation - Stress and pain - Sleep Sensory environment - Kangaroo Care - Motor development and positioning - Early feeding experience <u>Level 2: Practical Skills</u> Mainly self-directed learning focusing on improving practical skills and clinical practice	Theoretical and practical components Face-to-face training	<u>Level 1</u> : 1.5 days <u>Level 2</u> : 12 weeks	Level 1: ± \$246 (R4 544) Level 2: ± \$800 (R14 776)	United States of America, Canada, Australia, Europe and the Middle East
Wee Care Neuroprotective NICU programme (Wee Care) (Altimier et al., 2015)	Multidisciplinary healthcare professionals	- Healing environment - Partnering with families - Positioning and handling - Safeguarding sleep	Theoretical and practical components	18-month training programme	Costs are unit specific	United States of America

	Hospital-based	- Minimising stress and pain - Protecting Skin - Optimising Nutrition	Face-to-face and on-line training			
South African training programmes	Target group & Individual training/ Hospital-based	Content	Format	Duration	Cost/Person (excluding travel and accommodation)	Training centres
Little Steps® Neurodevelopmental Supportive Care (NDSC) Training Programmes (http://www.littlesteps.co.za/)	Multidisciplinary healthcare professionals Individual training	Introductory Course - Fetal development; - Neurosocial behaviour of the newborn infant - Disorganised behaviour in the preterm infant - Management strategies to support optimal neurodevelopment - Positioning, positive touch, macro- and micro environments - Kangaroo Mother Care (KMC) - Parental adaptations in preterm birth - Feeding of the preterm infant - Information on preparation for discharge - Transition to the home environment <i>The essential components of the introductory and comprehensive programmes are the same. The four-day programme, however, provides more opportunity for practice, observations, videos, discussions and bedside training sessions.</i>	Theoretical and practical components Face-to-face training	Introduction course on NDSC: 1 day Comprehensive course on NDSC: 4 days	\$43 (R800) \$244 (R4500)	South Africa

* Rate of exchange used ZAR1.00: USD18.47 XE.com 18 May 2020

2.7 STUDIES ON INTERNATIONAL NEURODEVELOPMENTAL SUPPORTIVE CARE TRAINING PROGRAMMES

There are a multitude of studies on NIDCAP although a large quantity of these are literature reviews and systematic reviews (Als & McAnulty, 2011; Legendre et al., 2011; Ohlsson & Jacobs, 2013; Bieleninik & Gold, 2014; Haumont, 2014; Kaye, 2016; Silberstein & Litmanovitz, 2016; Acevedo, Becerra, & Martínez, 2017; Nelson, 2019). Empirical studies on NIDCAP from 2010 to 2020 focused mainly on infant outcomes, staff perceptions, parent satisfaction and barriers in the implementation of NIDCAP (McAnulty et al., 2010; Solhaug, Bjørk, & Sandtrø, 2010; Als et al., 2011; Als et al., 2012; Mosqueda et al., 2013; Nelson & Bedford, 2016; Sannino et al., 2016; Moody, Callahan, Aldrich, Gance-Cleveland, & Sables-Baus, 2017; Dehghani, Vahedian, & Salmani, 2019; Mirlashari, Fomani, Brown, & Tabarsy, 2019). These studies did not investigate the implementation of NIDCAP as a training programme but rather the effect of the previously implemented NIDCAP approach. In many of these studies, the healthcare professionals were already trained in NIDCAP or the units already employed the NIDCAP approach. This is possibly due to the fact that NIDCAP training has been in existence in the USA since the 1980s, when developmental care became the standard of practice, not only in the USA, but also in other parts of the world (Kaye, 2016; Craig & Smith, 2020). Healthcare professionals working in these NICUs therefore received the necessary training on developmental care or were directed by NIDCAP trained professionals on developmental care guidelines, prior to the studies being conducted. From the literature it is clear there is sufficient evidence of the multiple benefits of the NIDCAP approach but it is not a suitable training programme to be implemented in all NICUs due to the excessive costs associated with the training and the extensive time it takes for complete implementation of the programme.

Studies on the Wee Care and the FINE training programmes are sparse. Three studies on the Wee Care programme were identified which indicated improved infant medical outcomes, decreased length of stay, decreased hospital costs and improved developmental care practice based on the seven core measures (Hendricks-Muñoz, Prendergast, Caprio, & Wasserman, 2002; Altimier, Eichel, Warner, Tedeschi, & Brown, 2005; Altimier et al., 2015). Although the Wee Care training program was used in all three studies, there were differences in the duration

of the educational components, varying from an 8-hour course to a 5-day programme. This is probably due to the individual needs of each unit as determined by the initial assessment of the hospital. In all three studies the entire NICU staff were trained including auxiliary staff. In two of the studies the staff were further supported by the Wee Care team for at least another year following the individual training (Hendricks-Muñoz et al., 2002; Altimier et al., 2015). In one study the training programme was further accompanied by various environmental changes in the NICU environment related to light and noise (Altimier et al., 2005). These changes in the NICU contributed to the positive results of this study. It is also important to note, in the study by Hendrick-Muñoz (2002), the training program was presented to staff who were providing services in a NICU where a family-centred care approach has already been implemented. The training programme was therefore an additional strategy to improve developmental care in the NICU.

Only one study has been conducted on the FINE training programme reporting improvement in practice of participants who attended the training (Warren, Mat-Ali, Green, & Nyathi, 2019). Similarly to the NIDCAP studies, this study was conducted in units where some of the participants already received FINE training, prior to the study. Aspects of developmental care was therefore already practiced in these units when participants had to report on either a change in practice across the unit (Survey 1) or their perception of a change in their own practice following the training (Survey 2). Participants, whether they received the FINE training or not, perceived the practice in units as positive following the training programme. It is, however, important to note that this was self-reported change in the units or in individual practices which does not necessarily indicate the true quality of services provided. The training was available to all MDT members although not all staff attended the training. The authors indicated a total of 131 staff members, from all units, attended the training but it is not clear what the total percentage was of staff who were trained. The training programme that staff attended was the Level 1 course which is an introductory course.

Other studies on developmental care training include studies by Milette et al. (2005), Ludwig et al. (2008) and Mosqueda-Peña et al. (2016). The authors employed developmental care training programmes to determine if these would improve infant outcomes, knowledge of staff and developmental care practice in the NICU. The

training programme used in Milette et al.'s study (2005) was in-house training developed by an advanced practice nurse and consisted of an 8-hour training session on developmental care while the four-day training course in Mosqueda-Peña et al.'s study (2016) was in-house training presented by a doctor and a nurse who were trained in NIDCAP. In Ludwig et al.'s (2008) study the authors referred to a four-day focused educational programme. These training programmes also included a variety of formal and informal teaching methods with videos, photographs, quizzes and positioning practice periods. Although the training programmes used in these studies were not well-recognised developmental care training programmes, the content appeared to be similar to the NIDCAP, Wee Care and FINE training programmes. The results of these studies supported the use of training programmes to improve the knowledge of staff on developmental care although it is not clear if an increase in knowledge translated to a definite change in practice in the NICU (Milette et al., 2005; Mosqueda-Peña et al., 2016).

2.8 NEURODEVELOPMENTAL SUPPORTIVE CARE IN SOUTH AFRICA

Despite developmental care being a well-researched area with obvious benefits, it remains a mainly theoretical concept in South Africa. Studies in 2009 and 2017 confirmed developmental care was still not fully implemented in South African private or public sector NICUs as standard practice of care (Lubbe, 2009; Rheeder et al., 2017). One of the main reasons for a lack of implementation of this intervention, can be linked to limited training and a gap in the knowledge of healthcare professionals on developmental care (Lubbe, 2009; Martinez et al., 2012; Galarza-Winton et al., 2013; Lawn, Davidge, Paul, von Xylander, Johnson, et al., 2013; Zhang, Lee, Chen, & Liu, 2016). Training on developmental care is not freely available in South Africa. Furthermore, information on this approach is not always included in the curricula of all medical, nursing or allied healthcare professional undergraduate programmes in South Africa, as it is often seen as a specialised field of practice (Vergara et al., 2006; Barbosa, 2013; Butler, 2018). The application of NDSC is associated with training on developmental supportive care. Staff who attended training on developmental care, are better able to apply basic NDSC principles such as reading preterm infant cues (Lubbe, 2009). Without the

necessary knowledge it will be challenging to implement the developmental care approach in the NICU.

2.9 TRAINING PROGRAMMES IN SOUTH AFRICA

The only comprehensive developmental care training programmes, currently available in South Africa, are the courses presented by Little Steps®. Little Steps® was founded in 2004 by Welma Lubbe, Professor in midwifery and neonatal nursing at the North-West University, Potchefstroom. The Little Steps® training programmes are currently being presented by the North-West University as an accredited short learning programme.

Two different courses are provided: a one-day, Introduction to NDSC Course and a four-day Comprehensive Training on NDSC Course (Table 2.1). These are structured courses which include theoretical and practical components. The content is based on the nine categories of developmental care as determined in an integrative literature review (Lubbe et al., 2012) and include information on: fetal development; neurosocial behaviour of the newborn infant; disorganised behaviour in the preterm infant; management strategies to support optimal neurodevelopment; positioning, positive touch, macro- and micro environments; kangaroo mother care (KMC); parental adaptations in preterm birth; feeding of the preterm infant; information on preparation for discharge and transition to the home environment. The content is similar to that of other international courses. The cost of the courses varies between R800 (\$43) per person for the one-day introductory course and R4500 (\$244) per person for the four-day course (2020 tariffs). These courses are much more affordable in comparison to international courses, especially for healthcare professionals working in the public sector hospitals in South Africa.

2.10 STUDIES ON NATIONAL NEURODEVELOPMENTAL SUPPORTIVE CARE TRAINING PROGRAMMES

To the best of the researcher's knowledge, there is currently no literature available related to studies on developmental care training programmes in South Africa. The only studies on developmental care focus on: the evaluation of current developmental care practice in the NICU, the development of best practice guidelines, guidelines for implementation of developmental care and the

implementation of developmental care guidelines (Hennessy, 2007; Lubbe, 2009; Post & Maree, 2009; Rakhetla & Lubbe, 2016; Rheeder et al., 2017). One of the guidelines implemented in Hennessy's study (2007) was the education and empowerment of staff which was seen as critical for successful implementation of developmental care. The researcher trained all medical and non-medical support staff at a specific public sector NICU on developmental care principles. These included: individualised care, family-centred approach, positioning, handling techniques, environmental manipulation, non-nutritive sucking and pain management. Training sessions included PowerPoint presentations and practical sessions and varied between 30 to 90 minutes. Additional support and bedside training were provided including the use of role models in the unit. The need for an induction programme was highlighted due to the fast turnover of staff. Although the main aim of Hennessy's (2007) study was to implement developmental care in the NICU, one of the secondary aims related to the knowledge and skill of the staff. The researcher highlighted how the educational programme improved the staff's knowledge and reported evidence of the implementation of developmental care, which was visible in the unit. This study provides valuable information to consider when implementing a training programme on developmental care in South Africa such as the inclusion of the entire MDT in the training, training the team on all developmental care principles, providing training on-site to facilitate attendance, presenting the training at the most convenient time for the participants and providing a training manual. Although there is a lack of studies on developmental care training programmes in South Africa, it is possible that private and public sector NICUs independently conduct quality improvement initiatives but publicly shared information on these is limited.

2.11 CONCLUSION

Neurodevelopmental supportive care is the best evidence-based approach for the care of preterm infants and their families. Knowledge of this approach is essential for the successful adoption of the NDSC approach in the NICU environment. Internationally, training programmes on NDSC are available to support the implementation of NDSC, however, in SA implementation is problematic due to limited training options. The international training programmes such as NIDCAP,

Wee Care and FINE are comprehensive but too costly and lengthy for the South African public healthcare sector context. The Little Steps® training programme is a South African course on neurodevelopmental supportive care which is more affordable, realistic for the public healthcare sector with limited resources and time, and contextualised for the SA context. Developmental care should be a shared, multidisciplinary approach and it is therefore important for all medical, nursing, allied health professionals and support staff, providing services in the NICU, to have sufficient knowledge of the care the preterm infant needs. There are currently no studies focusing on the process of implementing a neurodevelopmental supportive care training programme in public healthcare sector NICUs in South Africa. The next chapter will focus on the implementation process.

CHAPTER 3: REVIEW OF IMPLEMENTATION RESEARCH

“Making what is possible in theory, a reality in practice”

(Peters et al., 2013, p 8)

3.1 INTRODUCTION

The aim of this review was to critically review the implementation of evidence-based practice in the real world. The theoretical underpinning of implementation studies, including implementation theories, models and frameworks were explored and critically evaluated. Essential contextual factors or implementation facilitators/barriers, as identified from the literature, were scrutinised as these can impact on the successful implementation of an intervention. Implementation strategies, which can be used to address potential implementation barriers, were explored. The following databases were used: ScienceDirect, BioMed Central, Pubmed and Google Scholar including the Implementation Science Journal. Key words included implementation, theories, models, frameworks, determinants, contextual factors, facilitators, barriers and implementation strategies.

3.2 BEST EVIDENCE-BASED PRACTICE

Clinical and healthcare evidence is abundant, but affordable, life-saving research findings often do not translate into practice (Peters et al., 2013). This is to the detriment of patients, children and their families who are unable to benefit from these advances (Graham et al., 2006; Grimshaw, Eccles, Lavis, Hill, & Squires, 2012; Metz & Bartley, 2012). It is estimated that only about half of all evidence-based practices ever get implemented and it can take up to 17 years for such a process to be completed (Morris, Wooding, & Grant, 2011; Bauer et al., 2015; Durlak, 2015; Bauer & Kirchner, 2020). Research further shows not only do evidence-based interventions not get implemented in healthcare settings, but some existing care routines are deemed unnecessary or even harmful, further highlighting the need for speedy implementation of proven interventions (Schuster, 2015).

The adoption of evidence-based research into practice does not happen automatically and implementation research is one way of disseminating information (Bauer et al., 2015; Bauer & Kirchner, 2020). The World Health Organization (WHO) endorses implementation research to bridge the gap between research and

practice (Proctor et al., 2009; Peters et al., 2013) and in the last 30 to 40 years there has been an explosion of studies on implementation research (Peters et al., 2013; Durlak, 2015). Various reviews on implementation research have been conducted in recent years to make sense of the enormous amount of information on this field of study (Damschroder et al., 2009; Davies, Walker, & Grimshaw, 2010; Tabak, Khoong, Chambers, & Brownson, 2012; Chaudoir, Dugan, & Barr, 2013; Flottorp et al., 2013; Kirk et al., 2015; Moullin, Sabater-Hernández, Fernandez-Llimos, & Benrimoj, 2015; Albers, Mildon, Lyon, & Shlonsky, 2017; Birken, Powell, Presseau, et al., 2017; Geerligs, Rankin, Shepherd, & Butow, 2018; Nilsen & Bernhardsson, 2019).

3.3 IMPLEMENTATION RESEARCH

Implementation research is defined as “the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice and hence, to improve the quality and effectiveness of health services” (Eccles & Mittman, 2006, p. 1). Implementation research should form an integral part of programme development and implementation, as it is one way to achieve health gains in a short period of time (Peters et al., 2013). Implementation studies’ focus starts with evidence-based practice, such as neurodevelopmental supportive care, which is not effectively applied in practice (Bauer et al., 2015). Unlike dissemination studies which focus mainly on the spreading of information through training initiatives, implementation studies further take into consideration real-world issues often preventing successful implementation of an intervention (Peters et al., 2013; Bauer et al., 2015; Bauer & Kirchner, 2020). As discussed in Chapter 2, one of the potential reasons for poor implementation of developmental care in the NICU can be a lack of knowledge of this approach.

Implementation is described as a complex intervention with a vast scope relating to numerous fields of study including healthcare (May, 2013; NCEC, 2018; Damschroder, 2020). Researchers need to make various decisions, throughout the process, regarding the theories, models and/or frameworks they will use as well as the contextual factors and strategies to be included in the implementation study. A clear plan is needed to ultimately implement evidence-based practice and it is

therefore important for implementation structures to be based on theory (Bauer et al., 2015; Damschroder, 2020).

3.4 THEORY, MODELS AND FRAMEWORKS FOR IMPLEMENTATION

The success and failure of implementation studies have been linked to the use of theories as the basis for these studies (Tabak et al., 2012; Nilsen, 2015; Lynch et al., 2018). Theories can explain why certain knowledge or research findings translate to practices and others not. Various aims have been identified for the use of theories, models and frameworks in implementation studies such as: understanding the elements and describing the implementation process, improving the implementation design, considering the conditions of the context, evaluating factors affecting the implementation process, evaluating the implementation process, evaluating the implementation's effectiveness, and understanding the outcomes of implementation research (Eccles et al., 2009; Davidoff, Dixon-Woods, Leviton, & Michie, 2015; Nilsen, 2015; Birken, Powell, Presseau, et al., 2017).

When deciding on an implementation model, theory and/or framework it is recommended for researchers to consider the study's purpose, scope, available data as well as the resources (Lynch et al., 2018). Researchers in healthcare have access to more than 60 frameworks to outline their studies (Tabak et al., 2012) which can make it potentially difficult to decide which framework to use (Birken, Powell, Shea, et al., 2017; Lynch et al., 2018). The Center for Research in Implementation Science and Prevention (CRISP) (date unknown), developed a website to assist researchers in choosing appropriate models, frameworks or theories specific to their study and research question. The website includes a list of models which focus on dissemination, implementation or a combination of both. The website refers to models but the footnote states these also include theories and frameworks which aid in implementation research.

For the purpose of this study, only the implementation models were reviewed. CRISP identified 16 implementation models; each model is classified according to the construct flexibility which ranged from 1 to 5. A construct flexibility of 1 indicates a broad description of constructs while a 5 indicates specific, step-by-step procedures for implementation (Tabak et al., 2012). Healthcare interventions are developed to a high standard but when it comes to implementing these

programmes, the strategies lack the same rigor and attention to detail (Proctor et al., 2013; Fernandez et al., 2019). For this reason, only the CRISP models with a construct flexibility of 5 (detailed descriptions of the constructs or implementation steps) were critiqued in this review. These included three models: 1) Explaining Behavior Change in Evidence-Based Practice Model, 2) Availability, Responsiveness and Continuity (ARC) Model and 3) the Conceptual Model of Evidence-based Practice Implementation in Public Service Sectors.

In the first model, Explaining Behavior Change in Evidence-Based Practice, Michie et al. (2005) specifically looked at psychological theories, such as motivational theories, action theories and organisational theories and how these relate to change in human behaviour as successful implementation depends on human behaviour. The team identified 12 theoretical domains, constructs, and eliciting questions which can guide implementation researchers in understanding the facilitators and barriers in implementing evidence-based practice (Michie et al., 2005). The theoretical domains and constructs of this framework are well defined and the questions useful in guiding researchers but the framework does not provide a step-by-step plan or sequence of steps in order to execute the implementation. It rather guides the researcher in obtaining information on possible reasons for implementation failure or to improve poor implementation by analysing the possible causes and ultimately aiming to change behaviour.

The second model with a construct flexibility of 5, is the Availability, Responsiveness & Continuity (ARC) Model (Glisson & Schoenwald, 2005). This model was developed for the implementation of mental health treatment in poor rural community settings. Organisation and community change theories highlight the importance of the fit between the social context and the evidence-based practice to be implemented (Glisson & Schoenwald, 2005). The model identified four phases and 10 components needed for the successful implementation of social and mental health services for children. The authors briefly described the phases and components needed for implementation. This model was included in a 2012 review of 25 implementation frameworks by Meyers et al. (2012). The aim of the review was to determine the specific phases and steps to ensure quality implementation. When using the criteria from Meyers et al.'s review, the ARC Model included only

eight of the 14 critical implementation steps. Important aspects which were missing from the ARC Model included: a capacity/readiness assessment; possibility for adaptation; general organisational capacity building; staff recruitment/maintenance; implementation teams; and an implementation plan (Meyers, Durlak, et al., 2012). These are potentially important contextual factors or implementation strategies which can impact on successful implementation.

The last implementation model identified by CRISP, with a high construct flexibility, is the Conceptual Model of Evidence-based Practice Implementation in Public Service Sectors (Aarons, Hurlburt, & Horwitz, 2011). This is also a multilevel model with four phases: exploration, adoption decision/preparation; active implementation; and sustainment. The focus of this model is, however, mainly on the contextual factors which influence implementation and for this reason Meyers et al. (2012) did not include this model in their review of implementation frameworks. The model does not provide detailed steps for implementation but rather emphasises the typical problems faced in the implementation process.

Although the three models discussed above, were identified by CRISP as having detailed descriptions or clear implementation steps, on closer review, each model presented with a set of limitations. It is therefore necessary to consider other models or frameworks to guide the implementation process in this study. One type of model which can potentially provide the necessary structure for this implementation study, is process models. Process models usually consist of specific phases and steps on how an intervention should be implemented (Meyers, Durlak, et al., 2012; Bauer et al., 2015; Nilsen, 2015). Examples of such models are the Knowledge-to-Action framework (Graham et al., 2006) and the Quality Implementation Framework (QIF) (Meyers, Durlak, et al., 2012).

Due to the proliferation of implementation frameworks, it is tempting to use multiple frameworks simultaneously but this is not recommended as it can add unnecessary complexity to the process (Birken, Powell, Presseau, et al., 2017). The QIF was, however, developed based on the review of 152 studies related to implementation frameworks. The authors analysed 25 implementation frameworks to determine the crucial elements for quality implementation which then constituted the QIF (Meyers, Durlak, et al., 2012).

The QIF framework focuses on the how-to aspect of implementation and consists of four clearly defined phases and 14 critical steps for quality implementation (Figure 3.1). The four phases are: Initial Considerations Regarding the Host Setting; Creating a Structure for Implementation; Ongoing Structure Once Implementation Begins; and Improving Future Applications. It is described as a systematic process and although this framework provides a clear outline of the implementation process, it remains a dynamic process which indicates it might be necessary to revisit certain steps, skip steps or execute steps simultaneously (Meyers, Durlak, et al., 2012).

One of the limitations highlighted in the use of implementation frameworks, is that frameworks are often developed for specific contexts (Albers et al., 2017). The benefit of using the QIF in an implementation study, is that this framework was developed from literature on various studies, in various contexts, with various target populations. Many of the included healthcare studies focused specifically on the implementation of evidence-based innovations or interventions into everyday practice.

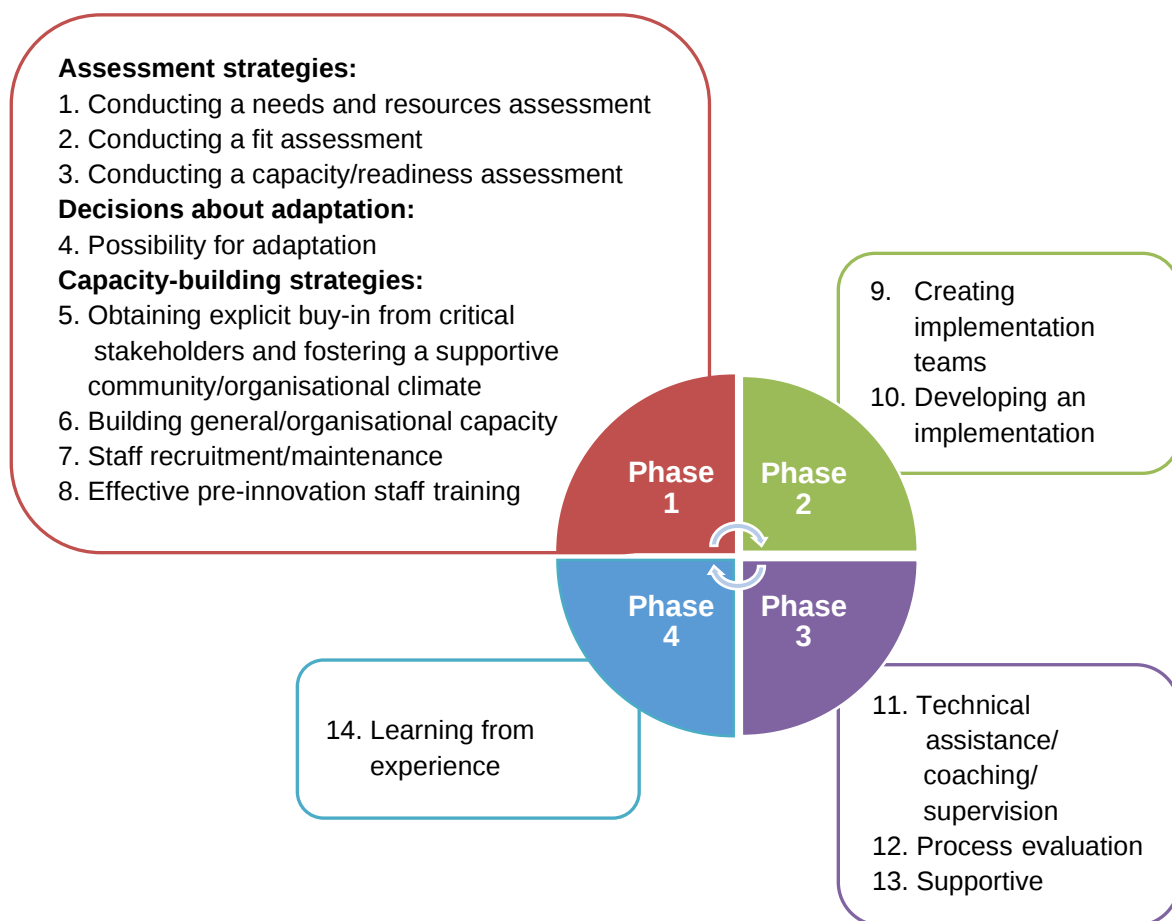


Figure 3.1: The Quality Implementation Framework (QIF) (Meyers, Durlak, et al., 2012)

Despite Meyers et al.'s (2012) synthesis of implementation frameworks, a 2015 systematic review determined there were still variations between available implementation frameworks (Moullin et al., 2015). It was recommended for the Generic Implementation Framework (GIF) to be used as a checklist when a researcher chooses a framework, making sure the main concepts are included in the chosen framework (Moullin et al., 2015). These concepts include: stages or steps of the implementation process; the intervention to be implemented; the implementation context; factors which can influence the implementation, strategies as well as evaluations (Moullin et al., 2015). When using the GIF checklist to scrutinise the QIF, the QIF seems to meet the requirements and include the main implementation concepts as set out in Table 3.1. Based on this evaluation, the QIF framework appears to be the most suitable process model to use in this implementation study. It has been derived from healthcare studies, it includes the most important concepts for quality implementation and the phases and steps of the framework are specific and practical.

Table 3.1: Using the Generic Implementation Framework as a checklist to evaluate the Quality Implementation Framework

GENERIC IMPLEMENTATION FRAMEWORK (GIF)	QUALITY IMPLEMENTATION FRAMEWORK (QIF)
Implementation process: Stages and steps	Four well-defined phases and 14 critical steps
The intervention/innovation	4. Possibility for adaptation 9. Creating implementation teams 10. Developing an implementation plan
The implementation context	1. Conducting a needs and resources assessment 2. Conducting a fit assessment 3. Conducting a capacity/readiness assessment
Influencing factors	5. Obtaining explicit buy-in from critical stakeholders and fostering a supportive community/organisational climate 6. Building general/organisational capacity 7. Staff recruitment/maintenance
Strategies	8. Effective pre-innovation staff training 11. Technical assistance/ coaching/ supervision
Evaluations	12. Process evaluation 13. Supportive feedback mechanism 14. Learning from experience

3.5 CONTEXTUAL FACTORS AFFECTING IMPLEMENTATION

Implementation is a complex process and various attempts to implement evidence-based programmes have failed (Aarons et al., 2011; Damschroder, 2020). This can often be attributed to contextual factors or determinants (Bauer & Kirchner, 2020). Contextual factors are described as facilitators and barriers which can support or prevent successful implementation and ultimately a change in practice (Wensing et al., 2011; Flottorp et al., 2013; Nilsen & Bernhardsson, 2019). Context is dynamic and what can be seen as a barrier in one setting, might be a facilitator in another setting (May, Johnson, & Finch, 2016). In a recent scoping review, 12 key context dimensions were identified to be considered in implementation studies (Nilsen & Bernhardsson, 2019). The most frequently identified context dimensions include:

organisational support, leadership, social relations and support, and financial resources (Nilsen & Bernhardsson, 2019).

An intervention cannot be implemented without the necessary support from the organisation. A supportive organisational culture which refers to the norms, beliefs and values of the organisation, can be seen as a facilitator in the implementation process (Burke et al., 2012; Geerligs et al., 2018; Nilsen & Bernhardsson, 2019). For successful implementation, the organisation and its members need to understand what the intervention entails and buy into its benefits (Meyers, Durlak, et al., 2012; Brooke-Sumner, Petersen-Williams, Kruger, Mahomed, & Myers, 2019). Buy-in from all members is essential as this will lead to ownership of the implementation process (Belizán et al., 2011). Furthermore, if the members of an organisation are ready for the proposed change, they are more likely to implement the intervention (Weiner, Lewis, & Linnan, 2008; Weiner, 2009; Geerligs et al., 2018).

Leadership is another contextual factor which can facilitate the implementation process. Leaders do not only include managers but also more informal leaders such as change agents or champions (Nilsen & Bernhardsson, 2019). Champions are individuals who can drive the implementation process, encouraging participation from others and making the necessary changes if challenges occur in the implementation process (Belizán, Bergh, Cilliers, Pattinson, & Voce, 2011; Burke et al., 2012; Nilsen & Bernhardsson, 2019).

Social relations and support are linked to good teamwork and communication which can also facilitate successful implementation (Belizán et al., 2011; Burke et al., 2012; Nilsen & Bernhardsson, 2019). Teamwork is essential especially where the intervention needs to be adopted by the entire team to be successful such as the neurodevelopmental supportive care approach (Godarzi et al., 2018). Clear and consistent communication between the organisation and the team members, on the intervention to be implemented, can motivate staff to take on the implementation challenge (Chan, Bergelson, Smith, Skotnes, & Wall, 2017; Geerligs et al., 2018). Open communication can further highlight difficulties in the implementation process which can be addressed timeously to ensure success (Geerligs et al., 2018).

Financial resources are one of the most frequently identified barriers in the implementation of interventions (Wakida et al., 2018; Nilsen & Bernhardsson, 2019). Financial resources are further linked to human resources, equipment and available time. If an organisation does not have sufficient financial resources, human resources, equipment or time available, the implementation process is likely to be unsuccessful (Chan et al., 2017; Geerligs et al., 2018; Godarzi et al., 2018).

It is suggested researchers should be aware of and be proactive in identifying potential barriers to implementation (Mihalic, Irwin, Fagan, Ballard, & Elliott, 2004; Meyers, Durlak, et al., 2012). By understanding the impact of contextual factors as discussed above, researchers can choose or develop implementation strategies to overcome these barriers ensuring successful implementation (Adesoye, Greenberg, & Neuman, 2016; Geerligs et al., 2018).

3.6 IMPLEMENTATION STRATEGIES

Implementation strategies are techniques used to support and improve the implementation of an intervention (Proctor et al., 2013; Powell et al., 2015; Kirchner, Smith, Powell, Waltz, & Proctor, 2020). Most of the time it is necessary to use multiple implementation strategies to ensure successful implementation of an intervention (Kirchner et al., 2020). In a project by the Expert Recommendations for Implementing Change (ERIC), 73 implementation strategies were identified grouped into nine thematic categories (Powell et al., 2015). Implementation strategies can be used to inform the planning of an implementation study or to improve on the implementation study post-implementation (Kirchner et al., 2020).

An implementation framework can guide a researcher in deciding which strategies to include in the implementation process (Kirchner et al., 2020). The QIF already includes a variety of implementation strategies which form part of the 14 implementation steps (Figure 3.1). These strategies are divided into three categories: assessment strategies, capacity building strategies and support strategies (Meyers, Durlak, et al., 2012; Meyers, Katz, et al., 2012). The assessment and capacity-building strategies are mainly employed in the first phase of the QIF which focuses on the setting where the implementation is due to be implemented. These implementation strategies include the assessment of the organisation's needs, the assessment of the fit between the intervention and the

organisation, the assessment of the readiness of the organisation, obtaining buy-in for the intervention and using pre-innovation training to inform management and staff of the intervention due to be implemented (Meyers, Durlak, et al., 2012; Powell et al., 2015; Kirchner et al., 2020). Support strategies in the QIF are employed once the intervention has been implemented and include strategies such as assistance or coaching, evaluation of the implementation process and feedback (Meyers, Katz, et al., 2012; Powell et al., 2015).

The assessment, capacity-building and support strategies of the QIF, therefore, form an essential part of planning and implementing the intervention. The aim of these strategies is to address potential barriers and facilitate successful implementation of the intervention, namely the neurodevelopmental supportive care training programme. By understanding the participants' training needs and their readiness for the implementation of the intervention, the intervention can be tailored to meet the organisation's specific needs ensuring a fit between the organisation and the intervention. Similarly, by ensuring management and staff understand the need for the intervention and buy into it, these strategies are likely to support the successful implementation of the intervention. Although training in itself can be seen as an implementation strategy, in this study the training programme was the intervention due to be implemented.

3.7 CONCLUSION

It is essential for best evidence-based practice to be implemented to ensure quality care for patients and their families. Fundamentally, the aim of implementation research is to improve healthcare. Implementation research transforms what we know, into what we do, but this is a complicated process. Theories, models and/or frameworks should form the foundation for implementation studies as this ultimately guides successful implementation. Researchers should be explicit about the framework they use to guide the implementation process. There is no doubt that context and implementation are intricately interwoven and contextual factors can influence implementation. It is, however, difficult to consider all possible factors which can affect the success of a study but the most important contextual factors (barriers and facilitators) should be considered in the planning, execution and evaluation of the implementation. Implementation strategies can then be employed

to address these potential barriers further contributing to successful implementation. In Chapter 4: Outline of the Methodology, the adaptation of the QIF for the purpose of this study will be discussed.

CHAPTER 4: OUTLINE OF THE METHODOLOGY FOR THE IMPLEMENTATION STUDY

4.1 INTRODUCTION

In this chapter the methodology used for this implementation study is presented. The use of the multiphase design and the Quality Implementation Framework (QIF) is presented and justified. A single study population and study sample were utilised for the study as a whole, even though the research moved through multiple phases. As a result, the measurement strategies (measurement tools and scoring, data collection procedure and data analysis) for the study are presented per phase and objective following the study approach, context of the study, study population and study sample. It is described in this format as the measurement strategies for each objective are distinctly different. The ethical considerations for implementation studies are considered and applied to this study.

4.2 STUDY APPROACH

The implementation of any evidence-based programme or intervention is an extremely complex process and needs to be described in detail (Meyers, Katz, et al., 2012; NCEC, 2018; Damschroder, 2020). In this implementation study the researcher used a multiphase design to implement a training intervention on best evidence-based practice, related to NDSC, in the real-world. The multiphase design is appropriate to use if the study consists of more than two phases, is conducted over a period of time and has a common programme objective or research question (Creswell et al., 2011; Schoonenboom & Johnson, 2017). This PhD study consisted of four phases with each phase building on the previous. The four phases were connected through the overarching research question: *What is the process of implementing a multidisciplinary training programme on neurodevelopmental supportive care in the public sector NICU and what are the contextual factors affecting implementation?* Each step in the implementation process thus contributed to answering the single research question.

A multiphase study often includes both quantitative and qualitative research methods which can assist the researcher to better understand research dilemmas such as poor implementation of quality services in health care (Robins et al., 2008;

Creswell et al., 2011; Almeida, 2018; Hamilton & Finley, 2019; Palinkas, Mendon, & Hamilton, 2019). These two research methods provide both depth to a study through the qualitative elements and breadth through the quantitative elements (Johnson, Onwuegbuzie, & Turner, 2007; Teddlie & Tashakkori, 2010; Schoonenboom & Johnson, 2017). In this study, quantitative methods, such as surveys, were used to investigate the NICU context, plan and implement the training programme and determine the effect of the training on the operationalisation of NDSC. Qualitative methods, such as focus groups, were used to determine the MDT's self-reported adherence to the NDSC approach and their perception of the training and implementation process.

When using a multiphase design, a researcher needs to consider various design dimensions such as the structure, function and process of the study (Palinkas et al., 2011; Schoonenboom & Johnson, 2017; Palinkas et al., 2019). The structure of the design refers to timing and weighting (Morse, 1991; Palinkas et al., 2011; Schoonenboom & Johnson, 2017). Timing indicates whether the different phases or steps of the study happens sequentially or simultaneously while weighting indicates which phase or step forms the primary and secondary part of the study. In this study the sequential structure was used. There was a specific order of data collection and analyses based on the phases and steps of the QIF. The sequential structure was used for example in the first few steps of Phase 1 of the study. Information was first gathered on the training needs of the MDT (Step 1) and the operationalisation of NDSC in the NICU (Step 2) before the researcher was able to confirm the training needs and conduct an intervention fit assessment (Step 3).

Weighting of the different steps or phases refers to the theoretical drive of the study, namely quantitative dominant, qualitative dominant or equal-status (Schoonenboom & Johnson, 2017). In this study the different phases and steps (regardless of being quantitative or qualitative) contributed equally to the answering of the research question. The quantitative inquiry described the implementation process while the qualitative inquiry explored possible reasons for successful or unsuccessful implementation of the training programme (Palinkas et al., 2011).

The next design dimension to consider is the function or purpose of using the multiphase design (Palinkas et al., 2011; Schoonenboom & Johnson, 2017). Five

possible functions have been identified: convergence, complementarity, expansion, development and sampling (Greene, Caracelli, & Graham, 1989; Palinkas et al., 2011; Palinkas et al., 2019). For this multiphase study the function can be described as both development and complementarity. The development function was used when the training needs were determined which then guided the development of the structure for the implementation of the training programme. The complementarity function entails the use of both quantitative and qualitative information for evaluation and elaboration. This was used in Phase 3 when the success of the implementation process was evaluated through the post-implementation survey and the focus groups elaborated on the contextual factors affecting the implementation process.

The last design dimension to consider is the process or strategies used to combine two or more sets of data (Palinkas et al., 2011). Quantitative and qualitative data can be combined or integrated through merging, connecting, embedding or by using a framework (Klassen, Creswell, Clark, Smith, & Meissner, 2012; Creswell & Clark, 2017). Connecting is when one data set is used to inform the following data collection procedure while embedding is when one study is conducted within another study to support that study. Merging is when the qualitative and quantitative data are combined in the discussion of the results (Palinkas et al., 2011; Schoonenboom & Johnson, 2017). In this study quantitative and qualitative data were merged for example during Phase 1 of the study when the training needs of the MDT were determined. This was, however, not true merging as it was not the merging of separate quantitative and qualitative data sets. The merging in this study was done as a single step where the questionnaire used, produced both quantitative and qualitative data which contributed to the findings. The strategy used in this study, to combine the different phases and steps, was therefore mainly through a framework: the QIF.

The QIF is a process model which provides a detailed structure for the implementation of an intervention. As previously discussed, the QIF consists of four well-defined phases and 14 steps which promote quality implementation. These phases and steps are sequential but also dynamic which means it is sometimes possible, or even necessary, to return to previous steps in the process, for example

to ensure buy-in from stakeholders or to retrain participants. Meyers et al. (2012) further stated it is not necessary to include all the QIF steps when using their model or that some steps might even be conducted simultaneously. Although the QIF provides a clear outline for a study, at the same time it is flexible enough to be adapted to individual studies. The QIF was used in this implementation study and more detail on how the framework was adapted will be discussed under each phase (Figure 4.1).

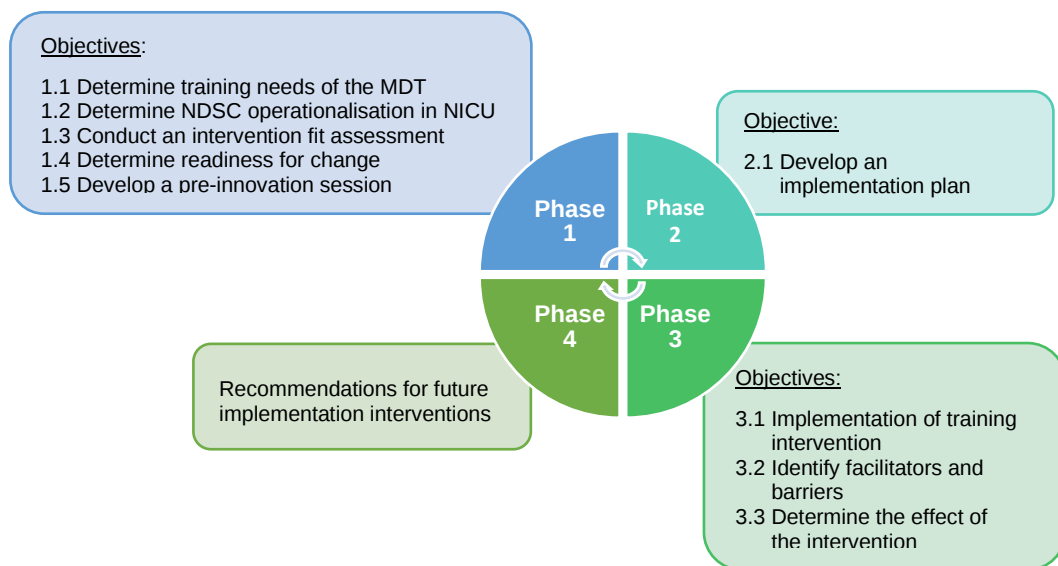


Figure 4.1: Adapted Quality Implementation Framework (QIF)

4.3 CONTEXT OF THE STUDY

South African public sector hospitals are classified according to the following categories: district hospitals, regional hospitals, tertiary hospitals and central/specialised hospitals (Western Cape Government, 2012; Ranchod et al., 2017). District hospitals provide care for sick neonates as well as standard care but not ventilation, while regional hospitals provide standard care, high-dependency care and intensive care (IUSS Norms and Standards Task Team, 2014). In this study the focus was on tertiary and central hospitals as these hospitals provide highly specialist paediatric services such as neonatal intensive care services. These tertiary and central hospitals are affiliated with academic institutions and provide training to healthcare professionals.

The public sector neonatal units (NNU) generally consist of a standard neonatal care wards, high care wards and the NICU. Standard care neonatal wards provide care to infants who are not stable enough for discharge and often include a Kangaroo Mother Care (KMC) ward which provides the opportunity for mothers to be roomed in with their infants and to do skin-to-skin care (low care). High care wards provide care for infants who are critically ill, e.g. cardio-respiratory problems, intravenous nutrition, metabolic problems, convulsions or infections. The NICU provides specialist care for premature infants or infants with complex medical and surgical problems who require continuous life support (IUSS Norms and Standards Task Team, 2014).

Infants from birth to 28 days are admitted to neonatal units which are often overcrowded with a bed occupancy of between 83% and 138% (Dramowski, Aucamp, Bekker, & Mehtar, 2017). The NICUs are usually small units (eight to 12 beds) and beds are not reserved for preterm infants but also used for medical and surgical infants (Dramowski et al., 2017). The public sector NICU is a busy, technological and noisy environment with a medical model focusing on saving the lives of vulnerable preterm infants. At one of the main public hospitals in the Western Cape, South Africa approximately 8000 infants are born every year of which 3120 infants are premature/low birth weight (Dramowski et al., 2017). This means on average 260 preterm infants per month require NICU care in one public hospital which explains the constant need for NICU beds.

Various healthcare professionals form part of the multidisciplinary team and are involved in the care of preterm infants. These healthcare professionals include consultants, registrars, medical officers, interns, professional nurses (general and speciality, all categories), enrolled nurses, nursing assistants, clinical nurses (practitioners, specialists and consultants), nursing managers, occupational therapists, physiotherapists, speech and language therapists, audiologists and dietitians amongst others (Maree, 2009; Barbosa, 2013). The scope of healthcare professionals working in the South African setting, related to the NICU or to preterm infants are not always well-defined, which can affect multidisciplinary teamwork. The different disciplines often have their own schedules and ward rounds, which

lead to healthcare professionals constantly moving in and out of the NICU environment.

4.3.1 The neonatal intensive care units

At Hospital A, the NICU consisted of 12 beds with an additional 43 high-care beds on average. There were nine cubicles with between one bed (isolation cubicle) and 12 beds per cubicle. Space was limited in the cubicles with often no workspace for the staff, no space for chairs for visitors and no privacy for parents or mothers to breastfeed. Equipment was limited and not every preterm infant was cared for in a closed incubator or attached to a monitor. The NICU environment in general as well as the cubicles were noisy with the doors of the individual cubicles open most of the time. Phones were ringing, people were talking at normal frequency voices (or louder) and monitor alarms were constantly sounding. Various team members moved constantly in and out of the unit and cubicles. The unit had bright fluorescent lights which were switched on most of the time even though there were windows and sufficient natural light. The nursing station was positioned central in the unit and this was a very busy environment as it was used for nurses' handovers and training activities.

Hospital B had a paediatric intensive care unit (PICU) with 10 beds: six NICU beds and four high care beds. Due to the limited number of NICU and high-care beds at Hospital B, preterm infants were often admitted to the neonatal ward which consisted of an additional five cubicles and 32 beds on average. For the purpose of this study this neonatal ward was included as preterm infants were subjected to the environmental factors of this ward such as the high number of infants cared for and the various ward activities. For Hospital B the NICU therefore included the intensive care, the high care and the neonatal ward, where preterm infants were routinely admitted. Space was limited, with often only one chair per cubicle and no privacy for parents or visitors. Some cubicles had a table which could be used by the MDT as a workspace. Most of the cubicle doors were left open apart from the isolation cubicles. Similarly to Hospital A, phones were ringing, staff were talking and alarms were sounding. Various MDT members were in the unit/ward doing ward rounds and treating patients. The unit and wards had bright fluorescent lights although some of the bulbs were out, making some areas a bit darker. Most

cubicles had windows with natural light and some even had curtains. The nurses' station was also positioned central in the NICU and the neonatal ward and again, a very busy area.

The MDT members were involved in the two NICUs and the neonatal ward to various degrees. For example, at Hospital A, the occupational therapists were more involved in the NICU than at Hospital B. This is possibly due to staff number differences as Hospital A had two occupational therapists specifically dedicated to the NICU whereas Hospital B had only two occupational therapists to service the whole hospital including outpatients. Each member of the MDT had their discipline specific role in the NICU although there was some overlap between some disciplines, for example the physiotherapists and the occupational therapists. Ward rounds at both hospitals were conducted with only the doctors present.

4.4 STUDY POPULATION

Due to the complexity of implementation studies, various stakeholders and multidisciplinary team members need to be involved (Peters et al., 2013). Healthcare providers are an essential part of the healthcare system they work in (Eccles et al., 2009) and practitioners on the ground are often best suited to be involved in implementation studies, as they are aware of quality issues in the real world (Peters et al., 2013). The inclusion of multidisciplinary team members in implementation studies could further contribute to an increase in the utilization of research or best-evidence practice (Estabrooks, Floyd, Scott-Findlay, O'Leary, & Gushta, 2003; Peters et al., 2013). The unit of analysis included all NICUs in public sector hospitals in Gauteng while the study population consisted of the multidisciplinary team (MDT) members (doctors, nurses, physiotherapists, speech therapists, dietitians and occupational therapists) who provided services in these NICUs. The total population for this study consisted of approximately 395 MDT members: 204 team members from Hospital A and 191 team members from Hospital B. The number of the total population changes from month to month due to staff rotations.

4.5 STUDY SAMPLE

Purposive homogenous sampling was used to include two of the main academic public sector hospitals in Gauteng: Hospital A and Hospital B. These are large tertiary hospitals providing services to a large number of preterm infants and their families where potentially the biggest impact in the province can be made (Lubbe, 2009; Statistics South Africa, 2017). These hospitals are further linked to universities where both undergraduate and postgraduate training on NDSC, can potentially be influenced.

For the MDT members, total population sampling was used as all members from the two hospitals were invited to participate in the implementation study. Developmental care is a multidisciplinary approach (Barbosa, 2013; Sturdivant, 2013) and it was therefore important for each discipline to be represented in the study (Etikan, Musa, & Alkassim, 2016). Another reason for the use of total population sampling was the relatively small numbers of participants (Etikan et al., 2016). Especially the allied health professional teams sometimes consisted of only two members in a specific discipline.

Critics would argue parents are a fundamental part of the NICU team when it comes to developmental care and they should be included in training initiatives and the day-to-day care of their preterm infants (Craig et al., 2015; De Bernardo, Svelto, Giordano, Sordino, & Riccitelli, 2017). The researcher shares this view, however, for the purpose of this study, the focus was on implementing a formal training programme to address the MDTs training needs. If the MDT has the necessary knowledge of developmental care and what it entails, they would be able to support and encourage parents to be involved in the care of their infants in the, often daunting, medical NICU environment.

4.5.1 Inclusion criteria

- All medical and nursing staff, physiotherapists, dietitians, occupational therapists, speech therapists and audiologists providing a service in the neonatal intensive care unit and/or to preterm infants
- Staff who are full-time employed by the hospital
- Community service staff

- Staff from all categories with any number of years' experience in the NICU/neonatal context
- Neonatal Intensive Care Unit nursing managers
- Heads of departments of the above-mentioned disciplines

4.5.2 Exclusion criteria

- Any other professionals providing services in the NICU or to preterm infants
- Support staff working in the NICU e.g. administration staff or cleaners
- Parents

4.6 MEASUREMENT STRATEGIES: PHASE 1

As mentioned above, this study was based on the four phases of the QIF with distinct steps. The measurement tools, data collection procedures and data analyses for each phase and the various steps are different and presented below according to the phases and objectives of the study.

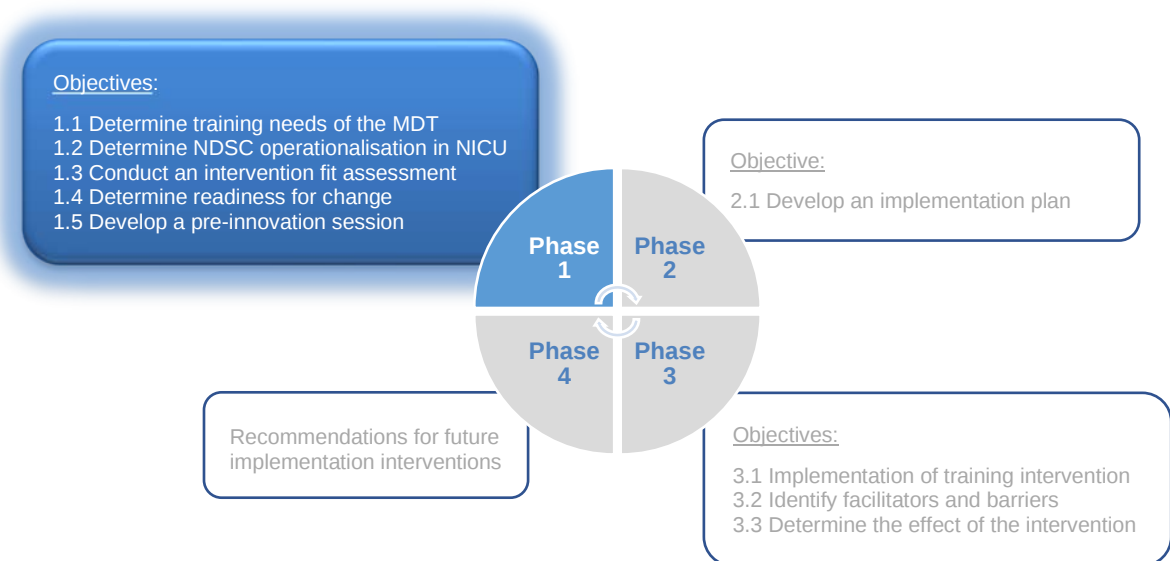


Figure 4.2: Phase 1 objectives of the study

Phase 1 of the study aimed to assess the current state of the neonatal intensive care unit with regard to neurodevelopmental supportive care in two public hospitals.

Figure 4.2 indicates the objectives associated with this phase. The information letter was sent via email to all heads of departments, unit managers and the MDT, providing information on the PhD study (Appendix A).

4.6.1 Objective 1.1: To determine the neurodevelopmental supportive care training needs of the multidisciplinary team, working in two selected neonatal intensive care units in Gauteng

There are various ways a training needs assessment can be conducted such as through clinical meetings, audit results, analysing adverse incidences or peer reviews to name but a few (Posner & Rudnitsky, 1994; Østergaard, Østergaard, & Lippert, 2008). Another way to assess the training needs of participants, is for clinicians to rate their own performance (Østergaard et al., 2008). In this study a cross sectional survey was conducted to determine the training needs of the MDT. This was done by asking the MDT to self-report their adherence and their unit's adherence to the NDSC approach and principles.

4.6.1.1 Measurement tools: Training needs

- Demographic questionnaire

The demographic questionnaire was developed by the researcher and included information on: the hospital where the participants worked; their profession; the year they qualified; the number of years' experience in the NICU; the number of years they worked in the current NICU; and training they received on NDSC on both an undergraduate and/or postgraduate level. The participants were further asked if they would be interested in participating in the planning and implementation process of the NDSC training programme as champions (Appendix C).

- The Implementation of Neurodevelopmental Supportive Care questionnaire

The Implementation of Neurodevelopmental Supportive Care (INDeSC) tool, an existing audit tool, was adapted to a questionnaire with the permission of the author. The INDeSC tool consisted of the nine neurodevelopmental supportive care categories which forms the foundation of the developmental care approach (Lubbe et al., 2012). Each NDSC category has subcategories and individual items which elaborate on the specific category. The INDeSC tool consists in total of 28 subcategories and 93 items. The adapted questionnaire consisted of the same

number of categories, subcategories and items as the INDeSC tool (Appendix D). Each item's statement was changed to a question and a 5-point Likert scale was used to indicate the level of adherence (Table 4.1). A tick box option for 'No Knowledge' (N/K) was included, to provide participants the opportunity to indicate if they had no knowledge of the specific NDSC principle in each question. For each subcategory, a comment box was provided for participants to add any additional thoughts, opinions or information related to the questions in that specific NDSC subcategory. The adapted questionnaire was used in a pre-test at Hospital C to review the questionnaire and revise it if necessary (Burns et al., 2008). The purpose was to ensure flow, clarity and ease of completing the questionnaire. Three participants, who met the inclusion criteria, as set for the main study, completed the questionnaire. Based on the results of the pre-test it was not necessary to make any changes to the questionnaire. The questionnaire did, however, take some participants up to 40 minutes to complete, especially if they provided detailed information in all the comment boxes.

Table 4.1: Likert-scale used per item in the self-reported Implementation of Neurodevelopmental Supportive Care (INDeSC) questionnaire

SCORE	DESCRIPTION
4	100% of the time
3	75% of the time
2	50% of the time
1	25% of the time
0	Never
N/K	No knowledge of this NDSC principle

4.6.1.2 Data collection procedure: Training needs

The web-based software program, Research Electronic Data Capture (REDCap) was used to collect and manage the data. The REDCap questionnaire was loaded onto iPads which made it possible for participants to complete the questionnaires themselves. Although the researcher was present to assist with any problems experienced with the iPad, the self-completion of the questionnaire limited potential biasing errors such as interviewer characteristics and interviewer skills in

comparison to face-to-face interviews (Phellas, Bloch, & Seale, 2011). Appointments were made with the various departments and participants were invited to participate in the study. An information letter was provided explaining the overall aim of the study as well as the different phases of the study including the purpose of the survey, namely to determine the training needs of the MDT providing services to preterm infants in the NICU. If participants agreed to participate in the study, they were requested to sign the consent form and continued to complete the questionnaire independently on the iPads provided. For the nurses at both hospitals, the researcher was only allowed to invite them to participate in the study during their tea- or lunchtime breaks. Although the researcher visited the nurses on different days at different times, the limited allowable timeframe potentially affected the response rate as participants were less willing to participate in the study during their breaks.

It was not possible to arrange face-to-face appointments with all the departments at the two hospitals as some of the HODs preferred for the survey to be emailed to the potential participants, to be completed in their own time, due to work pressure. This was the case for the doctors at both hospitals as well as the physiotherapists at the one hospital. The researcher obtained the email addresses for these participants from the HODs and emailed the information letter as well as the REDCap link to the various doctors and the physiotherapists. The email was re-sent every 2 weeks for a period of 2 months to maximise the potential response rate. For the online survey, consent was assumed through the completion of the questionnaire.

4.6.1.3 Data analysis: Training needs

The raw data were downloaded from the REDCap programme to a Microsoft Excel spreadsheet and cleaned. All identifying information was removed and stored in a separate, password protected folder on the researcher's computer. Subject codes were added to the raw data to maintain confidentiality. Descriptive statistics were used to analyse the quantitative data. Responses from participants of the two hospitals were combined and grouped into three a priori categories (based on similar studies): High-risk practice; average application of NDSC principles; and optimum application of NDSC principles (Table 4.2). Participants' perceptions of their own adherence on optimum application, average application, high-risk practice

or no knowledge of NDSC principles in the NICU were presented as frequency distributions. Only items where more than 50% of participants were in agreement on high-risk practice/no knowledge, average application or optimal application, were presented in the results.

Table 4.2: Analysis and categorisation guide to responses from participants per item

CATEGORY OF RESPONSES	DESCRIPTION OF CATEGORIES
High-risk practice	NDSC principles were never applied
	NDSC principles were applied 25% of the time
Average application of NDSC principles	NDSC principles were applied 50% of the time
Optimum application of NDSC principles	NDSC principles were applied 75% of the time
	NDSC principles were always applied
No knowledge of the NDSC principle	

Qualitative data were analysed through thematic analysis. The Framework Method was used to guide the process (Gale, Heath, Cameron, Rashid, & Redwood, 2013) and a deductive reasoning design was employed to determine codes prior to the analysis of the data (Bengtsson, 2016). The coding list was based on an integrative literature review by Lubbe et al (2012) which highlighted nine NDSC categories (Appendix E). The Framework Method consists of seven stages: transcription; familiarisation with the information; coding; developing an analytical framework; applying the analytical framework; charting data into the analytical framework; and interpreting the data (Gale et al., 2013). In this study there was no need for the researcher to transcribe the information as the content was obtained from the open-ended questions as part of the INDeSC questionnaire discussed above (Step 1 of the Framework Method). Participants typed their comments, related to each NDSC category and subcategory, on an iPad during the data collection process and the data were therefore already in written form. The researcher exported these comments from the REDCap program to a Microsoft Excel spreadsheet. The researcher read through the transcripts a few times to familiarise herself with the content (Step 2). The researcher used the predetermined coding list to conduct the coding (Step 3). At the same time a second researcher coded three transcripts

independently. Open coding was therefore also employed to ensure important information was not missed and the code list was updated as new codes emerged. Following the coding, the analytical framework was developed (Step 4). This was done by the two researchers discussing any discrepancies between allocated codes and reaching consensus on the final codes. Codes that were similar were grouped together into categories. The final analytical framework consisted of 11 categories and 25 codes (Appendix E). The final analytical framework was then applied to the transcripts which means appropriate codes from the analytical framework were attached to the text (Step 5). This was done by using the MAXQDA 2019 (VERBI Software, 2018) qualitative software program. The data were then charted by summarising it into a framework matrix (Step 6). By using MAXQDA it was easy to retrieve indexed data and participant quotes for each code. The last step was to interpret the data, thus derive meaning from the data (Step 7). Themes and subthemes were generated and supported with participant quotes which are presented in Chapter 5 (Paragraph 5.3).

4.6.2 Objective 1.2: To investigate the current neurodevelopmental supportive care operationalisation in the neonatal intensive care unit of the two selected public hospitals

Objective 1.2 fits within the first phase of the study which focuses on the current state of NDSC in the NICU. This objective focused on conducting a pre-implementation survey which was completed by the researcher herself as an observer of the operationalisation of NDSC in the NICU.

4.6.2.1 Measurement tool: Current care

- **The Implementation of Neurodevelopmental Supportive Care tool**

The original INDeSC tool as discussed in paragraph 4.6.1.1, was used to conduct the pre-implementation survey, determining the operationalisation of NDSC in the two NICUs in this study (Lubbe, 2009) (Appendix F). As mentioned above this tool consisted of nine NDSC categories, 28 subcategories and 93 items. A 4-point Likert scale was used to describe the adherence of the unit to each item (Table 4.3). Additionally, fieldnotes were documented as part of the observational process (Tjora, 2006; Lindorff & Sammons, 2018). The purpose of the fieldnotes was to provide supplementary information to justify the rating of scores for each observed

item on the measurement tool. These scores were then added to determine the total score per NDSC category as well as the total score for each unit. Total scores indicated an overall adherence to NDSC or high-risk practice related to the different items, subcategories and categories of developmental care. The level of adherence of the unit as a whole was calculated as a percentage. If 'not applicable' was indicated for a specific item, the total score for that section needed to be adjusted and reduced by four points. The INDeSC tool has been used in previous studies in South Africa, in both the private and public sector NICUs and demonstrated good content validity, construct validity and face validity (Lubbe, 2009; Rheeder et al., 2017). There is currently no other suitable tool available for the South African context to comprehensively measure the operationalisation of neurodevelopmental supportive care in the NICU.

Table 4.3: Scoring per item of the Implementation of Neurodevelopmental Supportive Care (INDeSC) tool

SCORE	DESCRIPTION
4	All the criteria for a certain item are met
3	Most of the requirements are met but there is room for improvement
2	Very little criteria are met and it is somewhat relevant
1	No criteria are met
N/A	The item is not relevant in the setting

4.6.2.2 Data collection procedure: Current care

The pre-implementation survey was conducted by the researcher to determine the current NDSC practice in the NICU through structured observations and field notes. Structured observations entailed the observation of the research participants without the researcher being directly involved. The researcher used the INDeSC tool as a standardised observation schedule (Phellas et al., 2011). This guided the researcher to document specific behaviour related to the research question. Observations can be described as overt or covert (Turnock & Gibson, 2001). In overt observations the team members are aware they are being observed while in covert observations they are unaware. The purpose for the use of covert observations is to avoid participants changing their behaviour because they are

being observed (Turnock & Gibson, 2001; Spicker, 2011). This can also be referred to as the Hawthorn effect which can lead to observation bias (Spicker, 2011; Wu et al., 2017). It was important for this study to determine the workings of the NICU in the real-world, to ensure the most realistic environment of the day-to-day practice in the NICU was observed. The observations included aspects such as the physical NICU environment, the MDT and their roles, interactions between team members - both formal and informal, frequency and duration of behaviour, and subtle factors such as non-verbal communication. It was even important to observe behaviours which should have happened but did not happen (Corbetta, 2003; Tjora, 2006).

The researcher made prior arrangements with the units for a specific day and time which suited them. On the day of the pre-implementation survey, the researcher reported to the sister in charge of the unit, briefly explained the purpose of the study again and presented all relevant information and permission letters. As stated above, the researcher was a covert observer and therefore wore scrubs to blend in as much as possible. Ethical issues related to covert observation have been highlighted and refers specifically to the inability of participants to provide consent (Petticrew et al., 2007; Spicker, 2011). This was, however, overcome through anonymity and confidentiality as no identifying information was documented. The researcher was further not interested in individual behaviours but rather in the collective practice and behaviour of the MDT, related to the management of preterm infants in the NICU.

The researcher spent on average 4 hours, in the morning, in each unit, on a normal weekday. This was deemed the busiest time in the NICU when most of the nursing care, therapy and medical activities were happening. This time of day was more likely to highlight risk practice such as excessive noise, light and handling (Pereira et al., 2013; Valizadeh et al., 2017; Alberto Alves Carvalhais, Vieira Da Silva, Silva, Xavier, & Santos, 2018) than later in the day or evening when it is usually quieter on the ward with less activity and less staff.

4.6.2.3 Data analysis: Current care

Data were entered into an Excel spreadsheet and cleaned. Field notes were used to guide the scoring per item. The allocation of scores on the different subcategories was confirmed by a second reviewer through peer debriefing. Descriptive statistics

were used to present the results of the adherence of the two units to the developmental care approach. The percentage of the adherence for each NDSC category for the two units were presented. Poor compliance with NDSC principles of the unit overall was stated as less than 70%, based on Lubbe's (2009) study.

4.6.3 Objective 1.3: To conduct an intervention fit assessment for the selected hospitals

The relevance of the content of the training and whether it fits the needs of the target audience, should be considered for the success of any training programme (Ratnapalan & Hilliard, 2002; Meyers, Durlak, et al., 2012; Kirchner et al., 2020). If the needs of the participants are taken into account and are incorporated in the development of the programme, trainees will be motivated, which can potentially lead to a change in practice (Grant, 2002; Salas, Tannenbaum, Kraiger, & Smith-Jentsch, 2012). The needs of the MDT have been determined through the self-reported adherence survey (Objective 1.1 - a subjective view from the participants' perspective) and the pre-implementation survey (Objective 1.2 - an objective view from the researcher's perspective). For Objective 1.3 the researcher summarised the training needs of the MDT, based on the results of Objective 1.1 and Objective 1.2. The existing Little Steps® One-day Introduction to NDSC training programme was selected for this study and the content and course objectives were compared to the identified training needs of the MDT. Comparisons were drawn and differences were highlighted. The fit between the needs of the MDT and the Little Steps® course content was described.

In the QIF, Step 4 entails the possibility for adapting the intervention. In this study Step 4 of the QIF was combined with Step 2 of the QIF: conducting a fit assessment. The possibility to adapt the Little Steps® training programme was considered and aspects such as financial resources, time needed and practical logistics were taken into account. The possibility for adapting the Little Steps® training programme was discussed as part of the results of the intervention fit assessment (Objective 1.3).

4.6.4 Objective 1.4: To determine the readiness of the multidisciplinary team for implementation of the neurodevelopmental supportive care training programme

For the successful implementation of any intervention it is important to consider the organisation's readiness for change (Alexander & Hearld, 2012; Shea et al., 2014). Readiness is described as the willingness of members of an organisation to implement change, both on a mental and behavioural level (Weiner, Amick, & Lee, 2008). The readiness for change of an organisation is determined by the collective actions of its individual members (Weiner, 2009). The NDSC approach is a multidisciplinary approach which requires the entire MDT to adopt the approach when providing services to the preterm infants in the NICU (Barbosa, 2013; Sturdivant, 2013). In Objective 1.4 of this study the researcher therefore considered the readiness for change of the MDT as a collective.

4.6.4.1 Measurement tool: Readiness for change

In the busy healthcare environment, a short, practical, valid and reliable measure is required to determine readiness for change (Shea et al., 2014) and the NICU is undoubtedly a busy medical environment. In this study the Organizational Readiness for Implementing Change (ORIC) measure was used to determine the readiness of the MDT for the implementation of a NDSC training programme as it is a brief tool consisting of only 10 items (Appendix G). Five items relate to change efficacy and five items relate to change commitment. A 5-point Likert scale was used to indicate the level of agreement on each statement (Table 4.4). The ORIC measure demonstrated good content validity, inter-rater reliability and inter-rater agreement (Shea et al., 2014). The convergent, discriminant, and predictive validity of the measure still need to be determined but at the time the readiness of the MDT was determined, no other suitably brief measure existed.

Table 4.4: Scoring per item of the Organizational Readiness for Implementing Change (ORIC) measure

SCORE	DESCRIPTION
1	Disagree
2	Somewhat disagree
3	Neither disagree nor agree
4	Somewhat agree
5	Agree

4.6.4.2 Data collection procedure: Readiness for change

The ORIC was conducted at the same time as the self-reported survey on the training needs of the MDT (Objective 1.1). The REDCap program was used to load both questionnaires, namely the INDeSC questionnaire and the ORIC questionnaire onto iPads. On completion of the first INDeSC questionnaire, participants had the option to continue to complete the ORIC questionnaire. The procedure and purpose of both questionnaires were explained as part of the introduction to the surveys. The combination of the two instruments and collection of data for two separate objectives were done for practical and convenience reasons, not only for the researcher, but also for the research participants. It made sense to conduct both these steps of the study at the same time as the samples of participants (the MDT) were the same. Furthermore, taking into consideration the MDT's busy schedules, it was more practical to collect the data at the same time, than arranging a second appointment to complete the brief, second questionnaire. The INDeSC questionnaire was lengthy but fortunately the ORIC questionnaire was very short and only added a maximum of five minutes to the total time it took participants to complete the surveys. More details on the data collection procedure were provided above in paragraph 4.6.1.2.

4.6.4.3 Data analysis: Readiness for change

Descriptive and inferential statistics were used to analyse the quantitative data. Results were presented as frequencies and percentages of readiness for change. The chi-square test was used to determine if there was a statistically significant difference between the two hospitals' change commitment and change efficacy.

4.6.5 Objective 1.5: To develop a pre-innovation session for the critical stakeholders

In the QIF, obtaining explicit buy-in from critical stakeholders and pre-innovation staff training are described as two separate steps under Capacity Building Strategies (Step 5 and 8) (Meyers, Durlak, et al., 2012). Buy-in of critical stakeholders and pre-innovation training sessions on what the intervention will entail serves as facilitators or implementation strategies in the implementation process (Burke et al., 2012; Kirchner et al., 2020). In this study these two implementation steps have been combined in Objective 1.5 as the buy-in from the heads of departments and unit managers were obtained through a pre-innovation session.

The main aim of a pre-innovation session was to get the necessary buy-in and support from key decision makers or stakeholders (Durlak & DuPre, 2008; Meyers, Katz, et al., 2012). It is important for these stakeholders to understand what the intervention entails, the need for the implementation of the intervention and to recognise the benefits for their organisation (Meyers, Durlak, et al., 2012). Through a pre-innovation session an awareness can be created and a supportive organisational climate can be promoted which will contribute to success in the implementation process (Meyers, Durlak, et al., 2012; NCEC, 2018). In this study the unit managers and heads of departments have been engaged right from the start of the study as they had to approve the study protocol and were therefore well-informed of what the study entailed. As the various phases of the study were conducted over a period of five years, it was necessary to re-engage the stakeholders at times through a pre-innovation session. The researcher developed the pre-innovation session (a PowerPoint presentation) based on results from Objective 1.1 – 1.4 of the study. Objective 1.1 highlighted the training needs of the MDT and Objective 1.2 focused on the operationalisation of NDSC in the NICU. The results of these two objectives highlighted the need and justification for training on NDSC. Objective 1.3 identified the fit between the Little Steps® training programme and the MDT's identified training needs while Objective 1.4 confirmed the readiness of the MDT for change. Individual appointments were made with the relevant departments for the researcher to present the pre-innovation session. This was done prior to the actual implementation of the training intervention: The Little Steps® Introduction to NDSC training programme.

Step 6 and Step 7 of the QIF, were not applicable in this PhD study. Step 6 is: *Building general/organisational capacity* and Step 7 is: *Staff recruitment/maintenance* (Meyers, Durlak, et al., 2012). The building of capacity entails addressing issues with the infrastructure, skills and motivation of the organisation to ensure quality implementation. It was not possible to change the infrastructure especially in the public sector NICUs with existing financial, human and equipment resource limitations. Skills and motivation of the organisation were addressed through the implementation of the training programme. This should ultimately build the staff's capacity but building capacity was the overall aim on the study rather than a step in the process. Staff recruitment and maintenance entail the recruitment of staff to implement the intervention. The intervention was the training programme which the researcher implemented and presented as part of the PhD study, so it was not necessary for staff to be recruited to implement the intervention in this study.

4.7 MEASUREMENT STRATEGIES: PHASE 2

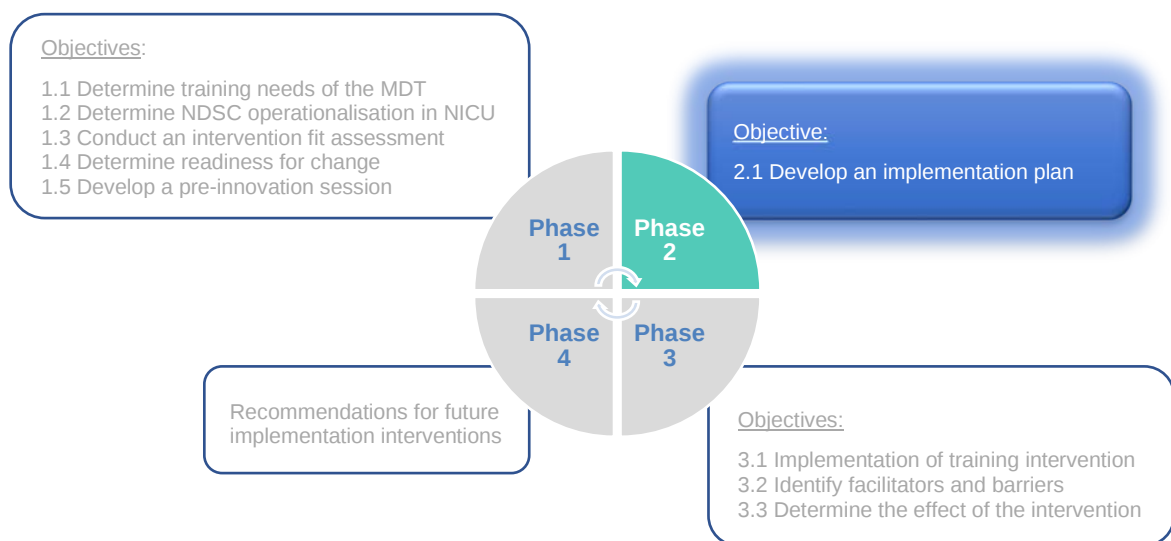


Figure 4.3: Phase 2 objective of the study

Phase 2 of this study entailed creating a structure or a plan for implementation (Figure 4.3). This is an organised structure to guide the implementation process and include a specific plan of how and when the intervention will be implemented and who would be responsible for specific tasks (Meyers, Durlak, et al., 2012). According to the QIF, Phase 2 consists of Step 9 and Step 10. Step 9 of the QIF

entails the creation of implementation teams and similarly to Step 6 and 7 discussed above (Paragraph 4.6.5), Step 9 was not relevant in this study. The researcher conducted the implementation of the training programme herself and it was therefore not necessary to create implementation teams. Step 10 of the QIF is presented below: Developing an implementation plan.

4.7.1 Objective 2.1: To develop a plan for implementing the training programme

Developing a clear plan for implementation and presenting it with transparency is essential in implementation studies (Ross et al., 2018) and this was done in Objective 2.1 of this study. An implementation plan should include aspects such as: listing of tasks needed for implementation; establishing a timeline for implementing the tasks; assigning implementation tasks to specific people and identifying the expected outcomes (Meyers, Durlak, et al., 2012; Meyers, Katz, et al., 2012; Ross et al., 2018). A detailed implementation plan ensures accountability during the implementation process (Meyers, Durlak, et al., 2012).

The WHO developed a course: The Essential Newborn Care Course which aims to provide healthcare workers with the necessary skills and knowledge to care for newborn infants (WHO, 2010). This course is comprehensive and includes all instructions and training materials to plan and conduct the course such as the trainer's guide; director's guide; training file; clinical practice; classroom practice and participant's workbook (downloadable documents). The researcher used some of these planning documents as a guide to develop the plan for the implementation of the NDSC training programme in this study. This ensured the most important aspects were considered and included in the development of the implementation plan (Table 4.5). This was developed in conjunction with the champions identified in Phase 1 of the study.

Table 4.5: Neurodevelopmental Supportive Care (NDSC) Training Programme: Implementation plan

IMPLEMENTATION TASKS FOR IMPLEMENTING A TRAINING PROGRAMME	
1.	Choose and book a course venue
2.	Decide on dates/length of the course
3.	Identify participants and send invitation letters
4.	Obtain the following: • Sufficient copies of course materials • Necessary supplies, stationery and equipment • Items needed for demonstrations • Necessary background information for the context • Delivery of materials, equipment and supplies to the course venue
5.	Prepare record forms such as attendance registers
6.	Prepare course completion certificates for participants who attended the training
7.	Prepare evaluation forms and course assessment forms for participants
8.	Decide on a course timetable
9.	Organise refreshments

4.8 MEASUREMENT STRATEGIES: PHASE 3

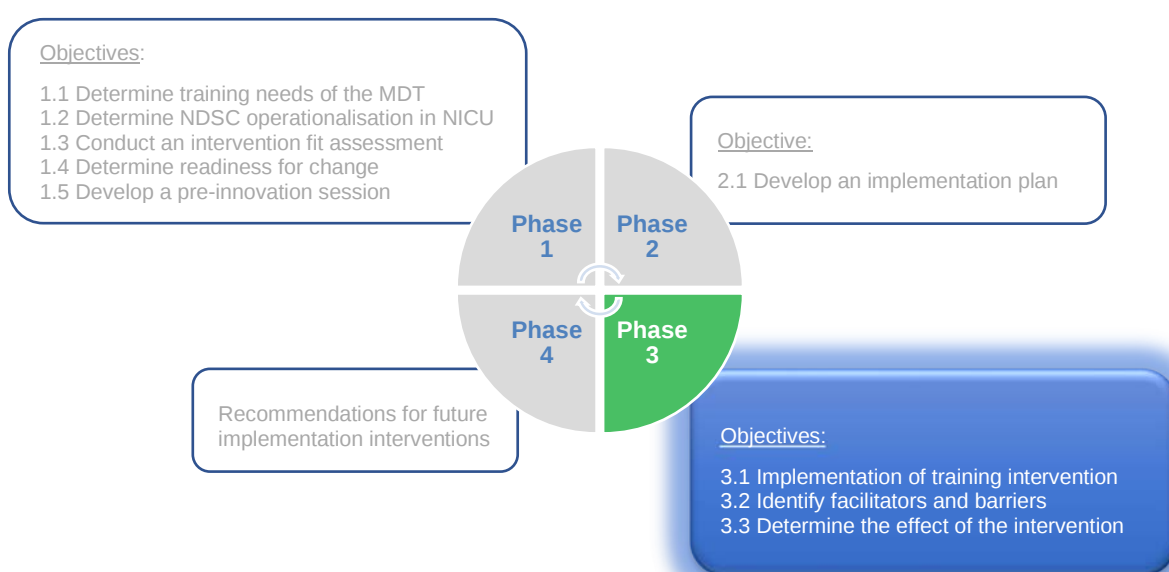


Figure 4.4: Phase 3 objectives of the study

According to the QIF, Phase 3 is when the actual implementation begins (Meyers, Durlak, et al., 2012). This phase is described as the *Ongoing Structure Once Implementation Begins* and includes three steps:

- Step 11 - Technical assistance/coaching/supervision
- Step 12 - Process evaluation
- Step 13 - Supportive feedback mechanism

The QIF, however, does not provide clear guidelines on the actual implementation of the intervention or the reporting of the implementation even though this is the most important aspect of implementation research. The actual implementation of the intervention was therefore described as part of Phase 3, Objective 3.1, of this PhD study (Figure 4.4).

Step 11 and Step 13 of the QIF, namely supervision and feedback, would be more relevant when the MDT starts implementing their knowledge of NDSC in the NICU. Although this is the long-term goal of implementing the NDSC training programme, it falls outside the scope of this PhD study. Step 12 of the QIF was included in this PhD study as it is the evaluation of the implementation process and it addresses the second part of the research question: *What are the contextual factors affecting implementation?* This step entails identifying facilitators and barriers which affected the implementation process as well as determining the effect of the implementation of the intervention. This information is important as it can highlight how the implementation process needs to be adapted to ensure successful implementation of the intervention as well as informing future implementation initiatives in these or other NICUs.

4.8.1 Objective 3.1: To implement the neurodevelopmental supportive care training intervention

Objective 3.1 entails the actual implementation of the training programme intervention. Interventions are often poorly reported in the literature which makes it nearly impossible for researchers to replicate these studies or to generalise the results of such studies (Glasziou, Meats, Heneghan, & Shepperd, 2008; Hoffmann et al., 2014; Albarqouni et al., 2018). The Standards of Reporting Trials Group developed one of the first reporting guidelines in 1994, namely the CONSORT

statement (CONsolidated Standards of Reporting Trials) (Begg et al., 1996; Phillips et al., 2016). This was used mainly for reporting on randomised controlled trials. Since then various reporting tools have been developed including the Template for Intervention Description and Replication (TIDieR) checklist; guidelines for reporting team-based learning activities in the medical and health sciences education literature; a checklist to improve reporting of group-based behaviour-change interventions; and a comprehensive checklist for reporting the use of objective structured clinical examination (OSCEs), to name but a few (Patrício et al., 2009; Moher, Schulz, Simera, & Altman, 2010; Haidet et al., 2012; Borek, Abraham, Smith, Greaves, & Tarrant, 2015; Phillips et al., 2016). The generic TIDieR checklist was developed to enable researchers to describe their interventions in sufficient detail. This formed the foundation for the development of the Guideline for Reporting Evidence-based practice Educational interventions and Teaching (GREET) (Hoffmann et al., 2014; Phillips et al., 2016). The GREET is a checklist used to report educational EBP interventions. In this study the researcher used the GREET checklist to report the implementation of the NDSC training programme. The GREET consists of 17 items or questions which guided the researcher to report the detail of the educational intervention. It includes items or questions such as: the name of the intervention, why, what, who provided, how, where, when, how much, planned changes, unplanned changes and how well the EBP educational intervention was implemented. The GREET is described as a specific, valid and reliable guide which provides a reporting framework for researchers (Phillips et al., 2016; Koota, Kääriäinen, & Melender, 2018).

4.8.2 Objective 3.2: To identify facilitators and barriers to change practice

Analysing the implementation process is just as important as implementing the intervention itself (Bauer et al., 2015). If the implementation of an intervention failed, it is important to distinguish between whether the failure was due to an ineffective intervention or due to poor deployment of a good intervention (Proctor et al., 2011). This can be determined by identifying the various contextual factors (facilitators and barriers) which impacted on the implementation process and ultimately a change in practice as was done in Objective 3.2.

4.8.2.1 Measurement tools: Facilitators and barriers

To determine the facilitators and barriers in the implementation process of this study, focus groups were conducted. Focus groups are often used in implementation studies and can provide rich information on aspects such as contextual factors which can affect successful implementation (Hamilton & Finley, 2019). Using focus groups to collect data has various benefits: data can be gathered from multiple participants simultaneously, dynamic interactions can lead to contradictory views and the most prominent issues are identified as a consistent, shared opinion (Taylor, 2017). Practical aspects which need to be considered are: the number of questions asked, the potential of social desirability bias, diversions and the taking of notes which can influence the data obtained from the focus groups (Taylor, 2017).

- **Sampling**

Purposive sampling was used as the 255 MDT members, who attended the NDSC training, were invited to participate in the focus groups. The group was heterogenous based on their professions but homogeneous in their NICU experience.

- **Inclusion criteria**

The inclusion criteria for the focus groups included any of the MDT members, at the two research sites, who attended either the full-day training programme or any of the adapted training formats (refer to Chapter 8: Implementation for more details on the different training formats). It was important to ensure all the disciplines who attended the training programme, namely the doctors, nurses, physiotherapists, dietitians, speech therapists/audiologists and occupational therapists participated in the focus groups as each discipline's voice had to be represented as part of the MDT.

- **Exclusion criteria**

Participants who did not attend the full 2-2 ½-hour training session were excluded from the focus groups.

4.8.2.2 Data collection procedure: Facilitators and barriers

The researcher set specific dates and times for the focus groups to be conducted. The dates and times, together with an information letter, was emailed to the HODs and all MDT members who participated in the training programme. HODs agreed on specific dates and times for their staff to attend the focus groups. MDT members were able to allocate themselves to a specific date and time based on their workload as well as the workload of their departments, as service delivery had to continue. The researcher requested for groups not to be bigger than eight participants, as a group of four to eight participants has been indicated as the ideal size for focus groups (Kitzinger, 1995). As the MDT work in the NICU as a team, it was decided not to be prescriptive regarding different disciplines attending the same group. Reminder emails were sent to the HODs and the MDT members a day before the focus groups. Champions at the hospitals assisted with booking of the venues at the two hospitals. Conducting the focus groups on site, at the hospitals, increased the likelihood of more participants attending and participating. It was important for the area to be quiet to ensure good quality of the audio recordings. The researcher developed the focus group script and questions to guide the interview process; it was important not to include too many questions and to keep questions as broad as possible (Appendix H) (Taylor, 2017). The purpose of the questions was two-fold: the first few questions related to the training programme itself while the second set of questions related to the translation of the NDSC training into their day-to-day practice. Prior to the focus groups the researcher conducted a pre-testing to ensure the questions were appropriate for obtaining rich data (Elo et al., 2014).

The researcher asked a colleague in the Occupational Therapy Department to act as an assistant moderator. The role of the assistant moderator was defined and included the following:

- help with the setting up of the interview room;
- deal with late-comers; quickly brief them on where the conversation was at before they joined the group;
- take notes throughout the discussion (mainly non-verbal behaviour);
- monitor recording equipment;
- ask questions if the researcher missed something a participant said;
- identify and manage diversions in the discussion;

- be prepared to give an oral summary at the end of the discussion;
- debrief the session with the researcher afterwards (thoughts, impressions, interesting observations); and
- remind participants not to talk over each other.

On the day of the focus groups, the researcher and assistant moderator set up the room. Chairs were positioned in a circle around a table and refreshments (drinks and snacks) were provided for the participants. As soon as all the participants arrived, the researcher welcomed them, introduced the assistant moderator, and asked them to read the information letter and sign the consent form (Appendix I). The information letter and consent form included details on the use of audio-recording equipment. Participants were reminded of confidentiality and not to use names when referring to another participant. For this reason, the researcher provided stickers with codes for each participant. The audio-recorders (traditional recorder and a cellular phone) were switched on by the assistant moderator. The researcher then read the introduction and questions verbatim from the focus group script. The time of the focus groups varied between 40 minutes and 1.5 hours depending on the size of the group. At the end of the focus group the researcher asked the participants as well as the assistant moderator if they had any other questions or comments. The researcher thanked the participants and they returned to their various departments. The researcher and the assistant moderator debriefed immediately after each session and general thoughts, impressions, and observations were recorded with the cellular phone.

Focus groups were conducted until all disciplines had participated and data saturation was achieved. This occurred after the eighth focus group at which point data gathering was discontinued.

4.8.2.3 Data analysis: Facilitators and barriers

The Framework Method, similar to the qualitative data analysis for Objective 1.1 (Gale et al., 2013) was used to thematically analyse the focus group data. As previously discussed, the Framework Method consists of seven stages: transcription; familiarisation with the information; coding; developing an analytical framework; applying the analytical framework; charting data into the analytical framework; and interpreting the data. Data from the audio recordings were

transcribed verbatim by the researcher which provided her the opportunity to be immersed in the data which further assisted with the familiarisation of the information (Gale et al., 2013). Deductive reasoning was used as codes were derived from literature on facilitators and barriers which can potentially affect successful implementation and a change in practice (Bengtsson, 2016) (presented in Chapter 3). The predetermined coding list (Appendix J) was used to code all transcripts line-by-line. Open coding was also employed to ensure all important information was included. The transcripts were independently coded by a second reviewer and results were compared (Elo et al., 2014). The final codes the researcher and second reviewer agreed on, were used to develop the analytical framework. The analytical framework consisted of codes and categories (Appendix J). Categories were similar codes which were grouped together. The final analytical framework consisted of 13 categories and 23 codes. MAXQDA 2019 (VERBI Software, 2018) was used to apply the analytical framework to the data and data were charted or summarised in a framework matrix. The researcher interpreted the data and identified themes and subthemes which were supported with illustrative quotes.

4.8.3 Objective 3.3: To determine the effect of implementing a multidisciplinary neurodevelopmental supportive care training programme

In Objective 3.3 of this study a post-implementation survey was conducted to determine the effect of the implementation of a NDSC MDT training programme on the operationalisation of NDSC in the two NICUs.

4.8.3.1 *Measurement tools: Effect of the intervention*

The same measurement tool was used as in the pre-implementation survey i.e. the INDeSC tool. Refer to paragraph 4.6.2.1 for more detail on the measurement tool.

4.8.3.2 *Data collection procedure: Effect of the intervention*

The researcher conducted the pre-implementation survey and for consistency the researcher also conducted the post-implementation survey. There was, however, a risk of researcher bias as the researcher implemented the NDSC training programme and potentially could experience the operationalisation of NDSC in the

NICU in a more positive light than what the reality was. This is referred to as confirmation bias (Nickerson, 1998). To counter this, a research assistant, who was not involved in the study, were employed to conduct the post-implementation survey at the same time as the researcher but independently. The post-implementation survey was conducted on the same weekday and the same time as the initial pre-implementation survey at both hospitals, to limit the effect any other potential variables could have on the results of the study. The post-implementation survey was further conducted six months after the training was presented. This gave the MDT time to process the information and to apply it in their everyday practice.

4.8.3.3 *Data analysis: Effect of the intervention*

The data from the researcher and research assistant were compared, any discrepancies were discussed and consensus was reached. The results were confirmed by the researcher's supervisors. Data analysis for the post-implementation survey were conducted the same as for the pre-implementation survey, described in 4.6.2.3. The results from the pre- and post-implementation surveys for each hospital were compared. Descriptive and inferential statistics were used to present the results. Pearson's chi-square test was used to determine if there was a statistically significant difference between the pre- and post-implementation results for each hospital. The chi-square test is a non-parametric test which was appropriate to use as the data were ordinal in nature (McHugh, 2013). A paired sample t-test was used to determine the effect of the implementation of the NDSC training programme from pre-test to post-test within the two NICUs using interval data in the form of total percentage of adherence for each hospital.

4.9 MEASUREMENT STRATEGIES: PHASE 4

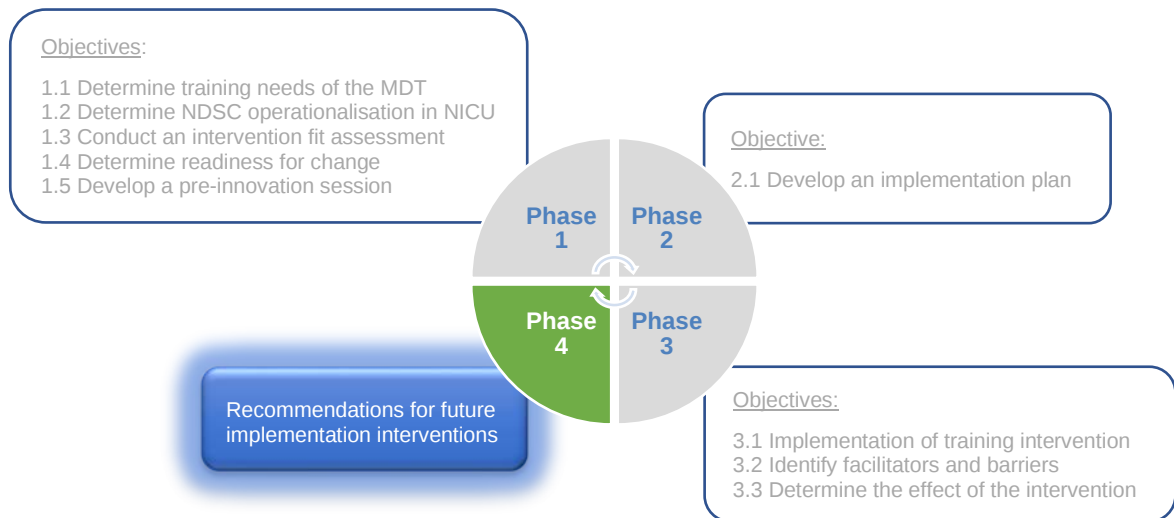


Figure 4.5: Phase 4: Learning from experience

The last phase of the QIF is Improving Future Applications and entails a critical, retrospective analysis of the implementation process. This QIF phase consists of only one step: Step 14 - Learning from experience (Meyers, Durlak, et al., 2012). By analysing the implementation process, it is possible to identify successes, failures, effective and ineffective strategies in the implementation process which can be used to improve future implementation interventions (Meyers, Durlak, et al., 2012; Eboreime, Eyles, Nxumalo, Eboreime, & Ramaswamy, 2019). In this PhD study Step 14 of the QIF is not included as an objective (Figure 4.5) but information will be included as recommendations, limitations and a reflection of the implementation process in Chapter 11.

4.10 ETHICAL CONSIDERATIONS

Implementation research is described as: “the link between what should happen in theory and what actually happens in practice” (Gopichandran et al., 2016, p. 2). There is a distinct difference between clinical research and implementation research which impacts on ethical considerations. The purpose of clinical research is to provide proof for the use of a specific intervention while the purpose of implementation research is concerned with the implementation process of existing research evidence (Gopichandran et al., 2016). It is therefore necessary to adapt ethical principles for implementation studies. These ethical issues can be divided

into the three phases: the planning phase, the implementation phase and the post-research phase (Gopichandran et al., 2016).

The planning phase includes the following ethical principles: responsiveness to local needs and priorities; equipoise; study design; and stakeholder engagement. The implementation phase includes: autonomy and informed consent; privacy and confidentiality; and health system strengthening while the post-research phase includes: dissemination of research findings; translating findings into public health action; and scalability and sustainability. Although these ethical issues are not limited to the specific phases and often overlap with other phases, the researcher will use this framework to apply and present the ethical issues associated with this implementation study.

4.10.1 The planning phase

4.10.1.1 *Responsiveness to local needs and priorities*

Responsiveness means priority health needs have been identified which can be addressed through an implementation study (Pratt & Hyder, 2015). Responsiveness further indicates the ethical responsibility of implementing an existing, proven intervention which will benefit patients (Gopichandran et al., 2016). The specific needs of preterm infants in the NICU have been identified through the review of the literature. Addressing these needs and implementing NDSC in the NICU have been highlighted as a priority as it links with the Millennium and Sustainable Goals which aim to decrease infant mortality and morbidity worldwide (Whitworth, Sewankambo, & Snewin, 2010; Gaffey et al., 2015; Kumar et al., 2016). NDSC has further been identified as the best evidence-based practice to care for preterm infants in the NICU. In the planning phase of this PhD study a training needs assessment and a pre-implementation survey, on the operationalisation of NDSC in the NICU, were conducted. The results confirmed the need for training on NDSC in the two public hospital NICUs. Thus, by implementing a training programme for healthcare professionals on NDSC the researcher is responsive to the needs of the staff as well as preterm infants and their families.

4.10.1.2 *Equipoise*

Clinical equipoise refers to the fact that researchers often do not know if a new intervention is better than the status quo (Gopichandran et al., 2016). In implementation studies there are usually no clinical risks or benefits from the intervention but rather situational equipoise which needs to be considered by the researcher. This entails the uncertainty of whether the implementation of the intervention will work in the specific context (Macklin, 2014). In this implementation study it was not clear if the implementation of a training programme on NDSC would be successful in the public sector NICUs.

4.10.1.3 *Study design*

Implementation studies usually include a variety of study designs which can highlight several ethical issues (Peters et al., 2013; Gopichandran et al., 2016). In this study the researcher used a multiphase design which included both qualitative and quantitative methods. It was necessary for the researcher to find a compromise between these two diverse approaches. The quantitative methods required scientific rigor while the qualitative methods required the researcher to consider the contextual factors which influenced the implementation of the training programme (Gopichandran et al., 2016). Scientific rigor was achieved through full and transparent descriptions of all the quantitative methods, measurement tools, procedures, analyses and outcomes of this study (Prager et al., 2019). Qualitative rigor was achieved through the four aspects of trustworthiness: credibility, transferability, dependability, and confirmability (Johnson, Adkins, & Chauvin, 2020). Credibility was achieved through honest and accurate reporting of results which were supported by empirical evidence such as participant quotes. Detailed contextual information of the hospitals and NICUs was provided to ensure transferability of results if applicable. Dependability related to the detailed description of the study by using the QIF and thus making it possible for other researchers to replicate the study. Confirmability was achieved when coding and thematic analyses were independently peer reviewed by other researchers thereby eliminating any researcher bias.

4.10.1.4 Stakeholders

A stakeholder can be defined as a person who will be involved in the implementation study i.e. the participants or a person who is not directly involved in the study but who can influence the study such as managers or heads of departments (Gopichandran et al., 2016). In an implementation study it is essential to engage the stakeholders throughout the study as this relationship can affect the success of the study (Goodyear-Smith, Jackson, & Greenhalgh, 2015). In this study the researcher referred to the stakeholders as the NICU managers and heads of departments. These stakeholders were not directly involved in the planning of the study but the researcher needed their buy-in and support to conduct the study. Buy-in was obtained through the pre-innovation session which provided information on the purpose of the study, details on what the study entailed and the benefits for the preterm infants and their families. Stakeholders were informed of the different phases of the study initially, prior to the commencement of the study, but also throughout the duration of the study. The stakeholders had to approve the various phases of the study including the participation of the MDT at different stages in the study.

4.10.2 The implementation phase

In this study autonomy, informed consent, privacy and confidentiality were not only limited to the implementation phase but rather applicable to all phases and steps of the study.

4.10.2.1 Autonomy and informed consent

Autonomy also refers to respect for persons and every person's right to self-determination. A person can exercise their rights in research through informed consent (Gopichandran et al., 2016). Although it can sometimes be difficult to operationalise informed consent in implementation research (Hutton, Eccles, & Grimshaw, 2008), this was not the case in this study. Permission and ethical clearance were, first of all, obtained from the University of the Witwatersrand Human Research Ethics Committee (Appendix B). Anonymity was maintained throughout the study which also facilitated the autonomy of subordinates. Multidisciplinary team members were provided with information letters and invited to participate in

the various phases and steps of the study. Informed consent was therefore obtained from the participants for every step of the study apart from the pre- and post-implementation surveys. This was due to the potential Hawthorn effect and to limit observation bias as discussed earlier. Permission for the pre- and post-implementation surveys was, however, obtained from the sister in charge at both units on both occasions.

4.10.2.2 Privacy and confidentiality

Confidentiality was maintained at all times by making use of subject codes on all demographic forms, questionnaires and transcripts. In the audio-recordings of the focus groups, participants were prompted to use the provided subject codes rather than names when referring to another participant. Subject names and codes were stored in a password protected file on the researcher's computer. The iPads used in Phase 1 of the study were also password protected.

4.10.2.3 Health system strengthening

The aim of implementation research is to strengthen the health system where the study was conducted (Gopichandran et al., 2016). Through increased knowledge of NDSC, following the implementation of the training programme, the MDT can apply the developmental care approach in their day-to-day practice. This change in practice should benefit the preterm infants and their families and ultimately translate to better infant outcomes (Østergaard et al., 2008). The research findings should further inform public health policies to improve patient care (Pratt & Hyder, 2015) although this was outside the scope of this study.

4.10.3 Post-research phase

4.10.3.1 Dissemination of research findings

Implementation research directly affects the public health system and it is therefore important to disseminate the research findings by feeding back to the stakeholders and participants of the study (Wyber et al., 2015). The results should be presented, irrespective of the positive or negative impact it had in a specific context (Gopichandran et al., 2016). Research findings were disseminated through presentations at national conferences and an international congress. The researcher is further in the process of preparing various articles for publication. The

researcher plans to provide feedback to the various departments at the two hospitals and the final thesis will be made available to all participants and stakeholders following the examination process. The thesis will be published on the university repository.

4.10.3.2 Translating findings into public health action

It is ultimately the purpose of implementation research to translate research findings into practice and this links to the duty of social justice. The researcher should continue to engage with the participants, champions, key stakeholders and policy-makers to ensure uptake of the intervention through continued training and development (Gopichandran et al., 2016). The researcher has planned meetings, post-implementation, with the champions at the two hospitals to discuss the next course of action.

4.10.3.3 Scalability and sustainability

The researcher cannot solely take responsibility for the scalability and sustainability of the implementation process and participants need to be engaged throughout the study (Gopichandran et al., 2016). Various possibilities to sustain the implementation of the training programme and to translate the knowledge to practice, have been discussed with the champions at the two hospitals. These include aspects such as training for new staff members, inclusion of best-practice guidelines as part of the information pack, manufacturing of Kangaroo Mother Care wraps for parents to use or buy, and increased MDT collaboration to limit handling of preterm infants.

4.11 CONCLUSION

Implementation research is deemed the best way to bridge the gap between research and practice to improve patient care. The researcher used an implementation research approach and a multiphase design to implement the intervention, namely a training programme for healthcare professionals on neurodevelopmental supportive care, in two public hospital NICUs. The Quality Implementation Framework (QIF) was used to guide this study as it provided a clear plan with distinct phases and detailed steps on how to implement the intervention. The researcher painted a picture of the NICU environment of the two hospitals which provided the necessary contextual background for the study. The methodology for

the phases of the study has been outlined and the researcher indicated how the QIF was adapted to fit this study. The specific measurement strategies for each phase and objective of the study have been presented and justified. These strategies included the population, sampling, inclusion/exclusion criteria, the measurement tools used, the data collection procedure as well as the analysis of the data. Ethical considerations, specifically associated with implementation studies, have been discussed. In the next three chapters the results of Phase 1 of the study will be presented.

CHAPTER 5: TRAINING NEEDS OF THE MULTIDISCIPLINARY TEAM

5.1 INTRODUCTION

This chapter forms part of Phase 1 of the study which aimed to assess the current state of the neonatal intensive care unit (NICU) with regard to neurodevelopmental supportive care (NDSC) in two public sector hospitals (Figure 1.1). The results of Objective 1.1, the training needs of the multidisciplinary team (MDT), are presented in this chapter. The MDT's training needs were determined through a self-reported survey on their adherence to the NDSC principles in the NICU. The survey consisted of both quantitative and qualitative elements; the quantitative results are presented in the form of a manuscript (Paragraph 5.2) while the qualitative results, discussion and summary are presented separately in Paragraph 5.3.

5.2 MANUSCRIPT 1: ADHERENCE TO NEURODEVELOPMENTAL SUPPORTIVE CARE IN THE NEONATAL INTENSIVE CARE UNIT: A SURVEY AMONG THE MULTIDISCIPLINARY TEAM

For the purpose of this PhD study, the researcher was interested in the overall training needs of the MDT at both hospitals, as this formed the foundation for creating a structure for implementation of the NDSC training programme (Phase 2) and the implementation of the programme (Phase 3). The results are presented in the form of a manuscript, titled: *Adherence to neurodevelopmental supportive care in the neonatal intensive care unit: A survey among the multidisciplinary team*. At the time of the submission of this thesis for examination, this manuscript was submitted to *The Journal of Evaluation in Clinical Practice*. The format of the manuscript is based on the author's guidelines for the journal and therefore includes the title page, abstract, key messages, manuscript and references.



TITLE

Adherence to neurodevelopmental supportive care in the neonatal intensive care unit: A survey among the multidisciplinary team

AUTHORS

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WORD COUNT: 3174

KEY WORDS: neurodevelopmental supportive care, multidisciplinary team, neonatal intensive care unit

ABSTRACT

The Neurodevelopmental Supportive Care (NDSC) Approach is deemed the best evidence-based practice when caring for the preterm infant and various studies highlighted the importance of the nine developmental care categories as the basis for developmental care.

The aim of this study was to determine the self-reported adherence to neurodevelopmental supportive care principles of the multidisciplinary team (MDT), providing services to preterm infants and their families, in the Neonatal Intensive Care Unit (NICU).

A descriptive, cross-sectional survey was conducted at two academic public sector hospitals in Gauteng, South Africa. Doctors, nurses, physiotherapists, dietitians, speech therapists and occupational therapists, providing services to preterm infants, were invited to participate in the study. A self-report questionnaire based on the Implementation of Neurodevelopmental Supportive Care audit tool was used. Fifty-nine participants completed the questionnaire.

Staff highlighted five NDSC categories as high-risk practice areas in their NICUs including: the NICU design; environmental manipulation (noise, light and smell); handling techniques; feeding; and pain management. Mixed results were obtained for four NDSC categories, namely individualised care, family-centred care, positioning and knowledge of infant development. Although there were individual items staff highlighted as optimal practice, majority of the items were identified as either high-risk practice or staff indicated they had no knowledge of the NDSC principles.

Staff were able to identify the risk areas in their NICUs and therefore acknowledge the NICU environment as not being optimal for the development of preterm infants. This realisation will support the need for neurodevelopmental supportive care training. The results of this study firstly confirmed the need for a training programme on developmental care. Secondly, the results, together with a pre-implementation survey on the operationalisation of NDSC in the NICU, could be used to develop a neurodevelopmental supportive care training programme to address the specific identified needs of the staff.

KEY MESSAGES

- Needs assessments, as a precursor to training programmes, provide valuable information for successful implementation of the programme. In this study it was done through the self-reported adherence of the multidisciplinary team (MDT) to neurodevelopmental supportive care (NDSC) principles.
- The MDT identified five of the nine NDSC categories as high-risk practice. These included the neonatal intensive care unit (NICU) design; environmental manipulation (noise, light and smell); handling techniques; feeding; and pain management. Not one of the NDSC categories was identified as optimal practice.
- These self-identified risk areas of practice together with a pre-implementation survey on the operationalisation of NDSC in the NICU, can be used as the foundation to develop a contextually sensitive training programme specific to the needs of the MDT.

INTRODUCTION

Mortality and morbidity of the preterm infant (born < 37 weeks gestation) is an ongoing concern worldwide (Howson et al., 2012; Liu et al., 2016). In the safety of the intrauterine environment, unborn foetuses are protected from bright lights, noise, noxious smells, excessive handling, poor positioning as well as pain whereas in the neonatal intensive care unit (NICU), preterm infants are constantly subjected to a variety of unpleasant and often harmful stimuli (Waitzman, 2007; Holsti, Grunau, & Shany, 2011; Goldstein, 2012). Preterm infants are at great risk for various health and developmental problems due to their prematurity.

It was recommended the NICU environment should imitate the intrauterine environment to decrease the stress levels of the preterm infant. These recommendations led to the development of the Neurodevelopmental Supportive Care (NDSC) Approach (Symington & Pinelli, 2006). Various studies have been conducted on the effect of developmental supportive care and results confirmed that, to date, it is the best approach to use when caring for the preterm infant in the NICU (McAnulty et al., 2010; Legendre et al., 2011; Montirosso, Del Prete, Bellù, Tronick, Borgatti, et al., 2012; Altimier & Phillips, 2016).

Developmental care should be a collaborative, multidisciplinary team (MDT) approach (Lubbe et al., 2012). It is further essential for all medical, allied health professionals (physiotherapists, speech therapists, dietitians and occupational therapists) and support staff, providing a service in the NICU, to have sufficient knowledge of effective care for the preterm infant (Lubbe, 2009; Rheeder et al., 2017). Limited evidence of the application of the NDSC approach in South African NICUs was found. It was determined the poor implementation of NDSC was directly related to the lack of training on NDSC and that health care workers who did not attend training on developmental care, were less likely to apply the basic NDSC principles (Lubbe, 2009; Lawn, Davidge, Paul, von Xylander, de Graft Johnson, et al., 2013).

Training of the MDT is described as one of the key aspects needed for developmental care to be successfully implemented in the NICU (Als, 2008). Training, however, does not necessarily translate to the implementation of developmental care in practice and can be ineffective if the needs of staff are not

taken into consideration (Brown, 2002; Burke & Hutchins, 2007). Assessing the needs of staff is important to ensure the proposed training is relevant and addresses the needs of staff (Ratnapalan & Hilliard, 2002). Brown (2002) also highlights the importance of a needs assessment for the success of any training. When planning and implementing training, it is important for staff to understand the need for training (Meyers, Durlak, et al., 2012). If staff are unable to identify the risks in their units, they might also not see the need for training. A training needs analysis aims to assess current knowledge and practice, to identify the gap therein, and to guide the development of a suitable training programme (Cekada, 2010; Salas et al., 2012).

The aim of this study was to determine the self-reported adherence to neurodevelopmental supportive care principles of the multidisciplinary team, providing services to preterm infants and their families.

METHODOLOGY

A descriptive, cross-sectional survey was conducted at two academic, public sector hospitals in Gauteng. These two tertiary hospitals have a high population of preterm infants and would be representative of the public healthcare sector in Gauteng. At one of the main public hospitals in South Africa an estimated 3120 infants are born preterm every year (Dramowski et al., 2017).

Purposive sampling was used and all doctors, nurses, physiotherapists, dietitians, speech therapists and occupational therapists (a total of 255 participants) were invited to participate in the study. Inclusion criteria stated that healthcare workers had to provide a service in the NICU or to preterm infants, be full-time staff with any level of expertise or years of experience, including community service staff. Neonatal Intensive Care Unit managers and heads of departments of the above-mentioned disciplines were also invited to participate. Parents form a vital part of the developmental care team but were excluded for the purpose of this study as it focused on the training needs of the MDT.

An existing audit tool, the Implementation of Neurodevelopmental Supportive Care tool (INDeSC tool) was adapted into a self-report questionnaire with the permission of the author (Lubbe, 2009). The tool was previously used in 12 South African (SA) public and 25 private sector NICUs and has shown good content validity, construct

validity and face validity (Lubbe, 2009; Rheeder et al., 2017). The questionnaire consisted of a demographic section and a section with questions on the nine NDSC categories: the NICU design, individualised care, family-centred approach, positioning, handling techniques, environmental manipulation, pain management, knowledge of infant development, and feeding. A 5-point rating scale was used to indicate whether NDSC principles were adhered to (never, 25% of the time, 50% of the time, 75% of the time and always). Participants further had the option to indicate if they had no knowledge of the specific NDSC principles. Participants completed the questionnaire independently.

Research Electronic Data Capture (REDCap), a web-based software programme was used to collect and manage the data. Consent was assumed through the completion of the questionnaire and questionnaires were coded to maintain confidentiality.

Descriptive statistics were used to analyse the data. Responses from participants were grouped into 3 categories: high-risk practice (NDSC principles were applied 25% of the time or never), average application of NDSC principles (50% of the time) and optimum application of NDSC principles (75% of the time or always).

Frequency distributions were used to indicate participants' perceptions on optimum application, average application, high-risk practice or no knowledge of NDSC principles in the NICU. Only items where 50% or more of the participants were in agreement on high-risk practice/no knowledge, average application or optimal application, are presented in this paper.

Ethical approval (M160120) was obtained from the Human Research Ethics Committee of the University of the Witwatersrand as well as the hospital CEOs and heads of departments.

RESULTS

Demographics

From the potential 255 participants, 59 participants (23%) from the two hospitals completed the questionnaire (Table 1). Sixty-two percent (n=36) and 80% (n=47) of the participants respectively stated they received no NDSC training on an

undergraduate or post-graduate level. The years of experience in the NICU and with preterm infants varied greatly and ranged from one month to 24 years.

Table 1: Participant demographics

PROFESSION (n=59)	TOTAL n=59 (%)		HOSPITAL A n=30 (%)		HOSPITAL B n=29 (%)	
Nurses	21 (35.59%)		10 (33.33%)		11 (37.93%)	
Doctors	1 (18.64%)		6 (20.00%)		5 (17.24%)	
Speech therapists	8 (13.56%)		5 (16.67%)		3 (10.35%)	
Occupational therapists	8 (13.56%)		6 (20.00%)		2 (6.90%)	
Dietitians	6 (10.17%)		2 (6.67%)		4 (13.79%)	
Physiotherapists	5 (8.48%)		1 (3.33%)		4 (13.79%)	
NDSC TRAINING	YES	NO	YES	NO	YES	NO
Undergraduate training (n=58)	22 (37.93%)	36 (62.07%)	6 (20.00%)	24 (80.00%)	16 (57.14%)	12 (42.86%)
Postgraduate training (n=59)	12 (20.34%)	47 (79.66%)	5 (16.67%)	25 (83.33%)	7 (24.14%)	22 (75.86%)
YEARS' EXPERIENCE IN THE NICU (n=58)	TOTAL n (%)		HOSPITAL A n=30 (%)		HOSPITAL B n=28 (%)	
1 - 4 years	34 (58.62%)		19 (63.33%)		15 (53.57%)	
5 - 10 years	16 (27.59%)		8 (26.67%)		8 (28.57%)	
11 years and more	8 (13.79%)		3 (10.00%)		5 (17.86%)	

Neurodevelopmental Supportive Care Categories

The results of the study are discussed according to the nine neurodevelopmental supportive care categories (Table 2) as identified by Lubbe (2009) and Lubbe et al. (2012).

Table 2: Description of the neurodevelopmental supportive care categories

NO	NEURODEVELOPMENTAL SUPPORTIVE CARE	DESCRIPTION
1.	Neonatal Intensive Care Unit (NICU) Design	The NICU environment should be a uterine-like environment: quiet, dim and warm, with minimal activity as this promotes growth and development of the preterm infant (Lubbe, 2009).
2.	Individualised Care	An important aspect to consider is the individuality of the infant and being aware of infant cues and behaviours. Interventions from both parents and staff should be adapted according to the infant's individual needs (Lubbe, 2009).
3.	Family-Centred Philosophy	Family-centred care (FCC) provides parents the opportunity to take responsibility for their child's care (Smith, Desai, Sira, & Engelke, 2014).
4.	Positioning	Positioning of the preterm infant is vital as these infants do not have the necessary muscle tone to maintain physiological flexion (Waitzman, 2007; Zarem et al., 2013). It includes aspects such the position of the body, neck, shoulders, arms, hips and knees.
5.	Handling Techniques	Handling refers to a variety of techniques such as a specific way of touch, care-giving to promote rest, tactile stimulation, swaddling, skin-to-skin care, movement, co-bedding and the support of self-regulation (Lubbe, 2009).
6.	Environmental Manipulation	The reduction of noise and light has been found to be beneficial for the development of the infant (Byers, 2003; Lubbe, 2009).
7.	Pain Management	Non-pharmacological pain management for preterm infants includes the use of oral sucrose and the provision of opportunities for non-nutritive sucking (NNS) (Lubbe, 2009).
8.	Knowledge of Infant Development	NICU professionals should have training on infant cues and behaviours, knowledge should be shared between professionals, and a multidisciplinary team approach should be applied. Staff should further teach parents to recognise infant cues and behaviours, and to interact accordingly (Aita & Snider, 2003; Lubbe, 2009).
9.	Feeding	Feeding includes non-nutritive sucking during gavage feeding as well as preparation of the infant and the environment for feeding (Lubbe, 2009).

Neonatal Intensive Care Unit Design

The first NDSC category related to the first impression on entering the NICU which should be uterine-like. Of the 59 participants, 61% (n=36) indicated the NICU design was not conducive to the development of the preterm infant. The NICU did not represent a uterine-like atmosphere and therefore did not meet the gestational developmental level needs of the preterm infant.

Individualised Care

This category consisted of six questions related to the observation and care of the preterm infant. Participants were only in agreement on the question related to the use of autonomic, motoric and behavioural cues to support individualised caregiving. Half (50%, n=29) of the 58 participants indicated that when observing individualised care of the preterm infant, the autonomic, motoric and behavioural cues were not identified by the MDT to support individualised caregiving. This can be seen as high-risk practice as infant cues are missed and appropriate care, to prevent infant stress, is not provided.

Family-Centred Philosophy

The family-centred philosophy category included questions on parents as active participants, privacy and comfort in the NICU environment, visitation and parent support groups. Positive results included parents' involvement in the care of their infants (57%, n=33), the fact that parents could see their infants immediately after birth (60%, n=35), mothers being encouraged to breast feed or express milk for their infants (95%, n=55) and information being shared between professionals and parents (54%, n=31) (Figure 1).

High-risk areas included that parents are not allowed to personalise their infant's bed space; the nursery is not homelike, warm, comfortable or soothing; privacy is not provided for parents; siblings are not allowed to visit; and parents are not allowed to visit at any time (Figure 1). Although 42% of participants (n=24) indicated their facility does not have parent support groups, a further 23% (n=13) indicated they had no knowledge of support groups contributing to this aspect as high-risk practice.

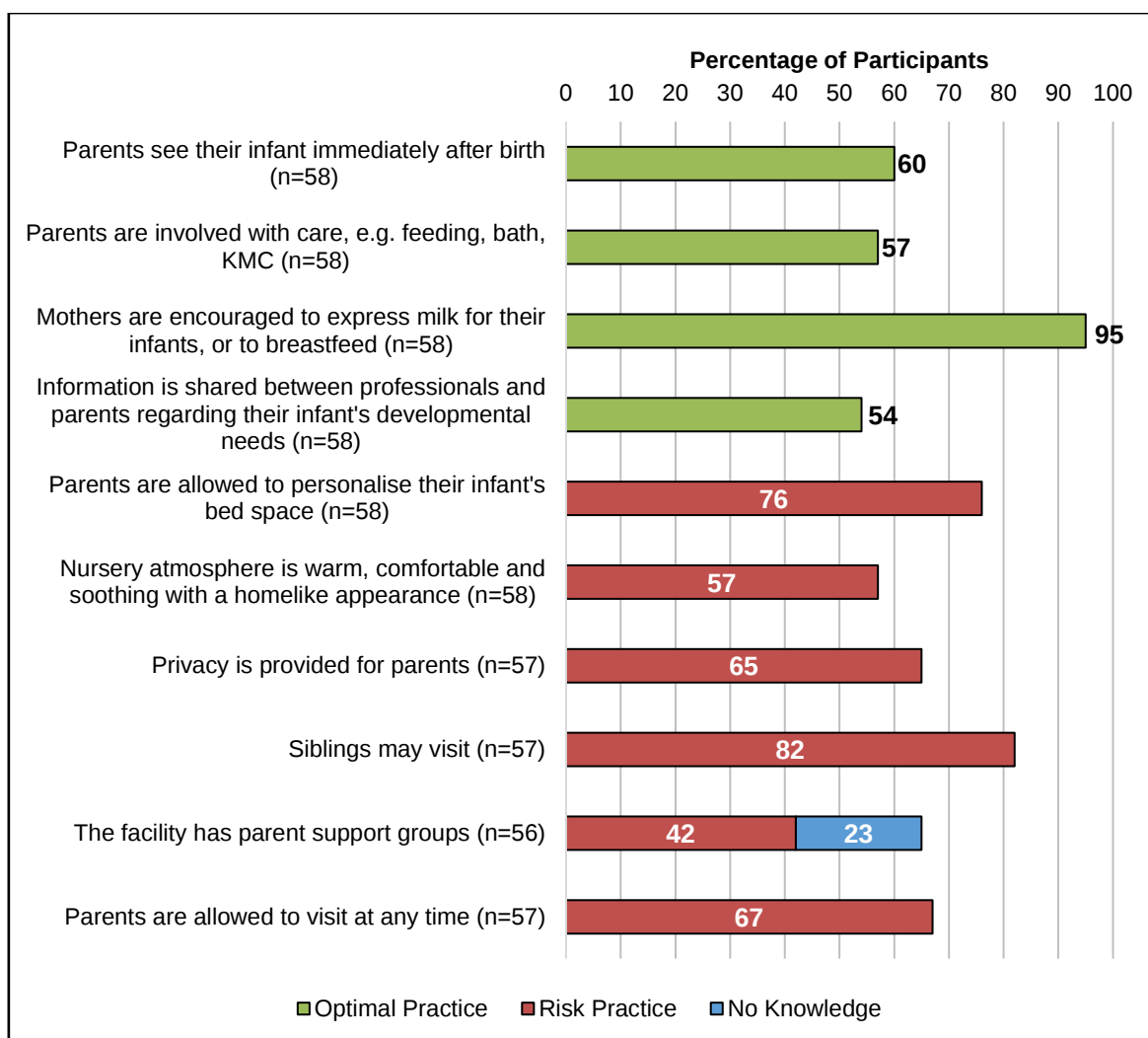


Figure 1: Family-centred philosophy

Positioning

Positioning constitutes the anatomical position of the infant in the NICU and includes aspects such as containment and individualised bedding. Of the 12 questions related to positioning, no agreement was achieved on five of the questions while participants indicated high-risk practice on seven of the questions (high-risk or no knowledge of these NDSC principles). These high-risk areas included aspects such as the absence of firm boundaries, not maintaining the anatomical positioning of the infants (protraction of the shoulders, arms in midline, adduction and flexion of the hips, flexion of the knees), not providing postural supporting during positioning and positioning infants mainly in supine.

Handling Techniques

Most of the items under this NDSC category were highlighted as high-risk practice areas as between 51% (n=29) and 84% (n=47) of participants indicated these individual principles were not adhered to (Figure 2).

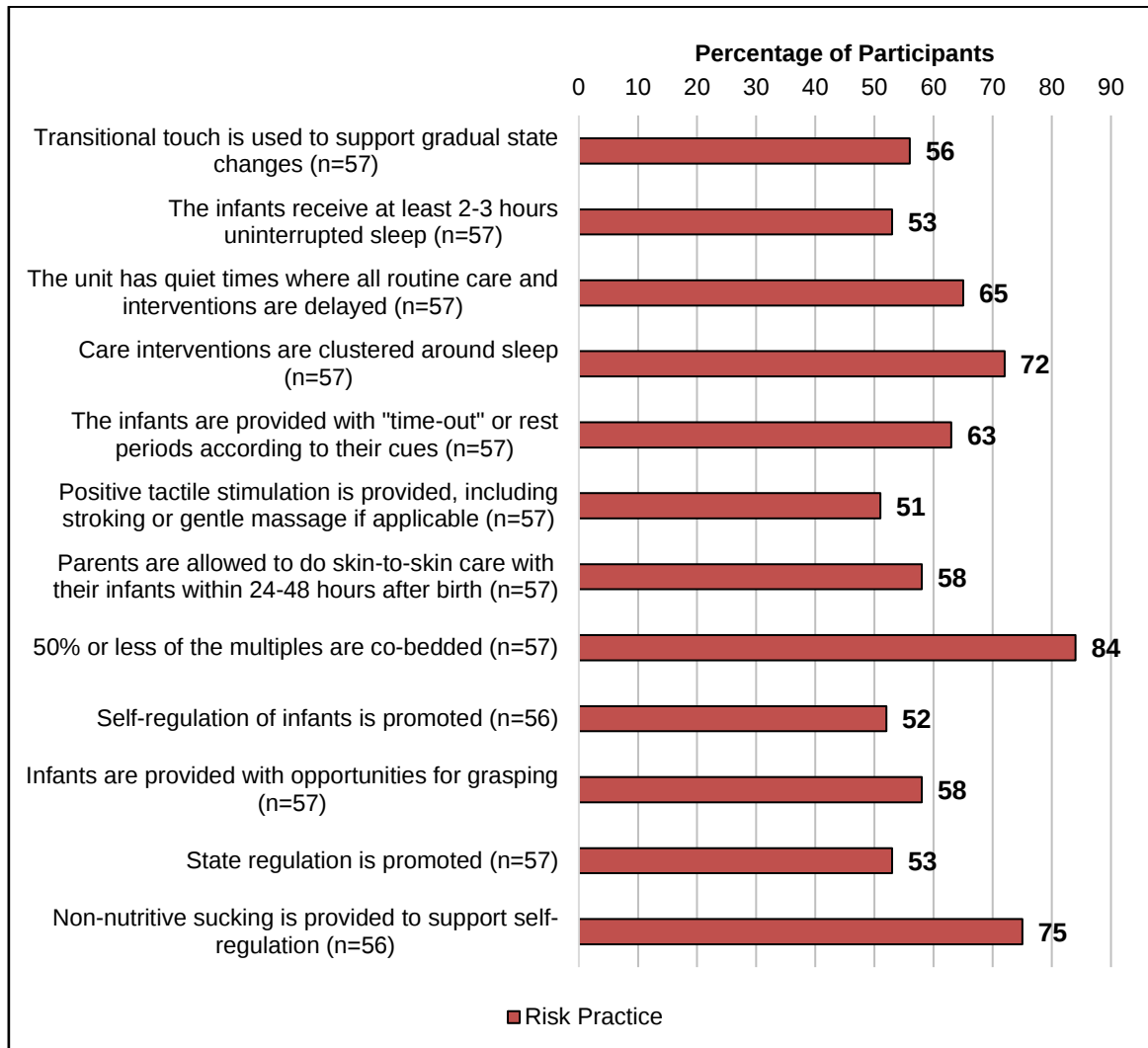


Figure 2: Handling techniques

Environmental Manipulation

This NDSC category included questions on noise, light and smell in the NICU environment. For almost all questions related to noise and light, more than 50% of participants indicated these as high-risk practice areas (Figure 3; Figure 4). Regarding positive olfactory stimulation, 75% (n=42) of the 56 participants indicated no positive olfactory stimulation was provided in the NICU which also highlighted this as high-risk practice.

Participants were, however, aware of the risks of phototherapy and 93% of participants (n=53) stated eye protection was optimally applied during phototherapy (Figure 4).

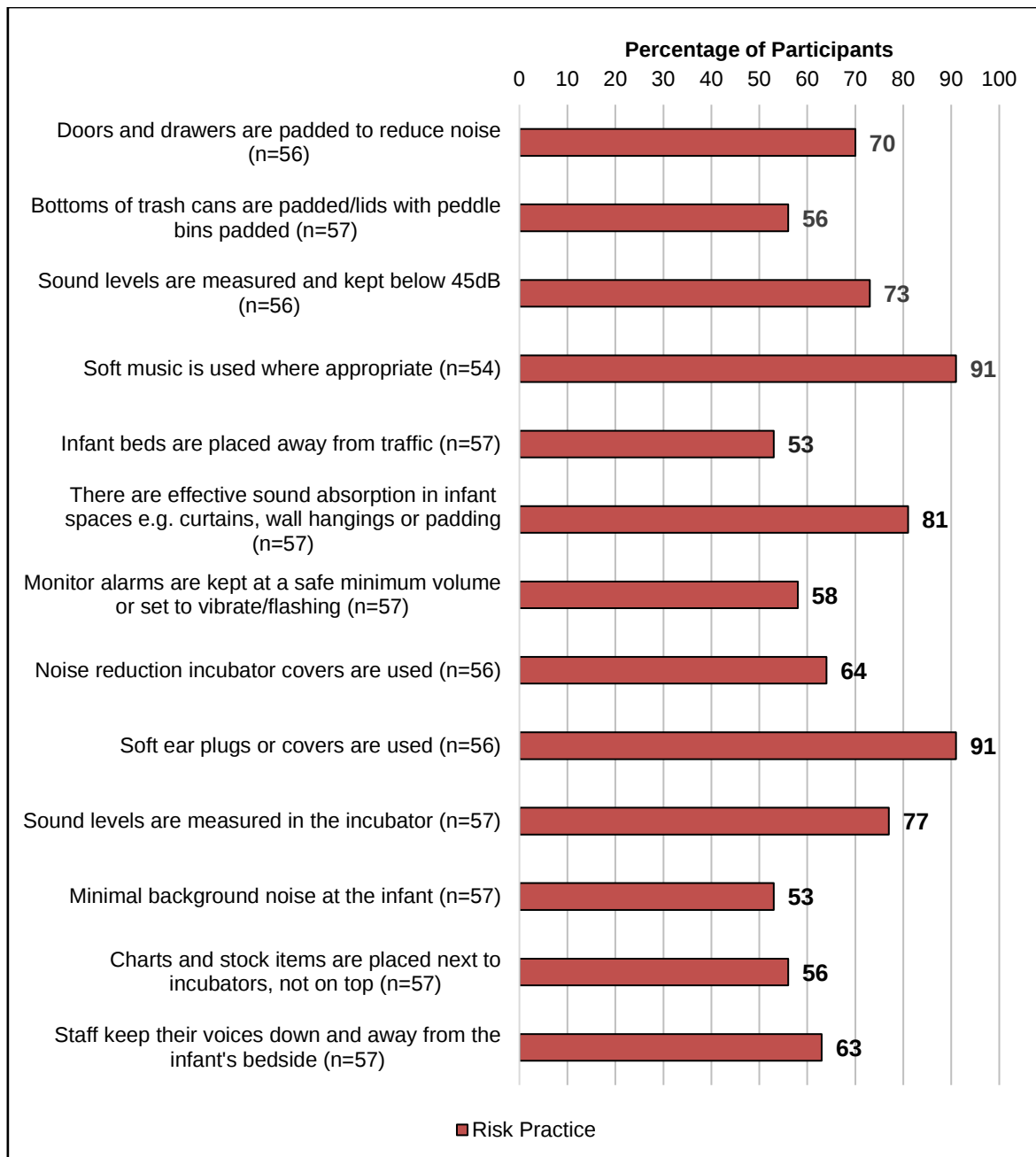


Figure 3: Environmental manipulation: Noise

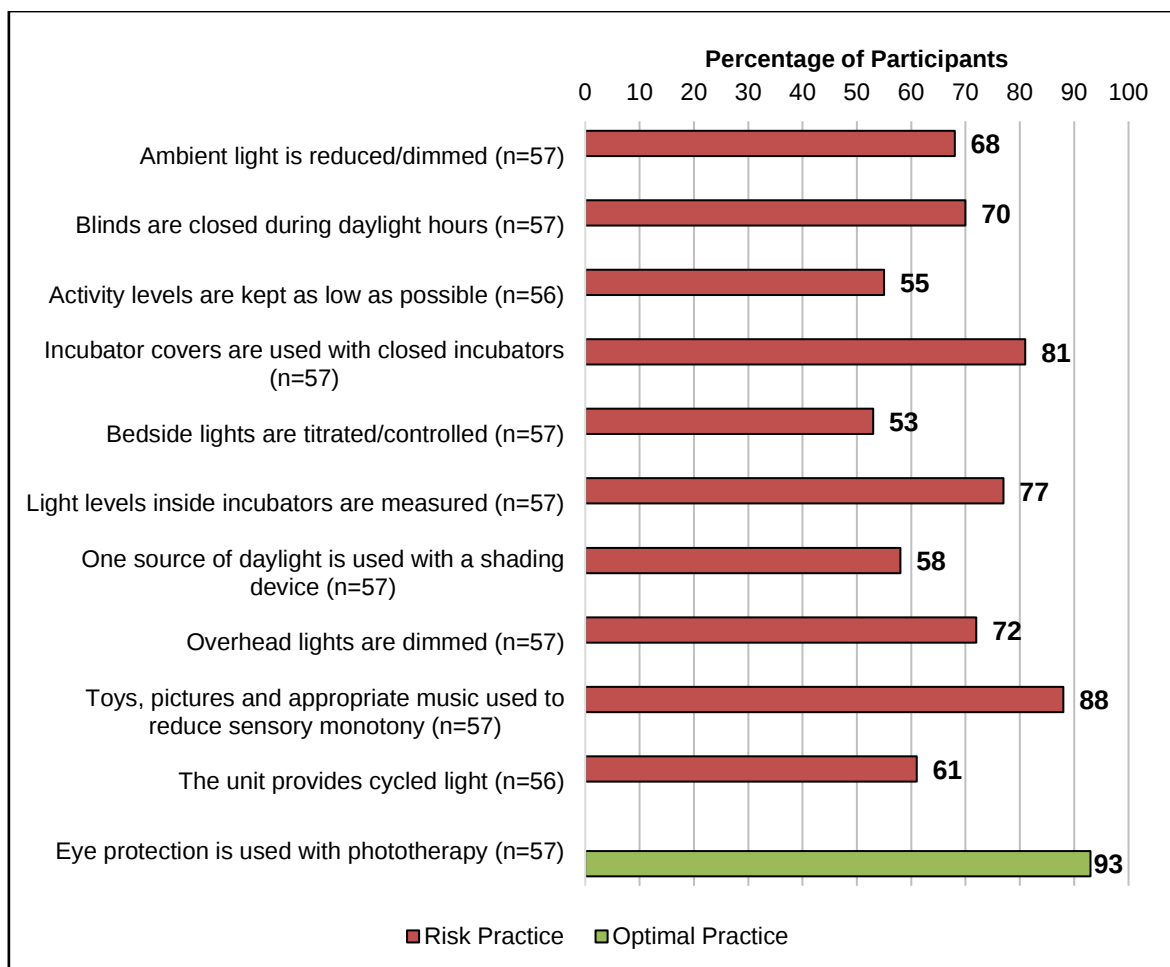


Figure 4: Environmental manipulation: Light

Pain Management

More than 50% of participants indicated oral sucrose and/or non-nutritive sucking were not being used during minor or painful procedures or they had no knowledge of these NDSC principles (Figure 5).

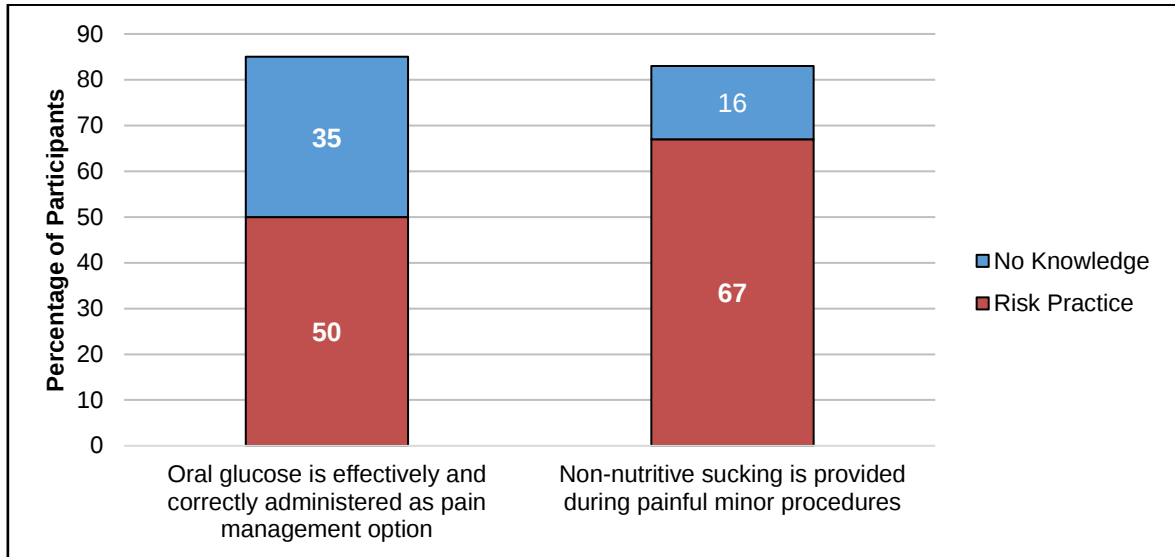


Figure 5: Pain management (n=58)

Knowledge of Infant Development

This NDSC category referred to the knowledge of staff and parents on the development of preterm infants. Regarding the MDT approach, 67% of the participants (n=38) felt an MDT approach is applied in the NICU (Figure 6). With regard to knowledge of infant cues and behaviour, 48% of the participants (n=28) indicated they had not attended training on this topic and a further 26% (n=15) indicated they had no knowledge of what this entails. This related to the results on parents being taught preterm infant cues and behaviours with 43% (n=25) of participants indicating this was not practiced and another 10% (n=6) of participants indicating they had no knowledge of this.

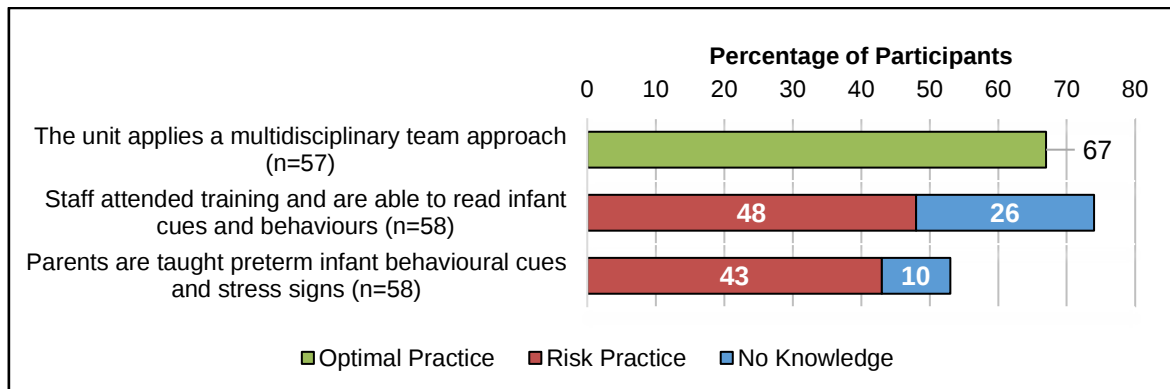


Figure 6: Knowledge of infant development

Feeding

The last NDSC category related to aspects such as preparing the environment as well as the infant for feeding (wrapping the infant to provide containment, positioning the infant to avoid repositioning after feeding, reducing light and noise during feeding and providing non-nutritive sucking during gavage feeding). The results for the preparation for feeding indicated that 47% of the participants (n=27) highlighted this as a high-risk area while a further 14% of the participants (n=8) indicated they had no knowledge of these principles which also indicates high-risk practice (61%; n=35). The positioning of preterm infants prior to gavage feeding (50%; n=29) and providing non-nutritive sucking during gavage feeding (88%; n=51) were also identified as high-risk practice/no knowledge areas.

DISCUSSION

Five of the nine NDSC categories were highlighted by the NICU staff as high-risk practice which indicated poor application of neurodevelopmental supportive care in the NICU environment. These five high-risk categories were: the NICU design, handling techniques, environmental manipulation, feeding and pain.

Staff identified the NICU environment as being not uterine-like and therefore not an optimal environment for preterm infant development (Symington & Pinelli, 2006; Van den Berg, 2007). Aspects such as bright lights and no blinds or incubator covers contributed to this environment not being optimal. Staff further acknowledged aspects such as excessive background noise, loud monitor alarms, items being placed on top of incubators, staff conversations at normal frequency range and high traffic between incubators affecting the ideal noise levels in the NICU. Evidence of the negative effect of excessive noise (McMahon, Wintermark, & Lahav, 2012) and bright lights (Rodríguez & Pattini, 2016) on the preterm infant in the NICU is clear, and in this study, staff also highlighted these aspects as risk areas in their own units. This could be due to a lack of knowledge of how ideal NICU environments should be designed. Staff members might not have access to the necessary research evidence or training, demonstrating the multiple benefits of a uterine-like environment as well as the potential harm an overstimulating environment may cause (McMahon et al., 2012; Rodríguez & Pattini, 2016).

Out of the 19 subcategories under the handling techniques category, staff identified 12 of these as high-risk areas. According to the literature, preterm infants should receive periods of uninterrupted sleep as sleep is important for growth and development (Calciolari & Montiroso, 2011). From the results, it seemed that there was no policy related to uninterrupted sleep, time out or quiet times for these preterm infants. It appeared MDT members attended to these infants at various times throughout the day and night without considering the infants' behavioural state or previous interventions. Promotion of self-regulation was another important principle of handling techniques. If infants are not positioned with shoulder protraction and midline orientation, they would not be able to touch their face or suck their thumb to self-soothe (Browne & Talmi, 2012; Zarem et al., 2013). According to the results, these infants further did not have something to hold onto

or suck to self-regulate which links to the family-centred philosophy. As part of this philosophy, parents should be allowed to personalise the infant's bed space (Lubbe, 2009). In this study parents were not allowed to use any personal blankets or toys in the incubators possibly due to strict infection control protocols in the NICUs. There appears to be a fine balance in the NICU between infection control and providing developmental care. Objects in the incubator can potentially put the infant at risk of infection while according to the NDSC approach, the infant needs something like a blanket or soft toy to self-soothe especially when the parent is not available for kangaroo mother care (KMC).

In South Africa, feeding falls mainly within the scope of the nurse, speech therapist and the dietitian but this NDSC principle entails more than just the intake of breast milk. It also includes aspects such as the infant's readiness to feed as well as preparation of the environment and infant for feeding. This requires wrapping and positioning the infant inside the incubator in a manner that will decrease the need for repositioning after the feed (Lubbe, 2009). Light and noise also need to be reduced to create an optimum environment for feeding. More than 50% of staff either identified this as a high-risk area or had no knowledge of this principle which also indicates risk in itself. Research suggests that all professionals involved in the care of preterm infants should have training on feeding (Nygqvist et al., 2013).

Regarding pain management, more than 80% of participants indicated oral sucrose or non-nutritive sucking is either not being used in the NICU or they had no knowledge of these pain management principles. Research indicates an infant born before 29 weeks gestational age can experience as many as 300 painful procedures such as heel sticks, in the first few months in the NICU (Holsti et al., 2011). Evidence further confirms an association between an increase in procedural pain and (Brummelte et al., 2012) the potential change in brain microstructure and function, stress systems, neurodevelopment, and stress-sensitive behaviours which could lead to neurodevelopmental and behavioural problems (Brummelte et al., 2012; Grunau, 2013). Although medication is often needed, there are also various non-pharmacological ways of managing the preterm infant's pain. These include oral sucrose (Stevens, Yamada, Lee, & Ohlsson, 2013), skin-to-skin contact (Cong et al., 2012), breast feeding (Shah, Herbozo, Aliwalas, & Shah, 2012) and non-nutritive sucking (Liaw et al., 2010) which all form part of the developmental care

approach. Considering the potentially devastating effects of pain on the developing brain of the preterm infant, this important developmental care principle cannot be ignored.

Mixed results (optimal and high-risk practice) were obtained for four NDSC categories, namely individualised care, family-centred care, positioning as well as knowledge of infant development. It is possible that staff did not have a clear understanding of what individualised care entails which might account for the mixed results. According to the NDSC approach, individualised care is comprehensive and linked to the maturity of the infant, cues and behaviours and adapting care to each individual infant (Symington & Pinelli, 2006; Van den Berg, 2007; Lubbe, 2009). Another possible reason for the discrepancy in the results of individualised care is that some staff members felt they were doing their best, despite institutional limitations such as staff shortages (Lala, Lala, & Dangor, 2017). Institutional limitations are important potential barriers for implementation of developmental care in the NICU which need to be considered.

Regarding the family-centred philosophy it is vital for parents to be involved in the care of their infants as this reduces infant and parent stress (Als, 1986; De Bernardo et al., 2017). Although the staff in this study supported parents to be involved in the care of their infants, encouraged mothers to breast feed and shared information with parents, the parents' involvement was often limited due to strict visiting hours, a negative aspect highlighted by staff. Parents and siblings should be able to visit the infants at any time (Lubbe, 2009; Craig et al., 2015; De Bernardo et al., 2017). This is, however, not always possible due to limited space in the NICU to accommodate all parents simultaneously or strict infection control policies related to siblings visiting. It is further challenging to create a home-like atmosphere and to provide privacy for parents, two other important family-centred principles which were highlighted as high-risk practice. The lack of parental support groups was highlighted by staff. Parents find it stressful to care for their preterm infants and support groups can provide a valuable platform for parents to discuss their feelings and concerns (Gooding et al., 2011). Although there are some positive aspects of the family-centred philosophy it appears that these are overshadowed by the negative aspects as highlighted by staff.

The positioning category too presented mixed results. The flexion posture of the preterm infant is important for the development of aspects such as head control and midline orientation which is eventually necessary for tasks such as eating, dressing, play and education. The correct positioning is described as the neck in a neutral position, shoulders protracted, a symmetric body, knees flexed with hips and arms in the midline (Aucott, Donohue, Atkins, & Allen, 2002; Madlinger-Lewis et al., 2014) and is achieved through firm boundaries (Altimier & Phillips, 2016). From observation, the infants were contained with individualised bedding but the boundaries were not firm and snug (Madlinger-Lewis et al., 2014) and did not support the correct anatomical position. It is possible that participants did not have a clear understanding of what the correct positioning of the preterm infant entails.

Knowledge of infant development would contribute to the optimal practice of other NDSC principles such as individualised care, family-centred care, positioning, handling techniques, environmental manipulation, pain management as well as feeding. With sufficient knowledge of infant development, staff should be able to provide evidence-based, developmentally appropriate care which have various neurodevelopmental, clinical, cost-effective and social benefits (Rheeder et al., 2017). Staff would further be able to support and teach parents how to care for their preterm infants based on developmental care principles.

Staff highlighted mixed opinions on knowledge of infant development. A positive aspect identified by staff was the use of a multidisciplinary team approach. The need for a collaborative, efficient team, to provide the necessary care these infants and their families need (Van den Berg, 2007; Barbosa, 2013), is essential for improved infant outcomes and supporting families (Barbosa, 2013). Well-coordinated, multidisciplinary services are important to avoid duplication of services, limit excessive handling of infants and to prevent complications (Limperopoulos & Majnemer, 2002; Barbosa, 2013). A negative aspect highlighted by staff related to the limited training they had on infant cues and behaviours. This most probably links to the MDT's undergraduate and postgraduate training on preterm infants where between 62% and 80% of participants indicated they had no training on neurodevelopmental supportive care (Table 1). It is possible that staff learn practical developmental care skills while on duty or through in-service training but

this self-identified potential gap in their knowledge, should be considered in the development of a training programme.

One of the known limitations for a survey design is the poor response rate (Baruch & Holtom, 2008). Despite various efforts from the researcher, the response rate remained very low at only 23% (n=58) which is below the predicted 52.7% for data collected from individuals (Baruch & Holtom, 2008). Another limitation was the lengthy measurement tool and it is recommended for the INDeSC tool to be used as an audit tool rather than a questionnaire.

Caring for the preterm infant is a specialised area and there is sufficient evidence to support the application of the NDSC approach in the NICU (Lubbe, 2009; White, Smith, & Shepley, 2013; Altimier & Phillips, 2016). This study provided valuable insight into the self-reported adherence to NDSC principles of staff who deliver services to preterm infants and their families in the public sector NICUs in Gauteng. The results indicate preterm infants and their families are not currently receiving the best evidence-based care in the NICU according to the staff.

Based on the results of this study a training programme will have to include all aspects of the developmental care approach as not one of the NDSC categories was identified by staff as optimal practice. This realisation will help staff to understand the need for neurodevelopmental supportive care training which can ultimately lead to improved neonatal outcomes through the use of research-based knowledge (Wallin, Ewald, Wikblad, Scott-Findlay, & Arnetz, 2006; Altimier & Phillips, 2016).

DECLARATIONS

Authors' contributions

Writing the paper was led by LJ. MB acted as the research assistant and assisted with data collection for the study. All revisions were made and the final manuscript approved by all authors involved.

REFERENCES

- Aita, M., & Snider, L. (2003). The art of developmental care in the NICU: a concept analysis. *Journal of Advanced Nursing*, 41(3), 223-232.
<https://doi.org/10.1046/j.1365-2648.2003.02526.x>
- Als, H. (1986). A synactive model of neonatal behavioral organization: framework for the assessment of neurobehavioral development in the premature infant and for support of infants and parents in the neonatal intensive care environment. *Physical & Occupational Therapy in Pediatrics*, 6(3-4), 3-53.
https://doi.org/10.1080/J006v06n03_02
- Als, H. (2008). Program guide: Newborn Individualized Developmental Care and Assessment Program (NIDCAP®), rev. ed. South Attleboro (Mass): NIDCAP Federation International.
- Altimier, L., & Phillips, R. (2016). The neonatal integrative developmental care model: Advanced clinical applications of the seven core measures for neuroprotective family-centered developmental care. *Newborn and Infant Nursing Reviews*, 16(4), 230-244.
<https://doi.org/10.1053/j.nainr.2016.09.030>
- Aucott, S., Donohue, P. K., Atkins, E., & Allen, M. C. (2002). Neurodevelopmental care in the NICU. *Developmental Disabilities Research Reviews*, 8(4), 298-308. <https://doi.org/10.1002/mrdd.10040>
- Barbosa, V. M. (2013). Teamwork in the neonatal intensive care unit. *Physical & Occupational Therapy in Pediatrics*, 33(1), 5-26.
<https://doi.org/10.3109/01942638.2012.729556>
- Baruch, Y., & Holtom, B. C. (2008). Survey response rate levels and trends in organizational research. *Human Relations*, 61(8), 1139-1160.
<https://doi.org/10.1177/0018726708094863>
- Brown, J. (2002). Training needs assessment: A must for developing an effective training program. *Public personnel management*, 31(4), 569-578.
<https://doi.org/10.1177/009102600203100412>
- Brown, J., & Talmi, A. (2012). Developmental supports for newborns and young infants with special health and developmental needs and their Families: The BABIES Model. *Newborn and Infant Nursing Reviews*, 12(4), 239-247.
[doi:https://doi.org/10.1053/j.nainr.2012.09.005](https://doi.org/10.1053/j.nainr.2012.09.005)
- Brummelte, S., Grunau, R. E., Chau, V., Poskitt, K. J., Brant, R., Vinall, J., . . . Miller, S. P. (2012). Procedural pain and brain development in premature newborns. *Annals of Neurology*, 71(3), 385-396.
<https://doi.org/10.1002/ana.22267>
- Burke, L. A., & Hutchins, H. M. (2007). Training transfer: An integrative literature review. *Human Resource Development Review*, 6(3), 263-296.
<https://doi.org/10.1177/1534484307303035>

- Byers, J. F. (2003). Components of developmental care and the evidence for their use in the NICU. *MCN: The American Journal of Maternal/Child Nursing*, 28(3), 174-180.
- Calciolari, G., & Montiroso, R. (2011). The sleep protection in the preterm infants. *The Journal of Maternal-Fetal & Neonatal Medicine*, 24(sup1), 12-14. <https://doi.org/10.3109/14767058.2011.607563>
- Cekada, T. L. (2010). Training needs assessment: Understanding what employees need to know. *Professional Safety*, 55(03), 28-33.
- Cong, X., Cusson, R. M., Walsh, S., Hussain, N., Ludington-Hoe, S. M., & Zhang, D. (2012). Effects of skin-to-skin contact on autonomic pain responses in preterm infants. *The Journal of Pain*, 13(7), 636-645. <https://doi.org/10.1016/j.jpain.2012.02.008>
- Craig, J., Glick, C., Phillips, R., Hall, S., Smith, J., & Browne, J. (2015). Recommendations for involving the family in developmental care of the NICU baby. *Journal of Perinatology*, 35(S1), S5. <https://doi.org/10.1038/jp.2015.142>
- De Bernardo, G., Svelto, M., Giordano, M., Sordino, D., & Riccitelli, M. (2017). Supporting parents in taking care of their infants admitted to a neonatal intensive care unit: a prospective cohort pilot study. *Italian Journal of Pediatrics*, 43(1), 36. <https://doi.org/10.1186/s13052-017-0352-1>
- Goldstein, R. F. (2012). Developmental care for premature infants: a state of mind. *Pediatrics*, 129(5), e1322-e1323. <https://doi.org/10.1542/peds.2012-0511>
- Gooding, J. S., Cooper, L. G., Blaine, A. I., Franck, L. S., Howse, J. L., & Berns, S. D. (2011). Family support and family-centered care in the neonatal intensive care unit: origins, advances, impact. Paper presented at the Seminars in Perinatology. <https://doi.org/10.1053/j.semperi.2010.10.004>
- Grunau, R. E. (2013). Neonatal pain in very preterm infants: long-term effects on brain, neurodevelopment and pain reactivity. *Rambam Maimonides Medical Journal*, 4(4). <https://doi.org/10.5041/RMMJ.10132>
- Holsti, L., Grunau, R. E., & Shany, E. (2011). Assessing pain in preterm infants in the neonatal intensive care unit: moving to a 'brain-oriented' approach. *Pain Management*, 1(2), 171-179. <https://doi.org/10.2217/pmt.10.19>
- Howson, C. P., Kinney, M. V., & Lawn, J. E. (2012). Born too soon: the global action report on preterm birth. Geneva: World Health Organization, 1-126.
- Lala, S., Lala, N., & Dangor, Z. (2017). The nursing crisis in paediatrics in South African state hospitals-an unaddressed problem. *South African Journal of Child Health*, 11(2), 64-65. <https://doi.org/10.7196/SAJCH.2017.v11i2.1432>
- Lawn, J. E., Davidge, R., Paul, V. K., von Xylander, S., de Graft Johnson, J., Costello, A., . . . Molyneux, L. (2013). Born too soon: care for the preterm

baby. *Reproductive Health*, 10(1), S5. <https://doi.org/10.1186/1742-4755-10-S1-S5>

- Legendre, V., Burtner, P. A., Martinez, K. L., & Crowe, T. K. (2011). The Evolving Practice of Developmental Care in the Neonatal Unit: A Systematic Review. *Physical & Occupational Therapy in Pediatrics*, 31(3), 315-338. <https://doi.org/10.3109/01942638.2011.556697>
- Liaw, J. J., Yang, L., Ti, Y., Blackburn, S. T., Chang, Y. C., & Sun, L. W. (2010). Non-nutritive sucking relieves pain for preterm infants during heel stick procedures in Taiwan. *Journal of Clinical Nursing*, 19(19-20), 2741-2751. <https://doi.org/10.3109/01942638.2011.556697>
- Limperopoulos, C., & Majnemer, A. (2002). The role of rehabilitation specialists in Canadian NICUs: A national survey. *Physical & Occupational Therapy in Pediatrics*, 22(1), 57-72. https://doi.org/10.1080/J006v22n01_05
- Liu, L., Oza, S., Hogan, D., Chu, Y., Perin, J., Zhu, J., . . . Black, R. E. (2016). Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. *The Lancet*, 388(10063), 3027-3035. [https://doi.org/10.1016/S0140-6736\(16\)31593-8](https://doi.org/10.1016/S0140-6736(16)31593-8)
- Lubbe, W. (2009). Best practice guidelines for neurodevelopmental supportive care of the preterm infant. (PhD Obstetrical and Neonatal Nursing Science Doctoral dissertation), North-West University (Potchefstroom Campus), Potchefstroom. Retrieved from <https://pdfs.semanticscholar.org/9919/4bdea06b10d3a7facea65f3b1f4c35297be2.pdf>.
- Lubbe, Walt, V. d., & Kloppe. (2012). Integrative literature review defining evidence-based neurodevelopmental supportive care of the preterm infant. *The Journal of Perinatal & Neonatal Nursing*, 26(3), 251-259. <https://doi.org/10.1097/JPN.0b013e3182650b7e>
- Madlinger-Lewis, L., Reynolds, L., Zarem, C., Crapnell, T., Inder, T., & Pineda, R. (2014). The effects of alternative positioning on preterm infants in the neonatal intensive care unit: A randomized clinical trial. *Research in Developmental Disabilities*, 35(2), 490-497. <https://doi.org/10.1016/j.ridd.2013.11.019>
- McAnulty, G. B., Butler, S. C., Bernstein, J. H., Als, H., Duffy, F. H., & Zurakowski, D. (2010). Effects of the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) at age 8 years: preliminary data. *Clinical Pediatrics*, 49(3), 258-270. <https://doi.org/10.1177/0009922809335668>
- McMahon, E., Wintermark, P., & Lahav, A. (2012). Auditory brain development in premature infants: the importance of early experience. *Annals of the New York Academy of Sciences*, 1252(1), 17-24. <https://doi.org/10.1111/j.1749-6632.2012.06445.x>

- Meyers, D. C., Durlak, J. A., & Wandersman, A. (2012). The quality implementation framework: a synthesis of critical steps in the implementation process. *American Journal of Community Psychology*, 50(3-4), 462-480. <https://doi.org/10.1007/s10464-012-9522-x>
- Montirosso, R., Del Prete, A., Bellù, R., Tronick, E., Borgatti, R., & Neonatal Adequate Care for Quality of Life (NEO-ACQUA) Study Group. (2012). Level of NICU quality of developmental care and neurobehavioral performance in very preterm infants. *Pediatrics*, 129(5) e1129-e1137. <https://doi.org/10.1542/peds.2011-0813>
- Nyqvist, K. H., Häggkvist, A.-P., Hansen, M. N., Kylberg, E., Frandsen, A. L., Maastrup, R., . . . Haiek, L. N. (2013). Expansion of the baby-friendly hospital initiative ten steps to successful breastfeeding into neonatal intensive care: expert group recommendations. *Journal of Human Lactation*, 29(3), 300-309. <https://doi.org/10.1177/0890334413489775>
- Ratnapalan, S., & Hilliard, R. I. (2002). Needs assessment in postgraduate medical education: a review. *Medical Education Online*, 7(1), 4542. <https://doi.org/10.3402/meo.v7i.4542>
- Rheeder, A., Lubbe, W., & Pretorius, R. (2017). Compliance with Best Practice Guidelines for Neurodevelopmental Supportive Care in South Africa: A Situational Analysis. *The Journal of Perinatal & Neonatal Nursing*. <https://doi.org/10.1097/jpn.0000000000000275>
- Rodríguez, R. G., & Pattini, A. E. (2016). Neonatal intensive care unit lighting: update and recommendations. *Archivos Argentinos de Pediatría*, 114(4), 361-367. <https://doi.org/10.5546/aap.2016.361>
- Salas, E., Tannenbaum, S. I., Kraiger, K., & Smith-Jentsch, K. A. (2012). The science of training and development in organizations: What matters in practice. *Psychological Science in the Public Interest*, 13(2), 74-101. <https://doi.org/10.1177/1529100612436661>
- Shah, P. S., Herbozo, C., Aliwalas, L. L., & Shah, V. S. (2012). Breastfeeding or breast milk for procedural pain in neonates. *The Cochrane Library*. <https://doi.org/10.1002/14651858.cd004950.pub3>
- Smith, J. G., Desai, P. P., Sira, N., & Engelke, S. C. (2014). Family-centered developmentally supportive care in the neonatal intensive care unit: Exploring the role and training of child life specialists. *Children's Health Care*, 43(4), 345-368. <https://doi.org/10.1080/02739615.2014.880917>
- Stevens, B., Yamada, J., Lee, G. Y., & Ohlsson, A. (2013). Sucrose for analgesia in newborn infants undergoing painful procedures. *Cochrane database of systematic reviews*, 1(1). <https://doi.org/10.1002/14651858.CD001069.pub4>
- Symington, A. J., & Pinelli, J. (2006). Developmental care for promoting development and preventing morbidity in preterm infants. *Cochrane*

database of systematic reviews (2)
<https://doi.org/10.1002/14651858.cd001814.pub2>

Van den Berg, K. A. (2007). Individualized developmental care for high risk newborns in the NICU: a practice guideline. *Early Human Development*, 83(7), 433-442. <https://doi.org/10.1016/j.earlhumdev.2007.03.008>

Waitzman, K. A. (2007). The importance of positioning the near-term infant for sleep, play, and development. *Newborn and Infant Nursing Reviews*, 7(2), 76-81. <https://doi.org/10.1053/j.nainr.2007.05.004>

Wallin, L., Ewald, U., Wikblad, K., Scott-Findlay, S., & Arnetz, B. B. (2006). Understanding work contextual factors: a short-cut to evidence-based practice? *Worldviews on Evidence-Based Nursing*, 3(4), 153-164. <https://doi.org/10.1111/j.1741-6787.2006.00067.x>

White, R. D., Smith, J., & Shepley, M. (2013). Recommended standards for newborn ICU design. *Journal of Perinatology*, 33(S1), S2. <https://doi.org/10.1038/jp.2013.10>

Zarem, C., Crapnell, T., Tiltges, L., Madlinger, L., Reynolds, L., Lukas, K., & Pineda, R. (2013). Neonatal nurses' and therapists' perceptions of positioning for preterm infants in the neonatal intensive care unit. *Neonatal Network: NN*, 32(2), 110. <https://doi.org/10.1891/0730-0832.32.2.110>

5.3 QUALITATIVE RESULTS OF THE MULTIDISCIPLINARY SURVEY

As previously mentioned, the self-reported survey on the MDT's adherence to NDSC included both quantitative and qualitative elements. For each NDSC subcategory on the INDeSC questionnaire, a comment box was provided for participants to add any additional thoughts, opinions or information relating to the questions in each specific NDSC subcategory. These qualitative results were not included in the manuscript presented in Paragraph 5.2 above. The researcher analysed the qualitative data and presents the results below in Paragraph 5.3.1. The methodology for these qualitative results was described in Chapter 4: Methodology (Paragraph 4.6.1).

5.3.1 Results

The demographic information of the participants was presented in the previous Manuscript 1: Adherence to neurodevelopmental supportive care in the neonatal intensive care unit: A survey among the multidisciplinary team (Paragraph 5.2, Table 1).

Four themes relating to the adherence of NDSC principles in the NICU were derived from the thematic analysis: *the medical model, knowledge of NDSC, the multidisciplinary team (MDT) approach and facility limitations* (Table 5.1). These themes are described and supported below with direct quotes from the participants.

5.3.1.1 The medical model

Participants felt some MDT members prioritise routine procedures, medical conditions or medical protocols in the NICU above the application of developmental care. This could be seen in comments such as *"care is not individualized according to the infant's needs. Staff are more concerned about doing the job than providing developmentally appropriate care"*. Another participant noted *"...procedures are done without regard for the developmental and sensory needs of the infant which in turn over stimulates the infant even more"*. Medical conditions and protocols further impacted on developmental care as seen from the comments: *"holding them is not possible when a baby is on a machine, e.g. a ventilator, where we sometimes operate on minimal touch regime"* and *"most of the noise reducing equipment is not used as it creates a risk for infection"*.

5.3.1.2 Knowledge of neurodevelopmental supportive care

Knowledge of NDSC was one of the salient themes identified which potentially also impacted on some of the other themes such as the MDT approach and the medical model. This theme included the lack of knowledge of both staff and parents, and it was clear this impacted on the application of developmental care in the NICU. One participant suggested: *"...generally, only the therapy staff who are trained in NDSC respond to cues and provide interventions according to the gestational age of the infant"*. With regard to parent knowledge, this also seemed to be limited as a participant noted *"...parents have very limited training and time to spend with the infant in the facility..."*.

5.3.1.3 The multidisciplinary approach

Various participants commented on the limited training of the MDT on NDSC and inconsistent or limited services as a result of this. Some of the comments from participants included: *"not all staff are trained"*, *"more training is required"* and *"they don't train us"*. This was linked to aspects such as parent involvement in the NICU: *"...mothers are not encouraged to hold their babies and be involved in their care"* and *"... a few of the infants are referred for therapy. These mothers receive a bit more education than the other mothers"*. Other participants noted *"some nursing staff will nest children"* and *"it (developmental care) is not always encouraged by the staff as they also do not see the necessity of it"*.

5.3.1.4 Facility limitations

Facility limitations included aspects such as staff shortages, insufficient equipment, structural limitations of the units and policies such as visitation by parents which impeded the operationalisation of developmental care. The NICUs are often overcrowded with patients and staff which contribute to excessive noise and overstimulation in these units. One participant stated *"infants are also very close to one another and if one is crying, it disturbs the others"*. Several participants commented on the limited equipment in these units: *"Lack of bedding and positioning tools"*, *"bedding is not always available"* while others noted the effect of staff shortages: *"Short staff doesn't allow for continuous care and assessment of infant needs"*. The shortages of staff can further potentially explain limited services as one participant said *"I haven't heard about any support groups for parents"*.

Policies seemed to further limit developmental care as can be seen from the statement *“The step-down neonate ward attempted to do no visiting hours but this was stopped shortly after due to infection control problems”*.

Table 5.1: Qualitative analysis of the Implementation of Neurodevelopmental Supportive Care (INDeSC) questionnaire

Themes	Subthemes	Quote examples
Knowledge of NDSC	Staff knowledge	<i>Doctors and nurses are usually not aware of transitional touch (P12)</i> <i>Procedures are done without regard for the developmental and sensory needs of the infant (P3)</i>
	Parent knowledge	<i>Parents are given health education most of the time (P5)</i> <i>Mothers are more aware of the infants' cues but do not always respond to them in the appropriate manner (P35)</i> <i>Often the infants are left crying, moving and fussing with no interaction or response from the parents (P18).</i>
Facility limitations	Staff shortages	<i>Nurses have a high load and cannot see to each infants positioning (P10)</i> <i>Wards are under-staffed and staff cannot respond to all infants' cues and behaviours due to high loads (P23)</i>
	Insufficient equipment	<i>No dedicated positioning tools are available (P1)</i> <i>Staff use sheets found in cots to position which usually is not sufficient (P5)</i>
	Structural limitations	<i>The noise in the unit is fairly loud with the overcrowding of people (P17)</i> <i>All infants' things are placed on top of incubators (P3)</i> <i>There are no curtains on the windows, no dimmers on the lights (P22)</i> <i>There's no blinds or curtains at our windows (P19)</i>
The multidisciplinary team (MDT) approach	Limited training on neurodevelopmental supportive care (NDSC)	<i>Doctors and nurses are usually not aware of transitional touch (P14)</i> <i>Procedures carried out quickly and no pain reduction strategies observed (P5)</i> <i>Developmental care is not seen as a priority (P9)</i>
	Parent involvement	<i>In NICU the parents have to stand next to the incubators during visiting times which discourages handling (P18)</i> <i>Parents are only allowed in to the unit during feeding times (P39)</i>
	Limited services	<i>No support groups to my knowledge (P23)</i> <i>We only refer to psychology or social workers when we realise the parents need extra support (P20)</i>
	Inconsistent services	<i>Follow up clinic for certain premature infants (P31)</i> <i>Kangaroo Mother Care is allowed but only a select few mothers are taught about this (P27)</i>

Themes	Subthemes	Quote examples
The medical model	Prioritise routine medical practice	<i>Care is standard for all infants as development is not a priority for majority of the staff (P3)</i> <i>They are usually in a hurry to complete the procedure then they ignore the state of the infant (P9)</i> <i>Cues not identified by medical staff as infants seen in bed sequence and not according to individual states (P11)</i> <i>Routine oriented not individual care (P6)</i>
	Medical protocols	<i>The step-down neonate ward attempted to do no visiting hours but this was stopped shortly after due to infection control problems (P15)</i> <i>Strict policy due to infection control (P9)</i> <i>No personal items are allowed and due to infection control (P12)</i>

5.3.2 Discussion

As part of the MDT self-reported survey, participants provided qualitative comments on the NDSC subcategories related to the adherence of the NICUs to the developmental care approach. Various barriers have been highlighted by the MDT as potentially impacting on the operationalisation of developmental care in the NICU.

The medical model is one of the themes identified in the survey which potentially affects the operationalisation of NDSC in the NICU. The medical or biomedical model of care focuses mainly on illness and disease (Farre & Rapley, 2017) and although it is vitally important to, first of all, save the lives of these preterm infants (Howson et al., 2012), it is also important to consider their quality of life going forward (Symington & Pinelli, 2006; Van den Berg, 2007; Lubbe, 2009). The busy, noisy, bright NICU environment has been identified as a stressful environment, negatively affecting the development of these infants' brain structure and function (Smith et al., 2011) potentially leading to conditions such as severe developmental disability, cerebral palsy, cognitive impairment, and speech and hearing impediments (Post & Maree, 2009; Mwaniki, Atieno, Lawn, & C, 2012; Chang, 2015). Regardless of this evidence, it appears the medical model is still dominating in these public sector NICUs focusing on standard, routine care and procedures where medical conditions are prioritised regardless of the maturation, state or behaviour of the preterm infants. Parent information or education often also focuses on medical aspects such as the infant's diagnosis, prognosis and medication, and include very little on their developmental care needs. This theme can probably also link back to the knowledge of NDSC. MDT members practice within the framework they know, how they were trained and what they feel most comfortable with. For change to occur in these units, there will have to be a paradigm shift towards a premie-friendly and family-centred model of care which forms the foundation of the NDSC approach (Post & Maree, 2009).

Knowledge of neurodevelopmental supportive care was another theme identified by the participants as a potential barrier to the application of NDSC principles in the NICU. This related not only to the knowledge of staff but also to the knowledge of

parents. If staff do not have knowledge of NDSC, it is impossible to implement this foundational approach in the NICU (Lubbe, 2009; Altimier & Phillips, 2013). Furthermore, staff would not be able to train parents on the importance of aspects such as positioning, handling and kangaroo mother care (KMC) without having the necessary knowledge themselves (Rheeder et al., 2017). Similarly to a country such as Spain, it seems NDSC is not always included in the curricula of healthcare professionals working in the NICU, on an under- or postgraduate level (Mosqueda-Peña et al., 2016; Butler, 2018). Training of both staff and parents is vital in the successful implementation of developmental care (Lawn, Davidge, Paul, von Xylander, Johnson, et al., 2013; Milette et al., 2017). Parents play an essential role in neurodevelopmental supportive care and are described as collaborators in the care of these infants (Craig et al., 2015). In fact, one of the key categories of developmental care is the family-centred philosophy which promotes long-term parent-infant relationships and contributes to the development of these infants on a physical, psychological and cognitive level (Lubbe, 2009; Craig et al., 2015). In studies where parents were actively involved in the care of their infants, these infants presented with improved breast feeding, increased weight gain and decreased length of stay in the hospital (Mörelus, Broström, Westrup, Sarman, & Örténstrand, 2012; O'Brien et al., 2013; De Bernardo et al., 2017).

A third theme identified by participants affecting NDSC in the NICU, was the MDT approach. This approach requires healthcare professionals from all disciplines to provide a collaborative service to preterm infants and their families (Altimier et al., 2015). From the results, it appears not all MDT members are involved with every preterm infant in the NICU. Not all infants are referred to the various disciplines such as the physiotherapist, dietitian or speech therapist which seems to cause inconsistencies in service delivery in the public sector NICU. Infants and parents who are referred to allied health professionals tend to get the essential information and training related to developmental care. It is likely that these infants have more overt medical or neurological conditions requiring additional support services and are therefore referred to the other disciplines. It does not, however, mean preterm infants with less severe medical conditions do not need developmental care and the support from the rest of the MDT. NDSC needs to be a high-quality, multidisciplinary approach applied to the entire NICU and benefiting each and every infant in the

NICU (Montirosso, Del Prete, Bellù, Tronick, & Borgatti, 2012). Such a multidisciplinary collaboration can, not only lead to continuity of care, but also to improved patient outcomes (Welch, Check, & O'Shea, 2017). The MDT approach theme also links with the second theme, namely knowledge of NDSC, which can further impact on inconsistent services in the NICU (Rheeder et al., 2017). Those MDT members who have knowledge of NDSC tend to apply this MDT approach in the NICU, where those who don't, are likely to provide standard care.

The last theme identified which can impact on the operationalisation of NDSC in the NICU related to facility limitations which included the physical structure of the units, resources (staff, equipment and time), available services and current policies. The units in this study have limited space and are, most of the time, overcrowded with patients and staff, contributing to the noise levels in the NICU. In another South African study, conducted in a public sector NICU, reasons for poor operationalisation of developmental care in the NICU also included availability and maintenance of equipment, ward routine and the shortage of staff (Rakhetla & Lubbe, 2016). Shortages of staff and equipment is an ongoing concern in the public healthcare sector which further impact on the delivery of services (Manyisa & van Aswegen, 2017; Mokoena, 2017). Not all preterm infants and their families receive the necessary services they need, such as parent support groups. Policies in the units, such as visitation of parents, are often further driven by a lack of space and privacy in these units making it difficult to apply all NDSC principles in the NICU.

5.3.3 Conclusion

The themes identified in the qualitative analysis provided insight into the need for training of the MDT on the NDSC approach. A lack of knowledge of neurodevelopmental supportive care was one of the main reasons for insufficient developmental care operationalisation in the NICU, while aspects such as facility limitations, an inadequate MDT approach and the dominance of the medical model in these units, can be considered as potential reasons for why the MDTs do not adhere to NDSC principles. These potential barriers will have to be considered when planning and implementing a training programme, as some of these aspects are unlikely to change in the public healthcare sector, in the short term.

5.4 SUMMARY

In this chapter the training needs of the MDT, providing services in the selected NICUs, were determined as part of Phase 1 of the study. Determining training needs is seen as a critical first step in the implementation process. This was done through a survey on the MDT's self-reported adherence to NDSC principles in the NICU. Participants completed the INDeSC questionnaire which included both quantitative and qualitative elements. The quantitative results confirmed the MDT at both hospitals did not adhere to the NDSC approach and would benefit from a training programme on all nine NDSC categories. The qualitative results supported the identified need of the MDT for training but also highlighted potential barriers for why the MDTs did not adhere to developmental care principles. These contextual factors can potentially influence the successful implementation of the training programme and need to be considered in the planning of the implementation. The next chapter will focus on the rest of the objectives of Phase 1 of the study.

CHAPTER 6: NEURODEVELOPMENTAL SUPPORTIVE CARE IN THE NEONATAL INTENSIVE CARE UNIT

6.1 INTRODUCTION

This chapter forms part of Phase 1 of the study and addresses the results and discussion of Objective 1.2 to Objective 1.5 (Figure 1.1). Objective 1.2 aimed to determine the operationalisation of neurodevelopmental supportive care (NDSC) in the neonatal intensive care unit (NICU) before implementation of the intervention. The next step in the implementation process was to conduct an intervention fit assessment (Objective 1.3). The purpose of this step was to ensure the intervention, the Little Steps® Introduction to NDSC training programme, met the needs of the multidisciplinary team (MDT) as identified in Objective 1.1. Following this, the readiness of the MDT, for the implementation of a NDSC training programme, was determined (Objective 1.4). The last part of Phase 1 of the study was to develop a pre-innovation session for the critical stakeholders (Objective 1.5). The results of Objective 1.4 are presented in the form of a manuscript (Paragraph 6.4) while Objective 1.2, Objective 1.3 and Objective 1.5 are presented separately in Paragraphs 6.2, 6.3 and 6.5.

6.2 THE CURRENT OPERATIONALISATION OF NEURODEVELOPMENTAL SUPPORTIVE CARE IN THE NEONATAL INTENSIVE CARE UNIT

Prior to the implementation of a NDSC training programme it is important to determine the current state of operationalisation of NDSC in two public sector NICUs. The researcher conducted a pre-implementation survey in the two NICUs and the results are presented below.

6.2.1 Results

An existing structured observation checklist, the Implementation of Neurodevelopmental Supportive Care (INDeSC) tool was used (Lubbe, 2009). The adherence to the nine NDSC categories, are presented as a percentage per category for the two NICUs (Figure 6.1). For both hospitals, on eight of the nine NDSC categories, an adherence of 40% or less was demonstrated. These results indicated high-risk practice relating to developmental care and a definite need for change was indicated for both NICUs. Positioning was the only NDSC category

where both hospitals demonstrated more than 50% adherence (Hospital A: 59%; Hospital B: 54%). Although the operationalisation of NDSC, in both units, were deemed to be below standard (36% for both hospitals), there were some individual items on the INDeSC tool which were highlighted as optimal practice (Table 6.1). Individual items highlighted as optimal practice for Hospital A included: infants' eyes are covered for phototherapy; mothers are encouraged to express milk for their infants, or to breastfeed; infant beds are positioned away from traffic and appropriate soft bedding is used. Optimal practice items identified for Hospital B included: the unit has quiet times where all routine care and interventions are delayed; bottoms of trash cans are padded/lids with peddle bins padded; eye protection is used with phototherapy; and mothers are encouraged to express milk for their infants, or to breastfeed.

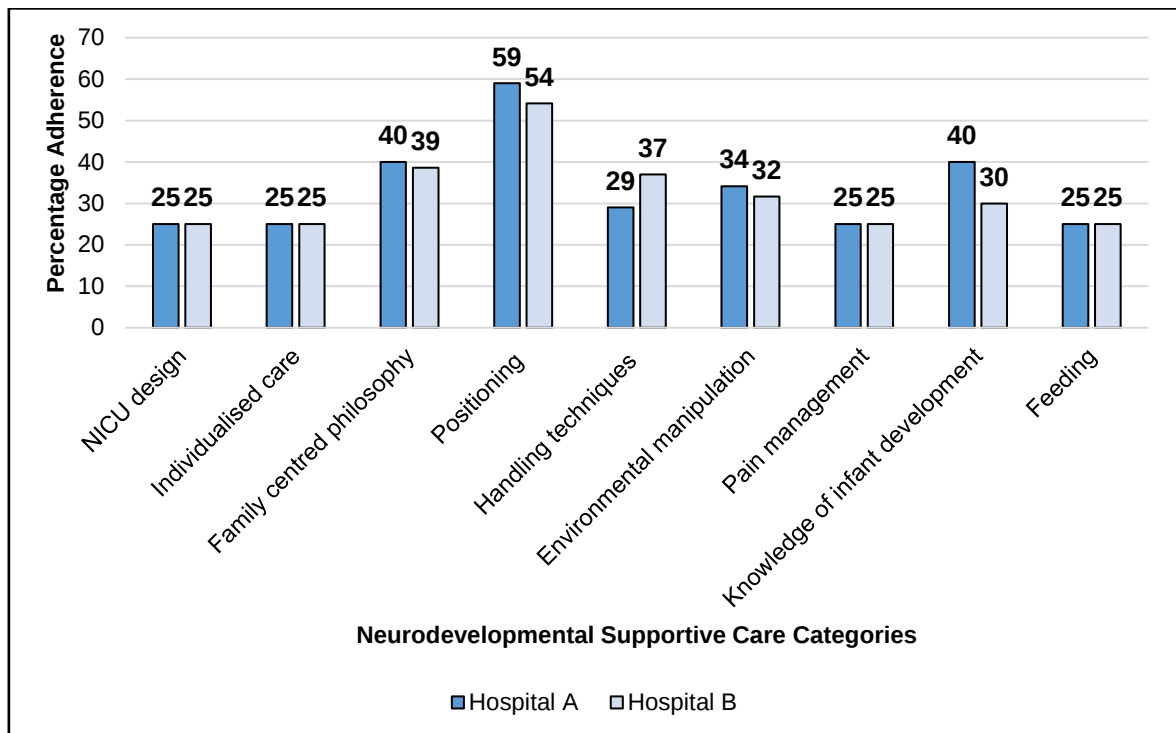


Figure 6.1: Adherence to Neurodevelopmental Supportive Care categories

Table 6.1: Pre-implementation survey: Implementation of Neurodevelopmental Supportive Care (INDeSC) tool

Score of 4: <i>All the criteria for a certain item are met and it is deemed to be highly relevant to the criteria.</i> Score of 3: <i>Most of the requirements are met, but there is room for improvement and it is quite relevant.</i> Score of 2: <i>Very little criteria are met and it is somewhat relevant.</i> Score of 1: <i>No criteria are met and the item is not relevant.</i>			Hospital A	Hospital B
No	Guideline	Measurement Criteria		
1. NICU Design			1/4	1/4
1		Is a uterine-like environment created for each infant to support and environment conducive to growth and optimum development	1	1
2. Individualised care			6/24	6/24
2.1	Observation	The caregiver reads the infant's cues and behaviours	1	1
		The staff respond to infant cues and behaviours	1	1
		The caregiver continuously and systematically assesses and evaluates the infant's developmental needs	1	1
		Care is adapted according to cues and behaviours	1	1
2.2	Care	Care is provided according to the infant's individual developmental maturity	1	1
		Autonomic, motoric, and behavioural cues are identified and used to support individualised caregiving	1	1
3. Family centred philosophy			19/48	17/44
3.1	Parents as active participants	Parents see their infant immediately after birth	2	N/A
		Parents touch their infant immediately after birth	2	N/A
		Parents hold their infant	1	1
		Parents are involved with care, e.g. feeding, bath, KMC	3	1
		Parents are allowed to personalise their infant's bed space	1	1
		Mothers are encouraged to express milk for their infant, or to breastfeed	4	4
		Discharge training commenced	N/A	1
3.2	Privacy and comfort	Nursery atmosphere is warm, comfortable and soothing with a homelike appearance	1	1
		Privacy is provided for parents	1	1
		Information is shared between professionals and parents regarding their infant's developmental needs.	1	1
3.3	Visitation	Parents are allowed to visit at any time	1	3
		Siblings may visit	1	1
3.4	Parent support groups	The facility has parent support groups	1	2

4. Positioning			26/44	26/48
4.1	Anatomical infant positioning	Is the preterm infant positioned anatomically?	1	2
	Containment	The infants are contained	3	2
		The infants have firm boundaries that fit snugly	2	2
	Midline	The body position is symmetric	3	2
		The neck is in neutral position with the head in midline in line with the body	2	2
		The shoulders are protracted	2	2
		The arms are in midline	2	2
	Flexion	The knees are flexed	3	3
		The hips are flexed in a neutral position with some adduction	3	3
		Infants are kept in flexion (limbs and shoulders) during positioning and postural support	N/A	1
4.2	Orientation	Prone or side-lying positions are rather used than supine, especially in acutely ill infants	2	2
4.3	Individualised	Individualised bedding is used to position infants	3	3
5. Handling Techniques (transition support)			21/72	28/76
5.1	Care according to maturation	Care changes as infants mature	1	1
5.2	State changes	The caregiver supports gradual state changes by using transitional touch	1	1
5.3	Promotion of rest and sleep	The infants receive at least 2-3 hours uninterrupted sleep	1	3
		The unit has quiet times where all routine cares and interventions are delayed	1	3
5.4	Modified hands-on care-giving	Care interventions are clustered around sleep	1	3
		Calm, gentle containment and facilitation is provided during handling procedures to support flexion.	1	1
		The infant is provided with "time-out" or rest periods according to his/her cues	1	1
		Direct hands-on-caregiving is modified by providing positive tactile stimulation	1	1
5.5	Positive tactile stimulation	Positive tactile stimulation is provided, including stroking or gentle massage if applicable	1	1
		Containment or still hold is provided	1	1
		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)	N/A	1
		Preterm infants are swaddled	1	2

5.6	Movement (Kinaesthetic stimulation)	Preterm infants are moved slowly, as a whole, keeping the body and head aligned and limbs tucked in.	1	1
		Appropriate soft bedding is used	4	3
		Multiples are co-bedded. Always (2) if stable (1) never (0)	1	1
5.7	Self-regulation	Self-regulation of infants is promoted.	1	1
		Infants are provided with opportunities for grasping.	1	1
		State regulation is promoted.	1	1
		Non-nutritive sucking is provided to support self-regulation	1	1
6. Environmental manipulation			39/116	38/120
6.1	Reduction of noise			
	Ambient environment	No radio or stereo equipment used in the unit, telephones away and rings softly.	2	1
		Doors and drawers are padded to reduce noise	2	1
		Bottoms of trash cans are padded/lids with peddle bins padded	1	4
		Sound levels are measured and kept below 45dB	1	1
		Soft music is used where appropriate.	N/A	1
		Infant beds are placed away from traffic	3	1
		There is effective sound absorption in infant spaces e.g. curtains, wall hangings or padding.	1	1
		Monitor alarms are kept at a safe minimum volume or set to vibrate/flashing	1	1
		Staff respond to alarms quickly	1	1
	Immediate infant environment	Noise reduction incubator covers are used.	1	1
		Soft ear plugs or covers are used.	1	1
		Closed incubator portholes are closed quietly by using the latch	N/A	1
		Sound levels are measured in the incubator	1	1
		Ventilator tubes are emptied regularly, no water build-up	4	N/A
		Minimal background noise at the infant	1	1
	Staff generated noise	Charts and stock items are placed next to incubators, not on top.	1	1
		Staff keep their voices down and away from the infant's bedside	1	1
6.2	Reduction of light			
	Ambient light	Ambient light is reduced/dimmed	1	1
		Blinds are closed during daylight hours	1	1
		Activity levels are kept as low as possible	1	1

	Immediate infant bed space	Incubator covers are used with closed incubators	1	1
		Direct bright light is avoided	1	1
		Bedside lights are titrated/controlled	1	N/A
		Light levels inside incubators are measured	1	1
		Eye protection is used with phototherapy	4	4
		One source of daylight is used with a shading device	1	1
		Overhead lights are dimmed	N/A	1
		Procedures are kept to a minimum to ensure minimum handling	1	1
		Toys, pictures and appropriate music used to reduce sensory monotony	1	1
	Cycled light	The unit provides cycled light	1	2
		Day/night cycle is provided with 12 hours of low light and sound at night	1	2
6.3	Olfactory simulation			
		Positive olfactory stimulation is provided, such as mom's smell inside the incubator.	1	1
7. Pain management			2/8	2/8
7		Oral glucose is effectively and correctly administered as pain management option	1	1
		Non-nutritive sucking is provided during painful minor procedures	1	1
8. Knowledge of infant development			8/20	6/20
8.1	Staff	Staff attended training and are able to read infant cues and behaviours	2	1
		Knowledge is shared between professionals	1	1
		The unit applies a multidisciplinary team approach	3	2
8.2	Parental education	Parents are taught preterm infant behavioural cues and stress signs.	1	1
		Parents are taught how to interact with their preterm infant based on the cues and behaviours.	1	1
9. Feeding			3/12	3/12
9		Preterm infants are prepared for feeding.	1	1
		Preterm infants are positioned in a way that prevents the need for repositioning after a gavage feed.	1	1
		Non-nutritive sucking is provided during gavage feeding.	1	1
Overall compliance with neurodevelopmental supportive care (NDSC) principles		Grand total for unit	125/348	127/356
		Compliance in percentage	35.9%	35.6%

6.2.2 Discussion

Neurodevelopmental supportive care has been identified as the best evidence-based practice when caring for preterm infants and their families (Legendre et al., 2011; Montirosso, Del Prete, Bellù, Tronick, Borgatti, et al., 2012; Altimier & Phillips, 2016). The results of the pre-implementation survey confirmed the operationalisation of NDSC was not optimal in two public sector hospital NICUs in Gauteng. Eight of the nine NDSC categories were identified as areas of high-risk practice and in need of change (Figure 6.1).

The only NDSC category with more than 50% adherence for both hospitals, was positioning. Majority of the preterm infants in the two NICUs had individualised bedding and were positioned with their hips and knees in a flexed position which aligns with the NDSC guidelines (Consensus Committee of the Standards et al., 2020). The infants from Hospital A were further more contained in a symmetrical position which facilitates better physiological flexion. and self-soothing (Zarem et al., 2013). Although the units adhered to some of the positioning principles, other items within the positioning category were highlighted as high-risk practice and included aspects such as: infants being positioned in supine, positioning boundaries are not firm, shoulders are retracted and arms are not in the midline. Poor positioning of the preterm infants affects self-regulation and self-soothing and need to be considered as part of the NDSC approach (Browne & Talmi, 2012).

A few other individual positive aspects were identified at both hospitals under the nine NDSC categories such as: infants' eyes being covered for phototherapy, mums breastfeeding or being involved in feeding their infants, quiet times being provided on the ward or beds positioned away from traffic (Table 6.1), but the overall findings indicated poor compliance to the NDSC approach (36% for both hospitals) and a clear need for a change in practice.

The overcrowded NICUs, lack of individualised and family-centred care, inappropriate handling of infants, excessive environmental stimuli, insufficient management of infants' pain, inadequate feeding support and knowledge of infant development all contribute to an environment which is not conducive to the development of preterm infants. These findings are similar to the findings from previous studies on developmental care conducted in South African NICUs. The

authors used the same measurement tool as in this study and found poor compliance on all nine NDSC categories in SA NICUs in both the public and private sectors (Lubbe, 2009; Rheeder et al., 2017). In Lubbe's (2009) study poor compliance were stated as less than 70%. Various barriers have been identified in these studies which influenced the operationalisation of NDSC in the NICU and included aspects such as: resources, physical facilities, staff attitude, multidisciplinary teams, communication, policies and the family-centred care. Similar barriers or reasons for poor adherence to NDSC have also been identified as part of Objective 1.1 of this study but the lack of knowledge of infant development was also highlighted as a barrier. Considering these barriers and addressing all nine NDSC categories as part of a training intervention should contribute to improved practice in the NICU and better care for preterm infants and their families.

6.2.3 Conclusion

The results of the pre-implementation survey provide background information on the current state of NDSC operationalisation in the two NICUs, prior to the implementation of the training intervention. Items in all nine NDSC categories were highlighted as high-risk practice. The pre-implementation survey results confirmed the self-reported poor adherence to the NDSC approach of the MDT as part of Objective 1.1 and justify the need for training on neurodevelopmental supportive care in the two NICUs. The pre-implementation survey results are discussed in more detail and compared to the post-implementation survey results in Chapter 10, following the implementation of the training intervention.

6.3 INTERVENTION FIT ASSESSMENT

As part of the implementation process, an intervention fit assessment is recommended (Meyers et al., 2012a). This assessment aims to determine if the intervention, due to be implemented, matches the identified needs of the organisation and its members, if it fits the setting and if changes to the intervention are needed (Castro, Barrera Jr, & Holleran Steiker, 2010; Meyers, Katz, et al., 2012). In Objective 1.1 and Objective 1.2 (Phase1), the training needs of the MDT have been determined. This was done through a survey of the MDT's self-reported adherence to NDSC principles as well as a pre-implementation survey on the operationalisation of NDSC in the NICUs. All nine NDSC categories were identified

as high-risk practice in the two NICUs in this study and information on these categories should therefore be included in the training intervention. The objectives of the existing Little Steps® Introduction to NDSC training programme were compared to the nine NDSC categories and it was clear that the nine NDSC categories would be addressed by the training programme objectives (

Table 6.2). The only two NDSC categories which did not have specific matched objectives were pain management and feeding. These two NDSC areas, however, overlap with most of the other NDSC categories such as individualised care, family-centred philosophy, positioning, handling, environmental manipulation and knowledge of the infant. For example, the infant's experience of pain is addressed in the lecture on the development of the infant's sensory systems while the management of the infant's pain is addressed in lectures on kangaroo mother care (KMC), handling (containment hold) and positioning (swaddling). Feeding is addressed in lectures on individualised care (considering the infant's behavioural states and readiness to feed), family-centred philosophy (including parents), positioning (ideal positioning when providing gavage feed), manipulation of the environment (decreasing noise and light during feeding) and knowledge of infant development.

Table 6.2: Fit assessment between the identified training needs and the objectives of the Little Steps® training programme

NO	IDENTIFIED TRAINING NEEDS OF THE MULTIDISCIPLINARY TEAM	LITTLE STEPS® TRAINING PROGRAMME OBJECTIVES
1.	NICU design	• Explain the importance of the intrauterine environment to support fetal development • Understand the impact of the NICU environment on the extrauterine fetus
2.	Individualised care	• Describe what neurodevelopmentally supportive care is • Understand the Model of Synactive Organization of Behavioural Development as developed by Dr. Heidelise Als • Describe the three stages of neurosocial behaviour according to Peter Gorski • Recognise an organised/self-regulated infant • Identify when an infant needs protection and when stimulation • Demonstrate the ability to identify stress signals in the preterm infant

NO	IDENTIFIED TRAINING NEEDS OF THE MULTIDISCIPLINARY TEAM	LITTLE STEPS® TRAINING PROGRAMME OBJECTIVES
2.		• Know how to prevent disorganisation in the fragile infant • Demonstrate how to support the infant to a level of self-regulation by means of changes in care
3.	Family-centred philosophy	• Know what skin-to-skin/Kangaroo Mother Care (KMC)/Kangaroo Father Care (KFC) is • Understand the history of KMC/KFC • Describe the benefits of KMC/KFC • Understand the physiology behind KMC/KFC
4.	Positioning	• Demonstrate how to support the infant to a level of self-regulation by means of positioning • Model appropriate positioning techniques to colleagues
5.	Handling techniques	• Demonstrate how to support the infant to a level of self-regulation by means of handling • Model appropriate handling techniques to colleagues
6.	Environmental manipulation	• Describe the different sensory systems and the impact of the environment on the extrauterine fetus
7.	Pain management	<i>Addressed through individualised care, family-centred philosophy and handling techniques</i>
8.	Knowledge of infant development	• Understand the process of development of the sensory systems in utero • Identify the role and function of myelination in the maturation of the nervous system • Identify the normal values for vital signs in the premature infant • Identify the five subsystems of infant development and their defining characteristics • Understand how stressful events may influence the infant's short- and long-term development
9.	Feeding	<i>Addressed through individualised care, family-centred philosophy, positioning, handling techniques environmental manipulation and knowledge of the infant development</i>

Time and financial support for educational activities are often limited, especially in the public healthcare sector (Ratnapalan & Hilliard, 2002; Naranjee, Sibiya, & Ngxongo, 2019). It was necessary, in this study, to consider if the training intervention fitted the busy public healthcare sector setting, taking into account practical aspects such as the time available for training, workload of staff, staff shortages and the cost of the training programme.

A one-day course was more practical for the MDT to attend than a four-day course due to work pressures and staff shortages. The one-day Little Steps® training programme was not an all-encompassing training programme on NDSC but a good

introduction to the developmental care approach. Knowing the basic principles of NDSC and applying it in practice, should already make a significant difference in the day-to-day operationalisation of developmental care in the NICU. The researcher further considered how the training programme could potentially be adapted to fit the practical or real-world needs of the various disciplines. It was possible for the one-day programme to be split into shorter daily sessions instead of a full day. It was further possible to condense the programme into a 2-2½-hour session with only the most important, core information being presented. This would, however, not be ideal as time for the practical aspects of the course would be limited.

The cost of the one-day Little Steps® training programme was minimal in comparison to other available international courses. For the purpose of this study, the researcher presented the training herself which absorbed majority of the cost. The Faculty Research Committee Individual Research Grant (University of the Witwatersrand) was used to print the training manuals and to buy the necessary stationery. It will, however, be necessary to consider the costs of a training programme for future training initiatives.

In conclusion, the one-day Little Steps® training programme was deemed most appropriate and realistic to be implemented in the public hospital NICUs for the purpose of this study. The one-day training programme will meet the training needs of the MDT, can be adapted if necessary and fits the time and financial resources of the setting.

6.4 MANUSCRIPT 2: A READINESS FOR CHANGE ASSESSMENT OF TWO TERTIARY HOSPITALS IN PREPARATION FOR A NEURODEVELOPMENTAL SUPPORTIVE CARE TRAINING INTERVENTION

The results of the readiness assessment are presented in a manuscript titled: *A readiness for change assessment of two tertiary hospitals in preparation for a neurodevelopmental supportive care training intervention*. This manuscript has been prepared for submission to the Journal of Change Management. The format of the manuscript is based on the author's guidelines for this journal.

TITLE

A readiness for change assessment of two tertiary hospitals in preparation for a neurodevelopmental supportive care training intervention

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ABSTRACT

Introducing a new intervention into a healthcare setting is often challenging. The organisation's readiness for change is an important aspect to consider for the successful implementation of any intervention. This study aimed to determine the readiness of the multidisciplinary team (MDT) prior to the implementation of a neurodevelopmental supportive care training programme in the public sector neonatal intensive care unit in Gauteng, South Africa. A quantitative, survey design was used and all MDT members, providing services to preterm infants and their families at these two hospitals, were invited to participate in the study. The Organizational Readiness for Implementation Change (ORIC) questionnaire was used to collect data on the teams' change commitment and change efficacy. The results confirmed the readiness for change of the MDTs at both hospitals as more than half of the participants from both hospitals indicated commitment to change and believed in their organisation's capacity to change. Task knowledge, resource availability and situational factors were considered as aspects potentially affecting the MDTs' readiness for change. Readiness for change can, however, be

strengthened through joint implementation goals, provision of resources to support the implementation process, building individual capacity, increasing knowledge and supporting open communication between concerned individuals.

INTRODUCTION

Neurodevelopmental supportive care training (NDSC) has been globally introduced since the 1980s. The NDSC approach is described as a group of interventions with the goal to reduce the stress of the neonatal intensive care unit (NICU) environment (Symington & Pinelli, 2006; Kaye, 2016). Numerous short- and long-term benefits of the NDSC approach have been identified such as: improved feeding, physiological regulation, muscle tone, attachment and bonding, neurobehavioural functioning, motor development, visual-motor functioning and better school performance, to name but a few (Ullenhag et al., 2009; Pickler et al., 2010; March of Dimes, PMNCH, Save the Children, & WHO, 2012; McAnulty et al., 2013; Rheeder et al., 2017).

Neurodevelopmental supportive care is the recommended multidisciplinary approach for the management of preterm infants in the NICU (Legendre et al., 2011; Montirosso, Del Prete, Bellù, Tronick, Borgatti, et al., 2012; Altimier & Phillips, 2016). The NDSC approach is, however, not currently implemented as standard practice of care in South African NICUs (Lubbe, 2009; Rheeder et al., 2017). As part of a larger implementation study, a training programme on NDSC for the multidisciplinary team (MDT), who provides services to preterm infants, was identified as a necessary intervention to be implemented. The purpose of this training intervention was to improve the care of preterm infants and their families in two public sector NICUs in Gauteng, South Africa.

Introducing a new intervention into a healthcare setting is often challenging and an important aspect for successful implementation, is the organisation's readiness for change (Alexander & Hearld, 2012; Holt & Vardaman, 2013; Shea et al., 2014; Scaccia et al., 2015). Organisational readiness relates to the level of psychological and behavioural readiness of individual members, to implement organisational change (Weiner, Amick, et al., 2008, p. 381). If an organisation is deemed ready for change, its individual members are more likely to successfully implement the

change (Weiner, Amick, et al., 2008; Weiner, 2009) while resistance to change can be experienced if members are not ready for the suggested change (Shea et al., 2014). Both organisational- and individual-level readiness can affect successful implementation (Attieh et al., 2013; Bosch et al., 2016; Benzer, Charns, Hamdan, & Afafe, 2017). It is therefore essential to determine the readiness, on an individual level as well as on a supra-individual level, which can include the readiness of the team, the department or the organisation (Shea et al., 2014; Vakola, 2014).

Apart from the different levels of readiness for change, two facets of readiness have further been identified: change commitment and change efficacy (Weiner, 2009; Shea et al., 2014). One of the main determinants of change commitment is change valence, which is how much individuals value the suggested change (Weiner, 2009; Shea et al., 2014) or their motivation to change (Scaccia et al., 2015). Team members may have various reasons why they value the suggested change or why they are motivated to change. Possible reasons can include a self-identified need for change, solving problems through change, potential benefits brought on by change or the change relates to core values (Weiner, 2009). The reasons why the change is valued are not as important as how much the change is valued (Shea et al., 2014).

Change efficacy relates to the shared belief of the organisational members to bring about change (Weiner, Amick, et al., 2008; Weiner, 2009; Shea et al., 2014). Factors affecting change efficacy include: task knowledge, resource availability and situational factors (Shea et al., 2014) or as described by Scaccia (2015): the capacities of the organisation (context, culture, current infrastructure, organisational processes) and intervention specific capacities (human, technical and financial conditions) (Scaccia et al., 2015).

All factors of readiness interact with each other, affect each other, and are necessary for successful implementation of an intervention. It is consequently proposed that if any of the factors related to readiness are zero, or close to zero, the organisation is not ready for the change (Scaccia et al., 2015). It is, however, suggested an organisation which appears not to be ready for change, may have the greatest need for change (Scaccia et al., 2015). Ultimately organisational readiness for change is needed to bridge the gap between new interventions and the

implementation of these in practice (Wandersman et al., 2008; Scaccia et al., 2015). The aim of this study was to determine the readiness of the MDT for the suggested change, namely the implementation of a training programme on NDSC in two public sector NICUs in Gauteng, South Africa.

METHODOLOGY

Study context

In South African public sector hospitals, the NICU is a busy, technological and noisy environment with a medical model focusing on saving the lives of vulnerable preterm infants. Various healthcare professionals are involved in the care of these infants. Healthcare professionals from different disciplines often have their own schedules and ward rounds, which lead to the MDT members constantly moving in and out of the NICU environment. The two tertiary hospitals, included in this study, each has a neonatal intensive care unit. Hospital A's NICU has on average 12 NICU beds and an additional 43 neonatal high care beds. Hospital B has a small paediatric intensive care unit (PICU) with 10 beds: six NICU beds and four high care beds. Due to the limited number of NICU beds at Hospital B, the overflow of preterm infants is admitted to general paediatric wards. For the purpose of this study Hospital B's neonatal ward has therefore been included. This ward consists of an additional 32 beds. The MDT in this study included the doctors, nurses and allied health professionals, who provided services in these NICUs or neonatal wards. The MDT from Hospital A consisted of: four speech therapists/audiologists, six dietitians, six occupational therapists, 18 physiotherapists, 28 doctors and 63 nurses. The MDT from Hospital B consisted of: three occupational therapists, four physiotherapists, four speech therapists/audiologists, six dietitians, 52 doctors and 61 nurses. The total sample consisted of 255 participants.

Study design and measurement tool

A quantitative, survey design was used to determine the readiness of the MDT for change to be implemented. Total population sampling was used as all MDT members, providing services to preterm infants and their families at these two hospitals, were invited to participate in the study. The Organizational Readiness for Implementation Change (ORIC) questionnaire was used to collect data on the

teams' readiness (Shea et al., 2014). The ORIC is a brief instrument which is suitable for busy environments such as healthcare settings. It consisted of 10 questions: the first five questions related to the staff's commitment to change while the last five questions related to change efficacy. The tool's psychometric properties were assessed in four studies including a field study and it was determined the ORIC had good content validity and inter-rater reliability (Shea et al., 2014). The questionnaire was either emailed to the participants, or made available on an iPad for participants who did not have access to computers or the internet. Completion of the questionnaire was assumed as consent and no identifying information was included in the questionnaire, to maintain anonymity. The iPads were password protected.

For the data analysis, descriptive and inferential statistics were used to determine if Hospital A and Hospital B's demographic factors were comparable. Percentages were used to analyse the data from the readiness for change assessment. The chi-square test was used to determine if there was a statistically significant difference between the two hospitals' change commitment and change efficacy. The Human Research Ethics Committee of the University of the Witwatersrand, the hospital chief executive officers and heads of departments granted ethical approval (M160120) and permission for the study.

RESULTS

Forty-nine (19%) participants completed the ORIC questionnaire: 23 (18.40%) participants from Hospital A and 26 (20.00%) participants from Hospital B (Table 1). The two hospitals were comparable regarding the different multidisciplinary team members ($p=0.26$). There were, however, statistically significant differences between Hospital A and Hospital B related to training on neurodevelopmental supportive care ($p=0.03$) and years' experience in the NICUs ($p=0.00$). Participants from Hospital B received more training on an undergraduate level than participants from Hospital A. Hospital B had more participants with zero to two years' experience and more participants with seven to ten plus years' experience while Hospital A had more participants with three to six years' experience.

Table 1: Comparison of participant demographics of Hospitals A and B

MULTIDISCIPLINARY TEAM MEMBERS	TOTAL n=49	HOSPITAL A n=23	HOSPITAL B n=26	p- VALUE
Doctors	5 (10.20%)	2 (8.70%)	3 (11.54%)	0.26
Nurses	19 (38.78%)	9 (39.13%)	10 (38.46%)	
Occupational therapists	8 (16.33%)	6 (26.09%)	2 (7.69%)	
Physiotherapists	5 (10.20%)	1 (4.35%)	4 (15.39%)	
Speech therapists	6 (12.25%)	3 (13.04%)	3 (11.54%)	
Dietitians	6 (12.25%)	2 (8.70%)	4 (15.39%)	
TRAINING ON NEURODEVELOPMENTAL SUPPORTIVE DEVELOPMENTAL CARE	TOTAL n=31	HOSPITAL A n=10	HOSPITAL B n=21	p- VALUE
Undergraduate level	20 (64.52%)	5 (50.00%)	15 (71.43%)	0.03*
Postgraduate level	11 (35.48%)	5 (50.00%)	6 (28.57%)	
NUMBER OF YEARS' EXPERIENCE IN THE NICU	TOTAL n=48	HOSPITAL A n=23	HOSPITAL B n=25	p- VALUE
Less than 1 year	11 (22.92%)	5 (21.74%)	6 (24.00%)	0.00*
1-2 years	11 (22.92%)	4 (17.39%)	7 (28.00%)	
3-4 years	5 (10.42%)	4 (17.39%)	1 (4.00%)	
5-6 years	4 (8.33%)	3 (13.04%)	1 (4.00%)	
7-10 years	10 (20.83%)	4 (17.39%)	6 (24.00%)	
More than 10 years	7 (14.58%)	3 (13.04%)	4 (16.00%)	

$p \leq 0.05$ statistical significance*

Change Commitment

The first facet of readiness is change commitment which reflected organisational members' shared determination to change and included the following five aspects: people are committed to implementing this change; people will do whatever it takes to implement this change; people want to implement this change; people are determined to implement this change; and people are motivated to implement this change. Between 57% and 78% of Hospital A participants indicated they agree or somewhat agree on the commitment to change, while between 69% and 85% of Hospital B participants indicated they agree or somewhat agree on this facet of change (Figure 1). Statistically significant differences were found on three of the five questions related to change commitment: people are committed to implementing this change ($p=0.01$), people will do whatever it takes to implement this change (0.00); and people want to implement this change ($p=0.00$). Therefore, Hospital B appears to be more committed to change than Hospital A.

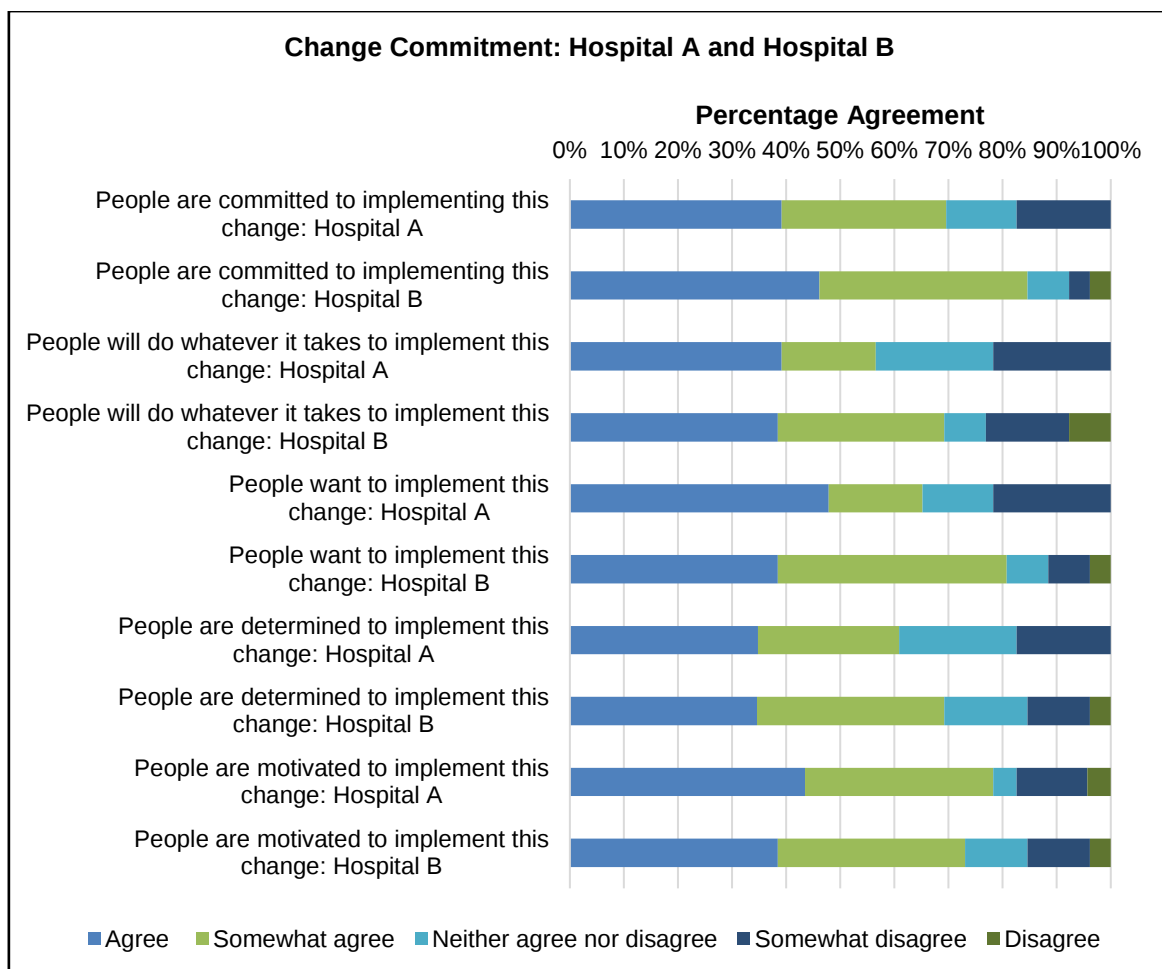


Figure 1: Change commitment (Hospital A: n=23; Hospital B: n=26)

Change Efficacy

The second facet of readiness is change efficacy which reflected organisational members' shared belief in their collective capability to implement a change. Change efficacy included the following five aspects: people can handle the challenges that might arise in implementing this change; people can keep track of progress in implementing this change; people can coordinate tasks so that implementation goes smoothly; the organisation can support people as they adjust to this change; and people can manage the politics of implementing this change. For Hospital A, between 52% and 61% of participants indicated they agree or somewhat agree on the individual's and organisation's capability to implement change while 69% of participants for Hospital B indicated agreement on four of the items for this facet (Figure 2). The only item, which less than 60% of participants from Hospital B agreed on, related to the management of politics of implementing the change (58%).

Statistically significant differences between the two hospitals were found on each of the five questions related to change efficacy, indicating Hospital B participants felt they are more capable to implement change than Hospital A participants ($p=0.04$; $p=0.00$; $p=0.00$; $p=0.01$ and $p=0.00$).

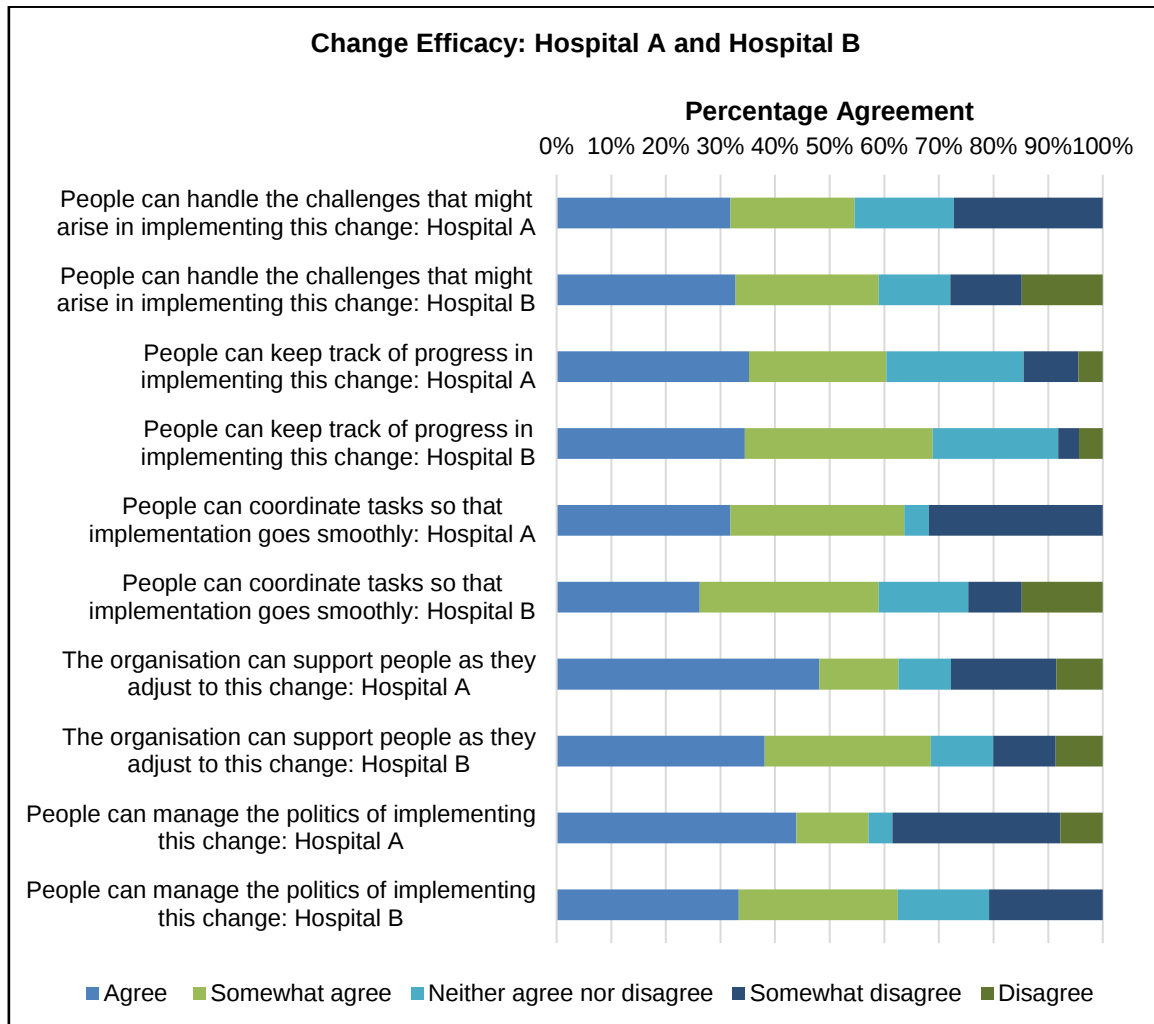


Figure 2: Change efficacy (Hospital A: n=23; Hospital B: n=26)

In summary, although there were significant differences on some of the individual items for change commitment and change efficacy between Hospital A and Hospital B, more than half of the participants, from both hospitals, indicated they were determined to change and they believed in their organisation's capability to change.

DISCUSSION

Introducing training is one way to facilitate the implementation of a new intervention, such as neurodevelopmental supportive care training, in practice (Lubbe, 2009; Lawn, Davidge, Paul, von Xylander, de Graft Johnson, et al., 2013). Training transfer in itself is, however, likely to fail in the implementation of an intervention, if a team is not ready for change (Burke & Hutchins, 2007). Prior to the introduction of an intervention such as a training programme, it is important to determine the readiness of the organisation and the individuals' readiness for change (Shea et al., 2014; Scaccia et al., 2015). The results from this study confirmed the readiness for change of the MDTs at both hospitals. Between 52% and 61% of the participants from both hospitals indicated commitment to change and believed in their organisation's capacity to change.

Neurodevelopmental supportive care is an MDT approach which requires a collective effort (Van den Berg, 2007; Barbosa, 2013). Every team member, working with the preterm infant, needs to apply the same NDSC principles for efficient neuroprotection of the infant. An example would be the management of noise in the NICU. All members need to adhere to the WHO's recommended noise levels of less than 40 decibels during the day and less than 35 decibels at night (WHO, 2002) and need to be aware of the noise created by aspects such as talking to each other, placing objects on top of incubators, slamming doors or bins, telephones ringing and alarms sounding (Fortes-Garrido, Velez-Pereira, Gázquez, Hidalgo-Hidalgo, & Bolívar, 2014). This change cannot be implemented by only one member of the team and collective motivation for the intervention is needed (Weiner, 2009; Scaccia et al., 2015). Another example is the number of times preterm infants are handled or undergoing painful procedures on a daily basis while admitted to the NICU. It has been reported that preterm infants are handled between 14 and 71 times in a 24-hour period (Pereira et al., 2013) and they undergo as many as 300 painful procedures in the first 3 months of their lives (Holsti et al., 2011). If each team member does not take this into account, preterm infants can easily be overstimulated and are at risk of a multitude of medical complications and long-term developmental deficits (Lyngstad, Tandberg, Storm, Ekeberg, & Moen, 2014; Altimier, 2015).

Organisational readiness for change is described as a multi-levelled (individual, team, department, and organisation) and multi-faceted construct (change commitment and change efficacy) and various aspects can affect readiness (Weiner, 2009; Shea et al., 2014). For the implementation of the proposed NDSC training programme, it is imperative to consider the participants' change commitment (motivation) and change efficacy (organisation and intervention capacity) (Shea et al., 2014; Scaccia et al., 2015) as these factors will ultimately impact on the successful implementation of the training programme.

Change commitment indicates the level of motivation of the participants to change and this individual motivation is crucial for successful change (Benzer et al., 2017). It is only through the collective actions of individuals that organisational change can occur (Vakola, 2013). According to Weiner (2009), the 'want to' item of the ORIC: Change commitment questionnaire indicates the highest level of change commitment. In this study 81% of participants from Hospital B indicated 'people want to implement the change' while 65% of participants from Hospital A indicated this change commitment. It is possible that team members have vested interest as they want what is best for the preterm infants and their families. The reasons for the change commitment might be very different for each participant (Weiner, 2009). Participants' motivation might be driven by health-related factors such as: better feeding, weight gain, decreased infection rates, reaching developmental milestones or cost-related factors such as: shorter length of hospital stay and increased discharge rates.

The degree of motivation can also be based on previous experience (Benzer et al., 2017). It was clear that there was a difference between the motivation of the two hospitals with Hospital B participants being more motivated than Hospital A participants. A possible reason for this difference can be the percentage of participants who had training on developmental care on an undergraduate level (Table 1), as motivation can be influenced by a person's capacity (Benzer et al., 2017). More participants from Hospital B had training on neurodevelopmental supportive care which probably contributes to their understanding of the need for a change in practice. The reasons for the motivation are, however, not as important as the level of the motivation (Shea et al., 2014).

Change efficacy refers to the belief in the collective abilities of the organisation to bring about change (Weiner, Amick, et al., 2008). Between 52% and 69% of participants from both hospitals believed in the organisation's ability to implement change (Figure 2). Factors affecting change efficacy include task knowledge, resource availability and situational factors (Weiner, 2009; Shea et al., 2014). Decreased adherence to the NDSC approach in the NICU does not necessarily indicate lack of knowledge (Burke & Hutchins, 2007), but this potentially links to the limited NDSC training MDT members had on an undergraduate and postgraduate level (Table 1). Similarly to change commitment, the difference between the two hospitals on the change efficacy, can also be due to Hospital B participants who had more training on NDSC on an undergraduate level. According to Benzer (2017), a person cannot drive change if he/she does not have sufficient skill or knowledge. It is further possible participants who felt the organisation was not ready for change, considered some of the known implementation barriers such as resource availability (Weiner, 2009).

Human and financial resources can influence change and can be seen as barriers (Benzer et al., 2017). Typical barriers in the implementation of a programme include shortages of staff and resources (Weiner, 2009; Chan et al., 2017) but NDSC does not necessarily have to be resource intensive (staff or equipment). Neurodevelopmental supportive care can be achieved if each team member is aware of his/her behaviour related to the preterm infant as well as the effect the environment has on the development of preterm infants. In fact, practices such as Kangaroo Mother Care (KMC), one component of NDSC, was developed in Columbia, a resource-poor country (Whitelaw & Sleath, 1985; Campbell-Yeo et al., 2017). Similarly, the promotion of breastfeeding, another component of NDSC, will also be an advantage in a resource-poor country where parents often cannot afford formula milk (Ball & Wright, 1999). Regarding staff resources, the inclusion of parents in the care of their infants (family-centred care) can potentially decrease nurses stress by relieving them of the additional day-to-day care responsibilities (Fowlie & McHaffie, 2004; Ramezani, Shirazi, Sarvestani, & Moattari, 2014). Parents can take on part of this caring responsibility which does not only support the nurses but also empower parents (Gooding et al., 2011; Maastrup, Weis, Engsig, Johannsen, & Zoffmann, 2018). Management of the NICU environment

related to excessive light and noise, similarly does not have to be resource intensive. Simple adjustments can be made in the NICU, to limit noise and light by simple techniques such as: using daylight instead of fluorescent lights, partially covering incubators, covering infants' ears and positioning infants away from light and noise (Lubbe, 2009; Fortes-Garrido et al., 2014; Rodríguez & Pattini, 2016). Prior to the implementation of an intervention it will be important to consider these typical barriers which can impact on successful implementation and ultimately on change.

Situational factors that can affect change efficacy include aspects such as time needed to implement the change and the support provided by the organisation's political environment (Weiner, 2009). The only change efficacy item which less than 60% of participants from Hospital B agreed on, related to the management of politics of implementing the change (Figure 2). It seems these participants were concerned about the politics of their organisation and how this could potentially affect change.

Readiness for change is multi-levelled. In this study it was not only the individual who needed to be considered but also the team, the department and the organisation (Weiner, 2009; Shea et al., 2014). If an individual feels unsupported in the change process, it can affect individual and organisational readiness for change (Vakola, 2013). It will be essential to get the necessary buy-in from management (departments and organisation) in the implementation process to create a supportive political environment as this can increase staff's motivation (Meyers, Durlak, et al., 2012; Scaccia et al., 2015). The psychological and behavioural readiness of the individual will impact on the organisational readiness for change (Weiner, Amick, et al., 2008). Management should understand and agree with the need for the change, be convinced the intervention will benefit the organisation and be involved in the implementation of the intervention (Meyers, Durlak, et al., 2012).

Although the change commitment agreement and change efficacy agreement were more than 50% for both Hospital A and Hospital B, the participants who were not ready for change due to decreased motivation or perceived lack of capability, cannot be ignored. Readiness should be seen as a degree of readiness rather than a category of ready versus not ready (Flaspohler, Meehan, Maras, & Keller, 2012;

Scaccia et al., 2015). It might be necessary to recognise stress and support employees through the change process as this can impact on the successful implementation of the training programme (McCrae, Scannapieco, Leake, Potter, & Menefee, 2014). Aspects such as open communication, clear goals and including staff in the decision-making process, can all contribute to increased motivation of the individuals to embrace the suggested change (Teo, Pick, Newton, Yeung, & Chang, 2013; McCrae et al., 2014).

Support strategies such as training and technical assistance can further be used to increase knowledge, build individual capacity and increase organisational readiness (Wandersman, Chien, & Katz, 2012; Scaccia et al., 2015). The training should include aspects such as theory, ethics and skill-based competencies which should facilitate proper application of the intervention (Meyers, Durlak, et al., 2012). Technical assistance can be provided by champions who would drive the change process. A champion is described as an individual who uses their connections, expertise and social influence to support an intervention (Scaccia et al., 2015). It will be important to identify champions in the implementation process to ensure successful implementation of a NDSC training programme in the two public sector NICUs. When organisational readiness is high, members are more likely to initiate change, put greater effort in and exhibit greater persistence when there are obstacles. This overall results in more effective implementation of the proposed change (Weiner, 2009).

The main limitation of this study was the relatively small sample size as only 49 from a possible 255 participants (19%) from both hospitals completed the ORIC questionnaire. Completion of the questionnaire was voluntary. It is, however, possible that participants who agreed to complete the questionnaire, have a better understanding of the need for change in their NICU and the importance of the suggested intervention, namely the implementation of a multidisciplinary training programme on neurodevelopmental supportive care.

CONCLUSION

Organisational readiness for change is an important part of the implementation process and ultimately affects successful implementation of an intervention. Both change commitment and change efficacy are needed for organisational readiness for change. In this study both hospitals' change commitment agreement was between 57% and 85% on all items. Change efficacy agreement for Hospital A was 52% and above on all items and 69% and above for Hospital B. The only aspect which was highlighted as a potential concern for Hospital B was the management of politics of implementing the change. Readiness for change can be strengthened through joint implementation goals, provision of resources to support the implementation process, building individual capacity, increasing knowledge and supporting open communication between concerned individuals.

REFERENCES

- Alexander, J. A., & Hearld, L. R. (2012). Methods and metrics challenges of delivery-system research. *Implementation Science*, 7(1), 15.
doi:<https://doi.org/10.1186/1748-5908-7-15>
- Altimier, L., & Phillips, R. (2016). The neonatal integrative developmental care model: Advanced clinical applications of the seven core measures for neuroprotective family-centered developmental care. *Newborn and Infant Nursing Reviews*, 16(4), 230-244.
doi:<https://doi.org/10.1053/j.nainr.2016.09.030>
- Altimier, L. B. (2015). Neuroprotective core measure 1: The healing NICU environment. *Newborn and Infant Nursing Reviews*, 15(3), 91-96.
doi:<https://doi.org/10.1053/j.nainr.2015.06.014>
- Attieh, R., Gagnon, M.-P., Estabrooks, C. A., Légaré, F., Ouimet, M., Roch, G., . . . Grimshaw, J. (2013). Organizational readiness for knowledge translation in chronic care: a review of theoretical components. *Implementation Science*, 8(1), 138. doi:<https://doi.org/10.1186/1748-5908-8-138>
- Ball, T. M., & Wright, A. L. (1999). Health care costs of formula-feeding in the first year of life. *Pediatrics*, 103(Supplement 1), 870-876.
- Barbosa, V. M. (2013). Teamwork in the neonatal intensive care unit. *Physical & Occupational Therapy In Pediatrics*, 33(1), 5-26.
doi:<https://doi.org/10.3109/01942638.2012.729556>
- Benzer, J. K., Charns, M. P., Hamdan, S., & Afable, M. (2017). The role of organizational structure in readiness for change: A conceptual integration. *Health Services Management Research*, 30(1), 34-46.
doi:<https://doi.org/10.1177/0951484816682396>

- Bosch, M., Tavender, E. J., Brennan, S. E., Knott, J., Gruen, R. L., & Green, S. E. (2016). The many organisational factors relevant to planning change in emergency care departments: a qualitative study to inform a cluster randomised controlled trial aiming to improve the management of patients with mild traumatic brain injuries. *PloS One*, 11(2), e0148091.
- Burke, L. A., & Hutchins, H. M. (2007). Training transfer: An integrative literature review. *Human resource development review*, 6(3), 263-296. doi:<https://doi.org/10.1177/1534484307303035>
- Campbell-Yeo, M., Disher, T., Benoit, B., Fernandes, A., Streiner, D., Inglis, D., . . . Johnston, C. (2017). Skin-to-skin care for procedural pain in neonates. *The Cochrane Database of Systematic Reviews*, 2017(2).
- Chan, G., Bergelson, I., Smith, E. R., Skotnes, T., & Wall, S. (2017). Barriers and enablers of kangaroo mother care implementation from a health systems perspective: a systematic review. *Health Policy and Planning*, 32(10), 1466-1475. doi:<https://doi.org/10.1093/heapol/czx098>
- Flaspohler, P. D., Meehan, C., Maras, M. A., & Keller, K. E. (2012). Ready, willing, and able: Developing a support system to promote implementation of school-based prevention programs. *American journal of community psychology*, 50(3-4), 428-444. doi:<https://doi.org/10.1007/s10464-012-9520-z>
- Fortes-Garrido, J. C., Velez-Pereira, A. M., Gázquez, M., Hidalgo-Hidalgo, M., & Bolívar, J. P. (2014). The characterization of noise levels in a neonatal intensive care unit and the implications for noise management. *Journal of Environmental Health Science and Engineering*, 12(1), 104. doi:<https://doi.org/10.1186/2052-336X-12-104>
- Fowlie, P. W., & McHaffie, H. (2004). Supporting parents in the neonatal unit. *BMJ*, 329(7478), 1336-1338. doi:<https://doi.org/10.1136/bmj.329.7478.1336>
- Gooding, J. S., Cooper, L. G., Blaine, A. I., Franck, L. S., Howse, J. L., & Berns, S. D. (2011). Family support and family-centered care in the neonatal intensive care unit: origins, advances, impact. *Seminars in Perinatology*, 35(1), 20-28. doi:<https://doi.org/10.1053/j.semperi.2010.10.004>
- Holsti, L., Grunau, R. E., & Shany, E. (2011). Assessing pain in preterm infants in the neonatal intensive care unit: moving to a 'brain-oriented' approach. *Pain management*, 1(2), 171-179. doi:<https://doi.org/10.2217/pmt.10.19>
- Holt, D. T., & Vardaman, J. M. (2013). Toward a comprehensive understanding of readiness for change: The case for an expanded conceptualization. *Journal of Change Management*, 13(1), 9-18. doi:<https://doi.org/10.1080/14697017.2013.768426>
- Kaye, S. (2016). Historical Trends in Neonatal Nursing. *The Journal of perinatal & neonatal nursing*, 30(3), 273-276. doi:<https://doi.org/10.1097/JPN.0000000000000200>

- Lawn, J. E., Davidge, R., Paul, V. K., von Xylander, S., de Graft Johnson, J., Costello, A., . . . Molyneux, L. (2013). Born too soon: care for the preterm baby. *Reproductive Health*, 10(1), S5. doi:<https://doi.org/10.1186/1742-4755-10-S1-S5>
- Legendre, V., Burtner, P. A., Martinez, K. L., & Crowe, T. K. (2011). The Evolving Practice of Developmental Care in the Neonatal Unit: A Systematic Review. *Physical & Occupational Therapy In Pediatrics*, 31(3), 315-338. doi:<https://doi.org/10.3109/01942638.2011.556697>
- Lubbe, W. (2009). *Best practice guidelines for neurodevelopmental supportive care of the preterm infant*. (PhD Obstetrical and Neonatal Nursing Science Doctoral dissertation), North-West University (Potchefstroom Campus), Potchefstroom. Retrieved from <https://pdfs.semanticscholar.org/9919/4bdea06b10d3a7facea65f3b1f4c35297be2.pdf>.
- Lyngstad, L. T., Tandberg, B. S., Storm, H., Ekeberg, B. L., & Moen, A. (2014). Does skin-to-skin contact reduce stress during diaper change in preterm infants? *Early Human Development*, 90(4), 169-172. doi:10.1016/j.earlhumdev.2014.01.011.
- Maastrup, R., Weis, J., Engsig, A. B., Johannsen, K. L., & Zoffmann, V. (2018). 'Now she has become my daughter': parents' early experiences of skin-to-skin contact with extremely preterm infants. *Scandinavian journal of caring sciences*, 32(2), 545-553. doi:10.1111/scs.12478.
- March of Dimes, PMNCH, Save the Children, & WHO. (2012). *Born too soon: The global action report on preterm birth* (C. Howson, M. Kinney, & J. Lawn Eds.). Geneva: World Health Organization.
- McAnulty, G., Duffy, F. H., Kosta, S., Weisenfeld, N. I., Warfield, S. K., Butler, S. C., . . . Zurakowski, D. (2013). School-age effects of the newborn individualized developmental care and assessment program for preterm infants with intrauterine growth restriction: Preliminary findings. *BMC pediatrics*, 13(1), 25. doi:10.1186/1471-2431-13-25
- McCrae, J. S., Scannapieco, M., Leake, R., Potter, C. C., & Menefee, D. (2014). Who's on board? Child welfare worker reports of buy-in and readiness for organizational change. *Children and Youth Services Review*, 37, 28-35. doi:10.1016/j.childyouth.2013.12.001
- Meyers, D. C., Durlak, J. A., & Wandersman, A. (2012). The quality implementation framework: a synthesis of critical steps in the implementation process. *American journal of community psychology*, 50(3-4), 462-480. doi:10.1007/s10464-012-9522-x.
- Montirosso, R., Del Prete, A., Bellù, R., Tronick, E., Borgatti, R., & Group, N. A. C. f. Q. o. L. S. (2012). Level of NICU quality of developmental care and neurobehavioral performance in very preterm infants. *Pediatrics*, peds. 2011-0813. doi:<https://doi.org/10.1542/peds.2011-0813>
- Pereira, F. L., Góes, F., Fonseca, L. M. M., Scochi, C. G. S., Castral, T. C., & Leite, A. M. (2013). Handling of preterm infants in a neonatal intensive care unit. *Rev Esc Enferm USP [internet]*, 47(6), 1272-1278.

- Pickler, R. H., McGrath, J. M., Reyna, M. B. A., McCain, N., Lewis, M. M., Cone, M. S., . . . Best, A. (2010). A model of neurodevelopmental risk and protection for preterm infants. *The Journal of perinatal & neonatal nursing*, 24(4), 356. doi:10.1097/JPN.0b013e3181fb1e70.
- Ramezani, T., Shirazi, Z. H., Sarvestani, R. S., & Moattari, M. (2014). Family-centered care in neonatal intensive care unit: a concept analysis. *International journal of community based nursing and midwifery*, 2(4), 268.
- Rheeder, A., Lubbe, W., & Pretorius, R. (2017). Compliance With Best Practice Guidelines for Neurodevelopmental Supportive Care in South Africa: A Situational Analysis. *The Journal of perinatal & neonatal nursing*. doi:<https://doi.org/10.1097/jpn.0000000000000275>
- Rodríguez, R. G., & Pattini, A. E. (2016). Neonatal intensive care unit lighting: update and recommendations. *Archivos argentinos de pediatría*, 114(4), 361-367. doi:<https://doi.org/10.5546/aap.2016.361>
- Scaccia, J. P., Cook, B. S., Lamont, A., Wandersman, A., Castellow, J., Katz, J., & Beidas, R. S. (2015). A practical implementation science heuristic for organizational readiness: R= MC2. *Journal of Community Psychology*, 43(4), 484-501. doi:10.1002/jcop.21698.
- Shea, C. M., Jacobs, S. R., Esserman, D. A., Bruce, K., & Weiner, B. J. (2014). Organizational readiness for implementing change: a psychometric assessment of a new measure. *Implementation Science*, 9(1), 7. doi:<https://doi.org/10.1186/1748-5908-9-7>
- Symington, A., & Pinelli, J. (2006). Developmental care for promoting development and preventing morbidity in preterm infants. *The Cochrane Library*, 19(2), CD001814. doi:10.1002/14651858.CD001814.pub2.
- Teo, S. T., Pick, D., Newton, C. J., Yeung, M. E., & Chang, E. (2013). Organisational change stressors and nursing job satisfaction: the mediating effect of coping strategies. *Journal of Nursing Management*, 21(6), 878-887. doi:10.1111/jonm.12120.
- Ullenhag, A., Persson, K., & Nyqvist, K. H. (2009). Motor performance in very preterm infants before and after implementation of the newborn individualized developmental care and assessment programme in a neonatal intensive care unit. *Acta Paediatrica*, 98(6), 947-952. doi:10.1111/j.1651-2227.2009.01258.x.
- Vakola, M. (2013). Multilevel readiness to organizational change: A conceptual approach. *Journal of Change Management*, 13(1), 96-109. doi:<https://doi.org/10.1080/14697017.2013.768436>
- Vakola, M. (2014). What's in there for me? Individual readiness to change and the perceived impact of organizational change. *Leadership & Organization Development Journal*, 35(3), 195-209. doi:<https://doi.org/10.1108/LODJ-05-2012-0064>
- Van den Berg, K. A. (2007). Individualized developmental care for high risk newborns in the NICU: a practice guideline. *Early Human Development*, 83(7), 433-442. doi:<https://doi.org/10.1016/j.earlhumdev.2007.03.008>

- Wandersman, A., Chien, V. H., & Katz, J. (2012). Toward an evidence-based system for innovation support (tools, training, technical assistance, quality improvement/quality assurance) for implementing innovations with quality to achieve desired outcomes. *American journal of community psychology*, 50, 445-459.
- Wandersman, A., Duffy, J., Flaspohler, P., Noonan, R., Lubell, K., Stillman, L., . . . Saul, J. (2008). Bridging the gap between prevention research and practice: The interactive systems framework for dissemination and implementation. *American journal of community psychology*, 41(3-4), 171-181. doi:10.1007/s10464-008-9174-z
- Weiner, B. J. (2009). A theory of organizational readiness for change. *Implementation Science*, 4(1), 67.
- Weiner, B. J., Amick, H., & Lee, S.-Y. D. (2008). Conceptualization and measurement of organizational readiness for change: A review of the literature in health services research and other fields. *Medical care research and review*, 65(4), 379-436. doi:10.1177/1077558708317802.
- Whitelaw, A., & Sleath, K. (1985). Myth of the marsupial mother: Home care of very low birth weight babies in Bogota, Colombia. *The Lancet*, 325(8439), 1206-1208. doi:10.1016/s0140-6736(85)92877-6.
- WHO. (2002). *Community Noise- Environmental Health Criteria Document, External Review Draft*. Geneva: WHO Publishing.
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6.5 THE PRE-INNOVATION SESSION

Obtaining the buy-in from stakeholders and staff can facilitate the implementation of an intervention (Burke et al., 2012; Powell et al., 2015; Kirchner et al., 2020). In this study the critical stakeholders referred to the NICU managers and the various MDT heads of departments of the two public sector hospitals. As mentioned in the methodology chapter, the PhD protocol was sent to all stakeholders for their approval prior to the start of the study. As they were aware of the details, most of the stakeholders supported this implementation study and agreed for their staff to participate in the different phases and steps including the training programme. It was therefore not necessary to present the pre-innovation session to all stakeholders. The pre-innovation session was mainly presented to the nursing matrons and heads of the NICUs at both research sites to get their necessary buy-in. This was possibly due to the fact that the developmental care approach was not yet standard practice in South African NICUs and the heads of departments did not have sufficient knowledge of what exactly this approach or the training entailed or how it would impact on their staff and departments (Lubbe, 2009; Rheeder et al., 2017; Butler, 2018). The nursing staff and doctors form a vital part of the MDT in the NICU and it was therefore crucial to gain the necessary support from their managers, for the staff to attend the training programme

A one-hour pre-innovation session was developed by the researcher and presented to the stakeholders in meeting rooms at the two hospitals. The pre-innovation session was in the format of a PowerPoint presentation and included information on the following:

- The intrauterine environment versus the NICU environment;
- The risks and long-term developmental complications related to prematurity and the NICU environment;
- NDSC and the benefits of this approach for preterm infants and their families;
- Information on implementation research;
- The methodology of the PhD study including an outline of the different phases of the study;
- Information on the MDT's training needs and readiness for change;

- The importance of an MDT approach when providing developmental care in the NICU;
- The continuing professional development (CPD) benefits for the organisation and staff, in attending the training programme;
- Details of the training programme and the different topics to be included; and
- Details on the various dates and times the training programme would be presented.

Following the pre-innovation session, the required buy-in from the unit managers and heads of departments was obtained in the form verbal consent. The researcher was able to make the necessary arrangements with the different disciplines of the MDT, at both hospitals, for the implementation of the NDSC training programme.

6.6 SUMMARY

The pre-implementation survey confirmed the operationalisation of NDSC was not optimal in the two, public sector NICUs. Risk-practice, related to items on all nine NDSC categories, was identified. The results of this step supported the results of the first step of the implementation process (Objective 1.1) and thereby confirmed the need for the implementation of a training programme on developmental care for the MDT, who provided services to preterm infants in the NICU. The proposed training programme needs to include information on all nine NDSC categories.

The next step in the implementation process was to assess the readiness of the MDT for change. By determining the readiness of the individuals as well as the organisation, prior to the implementation of such a programme, can contribute to successful implementation. The results of the readiness assessment highlighted the readiness of the MDT, at both hospitals, for implementation of the training programme. Both hospitals presented with more than 50% agreement on change commitment and change efficacy indicating the MDT was motivated to change and they believed in the collective abilities of the organisation, to bring about change.

In the intervention fit assessment, the content of the training programme was compared to the identified training needs of the MDT. It was determined the Little Steps® Introduction on NDSC training programme would address all nine NDSC categories and would therefore meet the training needs of the MDT.

The pre-innovation session was further developed to ensure buy-in from all critical stakeholders, namely the heads of department and the NICU managers. The programme was presented mainly to the nursing staff and the doctors, at both hospitals. The pre-innovation session provided the stakeholders with the necessary information to justify the need for training on developmental care and for the stakeholders to support the study. This enabled the researcher to continue with the implementation of the multidisciplinary NDSC training programme at both public sector hospitals. The next chapter will focus on Phase 2 of the study: Preparation for Implementation.

CHAPTER 7: PREPARATION FOR IMPLEMENTATION

7.1 INTRODUCTION

In this chapter Phase 2 of the study is presented which focuses on creating a structure for implementation of the neurodevelopmental supportive care (NDSC) training programme for the multidisciplinary team (MDT) and preparing for implementation. This phase consists of one step: the development of the implementation plan (Figure 1.1).

7.2 DEVELOPMENT OF AN IMPLEMENTATION PLAN

Prior to the implementation of the MDT NDSC training programme, it was necessary to prepare for implementation of the training programme by developing an implementation plan. As discussed in the methodology chapter, the implementation plan should include the specific implementation tasks, identify the team members responsible for these tasks, determine the timeline associated with these tasks as well as identify the expected outcome for each task. The Essential Newborn Care Course planning documents were used as a guide in this PhD study (WHO, 2010). Majority of the planning tasks were allocated to the researcher and included duties such as preparing the course material, purchasing the necessary supplies, stationery and refreshments and printing the training manuals, attendance registers and continuing professional development (CPD) certificates. The champions at both hospitals assisted with tasks such as arranging suitable dates and times, booking the training venues and organising a projector for the PowerPoint presentations. Table 7.1 below outlines the plan for the implementation of the NDSC training programme at the two public hospitals.

Table 7.1: Neurodevelopmental Supportive Care (NDSC) training programme: Implementation plan

NO	TASK	PERSON RESPONSIBLE	TIMELINE	EXPECTED OUTCOME
1	Review the Little Steps® training material and update if necessary	Researcher	January & February 2019	Researcher was familiar with the training material and recent, relevant literature was included to support the content of the course.
2	Accreditation of the training programme	Researcher	January 2019	The course was accredited by the South African Medical Association (SAMA). Seven continuing professional development (CPD) points were allocated to participants who attended the full-day training programme.
3	Arrange training for the trainer	Little Steps® master trainers	February 2019	The researcher met with the Little Steps master trainers to ensure the Little Steps® training programme was presented according to their guidelines and specifications.
4	Print training manuals	Researcher	March 2019	Training manuals were provided to all participants. These provided additional information and supported the training process.
5	Decide on the time table for the training programme	Researcher	March 2019	The time table was presented on the first page of the training manual.
6	Obtain a training kit	Researcher	N/A	The researcher had a training kit which was used for the practical sessions during the training. The kit consisted of preterm infant size dolls, positioning equipment, swaddle blankets, Kangaroo Mother Care (KMC) wraps, preterm pacifiers and nappies.
7	Arrange training dates and times	Researcher liaised with the champions and heads of departments	March 2019	The various heads of departments agreed to specific dates and times for staff to attend the training programme.
8	Send invitation emails to all MDT members including reminder emails the day before the training	Researcher	March 2019	All MDT members of the two NICUs were invited to attend the training programme.
9	Book venues for the training	Champions	March 2019	Training venues were booked at both hospitals by the champions.

Table 7.1: Neurodevelopmental Supportive Care Training Programme: Implementation Plan (continue)

NO	TASK	PERSON RESPONSIBLE	TIMELINE	EXPECTED OUTCOME
10	Develop a quiz on neurodevelopmental supportive care	Researcher	April 2019	The quiz was used as a warm-up activity at the start of the training programme.
11	Develop and print attendance registers	Researcher	April 2019	Attendance registers were important to determine how many participants from the different disciplines attended the training programme. These were also used to print CPD certificates for the participants.
12	Obtain the necessary supplies and stationery	Researcher	April 2019	The researcher bought pens and stickers to use as name tags.
13	Buy refreshments (snacks and drinks)	Researcher	April 2019	Snacks and drinks were provided during the training. Participants were responsible for their own lunch due to financial constraints.
14	Arrange projector for PowerPoint presentations	Researcher or champions	May 2019	The researcher used the hospitals' projectors or borrowed a projector from the Occupational Therapy Department, University of the Witwatersrand.
15	Send reminder emails to all participants	Researcher	One day prior to each training session	The researcher was able to confirm attendance and participant numbers.
16	Print continuing professional development (CPD) certificates	Researcher	This was done following attendance of the training programme	CPD certificates were delivered or sent to all participants.
17	Prepare course evaluation forms	Researcher	This was done following attendance of the training programme	The course evaluation forms were emailed to participants to complete.

7.3 SUMMARY

In this chapter the development of the implementation plan was presented. The implementation plan entailed the listing of specific implementation tasks and the relevant timelines. The plan further indicated the person responsible for the various tasks and what the outcome of each task was. In the next two chapters, Phase 3 of the study will be presented which entails the implementation of the NDSC training programme as well as identifying facilitators and barriers in the implementation process.

CHAPTER 8: IMPLEMENTATION OF THE INTERVENTION

8.1 INTRODUCTION

This chapter describes the actual implementation of the multidisciplinary neurodevelopmental supportive care training programme (Objective 3.1) (Figure 1.1). The implementation plan is outlined in Paragraph 7.2.

8.2 IMPLEMENTATION OF THE TRAINING PROGRAMME

A major criticism of implementation studies, is the poor reporting of the details of the intervention (Glasziou et al., 2008; Hoffmann et al., 2014). Phillips and colleagues (2016) developed the guideline for reporting evidence-based practice educational interventions and teaching (GREET) to assist researchers with the reporting of evidence-based practice (EBP) educational interventions. The GREET was used in this study to report the implementation of the intervention and in Table 8.1 an extract of the GREET is provided. Further details of the GREET are included in Appendix M.

The one-day Little Steps® Introduction to NDSC training programme, which was implemented in this study, is a training programme based on the best available evidence on the care preterm infants' needs while they are in the NICU as discussed in Chapter 2 the literature review.

Table 8.1: The Guideline for Reporting Evidence-based Practice Educational Interventions and Teaching (GREET) checklist

INTERVENTION Little Steps® Introduction to neurodevelopmental supportive care (NDSC) training programme WHY? - this educational process 1. <u>Intervention:</u> An existing one-day Little Steps® Introduction to NDSC training programme, was adapted and presented to the multidisciplinary team (MDT), who provide services to preterm infants and their families, in two public sector NICUs. The course fit the training needs of the MDT as identified from Phase 1 of the implementation study. The course includes information on all NDSC categories but is brief enough to fit the workload and schedules of the MDT. 2. <u>Theory:</u> This course is based on Als' Synactive Theory (Als, 1986) and the developmental care approach (Symington & Pinelli, 2006). 3. <u>Evidence-based practice content:</u> The content of this course is based on the best evidence-based practice for preterm infants and their families in the NICU. Information on nine essential components of the NDSC approach, based on an integrative literature review, are included in the course (Lubbe et al., 2012). WHAT? 4. <u>Materials:</u> Little Steps® One-Day Introduction on NDSC training programme focusing on: the NICU, Fetal Development, Neurosocial Development, Disorganised Infant, Introduction to the management of the preterm infant and the role of the MDT in the NICU. PowerPoint presentations and manuals were provided. More information on the course can be obtained from the Little Steps® website: http://www.littlesteps.co.za

8.2.1 Results and discussion

The course was presented on site for both hospitals making it easier for the MDT to attend the training. Fit for purpose training venues were used for most of the sessions apart from the training for Hospital A's nurses which was conducted in the NICU at the nursing station due to limited staff available to cover clinical work (as requested by the nurse in charge).

A total of 272 participants attended the multidisciplinary training programme on NDSC, 142 participants from Hospital A and 130 participants from Hospital B.

Table 8.2 provides details on the number of participants from the different disciplines who attended the training. These participants included four heads of departments or unit managers who also participated in the training programme (two from Hospital A and three from Hospital B). The doctors and the nurses from both hospitals attended the 2-2½-hour training sessions while the allied health professionals attended the full-day training. It is important to note that of the 63 Hospital A nurses who attended the training, only 24 attended the full 2-2½-hour training programme. For these nurses the training was split into five 30-minute sessions. It is further important to note that although 18 physiotherapists from Hospital A attended the training, not all of these physiotherapists provide services in the NICU at the same time. The physiotherapists rotate every 3 months to gain experience in different practice areas or specialities. This does, however, mean if new physiotherapists rotate to the NICU, they already received the training on NDSC.

Table 8.2: Participants who attended the neurodevelopmental supportive care (NDSC) training programme

PROFESSION	TOTAL n (%)	HOSPITAL A n (%)	HOSPITAL B n (%)
Doctors	80 (31.37%)	28 (22.40%)	52 (40.00%)
Nurses (all categories)	124 (48.63%)	63 (50.40%)	61 (46.92%)
Physiotherapists	22 (8.63%)	18 (14.40%)	4 (3.08%)
Dietitians	12 (4.71%)	6 (4.80%)	6 (4.62%)
Speech therapists/Audiologists	8 (3.14%)	4 (3.20%)	4 (3.08%)
Occupational therapists	9 (3.53%)	6 (4.80%)	3 (2.31%)
TOTAL	255 (100%)	125 (100%)	130 (100%)

As NDSC is a multidisciplinary approach, participants of the different disciplines were invited to attend the training together. This was, however, not always possible due to discipline specific work schedules and staff shortages. The nurses and doctors, at both hospitals attended the training in separate groups, per their profession, while the rest of the allied health professionals, at both hospitals, attended the training in mixed groups.

All training sessions were presented face-to-face by the researcher which ensured consistency of the delivery method and content of the course. The format of the training was PowerPoint lectures which included the following topics: Fetal development and the NICU, neurosocial development, the disorganised infant, developmentally supportive management and skin-to-skin care (refer to Appendix M for more details on the objectives of the course). The training further included educational strategies such as quizzes, discussion groups, demonstrations, videos as well as practical sessions to practice new skills. Participants received a training manual which contained the course objectives and the most important course information.

The one-day training programme was deemed the most appropriate for the public sector hospitals. It was, again due to workload and staff shortages, not possible for all multidisciplinary teams to attend a full-day training. The training programme was adapted and a condensed training programme was presented for those who were unable to attend the full day. Details on the different training schedules and which disciplines attended these are provided in Appendix M.

As an incentive, continuing professional development (CPD) points were offered to participants who attended the training and CPD certificates were provided following the training. This may have motivated participation in the training programme.

8.3 SUMMARY

In this chapter the implementation of the intervention was reported by using the guideline for reporting evidence-based practice educational interventions and teaching (GREET). This provided the reader with a clear picture of what, where, how and by whom the training programme was implemented. More detail on the implementation of the training intervention is provided in Appendix M. The next two chapters will focus on the evaluation of the implementation process. Chapter 9 will present the facilitators and barriers which impacted on the implementation process while Chapter 10 will present the effect of the implementation of the NDSC training programme.

CHAPTER 9: IMPLEMENTATION PROCESS EVALUATION

9.1 INTRODUCTION

This chapter describes Objective 3.2 of Phase 3 of this study which aimed to identify the facilitators and barriers in the implementation process (Figure 1.1). In implementation studies it is just as important to analyse the implementation process as it is to implement the intervention. By investigating contextual factors in the implementation process, it is possible to identify specific facilitators and barriers which supported or prevented the successful implementation of the intervention. The results of Objective 3.2 are presented in the form of two manuscripts (Paragraph 9.2 and 9.3).

9.2 MANUSCRIPT 3: PERCEIVED FACILITATORS AND BARRIERS IN THE IMPLEMENTATION OF A NEURODEVELOPMENTAL SUPPORTIVE CARE TRAINING PROGRAMME IN THE SOUTH AFRICAN PUBLIC SECTOR HOSPITALS: A FOCUS GROUP STUDY

The first manuscript focuses on facilitators and barriers related to the neurodevelopmental supportive care (NDSC) training programme itself. This manuscript has been prepared for submission to the Implementation Science Journal. The format of the manuscript is according to the journal's author guidelines.

TITLE

Perceived facilitators and barriers in the implementation of a neurodevelopmental supportive care training programme in the South African public sector hospitals: A focus group study

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ABSTRACT

Background: Neurodevelopmental supportive care is the best evidence-based approach when caring for preterm infants in the neonatal intensive care unit. This multidisciplinary approach is not currently the standard of care in all private and public healthcare NICUs in South Africa. A one-day neurodevelopmental supportive care training programme was implemented as part of a larger implementation study at two public sector hospitals in Gauteng, South Africa. An important part of the implementation of any intervention is to evaluate the process of implementation. The purpose of this study was to identify facilitators and barriers which impacted on the successful implementation of the training intervention.

Methods: All multidisciplinary team members who attended the training programme were invited to participate in the study. Eight focus groups were conducted and fifty staff, across the two hospitals, participated. The different disciplines were represented in the groups. Data were analysed using the Framework Method.

Results: Six main themes, related to facilitators and barriers, were identified: general feelings on the neurodevelopmental supportive care training; duration and time of training; content of the training; training methods; training environment; and training participants. Facilitators included aspects such as: availability of different training options (2 ½ hour or full-day), on-site training, the inclusion of all disciplines in the training, simple and practical information, inclusion of practical sessions, the use of a reflective tool to evaluate an increase in knowledge (quiz) and the use of a training manual. Barriers included: not all staff attended the training impacting on team morale, a lack of mixed discipline groups, frequent rotation of staff, one-off short training sessions, more advanced training required for experienced staff,

limited access to additional information on neurodevelopmental supportive care, no real-world practice in the neonatal intensive care unit environment and a lack of support from some senior staff and managers.

Conclusions: Various contextual factors, impacting on the successful implementation of the neurodevelopmental supportive care training programme in the public healthcare sector, have been identified. The implementation of any intervention is a lengthy process but the training programme was experienced as beneficial and a good starting point for further training initiatives.

Key words: neurodevelopmental supportive care, training, facilitators, barriers, contextual factors, neonatal intensive care unit

INTRODUCTION

Neurodevelopmental supportive care (NDSC) has been identified as the best evidence-based approach to use when caring for preterm infants in the neonatal intensive care unit (NICU) (Legendre et al., 2011; Barbosa, 2013; Sturdivant, 2013; Altimier & Phillips, 2016). It is described as a multidisciplinary team (MDT) approach where team members recognise and respect each other, take collective responsibility for the care of infants and their families and demonstrate good communication and sharing of knowledge (Lubbe et al., 2012; Barbosa, 2013). For NDSC to be successfully implemented, training of all healthcare professionals, who provide services in the NICU, is essential (Als, 2008; Lubbe, 2009; Barbosa, 2013). Nationally and internationally, a lack of training has been identified as one of the reasons for poor implementation of NDSC in the NICU (Lubbe, 2009; Post & Maree, 2009; Galarza-Winton et al., 2013; Zhang et al., 2014; Rheeder et al., 2017).

There are a few well recognised training programmes internationally but training on NDSC is not freely available in South Africa. This is possibly one of the reasons why developmental care is not currently the standard of care in all private and public healthcare NICUs in South Africa (Lubbe, 2009; Rheeder et al., 2017). It further does not necessarily form part of the medical, nursing and allied health professional curriculums on either an undergraduate- or postgraduate level in South Africa (Breier, Wildschut, & Mggolozana, 2015; Butler, 2018). The only NDSC training programmes, currently available in South Africa, are the Little Steps® training

programmes presented by the North-West University as an accredited short learning programme. The content of the courses is based on the nine NDSC categories of developmental care, as determined in an integrative literature review (Lubbe et al., 2012). The one-day Little Steps® Introduction to NDSC training programme was implemented as part of a larger implementation study at two academic, public sector hospitals in Gauteng, South Africa. The training programme included both theoretical and practical aspects. More details on the Little Steps® training programme and how it was implemented are presented in Additional File 1: The Guideline for Reporting Evidence-based Practice Educational Interventions and Teaching (GREET) checklist (Appendix M in this thesis).

When implementing training programmes, specifically in the South African public healthcare sector, it is necessary to identify potential contextual factors, also referred to as facilitators and barriers, which can affect the success of an intervention. The public healthcare sector in South Africa is a complex and busy environment that caters for approximately 80% of the population (African Institute of Health & Leadership Development, 2015), often with insufficient staff, time and equipment (Manyisa & van Aswegen, 2017; Maphumulo & Bhengu, 2019). Service delivery in public sector NICUs is severely affected by these constraints and by identifying facilitators and barriers it can ultimately support or prevent a change in practice in the NICU (Wensing et al., 2011; Flottorp et al., 2013; Geerligs et al., 2018).

Facilitators and barriers can be divided into three categories: system, staff and intervention factors. System factors include aspects such as resources, staff turnover, communication processes and organisation level support, while staff factors are aspects such as staff commitment, awareness, knowledge, ability, skill and confidence. Intervention factors relate to the complexity, flexibility and acceptability of the intervention and the fit between the intervention and the system (Burke et al., 2012; Geerligs et al., 2018; Nilsen & Bernhardsson, 2019).

An important part of the implementation of any intervention is to evaluate the process of implementation. As a result, this paper aimed to identify facilitators and barriers which impacted on the successful implementation of the one-day Little Steps® NDSC training programme in two public sector NICUs in Gauteng, South

Africa. Understanding the impact of these contextual factors on the implementation process can guide future training intervention initiatives in the public healthcare sector.

METHODOLOGY

The design of the larger study was a multiphase implementation study guided by the Quality Implementation Framework (QIF) (Meyers, Durlak, et al., 2012). The NDSC training intervention was offered to all MDT members at the two hospitals. Focus groups were conducted approximately six months after the implementation of the training intervention to determine the MDT's perception of the one-day NDSC introductory course as well as to identify implementation facilitators and barriers. Purposive sampling was used as all staff who attended the training programme on NDSC, and who, at the time, provided services to preterm infants in the NICU, were invited to participate. In this study the MDT, who attended the training, consisted of: 124 nurses, 80 doctors, 22 physiotherapists, 12 dietitians, 9 occupational therapists and 8 speech therapists/audiologists.

The researcher used brief questions pertaining to the NDSC training programme. Additional prompt questions were used when necessary (Table 1). Data were gathered until saturation was achieved (eight focus groups). Most of the groups consisted of a combination of the different disciplines and between four and 10 participants. Audio recordings were transcribed and the Framework Method of Gale et al. (2013) was used to analyse the data. A predetermined list of codes on implementation facilitators and barriers, as derived from the literature, were used to code the transcripts line-by-line. Open coding was also used to ensure important information was not missed. A second reviewer independently confirmed the codes and after a consensus discussion between the first author and the reviewer, an analytical framework was developed which included the final codes and categories (Additional file 1 - Appendix J in this thesis). MAXQDA 2019 (VERBI Software, 2018) was used to apply the analytical framework and the data were summarised by category. The researcher identified themes and subthemes supported by illustrative quotes which were classified as facilitators and/or barriers.

Ethical permission (M160120) to conduct the study was obtained and participants provided written consent for their participation in the study and for conversations to be recorded.

Table 1: Focus group questions and prompts

Training questions	So, let's start by talking about the training....
	What were the highlights of the training for you?
	What were lowlights of the training?
Prompt questions	Enjoyable/useful/interesting aspects or NOT
	Duration of the training
	Complexity of the information
	Lectures versus practical sessions
	Recommendations

RESULTS

A total of 50 MDT members participated in the focus groups: 27 (54%) participants from Hospital A and 23 (46%) participants from Hospital B. All disciplines who attended the NDSC training were represented in the focus groups: 10 (20%) nurses, nine (18%) doctors, nine (18%) physiotherapists, eight (16%) dietitians, eight (16%) speech therapists/audiologists and six (12%) occupational therapists.

The results are presented according to the six identified themes: *general feelings on the NDSC training; duration and time of training; content of the training; training methods; training environment; and training participants*. The themes, subthemes and corresponding participant quotes are presented in Additional File 1.

General feelings on the neurodevelopmental supportive care training

The NDSC training programme in itself was experienced as a facilitator. The overall feeling was positive and participants enjoyed the training. The MDT described the training as: useful, interesting, enjoyable, applicable, informative, valuable, helping them with their thinking and reasoning, and easy to understand.

I absolutely enjoyed it, so much... it was so useful, ... the information (FG 1).

I think the training was good. I personally enjoyed it; it made me think of things differently when I went back into the unit (FG 8).

Participants described it as an eye-opener, even though some members of the MDT have been working in the NICU, or with preterm infants, for many years. The training created a general awareness of not only the NICU environment, but also of the participants' own behaviour in the NICU environment and the impact of this on the preterm infants.

There were just so many things that I wasn't aware of, like, how the infant experiences the world and of how the infant can be stressed by you simply, like, putting down a file or simple things like that (FG 1).

Although some participants had training on NDSC on an undergraduate or postgraduate level, they still felt it was a good reminder as they often become complacent and are not always aware of their own behaviour in the NICU.

A lot of the things that we covered, from my perspective, we covered in undergrad. So, it was a great refresher course and it was very thorough (FG 3).

It was not always possible, due to work pressure, for all team members of a specific discipline, to attend the training. The team members who attended the training, however, took it upon themselves to relate the information to the rest of their teams. Participants felt everyone, providing services to preterm infants, should be aware of the NDSC principles. This further included the training of students or new staff in some of the departments.

We are, also trying to do training when new staff are coming in and making them more aware of developmental care and all of that (FG 2).

The one-off training, especially the 2-hour sessions, was experienced as a barrier. Participants felt it was not sufficient for every team member to remember all the necessary detail of developmental care and some therefore found it difficult to apply in their day-to-day practice. It was felt continuous training would be better to facilitate a change in practice. Participants who attended the full-day training, had more time to practice the practical aspects of developmental care.

It lasted for about a week or two because then I couldn't remember some of the small things that you told us ... So, I think it should be on-going, so that we make it part of our practice. Because it was just a one-off and then I think it was lost in translation (FG 8).

Duration and time of the training

Various times and dates, for the NDSC training, was made available to the teams at both hospitals. The researcher was flexible and presented the training when it suited the MDT's schedules. The duration of the training, was identified as either a facilitator or a barrier. Some participants felt the one-day training was sufficient and would allow more NICU staff to attend the training. Participants who attended the one-day training, believed the full-day provided more time for consolidation and an opportunity for practical sessions.

I found the one-day course, like basic knowledge, fantastic (FG 3).

More experienced staff, who were familiar with preterm infants and the environment, were further able to link the information of the one-day training with their clinical experience. This potentially made it easier to grasp some of the new concepts.

We could almost understand, so that one day, for me, was ok. I managed to do everything you were saying, I could just ... take it in but it is because I have that experience of being up there (in the NICU), all the time (FG 2).

The 2-hour training sessions were also seen as either a facilitator or a barrier as participants experienced mixed feelings. Some participants who attended the 2-hour sessions, felt they needed more time. Others felt they would not be able to attend full-day training due to the busy, often understaffed, public healthcare sector environment and that the 2-hour sessions were ideal.

I don't think the full-day training is going to work for us (FG 8).

The one hospital's nurses attended five, 30-minutes training sessions adding up to 2½-hours of training. Team members felt these in-service sessions were too short and were seen as a barrier. Some of the disciplines were further of the opinion the

nurses should have more extensive training as they spend the most time with the preterm infants in the NICU.

I don't think what you're trying to teach us, ... we can't really retain it as well as having the full-day where you know you are going to focus on what's being discussed and not have little bit here, little bit there and trying to bring it together. I think it's very difficult (FG 7).

One of the participants highlighted the benefits of having different duration courses to suit individual needs which can be a facilitator.

But I think also the fact that you've got the options. You've got a full one-day training session and you've got a shortened version for those that don't have the time. So, I think that is nice (FG 5).

Another facilitator identified was allocated time for continuing professional development. Some departments already have a set time for training which can be utilised in future.

If it's an afternoon, you can actually make it a departmental thing because we already have afternoons set aside for CPD (continuing professional development) (FG 7).

Content of the training

The content of the one-day training was experienced as a facilitator. Participants mentioned the sheer volume of information presented in the one-day but nonetheless, experienced it as positive. They reported that the most important information was included and were presented in sufficient detail. The information was simple enough to understand and team members could easily relate the information to other staff members or parents.

I must say the amount of the knowledge, that you, in that one day, that we gained, just from that one day, was phenomenal. (FG 1)

Participants who attended the two-hour training sessions voiced mixed feelings on the depth of information. Some felt it was a barrier as too much information was presented. One of the allied health professionals, however, attended the 2-hour

training session with the doctors and felt that the content was sufficient and that she was not at a disadvantage for not attending the full day. It was, however, mentioned it would have been better to rather spread the sessions over a day, with regular breaks.

It was too much. I think if we can do like session one, then take a break, then chapter two and then take a break (FG 6).

... despite it being a condensed training, I still felt like the information, when the other team members presented to the rest of the group, I felt I got the same type of information, and if certain aspects weren't in-depth, it was still provided in the manual which supplemented that. So, I didn't feel like I was at a disadvantage because I didn't attend the full training (FG 2).

For me I would not say it was actually a bit too much. I would say just that, we did so many things at once, I think maybe if we, like the other participant said, maybe in a day, we have many chapters and then we separate maybe the hours (FG 6).

Participants felt the information provided in the NDSC training was a facilitator and essential for healthcare professionals working in the NICU or with preterm infants. They mentioned undergraduate students should receive the necessary information on developmental care before they are expected to work in the NICU environment. Participants were further of the opinion the training should form part of an induction programme especially for junior staff such as the doctors or community service therapists, who rotate on a regular basis. The constant rotation of staff can be a barrier in the implementation process if not addressed.

It must be like a rule, a part of orientation. When you start working at this hospital, maybe part of orientation, where you have to do the test and you have to do this course, to be able to work at this hospital (FG 4).

For participants who received training on NDSC on an undergraduate level, the content of the one-day training can be a barrier as they felt they might need more in-depth, follow-up training.

I would have just preferred maybe more, hmm, advanced stuff, so to speak, because we had covered the stuff in undergrad (undergraduate training) (FG 3).

The training programme was based on the best available evidence related to NDSC. The researcher included recent and relevant literature in the training, supporting the content of the course which was seen as a facilitator.

You had evidence and all of that as well ... So, what you teach and what you implement has to be evidence-based especially when you try and convince somebody to change their practice... I think you brought that through nicely (FG 7).

Training methods

The one-day training consisted of various teaching methods including presentations, practical demonstrations, simulation sessions, quizzes, photos, videos and group discussions. The two-hour training session also included the essential components (based on the nine NDSC categories) of the presentations and practical sessions. The practical part was seen as a facilitator and participants thought it was a vital component of the training. They even recommended more hands-on practise in the NICU environment.

It was a very nice balance. We often just get knowledge, knowledge and knowledge thrown at us. So, it's nice to actually apply and see if we are doing it correctly because I mean, we've been doing it for so long, you want to make sure that you are doing the right thing (FG 3).

The practical training is better ... shorter sessions with more practical. When we leave a classroom, we actually need to know how to put it into practice (FG 7).

The training manual was provided at the start of the training as a resource and was also experienced as a facilitator. Participants appreciated having a training manual, not only for making additional notes during the training session but also to refer back to after the training. Some staff even used it to train new staff or students.

The book that we had, was really helpful, just to wrap my head around everything and then also something to refer back to if it's something you're unsure of (FG 4).

People learn differently and it is therefore necessary to include diverse methods of teaching as part of the training programme. The lack of diverse teaching methods can be seen as a barrier as some participants, who attended the 2-hour course, voiced the need for the inclusion of more videos in the training programme.

Everything stuck a lot more, with the practical and with the videos that we ... or the pictures that we watched of the sleep states (FG 3).

A simple 10-question quiz on developmental care was used at the start of the training as a warm-up activity to highlight potential gaps in participants' knowledge of NDSC. Participants valued the use of this as part of the teaching methods and it can be seen as a facilitator.

That test before, it was a really useful reflective tool because you could look at what you've said and then think about it and it really made sense (FG 4).

Some participants requested additional resources for further self-study following the training, including access to recent and relevant literature on NDSC which was seen as a barrier.

I think maybe just, if we were given, some resources where we could look, keep looking up or like journal articles, references. Somewhere where we can just keep referring back and updating our knowledge (FG 3).

Training environment

The training environment can be seen as the location as well as the actual rooms where the training was presented. The training was presented at the two hospitals which made it easier for participants to attend and therefore a facilitator.

I think that, the training, the fact that it was here, made it easier for us ... that there was better access to the training (FG 7).

Participants did not have many comments on the training venues. This was possibly due to the use of appropriate or fit for purpose training venues. Only one participant,

who attended the shorter session with the doctors, felt the environment was not conducive to learning and experienced the behaviour of some members of the MDT as disruptive which can be seen as a barrier.

You don't really have control of it but I felt like the environment that we were in when the training was done, was a little bit disruptive because there were a few doctors that kept sitting on their phones and going in and out (FG 2).

Participants felt it would have been beneficial to go into the NICU or for the presenter to join the ward rounds. The lack of hands-on practical sessions in the NICU is experienced as a barrier. These sessions could have provided an opportunity for real-life demonstrations and discussions.

Hmm, but what I would want to still do is, it's lovely to hear about the NICU but ..., to actually go in and do the actual positioning with the children (FG 5).

Training participants

The initial plan, for the training, was for different members of the MDT to be trained together. This was, however, not possible as the training needed to be modified to suit the nurses' and doctors' workload and schedules. Three different training sessions were offered: one full-day training, one 2-2½-hour sessions and five 30-minute sessions (adding up to 2½-hours). Accommodating the needs of the various disciplines and participants was seen as a facilitator.

I think what was really nice is, the attempt to then, do the training with everybody across, so you were doing it with the doctors, you were doing it with the nurses and you were doing it with Allieds (allied health professionals) which I think, the only way it's going to work, is as if everybody works together and everybody is, working towards a common goal (FG 2).

Participants, however, believed joint training sessions would have been beneficial to promote better teamwork which highlighted this aspect as a barrier.

What would actually be nice, ... is trying to get the doctor and the Allieds (allied health professionals) and the nurses in one session. So, I think that

might work better and also help communications with us, and the doctors, and the nurses and then I think that might help to implement all of this better within the hospital (FG 3).

The training was offered to all staff working in the two hospitals' NICUs but not all staff were able to attend the training. This was experienced as a barrier and problematic especially related to implementation of the training in practice.

We managed to gather most of the important information from the training but it's, in terms of implementing it, becomes a bit of a challenge, if not everyone is trained and then, if not everyone is willing to implement it (FG 4).

It was felt senior or experienced staff should also attend the training as junior or new staff often follow their example.

Table 2 provides a summary of the various facilitators and barriers identified by the participants in the focus groups. Some themes were seen as both a facilitator and a barrier such as the duration of the training.

Table 2: Contextual factors related to the implementation of a training programme

THEMES	FACILITATORS	BARRIERS
Neurodevelopmental supportive care (NDSC) training	• Opportunity to receive training on NDSC	• One-off training is not sufficient
Duration and time of the training	• One-day training allows for more multidisciplinary team members to attend and more time for practical sessions and consolidation • Two-hour session more practical for some disciplines • Availability of different training options (2½-hours or full-day) • Allocated time for continuing professional development	• One-day training – not appropriate for all to attend • Two-hour session – more time needed • Short in-service training sessions
Content of the training	• Amount of information was sufficient for the one-day training • Content was clear and simple • Essential for students, new staff and rotating staff • Recent and relevant literature was included	• Too much information for the 2-hour training sessions • Experienced staff require more advanced training
Training methods	• Practical sessions • Training manual • Quiz as a reflective tool	• Two-hour session had limited opportunity for diverse training methods such as practical sessions and videos • Lack of additional resources following the training
Training environment	• On-site training	• Disruptive participant behaviour • Lack of real-life demonstrations in the NICU
Training participants	• Accommodating different needs of participants	• Lack of mixed multidisciplinary groups • Not all staff were trained • Senior and experienced staff should also attend training

DISCUSSION

The MDT had an overall positive experience of the Little Steps® Introduction to NDSC training programme and described it as enjoyable, informative and useful. This is possibly due to the fact that the training needs of the participants were taken into consideration prior to the implementation of the training programme (Østergaard et al., 2008; Meyers, Durlak, et al., 2012). As part of the pre-implementation phase, it was determined the MDT required training on all nine NDSC categories. The content of the one-day introduction training programme was not all-encompassing

but still included the essential information of the NDSC approach (Lubbe et al., 2012). The course further created a general awareness of the MDT's behaviour, related to preterm infants in the NICU. According to the NICU guidelines, an awareness and knowledge of what needs to change, is seen as important first steps to change practice (NICE: National Institute for Health and Care Excellence, 2007). There are various ways to create awareness and training is one of them. Even for staff who received previous training on developmental care, the content of the course was experienced as a good refresher and therefore a facilitator.

Another facilitator was the flexibility of the training programme (Geerligs et al., 2018). Initially the Little Steps®, one-day introductory training programme was deemed the most feasible for the MDT to attend and therefore an appropriate programme to implement, in two public hospitals, where services are provided to preterm infants and their families. Regardless of the shorter, more practical, one-day course, it was still necessary to further adapt the course to accommodate the work schedules of the doctors and the nurses. If the 2-hour sessions were not available, doctors and nurses would not have been able to attend the training. This could have had serious implications if only some disciplines attended the training, as NDSC is an MDT approach aiming to improve the outcomes of preterm infants (Barbosa, 2013; Milette et al., 2017). It was therefore necessary to take into consideration individual disciplines' availability for training and adapting the programme accordingly. While the original one-day training programme was adapted to a 2-hour session, the essential content of the course remained the same which relates to the fidelity of the training intervention (Altimier et al., 2015; Geerligs et al., 2018). To save time the practical aspects of the course were reduced.

The inclusion of all disciplines, forming part of the MDT in the NICU, in the implementation of the training was another facilitator. By including as many team members as possible, it is likely to increase the buy-in and sustainability of the implementation of the intervention (Altimier et al., 2015; Milette et al., 2017). Although there was no consensus on the ideal duration of the course, shorter sessions in general, were seen as a facilitator, as more MDT members, in the busy, public hospitals, would be able to attend the training. Conducting the training on-site was also beneficial allowing more team members to attend.

Another facilitator to the successful implementation of the training programme was that the information was not too complex (Geerligs et al., 2018). The MDT members easily understood the content and were able to relate information, not only to their colleagues, new staff and students, but also to the parents of the preterm infants. Parents are a vital part of the MDT in developmental care and it is important to include them in the implementation process (D'Agata & McGrath, 2016; Milette et al., 2017).

Adult learners have different learning styles, usually benefitting from a variety of learning activities in addition to lectures (Bertram et al., 2011; Anderson, 2016). The NDSC training programme included a variety of different teaching methods. The one-day training, although not suitable for all disciplines, allowed sufficient time for the amount of theory presented as well as practical activities such as watching videos, analysing and discussing photos of infant stress signs and sleep/awake states, and practicing skills such as positioning, swaddling and kangaroo mother care (KMC). The practical components of the course assisted with consolidation of knowledge (Milette et al., 2017). Having a training manual, during the training procedure, but also after the training as a reference, was experienced as a facilitator. The quiz was mainly used as a warm-up activity at the start of the training. At the end of each training session the researcher handed out the previously completed quizzes and asked the participants to complete the quiz again. The researcher provided the correct answers and participants were able to see the difference between their initial scores and their scores after the training. The MDT experienced this as a useful reflective tool evaluating their knowledge before and after the training session. This can be further developed for future training sessions and used as an evaluative tool to determine a change in knowledge as was done in a study in Spain (Mosqueda-Peña et al., 2016). The inclusion of recent and relevant literature, providing the necessary evidence to support the use of the NDSC approach in the NICU, was experienced as beneficial. Access to a variety of educational resources can assist with changing practice (Phillips, 2015).

Various barriers related to the implementation of the NDSC training programme, were also identified by the MDT. For NDSC to be successfully implemented, effective team work is required (Armstrong, Ball, & Leatherbarrow, 2012; Barbosa,

2013). One of the barriers of the training programme, identified by the MDT, was that each training group did not include all the different disciplines which formed part of the MDT. The allied health professionals attended the training together but the doctors and the nurses received their training separately. It was felt that this was a missed opportunity as it could have facilitated better working relationships between the different disciplines. Due to staff workloads and work schedules this was, however, not possible as the doctors and nurses were only able to attend a 2-hour training session. This needs to be taken into consideration for future MDT training on NDSC as effective teamwork in the NICU is essential and joint sessions can contribute to mutual respect and better communication between MDT members (Altimier et al., 2015; Milette et al., 2017).

Another barrier identified, was that not all staff working in the NICU, were trained. Due to this, participants felt it was difficult to implement some of the NDSC principles in the NICU. Although all staff were invited to participate in the training, it was not always possible due to work pressure and shortage of staff. It will be the ideal for all staff to be trained but it is recommended that an initial 30% of staff should be trained in large NICUs (Milette et al., 2017). In this study a total of 61% and 68% of staff at the two respective hospitals were trained which should in theory support a change in practice in the NICU.

One of the biggest barriers in the implementation of a training programme in an academic hospital, which links with the training of all staff, is the constant rotation of junior staff. Junior doctors rotate every 3-6 months while community service therapists usually rotate every year. This means continuous training will be needed to ensure sufficient knowledge of all staff, at all times, in the NICU (Wilson, Allen, & Pfalzer, 1996). The inclusion of NDSC in an induction programme for all new staff, providing services to preterm infants, has been recommended (Rheeder et al., 2017).

Some MDT members noted they were unable to remember all the information and a one-off training programme, on developmental care, can therefore be seen as a barrier, especially for individuals who only attended the 2-hour sessions. Some of these team members felt too much information was provided in the available time but at the same time highlighted the need for the inclusion of more videos and

hands-on practice. Participants felt the five, 30-minute sessions for the nurses were not ideal as it is difficult to consolidate the information over a period of time. It is recommended to have continuous follow-up training sessions or refresher courses on a regular basis to promote sound knowledge of developmental care. This further relates to the need expressed by some team members to have access to additional resources. A variety of educational material should be available to staff to retain information and to change their practice, especially in an academic hospital where students are trained (Phillips, 2015).

Another barrier, as identified by the MDT, was the need for the inclusion of the real-world NICU as part of the practical sessions. The team felt the practical sessions should have extended into the NICU environment, in the form of demonstration of practical aspects, on the preterm infants or through ward round discussions. Ethically it will not be possible to use preterm infants in demonstrations, as they are already handled too much in the NICU environment. Champions, who had the training and who already provide services in the NICU, can however, facilitate bedside activities and be role models for other staff members (Bertram et al., 2011; Altimier, 2015; Milette et al., 2017).

The MDT felt senior and experienced staff should also attend the training as this can potentially be a barrier in the implementation of the training into practice. A pre-innovation session can create an awareness of what the intervention entails which can contribute to successful implementation (Meyers, Durlak, et al., 2012; NCEC, 2018). Although some senior staff members and managers attended either the pre-innovation session or the NDSC training itself, this was not consistent across all disciplines. Support is required for successful developmental care practice (Altimier et al., 2015) and NICU staff would benefit from managerial support as well as support groups (Lubbe, 2009; Milette et al., 2017; Rheeder et al., 2017). Full implementation of developmental care is a lengthy process which requires strong leadership, patience, endurance and persistence (McGrath & Valenzuela, 1994; Milette et al., 2017).

Transferability of the results of this study is possible if the context resembles the two public health care settings of this study. The barriers and facilitators that emerged from this study often impact on the busy public healthcare sector environment.

Aspects such as the duration of the training, the content of the training and the training environment need to be considered in the implementation of any training programme and it would be beneficial for researchers to consider these contextual factors in similar training intervention studies.

A limitation of this study can be social desirability bias as the researcher presented the training programme as well as conducted the focus groups (Bergen & Labonté, 2020). One way to limit this potential bias was for the researcher to build a rapport with the participants (Bergen & Labonté, 2020). This relationship prompted participants to be open and honest in their responses. The participants were further aware that the purpose of the study was to inform future training initiatives in the public healthcare sector which they could potentially benefit from. Another limitation was that although all MDT members who attended the NDSC training programme were invited to participate in the focus groups, only some staff chose to participate. This was likely due to staff rotations and the different work schedules of the MDT.

CONCLUSION

Various contextual factors (barriers and facilitators), impacting on the successful implementation of the one-day Little Steps® introductory training programme on NDSC in the public healthcare sector, have been identified. The training programme was experienced as beneficial and a good starting point for further training initiatives. The identified facilitators and barriers in the implementation of the NDSC training programme can guide the formulation of recommendations for future NDSC training initiatives in the public sector NICUs. The implementation of any intervention is a lengthy process, but from the results of this study it seems awareness has been created, and as Eckhart Tolle said: “Awareness is the greatest agent for change” (Tolle, 2005). It is, however, unclear if an awareness is sufficient for the MDT to change their practice in the NICU.

ABBREVIATIONS

GREET: The Guideline for Reporting Evidence-based Practice Educational Interventions and Teaching; MDT: Multidisciplinary team; NDSC: Neurodevelopmental supportive care; NICU: Neonatal intensive care unit

DECLARATIONS

Ethics approval and consent to participate

The Human Research Ethics Committee of the University of the Witwatersrand, Johannesburg granted ethical approval (M160120) and permission for the study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and analysed during this study are not publicly available due confidentiality but are available from the corresponding author on reasonable request.

Competing interests

Not applicable.

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Authors' contributions

Writing the paper was led by LJ. All revisions were made and the final manuscript approved by all authors involved.

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Additional File 1: Facilitator and barriers in the implementation of a training programme on neurodevelopmental supportive care

Themes	Subthemes	Quote examples
General feelings on the neurodevelopmental supportive care training	Positive feelings	<i>So, it was very interesting and it helped me, personally, a lot with my thinking and reasoning (FG 1).</i> <i>It is not often you leave a course and you feel like, this was so useful, so helpful, and you really wanted to go further and make differences (FG 4).</i>
	An awareness	<i>I never knew the different ways of soothing a neonate, so that it's not just swaddling ... even just a containment-hold, that works beautifully, so just knowing the different types (FG 3).</i> <i>... you go in, and you think that you know, and be like, we've been working here for so many years, but just the, ... that one day, it makes you so much, ... so you become a lot more aware of the environment (FG 1).</i>
	A refresher	<i>So, having come for the training, you start going back to the way that you were trained and doing that holistic treatment for the patient and attending to some of the things that you wouldn't usually... (FG 2).</i>
	Training of other staff and students	<i>We did a feedback session with the rest of the paediatric speech team because, ... again, we need everybody in the team involved, even if they just seeing a neonate or, you know, it might not necessarily be in the NICU but seeing a neonate in another ward, whatever it is, then they also had access to that information (FG 7).</i> <i>So, when students, 4th year students, come in for their block, it helped us make them aware of what they need to do and their role in developmental care in the NICU (FG 2).</i>
Duration and time of the training	One-day versus two-hours	<i>I think the fact that we had the opportunity to have the full day, gave it that space to, to really focus on the theory but as well as the practical component of it which I think was also so valuable as most people also said (FG 2).</i> <i>Keeping it to one day might help in a sense that more people might be able to attend it (FG 1).</i> <i>If we do practical in the actual wards, where the nursing staff can watch exactly what you're teaching us, because I know there is a problem of short staff and if you tell them to come for a day, it's not going to happen (FG 4).</i>

Themes	Subthemes	Quote examples
Duration and time of the training (continue)	One-day versus two-hours (continue)	<i>The time was too short for everything, to grasp (FG 6). Most of the nurses should have lot more training ... I think that one half a day or two hours isn't enough (FG 3).</i>
	Departmental training	<i>... cause, I know on Wednesday mornings, they do have a staff meeting and that's when the sister-in-charge says to me, come and do your training, every staff meeting, like in-service (FG 3).</i>
Content of the training	Depth of information	<i>We did a feedback session with the rest of the team because, ... again, we need everybody in the team involved, even if they're just seeing a neonate or, you know, it might not necessarily be in the NICU but seeing a neonate in another ward, whatever it is, then they also had access to that information. So, ja, and it was easy enough to share, it was presented in a way that was, ja, easy to facilitate that (FG 2). So, we've also made the caregivers aware of a lot of the environmental things that they can change with their babies (FG 1). I did learn a lot on the training and I did find, you know, you did show us simple ways to, you know, try and help the babies (FG 8).</i>
	Prerequisite for NICU working	<i>So, if the training can be done at the varsity level and on the first day before you start with the patient, then it will be much beneficial (FG 4).</i>
Training methods	Theory versus practical sessions	<i>So, I think if it were feasible, to actually have small sessions and go to the wards and practice (FG 3). Maybe the follow-up would have been nice, if it was implemented on the wards when we actually go to ICU and we see what is our environment like, what changes can we implement from what we've learnt (FG 4).</i>
	Training material	<i>We also had a com serve (community service healthcare professional) rotate into paed (paediatrics) after the training. So, I used my manual to go through the information with her (FG 2). I sometimes refer back to those notes just because I wanna make sure that I remember it (FG 3).</i>

Themes	Subthemes	Quote examples
Training methods (continue)	Diverse training methods	<i>Sometimes a picture is worth more than 1000 words. ... for some of the other things like, don't lie like a star and put it to midline I think some of those things would have been better with a video (FG 8).</i> <i>I enjoyed the practical part, it was a lot of fun but because it was fun, it's stuck, it sticks with you, I remember the practical, ... the theory, because of the practical (FG 3).</i>
	Additional resources	<i>We spoke about access, to us having access to journal articles and the university's e-library... I think that would be something we could definitely benefit from, in terms of keeping up to date with the current literature (FG 2).</i>
Training environment	Local training sites	<i>I think that, the training, the fact that it was here, made it easier for us ... that there was better access to the training (FG 7).</i>
	The NICU environment	<i>I think maybe that's the thing, is to try to put that into a real world situation, hmm, so maybe if you, you know, someone could attend a ward round with us and then comment on the babies' positioning and it's, you know, and then suggest things on the ward round (FG 8).</i>
Training participants	The multidisciplinary team	<i>I think it's pretty difficult to get the doctors and the nurses to do a full day because of the time and everything; they're under staffed. Obviously, doctors need to be there (in the NICU) (FG 3).</i> <i>The shorter, more practical sessions are much better for us than the full days. It's just not really possible with our workload (FG 8).</i>
	Every team member	<i>I think it would be good if all the staff are trained (FG 6).</i> <i>You learn a lot from your superiors and I think a lot of the nurses and doctors and ourselves get into bad habits, following examples from our superiors and I think potentially targeting the group of nurses and doctors that are, that have been here for a while that have, you know, had a lot of experience in the system ... and by making sure that maybe they attend to this (FG 4).</i>

REFERENCES

- African Institute of Health & Leadership Development. (2015). *Minimum data sets for human resources for health and the surgical workforce in South Africa's Health System: A rapid analysis of stock and migration*. Retrieved from https://www.who.int/workforcealliance/031616south_africa_case_studiesweb.pdf?ua=1
- Als, H. (2008). Program guide: Newborn Individualized Developmental Care and Assessment Program (NIDCAP®), rev. ed. South Attleboro (Mass): NIDCAP Federation International.
- Altimier, L., Kenner, C., & Damus, K. (2015). The Wee Care neuroprotective NICU program (Wee Care): The effect of a comprehensive developmental care training program on seven neuroprotective core measures for family-centered developmental care of premature neonates. *Newborn and Infant Nursing Reviews*, 15(1), 6-16. doi://doi.org/10.1053/j.nainr.2015.01.006
- Altimier, L., & Phillips, R. (2016). The neonatal integrative developmental care model: Advanced clinical applications of the seven core measures for neuroprotective family-centered developmental care. *Newborn and Infant Nursing Reviews*, 16(4), 230-244. doi:<https://doi.org/10.1053/j.nainr.2016.09.030>
- Altimier, L. B. (2015). Neuroprotective core measure 1: The healing NICU environment. *Newborn and Infant Nursing Reviews*, 15(3), 91-96. doi:<https://doi.org/10.1053/j.nainr.2015.06.014>
- Anderson, I. (2016). Identifying different learning styles to enhance the learning experience. *Nursing Standard*, 31(7). doi:10.7748/ns.2016.e10407
- Armstrong, E. K., Ball, A. L., & Leatherbarrow, J. (2012). Constructing a programme of change to improve the provision of family-centred developmental care on a neonatal unit. *Infant*, 8(3), 86.
- Barbosa, V. M. (2013). Teamwork in the neonatal intensive care unit. *Physical & Occupational Therapy In Pediatrics*, 33(1), 5-26. doi:<https://doi.org/10.3109/01942638.2012.729556>
- Bergen, N., & Labonté, R. (2020). "Everything is perfect, and we have no problems": detecting and limiting social desirability bias in qualitative research. *Qualitative Health Research*, 30(5), 783-792. doi:<https://doi.org/10.1177/1049732319889354>
- Bertram, R., Blase, K., Shern, D., Shea, P., & Fixsen, D. (2011). Policy research brief: Implementation opportunities and challenges for prevention and promotion initiatives. Alexandria, VA: National Association of State Mental Health Program Directors (NASMHPD).

- Breier, M., Wildschut, A., & Mggolozana, T. (2015). Nursing in a new era.
- Burke, K., Morris, K., & McGarrigle, L. (2012). An introductory guide to implementation: terms, concepts and frameworks.
- Butler, M. L. (2018). *The self-reported perceptions of the multi-disciplinary team regarding standards of neurodevelopmental supportive care in the neonatal intensive care unit.*
- D'Agata, A. L., & McGrath, J. M. (2016). A framework of complex adaptive systems. *Advances in Nursing Science*, 39(3), 244-256.
doi:<https://doi.org/10.1097/ANS.0000000000000127>
- Flottorp, S. A., Oxman, A. D., Krause, J., Musila, N. R., Wensing, M., Godycki-Cwirko, M., . . . Eccles, M. P. (2013). A checklist for identifying determinants of practice: a systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice. *Implementation Science*, 8(1), 35.
doi:<https://doi.org/10.1186/1748-5908-8-35>
- Galarza-Winton, M. E., Dicky, T., O'Leary, L., Lee, S. K., & O'Brien, K. (2013). Implementing family-integrated care in the NICU: educating nurses. *Advances in Neonatal Care*, 13(5), 335-340.
- Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, 13(1), 117.
doi:<https://doi.org/10.1186/1471-2288-13-117>
- Geerligs, L., Rankin, N. M., Shepherd, H. L., & Butow, P. (2018). Hospital-based interventions: a systematic review of staff-reported barriers and facilitators to implementation processes. *Implementation Science*, 13(1), 36.
doi:<https://doi.org/10.1186/s13012-018-0726-9>
- Legendre, V., Burtner, P. A., Martinez, K. L., & Crowe, T. K. (2011). The Evolving Practice of Developmental Care in the Neonatal Unit: A Systematic Review. *Physical & Occupational Therapy In Pediatrics*, 31(3), 315-338.
doi:<https://doi.org/10.3109/01942638.2011.556697>
- Lubbe, W. (2009). *Best practice guidelines for neurodevelopmental supportive care of the preterm infant.* (PhD Obstetrical and Neonatal Nursing Science Doctoral dissertation), North-West University (Potchefstroom Campus), Potchefstroom. Retrieved from
<https://pdfs.semanticscholar.org/9919/4bdea06b10d3a7facea65f3b1f4c35297be2.pdf>.
- Lubbe, W., Van der Walt, C. S., & Klopper, H. C. (2012). Integrative literature review defining evidence-based neurodevelopmental supportive care of the preterm infant. *The Journal of Perinatal and Neonatal Nursing*, 26(3), 251-259. doi:10.1097/jpn.0b013e3182650b7e

- Manyisa, Z. M., & van Aswegen, E. J. (2017). Factors affecting working conditions in public hospitals: A literature review. *International journal of Africa nursing sciences*, 6, 28-38. doi:<https://doi.org/10.1016/j.ijans.2017.02.002>
- Maphumulo, W. T., & Bhengu, B. R. (2019). Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review. *Curationis*, 42(1), 1-9. doi:<https://doi.org/10.4102/curationis.v42i1.1901>
- McGrath, J. M., & Valenzuela, G. (1994). Integrating developmentally supportive caregiving into practice through education. *The Journal of perinatal & neonatal nursing*, 8(3), 46-57. doi:10.1097/00005237-199412000-00006
- Meyers, D. C., Durlak, J. A., & Wandersman, A. (2012). The quality implementation framework: a synthesis of critical steps in the implementation process. *American journal of community psychology*, 50(3-4), 462-480. doi:10.1007/s10464-012-9522-x.
- Milette, I., Martel, M.-J., da Silva, M. R., & Coughlin McNeil, M. (2017). Guidelines for the institutional implementation of developmental neuroprotective care in the NICU. Part B: recommendations and justification. A joint position statement from the CANN, CAPWHN, NANN, and COINN. *Canadian Journal of Nursing Research*, 49(2), 63-74. doi:10.1177/0844562117708126.
- Mosqueda-Peña, R., Lora-Pablos, D., Pavón-Muñoz, A., Ureta-Velasco, N., Moral-Pumarega, M. T., & Pallás-Alonso, C. R. (2016). Impact of a developmental care training course on the knowledge and satisfaction of health care professionals in neonatal units: A multicenter study. *Pediatrics & Neonatology*, 57(2), 97-104. doi:10.1016/j.pedneo.2015.04.010.
- NCEC, N. C. E. C. (2018). Implementation Guide and Toolkit for National Clinical Guidelines.
- NICE: National Institute for Health and Care Excellence. (2007). How to change practice: Understand, identify and overcome barriers to change. Retrieved from <https://www.nice.org.uk/Media/Default/About/what-we-do/Into-practice/Support-for-service-improvement-and-audit/How-to-change-practice-barriers-to-change.pdf>
- Nilsen, P., & Bernhardsson, S. (2019). Context matters in implementation science: a scoping review of determinant frameworks that describe contextual determinants for implementation outcomes. *BMC health services research*, 19(1), 189. doi:<https://doi.org/10.1186/s13012-015-0242-0>
- Østergaard, H., Østergaard, D., & Lippert, A. (2008). Implementation of team training in medical education in Denmark. *Postgraduate medical journal*, 84(996), 507-511. doi:10.1136/qshc.2004.009985.

- Phillips, R. M. (2015). Seven core measures of neuroprotective family-centered developmental care: Creating an infrastructure for implementation. *Newborn and Infant Nursing Reviews*, 15(3), 87-90. doi:<https://doi.org/10.1053/j.nainr.2015.06.004>
- Post, A. C., & Maree, C. M. (2009). Guidelines for the implementation of developmental care for preterm and sick neonates: paediatrics. *Professional Nursing Today*, 13(1), 38-40.
- Rheeder, A., Lubbe, W., & Pretorius, R. (2017). Compliance With Best Practice Guidelines for Neurodevelopmental Supportive Care in South Africa: A Situational Analysis. *The Journal of perinatal & neonatal nursing*. doi:<https://doi.org/10.1097/jpn.0000000000000275>
- Sturdivant, C. (2013). A collaborative approach to defining neonatal therapy. *Newborn and Infant Nursing Reviews*, 13(1), 23-26. doi: 10.1053/j.nainr.2012.12.010
- Tolle, E. (2005). *A New Earth* (p. 99). New York, London etc: Penguin Group.
- Wensing, M., Oxman, A., Baker, R., Godycki-Cwirko, M., Flottorp, S., Szecsenyi, J., . . . Eccles, M. (2011). Tailored implementation for chronic diseases (TICD): A project protocol. *Implementation Science*, 6(1), 103. doi:10.1186/1748-5908-6-103
- Wilson, J. R., Allen, J., & Pfalzer, S. M. (1996). Providing a seamless service system from hospital to home: The NICU training project. *Infants & Young Children*, 8(3), 77-84.
- Zhang, X., Lee, S.-Y., Chen, J., & Liu, H. (2014). Factors Influencing Implementation of Developmental Care Among NICU Nurses in China. *Clinical nursing research*, 1054773814547229. doi:<https://doi.org/10.1177/1054773814547229>

9.3 MANUSCRIPT 4: A CHANGE IN PRACTICE FOLLOWING THE IMPLEMENTATION OF A NEURODEVELOPMENTAL SUPPORTIVE CARE TRAINING PROGRAMME IN THE SOUTH AFRICAN PUBLIC HEALTHCARE SECTOR

The second focus group manuscript focuses on whether the MDT were able to translate their NDSC knowledge into their day-to-day practice following the implementation of the training programme as well as identifying contextual factors which impact on their ability to change their practice. Manuscript 4 forms part of Objective 3.2 of the study: to identify facilitators and barriers to change practice.

This manuscript has been prepared according to the author guidelines of the Implementation Science Journal.

TITLE

A change in practice following the implementation of a neurodevelopmental supportive care training programme in the South African public healthcare sector

AUTHORS

Lizelle Jacobs, Daleen Casteleijn, Welma Lubbe

ABSTRACT

Background: Neurodevelopmental supportive care is a recommended, best evidence approach applied in various international neonatal intensive care units but not in all South African hospitals. One of the ways to increase the adoption of this multidisciplinary approach in practice, is through training which can lead to the translation of best evidence into practice and better patient outcomes. As part of a larger implementation study, a one-day neurodevelopmental supportive care training programme was implemented at two public sector neonatal intensive care units in Gauteng, South Africa. The purpose of this study was to determine if the multidisciplinary team was able to apply the newly acquired knowledge in their day-to-day practice in the neonatal intensive care unit and to identify contextual factors supporting or hindering a change in practice.

Methods: A descriptive qualitative study design was employed and all multidisciplinary team members who attended the training programme were invited to participate. Fifty team members, across the two hospitals, participated in eight focus groups. Each discipline was represented in the groups and the Framework Method was used to analyse the data.

Results: Six themes were identified: Multidisciplinary team or no multidisciplinary team; despondence; the human aspect - not treating infants like babies; the little things; empowering parents - our indirect hands; and baby steps. For the multidisciplinary team to apply their knowledge into their day-to-day practice, was experienced as challenging. The translation of knowledge to practice was affected by factors such as teamwork, knowledge, resources, support, attitude, motivation

and drive. Some individual changes in practice were highlighted and by focusing on identified facilitators, further change in the neonatal intensive care unit can be supported. It is, however, necessary to consider and address the barriers preventing a change in practice.

Conclusions: From this study it appears there has been a mind shift in the two public sector neonatal intensive care units. The multidisciplinary team became more aware of the effect of their behaviour on preterm infants and the effect of environmental factors in the neonatal intensive care unit. They recognised the importance of the neurodevelopmental care approach and appeared motivated to continue the change process.

Key words: change in practice, implementation, neurodevelopmental supportive care, training, neonatal intensive care unit

INTRODUCTION

Neurodevelopmental supportive care (NDSC) is described as a preemie-friendly model of care aiming to decrease the negative effect of the stressful NICU environment on the preterm infant (Symington & Pinelli, 2006; Post & Maree, 2009; Haumont et al., 2013). This is a recommended, best evidence approach applied in various international NICUs (Altimier & Phillips, 2016) but not in South African NICUs (Lubbe, 2009; Rheeder et al., 2017). One of the ways to increase the adoption of this approach in practice, is through training which can lead to the translation of best evidence into practice and better patient outcomes (Galarza-Winton et al., 2013; Zhang et al., 2014; Flodgren, O'Brien, Parmelli, & Grimshaw, 2019).

The ultimate purpose of any training programme is to improve the knowledge, skills and practice of healthcare professionals (Burke & Hutchins, 2007; Mosqueda-Peña et al., 2016) but training does not necessarily translate to a change in practice. Individual or organisational change is described as a complex, multi-levelled and multi-faceted process (Belizán et al., 2011; Shea et al., 2014) which can either be supported or hindered by various contextual factors or determinants (Wensing et al., 2011; Flottorp et al., 2013). The most common factors influencing the successful adoption of any intervention include the following: individual attitude, behaviour and

skill; communication, social relations and teamwork; organisational support, culture, climate and readiness for change; leadership; and financial resources (Belizán et al., 2011; Burke et al., 2012; Nilsen & Bernhardsson, 2019).

Two multidisciplinary teams (MDT), providing services to preterm infants in public sector NICUs in Gauteng, South Africa attended a one-day Little Steps® NDSC training programme with the purpose of increasing their knowledge of NDSC and changing their practice in the NICU related to the care of preterm infants. More details on the Little Steps® training programme and how it was implemented are presented in Additional File 1: The Guideline for Reporting Evidence-based Practice Educational Interventions and Teaching (GREET) checklist (Appendix M in this thesis).

The training programme was well received, and a large percentage of participants at the two public hospitals attended the training programme (61% and 68% respectively). Following the implementation of the multidisciplinary NDSC training programme the aim was to determine if the MDT was able to apply the newly acquired knowledge in their day-to-day practice in the NICU and to identify contextual factors supporting or hindering a change in practice. This article focuses on the translation of knowledge into practice following a training programme.

METHODOLOGY

The study employed a descriptive qualitative design to determine the MDT's opinion with regard to their change in practice, approximately six months following the implementation of a NDSC training programme. The sampling was purposive (all inclusive) and included all MDT members who attended the NDSC training programme at two public hospitals in Gauteng. The MDT consisted of doctors, nurses and allied health professionals, who provided services in the NICU, to preterm infants and their families. The population for this study consisted of 255 MDT members: 125 team members from Hospital A and 130 team members from Hospital B.

The focus group script used was brief and included the following questions:

- From your perspective, what changes could you implement and what were the facilitators?
- From your perspective, what changes could you not implement and what were the barriers?

Focus groups were conducted until data saturation was obtained. A total of 50 MDT members participated in eight focus groups which consisted of between two and 10 participants. The focus groups were audio recorded and transcribed. Gale et al.'s (2013) Framework Method was employed and a deductive approach was used with a pre-established code list to code the transcripts. The code list was informed by literature defining implementation facilitators and barriers. Open coding was also used to ensure important information was not missed and new codes were added to develop the final analytical framework (Additional file 1 – Appendix J in this thesis). The analytical framework was applied to the transcripts by using the qualitative software program, MAXQDA 2019 (VERBI Software, 2018). The transcripts were independently coded by a second reviewer. Themes and subthemes were identified and summarised with illustrative quotes. Ethical permission (M160120) and individual written consent were obtained from the participants for their participation in the focus groups as well as the audio recordings.

RESULTS

Fifty members of the MDT participated in the eight focus groups. Twenty-seven (54%) participants were from Hospital A and 23 (46%) were from Hospital B. The groups consisted of a combination of different disciplines: ten nurses (20%), nine doctors (18%), nine physiotherapists (18%), eight speech therapists and/or audiologists (16%) and six occupational therapists (12%).

The following six themes were identified: *MDT or no MDT*; *Despondence*; *The human aspect - not treating infants like babies*; *The little things*; *Empowering parents - our indirect hands*; and *Baby steps*. The themes and subthemes are

presented in Additional File 1. The themes are discussed below and supported by direct participant quotes.

MDT or no MDT

Participants voiced mixed feelings about the working of their MDT, as an actual team in the NICU.

There are those opportunities where we are implementing and working as a team and then there are other aspects where you're trying to implement something and someone else is maybe not doing that (FG2).

This can link to the fact that there appeared to be some divide between the doctors/nurses, and the allied health professionals, although not all parties experienced it as such. A possible reason for this, as some participants noted, was that the doctors see developmental care as the domain of the allied health professionals. Different priorities of healthcare professionals in the NICU, were also highlighted by participants as a possible barrier which can impact on teamwork. Doctors tend to focus on the discharge of patients as soon as possible, to prevent further risk of infection, whereas allied health professionals are concerned with aspects such as feeding, to prevent readmissions.

Whereas doctors and nurses, I think that they are just there to get the child well and anything else around it... Because all they care about is the child needs to get medication, the child needs to be on a drip and then my work is done (FG1).

A lack of understanding of other disciplines' roles, can further affect teamwork. Platforms, such as intern and registrar presentations, are often used to convey this kind of information, but there is a sense that this is only seen as important when the information is presented by senior staff. Neurodevelopmental supportive care is a multidisciplinary approach and for change to occur in the NICU, every team member needs to adopt the approach. Participants felt change is unlikely to occur in the NICU, unless it is a team effort and everyone is on board. On the other hand, although NDSC is a team approach, there was also a feeling that for NDSC to work, every team member needs to take responsibility for their own actions, making small changes and being aware of their own behaviour on a daily basis.

I think that to implement it, you'd obviously need buy-in from everyone that's actually involved (FG7).

I think we are our own internal monitor (FG8).

Good communication and respect for one another is necessary for efficient teamwork. Participants noted it was important not to assume everyone attended the training or knew what developmental care entailed. Taking the time to explain the reasoning behind one's actions or requests, e.g. silencing the alarm on a monitor or closing a bin softly, can influence staff's attitudes towards change.

I just explained to her. And since then she, you know, when I go in there, she's always friendly and she's looking at things that she can do. So, just making them aware, does make a big difference (FG1).

There seems to be good teamwork and a level of trust between some of the disciplines when it comes to developmental care and participants referred to working as a 'transdisciplinary team'. Teamwork can lessen the workload as the team has joint goals and every infant does not have to be seen every day, by every team member. Joint goals can further contribute to a better quality of care, as team members can spend more time with an infant, if the workload is split between the various disciplines.

... having the ability to actually spend the amount of time that you need with that patient instead of rushing between patients (FG2).

Participants believed training of all team members is needed for NDSC to be successfully implemented and it is not possible for this approach to work in the NICU, if everyone does not have the necessary knowledge. If staff do not have the necessary information, ignorant behaviour will continue. Constant rotation of staff is a barrier to teamwork in the NICU and can affect the implementation of developmental care. To counter this, participants suggested training needs to start at an undergraduate level through interprofessional learning.

If you don't know how to, then you're not going to change (FG8).

Let everybody come on the training, so that we can all apply that (FG6).

Despondence

Some participants highlighted that there was so much that needed to change and voiced feelings of being overwhelmed.

I think it's just, when you realise how much should be changed, you become a little bit despondent. How are all these changes going to happen? How?
(FG1)

A change of practice is impacted by the excessive workload of staff and it was sometimes difficult for participants to see beyond this barrier, especially if they needed to take on additional responsibilities adding to their workload.

It becomes a burden, actually, to nurses because we already have enough work for us. So, if we have to sit down and counsel the mother, it becomes a lot (FG5).

We are trying our best, we are doing whatever we do, at our best level (FG6).

Although there is some interdisciplinary blaming, participants specifically recognised the extremely high workload of the nurses and doctors and sympathised with them.

I think everyone is just trying to do their best and they're all tired, so, that decreases motivation (FG3).

...the reality is we have one doctor sometimes for 10 babies in the cubicle and we have one nurse for 10 babies (FG8).

Another aspect which negatively affected participants' feelings towards change, was the continuous changing of staff. Participants see it as a never-ending process of constantly training new staff members, who provide services in the NICU. Participants further highlighted resistance to change which is associated with a lack of knowledge, poor communication regarding the expected change or negative attitudes towards change. Staff are sometimes reluctant to change especially when a junior staff member or a staff member from another discipline wants to change practice in the ward.

Every day you come and you have to re-explain everything. It's just very demotivating, I think. And I don't think you'd want to, every day, have to go to someone and be like, please make sure you don't unnecessarily handle the patient, or if you're moving them, please put them back in the same position (FG5).

Firstly, training for everybody about the change. After training, communication... everything will be fine (FG6).

One of the participants felt the 'older generation' was often more reluctant to change and that continuous training was needed for the newly implemented practice to become habit. Developmental care training of all health care professionals, on an undergraduate level, can potentially counter the reluctance of older staff members who have been working in the NICU for many years.

I actually think the older generations are more difficult to change. It's how older generations learned to do it, they're reluctant to change because it's worked for so long, in their perception (FG8).

The human aspect: not treating preterm infants like babies

There appeared to be a difference in the sensitivity towards preterm infants and their needs. Participants voiced feelings that not all staff handle or treat preterm infants with the necessary care and respect which could be contributed to cultural differences.

We need to get back to the personal aspect, the human aspect of it. I think preterm babies are sometimes not handled like babies (FG2).

And I think also cultural and personal values come into play a lot (FG2).

Participants noted these staff members would not treat their own infants in such a manner, so why would they treat other infants like this. Participants stated they try to use personal examples to explain why certain behaviours are unacceptable or they used positive feedback when positive behaviour was noticed. They said they were, in general, unsure how to change this culture. Some participants felt long-term consequences of staff behaviour, on the development of preterm infants, are

not taken into consideration and there needs to be accountability for inappropriate behaviour in the NICU. This should be enforced by unit or department managers.

... drawing up something on paper to help with that accountability. To say that we're all agreeing to this, we've all signed off on it. That this is our values and this is what we're aiming for in terms of implementation within our unit (FG5).

If there's one thing that, I think, I'd like to change, it would be that culture, because you walk into a private ICU and literally, a pin can drop and you could hear it (FG8).

Some participants experienced frustration with their team members as not everyone was implementing the NDSC principles even though they attended the training. They felt their colleagues had the necessary knowledge and should therefore understand the consequences of their behaviour in the NICU.

So, then it frustrates you even more that they got the training and they are not really changing (FG1).

The little things

Some participants commented that they felt better equipped to provide services in the NICU and were more sensitive to the needs of the infants and families, following the training on NDSC.

It's made me a lot more confident as a therapist and also, it's made me more understanding and more patient with the babies that I'm working with (FG3).

Participants highlighted various 'little things' they felt they could do to change their practice in the NICU. This included aspects such as the positioning and containment of preterm infants, identifying stress signals, the use of positive touch such as containment hold and kangaroo mother care, clustering of care, decreasing noise where possible and educating parents. Participants also indicated they were in general more aware of the effect of their behaviour on the infants.

So, I didn't know anything about the kangaroo care, but now I was able to implement it and show the mother how it's done (FG6).

... the clustering of doing procedures was also practiced during a round (FG 8).

Another thing that I thought was easy to implement in the ward, was the nesting of the premature infant, ... and putting hands on the preemies when they are stressed, that was easy to implement (FG6).

Although the MDT cannot always control aspects in the NICU environment such as light and noise, participants identified some things they can do, to make a difference such as hand-to-mouth facilitation for self-soothing and containment. Participants felt if they started with small changes in the unit, it would be more realistic and achievable than taking on too much initially.

I saw it as trying to think of things differently and to change practice on how we deal with the premature infant, so that we can improve the neurodevelopment and the outcomes of these infants (FG8).

Champions, across different disciplines, who are passionate, are key to the success of the implementation of developmental care. Participants, in general, recognised the need for champions in the change process. Some participants stated they would be able to support the implementation process but needed to be empowered to do so and for the rest of the team to recognise them as the champions driving the process.

... you need to have champions. Someone that has, like, a very strong sound knowledge, so that you can bring about change (FG8).

The participants demonstrated resilience by noting it was not worth focusing on what didn't work but rather on what could be done and how to go about making the necessary changes. By starting small, limited resources would be taken into consideration.

I think using the equipment that we do have, to the best of our abilities. And getting creative with what we have (FG2).

Empowering parents – our indirect hands

Following the training some participants felt more comfortable to train parents in making the necessary changes, e.g. not necessarily waking the infants when they are sleeping.

I think it's (developmental care) fairly easy and I think it's something that the caregivers can do once they've been educated on it. I think it's quite straightforward and logical (FG5).

Participants were of the opinion there should be more focus on empowering parents to recognise and be responsible for the quality treatment their infants receive in the NICU. Parents should be advocates for their infants.

That would also maybe help in terms of, accountability and the parents actually being the voice of their little ones (FG2).

Including parents in developmental care in the NICU, is seen as a fine balance as parents might be too stressed to take in the necessary information. Participants commented information for parents need to be tailored to their specific needs and include more basic NDSC principles focusing on aspects such as calming and bonding initially. One participant was of the opinion that providing information to parents is one of the main roles of the MDT.

Waiting for when they're in the right space, to educate them on it (FG5).

Empowering parents who spend more time with the infants than most of the MDT, can further assist with decreasing the workload of staff. It was felt parents should be involved as much as possible.

... better equipping the parents to be the therapist (FG2).

Baby steps

There are still various barriers in the NICU which often cannot be controlled. Participants realised it is not possible to change all aspects of developmental care simultaneously and a change in practice will take time. One of the participants described it as: *making a small difference in a big place (FG1).*

It might be necessary to have short-term as well as long-term goals as part of the change process.

And if you change practice by one thing at a time, so, today I will do this better and the next day I'll do that better, then the following, so by the end of the week, I would have done five things better (FG8).

A general awareness of NDSC, however, has been created which seemed to impact on the MDT's behaviour in the NICU. Participants stated they were also more aware of the sleep-awake states of the infants and the need to adapt their interventions accordingly.

...the small little things, just putting your file down gently, not speaking too loudly. All the small things that you can easily do to make a change, you just have to be conscious of making those changes (FG3).

Participants experienced a mind shift and realised they sometimes need to take a step back and 'not do'. Previously participants felt they had to do their job by treating all the infants every day, where they now felt it was more important to analyse the situation before providing an intervention.

I always felt that I was not doing my duty if I didn't come in and just treat without considering what is actually happening with the infant (FG1).

Participants felt they had control over their own actions and they were able to make small changes in their own practice. One participant stated the value and importance, placed on this approach, will further support a change in practice in the NICU.

If you see its value and you think it's important, you're more likely to do it as opposed to not having the time (FG8).

DISCUSSION

Various factors can impact on the change of practice such as teamwork, communication, individual attitude, motivation, organisational support, leadership and financial resources (Belizán et al., 2011; Burke et al., 2012; Nilsen & Bernhardsson, 2019). The participants in this study highlighted similar contextual factors impacting on their own change of practice in the NICU. Overall, there

appeared to be a good working relationship between the different MDT members based on trust, respect and good communication which can facilitate change and the implementation of developmental care in their units (McCrae et al., 2014; Chan et al., 2017). This is, however, not the same for all disciplines and there is room for improvement in teamwork.

Similarly to other studies, teamwork was highlighted as one of the main factors which can either facilitate or hinder the implementation of developmental care and a change in practice (Macho & Zukowsky, 2017; Godarzi et al., 2018). In the present study, understanding the roles of other disciplines, in the NICU, was highlighted as a way to improve teamwork. Another aspect identified was the buy-in from the entire MDT and for every individual to take responsibility for changing their practice and implementing developmental care in the NICU. Joint MDT goals can further assist to decrease workloads. The ongoing rotation of staff impacts, not only on teamwork, but also on the knowledge of team members related to developmental care. Limited knowledge of developmental care was also highlighted as a main implementation barrier in other studies (Zhang et al., 2014; Chan et al., 2017). Knowledge needs to be addressed through induction programmes and continuous training (Macho & Zukowsky, 2017).

Most participants appeared to be motivated and positive, although some participants experienced negative feelings towards changing their practice. These feelings related to the extent of the change needed in the NICU, routine practice, old habits, and the need for continuous training of staff. Change is a process and the MDT's practice will have to be altered one step at a time (Belizán et al., 2011). Some participants seemed to break it down into '*the little things*' which makes it more manageable to implement, while other participants were overwhelmed by the developmental care approach as a whole. The researcher can provide the necessary support to the champions in the units to identify realistic goals. Champions can then further drive the process of change, through the provision of continuous staff training on developmental care, doing practical demonstration sessions in the real-world NICU and providing feedback to team members on their performance (Milette et al., 2017; Soleimani, Torkzahrani, Rafiey, Salavati, & Nasiri, 2017). Some negative aspects, identified by participants, might require more

stringent measures such as the introduction of specific policies to facilitate a change in behaviour and practice in the NICUs. These aspects included infants not being handled with the necessary sensitivity (as fragile babies) and inappropriate behaviour in the NICU, in contrast to developmental care principles (Robison, 2003; Post & Maree, 2009). It was felt that the MDT needed to be accountable for their behaviour and practice, and support from seniors or management will be necessary to enforce the relevant policies. With the necessary support from management, staff are more likely to accept and implement the change which will improve the quality of care in NICUs (McCrae et al., 2014; Soleimani et al., 2017).

There were other aspects the MDT felt they had no control over, such as structural limitations of the units, lack of equipment, limited staff and excessive workloads, yet the teams appeared to be resilient and they make do with what they have. Limited resources in the public sector hospitals is nothing new and is unlikely to change in the foreseen future (Manyisa & van Aswegen, 2017; Maphumulo & Bhengu, 2019). The efforts and motivation of the staff to change practice and to provide the best possible care, often in dire circumstances with limited resources, need to be commended.

Immediate change, following an intervention, is not easy and cannot always be expected (Robison, 2003; Zhang et al., 2014). The MDT, however, felt better equipped following the training and started making various small changes in their day-to-day practice (Mosqueda-Peña et al., 2016; Park & Kim, 2019). They have seen, for themselves, the effects of their changed behaviour, on preterm infants. With the support of the champions, they can be advocates for developmental care in their units and set the example for other members of the team.

Another factor that changed was the awareness of the value of involving parents in the NICU. Staff realised that parents can be their “indirect hands”. Parents form an integral part of NDSC and apart from the health, developmental and social benefits parents provide to preterm infants, staff can also benefit from parents being part of the MDT and more involved in the units especially as developmental care can be time-consuming (Macho & Zukowsky, 2017; Soleimani et al., 2017). Parents can be empowered to take responsibility for their infants, support staff by reducing their workload and be advocates for quality care, for all infants in the NICU. Parents

further support each other in the NICU and assist with the sharing of information on NDSC. Existing policies related to visiting hours might have to be reviewed to support the involvement of parents in developmental care (Zhang et al., 2014; Chan et al., 2017).

Change takes time and it will be necessary to consider a phased implementation process with short- and long-term goals for full implementation of NDSC in the NICU (Post & Maree, 2009; McCrae et al., 2014). Participants realised this when they referred to “baby steps”. It appeared, however, there has been a mind shift in the two public healthcare NICUs. An awareness is needed for change to occur (Fonteijs, 2018). The MDT became more aware of the effect of their behaviour on preterm infants as well as the effect of environmental factors in the NICU. They recognised the importance of the NDSC approach in the NICU and appeared motivated to continue the change process. Support from seniors and unit managers will be required to support the process (McCrae et al., 2014).

The study had a few limitations. The researcher presented the training programme on developmental care and conducted the focus groups which can be a limitation to this study as it could lead to social desirability bias (Bergen & Labonté, 2020). The researcher made an attempt to counteract this by forming a trust relationship with the participants (Bergen & Labonté, 2020). The researcher further encouraged participants to be truthful during the focus groups and clearly explaining the purpose of the group discussions, i.e. to advise forthcoming training programmes on developmental care in the public healthcare sector. It was therefore in the interest of the participants to be genuine in their participation. Another limitation of this study was that not all MDT members, who attended the NDSC training programme, were able to participate in the focus groups. This was due to staff rotations and the different work schedules of the MDT. It is possible that the MDT members who participated in the focus groups are not representative of the MDT population (Etikan et al., 2016).

CONCLUSION

It was clear from the results of this study, a change in practice is a complex process which will take time. Various factors impacted on the translation of knowledge into practice and included aspects such as teamwork, knowledge, resources, support, attitude, motivation and drive. Some individual changes in practice were highlighted and by focusing on identified facilitators, further change in the NICU can be supported. At the same time, it is necessary to consider and address the barriers preventing a change in practice.

ABBREVIATIONS

GREET: The Guideline for Reporting Evidence-based Practice Educational Interventions and Teaching; MDT: Multidisciplinary team; NDSC: Neurodevelopmental supportive care; NICU: Neonatal intensive care unit.

DECLARATIONS

Ethics approval and consent to participate

The Human Research Ethics Committee of the University of the Witwatersrand, Johannesburg granted ethical approval (M160120) and permission for the study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and analysed during this study are not publicly available due confidentiality but are available from the corresponding author on reasonable request.

Competing interests

Not applicable.

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Authors' contributions

Writing the paper was led by LJ. All revisions were made and the final manuscript approved by all authors involved.

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Additional File 1: Change in practice following the implementation of a training programme on neurodevelopmental supportive care

Themes	Subthemes	Quote examples
The Multidisciplinary team	Mixed feelings	<i>I think we've taken steps towards improving our teamwork. FG2</i> <i>... then you feel like the team is a bit ... not very cohesive and working together. FG2</i> <i>... we don't have teamwork with them sometimes. FG6</i> <i>We do work together quite nicely. FG8</i> <i>As the allied team, we are working well together. FG3</i> <i>The therapist can maybe do a whole day training because this is their domain. FG8</i>
	Staff rotation	<i>The rotations are so quick and the staff turnover is so quick that there's no continuation of that information. FG3</i>
	Trust, communication and respect	<i>I think it's also because we trust each other. FG2</i>
	Decreased workload – joint goals	<i>Working towards the same goal... we're on the same page. FG5</i> <i>They all have the goal of developmental care. So, it doesn't mean then that that child gets OT (occupational therapy) and physio (physiotherapy) and speech (speech therapy) then on one day. FG1</i> <i>If a 'speechie' (speech therapist) has just seen a child, fed them, spoken to them, swaddled them, then why do I need to come and 'unswaddle' them and do my stuff? FG2</i>
	Knowledge of NDSC	<i>But with knowledge comes power, so if you show them this is your end point, this is what we're trying to prevent, this is where we're aiming to go, then I think things might change a little bit. FG8</i> <i>Because what's the use of implementing something if we don't know anything about it? How are we supposed to work now? FG6</i> <i>The fact that the allieds (allied health professionals) have the same knowledge and then the doctors and nurses have a different knowledge, creates a barrier. FG3</i> <i>There are one or two nurses where I've actually shown them and they were so surprised about the outcome of how the baby now was, calm and relaxed... Just because they did not know that this worked. It's the lack of knowledge that causes the biggest barrier in our setting. FG3</i>

Themes	Subthemes	Quote examples
The Multidisciplinary team (continue)	Individual responsibility	<i>We're each a manager of our own selves ... FG8</i>
	Knowledge of the roles of other disciplines	<i>We just have to work on making those inroads and sometimes to start would be, well, what does a physio do? what does an OT do? It will be a good start. FG7</i>
Despondence	Overwhelmed by the extend of change	<i>There is so many things happening in that unit, ... being shortage of staff, with all the problems that's in the neonatal ICU currently ...and then new changes and stuff that needs to be implemented. It becomes quite overwhelming for staff working in there. FG5</i> <i>Otherwise, I think it becomes overwhelming and if I bring you something that's going to increase the time that you have to spend with one patient or give you another 10 admin tasks, you are not... human nature is not to do that and to be very resistant. FG7</i>
	Old habits (or routine) die hard	<i>... keep the child in the midline ... and I showed people on the round, but I haven't done that recently, because we just got into the routine of things. FG8</i> <i>... other things you've tried to bring into the unit, old habits die hard. FG8</i> <i>It becomes difficult sometimes because now you are used to doing things this way and now suddenly this is what we must do. FG6</i> <i>You almost have to, for want of a better word, break the most resistant person. FG5</i>
	Continuous training	<i>So, trying to explain to one nurse but then there's six other nurses that are going to come in on a rotation basis... it feels like you're never getting to the core of it. FG1</i>
	Workload	<i>... but also, the number of patients. I think it does make a difference if you've got, a dedicated nurse in ICU, it's easier to implement. FG8</i>
	NICU design and resources	<i>We don't have space for files and all that. It's also another challenge, we can't apply what you taught us FG6</i> <i>Our wards, it's very, how can I say, it's crowded. So, hence we limit the visitors. FG6</i> <i>I think, obviously, with no resources you can't implement all the neurodevelopmental care. FG3</i>

Themes	Subthemes	Quote examples
The human aspect	Levels of sensitivity	<i>They really struggle to connect like with the infant as a human being. FG5 And I think also cultural and personal values come into play a lot. I mean, a lot of people think it's fine to just pick up a baby by the arm. FG2 I just feel like, not everyone is as sensitive as others to how they should be behaving. FG1</i>
	Frustration	<i>So, then it frustrates you even more that they got the training and they are not really changing. FG1</i>
	Accountable for behaviour	<i>... it must be a rule that if you don't do it, action will be taken against you</i>
	Managerial or senior support	<i>It comes from top management and if you don't have the buy-in of top management, from every sector, it's like fighting a pointless battle. FG5</i>
Little things	Better equipped	<i>My take-home message is, what I could have done when I see a patient or how to teach the people around me on what to look for, how to contain, how to this, how to do that... FG8</i>
	Resilience	<i>Resources is always gonna be challenging and it is difficult but, ... I think there is still some things that are in your control that aren't necessarily resource-dependent. FG2</i>
	The role of champions	<i>Target the right person, so that person becomes your champion for change or your change agent. FG6</i>
	Small changes	<i>... the only thing that comes to mind, is the containment, so I think we all found that easy to implement. FG8 I think I've used that a lot more in my therapy - the different ways to sooth. FG3</i>
Empowering parents – our indirect hands	Sharing of knowledge	<i>... empowering our caregivers in knowing what treatment their babies should be getting. FG2 Our main role is providing information. FG2 You've got someone who's taken it on and is actually implementing it daily ... and then you get the buy-in from the caregivers also. FG7</i>
	Advocates for their infants/parent advocates	<i>That would also maybe help in terms of, accountability and the parents actually being the voice of their little ones. FG2</i>
	Assist with workload	<i>... she should be taught how to recognise the signs of, ok my baby is in trouble or he needs a bit of care... Because then we will have many people targeting some of the things, we're trying to attain for the babies. FG8</i>

Themes	Subthemes	Quote examples
Baby steps	Change takes time	<i>It's about unpacking it and making things that are smaller and achievable and attainable. FG3</i>
	Short-term versus long-term goals	<i>I think when you look at change, we just have to be careful to try to change too much at once. FG7</i>
	General awareness	<i>It's not that we didn't do it before, but you are just more aware, that how just by mum holding her baby, that she is providing a lot of that positive touch. FG7</i>
	A mind shift	<i>For me it's that that it is doable but we need to realise how important it is. G6 So, by involving the parents ... those times can also be used as treatment. So, we don't have to come every time for the patient and wake them up just to disturb them from what they need. FG7 So, I think that one of the things I have done is, not just read the file, but actually just look at the child, consider the environment and what the child might be thinking or going through, at that time, and then adjust what I planned to do for treatment accordingly. FG1</i>
	Recognising the importance of NDSC	<i>It's this unseen sort of importance. FG8</i>

REFERENCES

- Altimier, L., & Phillips, R. (2016). The neonatal integrative developmental care model: Advanced clinical applications of the seven core measures for neuroprotective family-centered developmental care. *Newborn and Infant Nursing Reviews*, 16(4), 230-244.
doi:<https://doi.org/10.1053/j.nainr.2016.09.030>
- Belizán, M., Bergh, A.-M., Cilliers, C., Pattinson, R. C., & Voce, A. (2011). Stages of change: A qualitative study on the implementation of a perinatal audit programme in South Africa. *BMC health services research*, 11(1), 243.
doi:<https://doi.org/10.1186/1472-6963-11-243>
- Bergen, N., & Labonté, R. (2020). "Everything is perfect, and we have no problems": detecting and limiting social desirability bias in qualitative research. *Qualitative Health Research*, 30(5), 783-792.
doi:<https://doi.org/10.1177/1049732319889354>
- Burke, K., Morris, K., & McGarrigle, L. (2012). An introductory guide to implementation: terms, concepts and frameworks.
- Burke, L. A., & Hutchins, H. M. (2007). Training transfer: An integrative literature review. *Human resource development review*, 6(3), 263-296.
doi:<https://doi.org/10.1177/1534484307303035>
- Chan, G., Bergelson, I., Smith, E. R., Skotnes, T., & Wall, S. (2017). Barriers and enablers of kangaroo mother care implementation from a health systems perspective: a systematic review. *Health Policy and Planning*, 32(10), 1466-1475. doi:<https://doi.org/10.1093/heapol/czx098>
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, 5(1), 1-4. doi:10.11648/j.ajtas.20160501.11
- Flodgren, G., O'Brien, M. A., Parmelli, E., & Grimshaw, J. M. (2019). Local opinion leaders: effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*(6).
doi:<https://doi.org/10.1002/14651858.CD000125.pub5>
- Flottorp, S. A., Oxman, A. D., Krause, J., Musila, N. R., Wensing, M., Godycki-Cwirko, M., . . . Eccles, M. P. (2013). A checklist for identifying determinants of practice: a systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice. *Implementation Science*, 8(1), 35.
doi:<https://doi.org/10.1186/1748-5908-8-35>

- Fontein, W. (2018). Healing Power of Awareness. *International Journal of Clinical Research Trials*, 3, 128. doi:<https://doi.org/10.15344/2456-8007/2018/128>
- Galarza-Winton, M. E., Dicky, T., O'Leary, L., Lee, S. K., & O'Brien, K. (2013). Implementing family-integrated care in the NICU: educating nurses. *Advances in Neonatal Care*, 13(5), 335-340.
- Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, 13(1), 117. doi:<https://doi.org/10.1186/1471-2288-13-117>
- Godarzi, Z., Rahimi, O., Khalesi, N., Soleimani, F., Mohammadi, N., & Shamshiri, A. R. (2018). Nurses' Opinions on the Barriers to Effective Implementation of Developmental Care in Neonatal Intensive Care Units. *نن ین کن ننتنن ن یننتن ن ینن*, 11(2), 1-8
- Haumont, D., Amiel-Tison, C., Casper, C., Conneman, N., Ferrari, F., Huppi, P., . . . Pallas-Alonso, C. (2013). NIDCAP and developmental care: a European perspective. *Pediatrics*, 132(2), e551-e552. doi:<https://doi.org/10.1542/peds.2013-1447C>
- Lubbe, W. (2009). *Best practice guidelines for neurodevelopmental supportive care of the preterm infant*. (PhD Obstetrical and Neonatal Nursing Science Doctoral dissertation), North-West University (Potchefstroom Campus), Potchefstroom. Retrieved from <https://pdfs.semanticscholar.org/9919/4bdea06b10d3a7facea65f3b1f4c35297be2.pdf>.
- Macho, P., & Zukowsky, K. (2017). Individualized developmental care in the NICU. *Advances in Neonatal Care*, 17(3), 162-174. doi:<https://doi.org/10.1097/ANC.0000000000000374>
- Manyisa, Z. M., & van Aswegen, E. J. (2017). Factors affecting working conditions in public hospitals: A literature review. *International journal of Africa nursing sciences*, 6, 28-38. doi:<https://doi.org/10.1016/j.ijans.2017.02.002>
- Maphumulo, W. T., & Bhengu, B. R. (2019). Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review. *Curationis*, 42(1), 1-9. doi:<https://doi.org/10.4102/curationis.v42i1.1901>
- McCrae, J. S., Scannapieco, M., Leake, R., Potter, C. C., & Menefee, D. (2014). Who's on board? Child welfare worker reports of buy-in and readiness for organizational change. *Children and Youth Services Review*, 37, 28-35. doi:10.1016/j.childyouth.2013.12.001

- Milette, I., Martel, M.-J., da Silva, M. R., & Coughlin McNeil, M. (2017). Guidelines for the institutional implementation of developmental neuroprotective care in the NICU. Part B: recommendations and justification. A joint position statement from the CANN, CAPWHN, NANN, and COINN. *Canadian Journal of Nursing Research*, 49(2), 63-74. doi:10.1177/0844562117708126.
- Mosqueda-Peña, R., Lora-Pablos, D., Pavón-Muñoz, A., Ureta-Velasco, N., Moral-Pumarega, M. T., & Pallás-Alonso, C. R. (2016). Impact of a developmental care training course on the knowledge and satisfaction of health care professionals in neonatal units: A multicenter study. *Pediatrics & Neonatology*, 57(2), 97-104. doi:10.1016/j.pedneo.2015.04.010.
- Nilsen, P., & Bernhardsson, S. (2019). Context matters in implementation science: a scoping review of determinant frameworks that describe contextual determinants for implementation outcomes. *BMC health services research*, 19(1), 189. doi:<https://doi.org/10.1186/s13012-015-0242-0>
- Park, J., & Kim, J.-S. (2019). Factors Influencing Developmental Care Practice Among Neonatal Intensive Care Unit Nurses. *Journal of pediatric nursing*, 47, e10-e15. doi:10.1016/j.pedn.2019.03.014.
- Post, A. C., & Maree, C. M. (2009). Guidelines for the implementation of developmental care for preterm and sick neonates: paediatrics. *Professional Nursing Today*, 13(1), 38-40.
- Rheeder, A., Lubbe, W., & Pretorius, R. (2017). Compliance With Best Practice Guidelines for Neurodevelopmental Supportive Care in South Africa: A Situational Analysis. *The Journal of perinatal & neonatal nursing*. doi:<https://doi.org/10.1097/jpn.0000000000000275>
- Robison, L. D. (2003). An organizational guide for an effective developmental program in the NICU. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 32(3), 379-386.
- Shea, C. M., Jacobs, S. R., Esserman, D. A., Bruce, K., & Weiner, B. J. (2014). Organizational readiness for implementing change: a psychometric assessment of a new measure. *Implementation Science*, 9(1), 7. doi:<https://doi.org/10.1186/1748-5908-9-7>
- Soleimani, F., Torkzahrani, S., Rafiey, H., Salavati, M., & Nasiri, M. (2017). Assessing Factors Influencing the Quality of Developmental Care in Neonatal Intensive Care Units of Tehran. *Iranian Journal of Pediatrics*, 27(1). doi:10.5812/ijp.6733

Symington, A., & Pinelli, J. (2006). Developmental care for promoting development and preventing morbidity in preterm infants. *The Cochrane Library*, 19(2), CD001814. doi:10.1002/14651858.CD001814.pub2.

VERBI Software. (2018). MAXQDA 2018, computer program, Berlin.

Wensing, M., Oxman, A., Baker, R., Goddycki-Cwirko, M., Flottorp, S., Szecsenyi, J., . . . Eccles, M. (2011). Tailored implementation for chronic diseases (TICD): A project protocol. *Implementation Science*, 6(1), 103. doi:10.1186/1748-5908-6-103

Zhang, X., Lee, S.-Y., Chen, J., & Liu, H. (2014). Factors Influencing Implementation of Developmental Care Among NICU Nurses in China. *Clinical nursing research*, 1054773814547229. doi:<https://doi.org/10.1177/1054773814547229>

9.4 SUMMARY

In this chapter the facilitators and barriers related to the implementation of the multidisciplinary, NDSC training programme were discussed. These contextual factors related to the training programme itself but also to the translation of the NDSC knowledge into day-to-day practice in the NICU. These identified facilitators and barriers can guide the implementation of future training interventions. In the next chapter the effect of the implementation of the process will be discussed.

CHAPTER 10: THE EFFECT OF THE IMPLEMENTATION OF A TRAINING PROGRAMME

10.1 INTRODUCTION

In this chapter the researcher presents the results of the last objective of Phase 3 of the study. Objective 3.3 focuses on the effect of the implementation of the training intervention (Figure 1.1). A post-implementation survey was conducted and the results are compared to the pre-implementation survey results. The pre-implementation survey was conducted prior to the implementation of the neurodevelopmental supportive care (NDSC) training programme (Objective 1.2).

10.2 COMPARISON OF PRE-IMPLEMENTATION AND POST-IMPLEMENTATION SURVEY RESULTS

The pre-implementation survey was conducted as part of Phase 1 of the study which focused on the operationalisation of NDSC in the neonatal intensive care unit (NICU). The results of the initial survey were presented in Chapter 6 (Paragraph 6.2) and confirmed the NDSC approach was not optimally adhered to in the two, public hospital NICUs. In both NICUs, high-risk practice was identified relating to eight of the nine categories of the NDSC approach. Positioning was the only NDSC category with more than 50% adherence at both hospitals but even under this category individual items were highlighted as high-risk practice. The multidisciplinary team (MDT) training programme, which was subsequently implemented, therefore included information on all NDSC categories.

As part of Phase 3 of the study, the aim was to determine the effect of the implementation of the multidisciplinary NDSC training programme. This was done by assessing if there was a change in the day-to-day operationalisation of NDSC in the NICUs following the training. A post-implementation survey was conducted at both hospitals and the results were compared to the results of the pre-implementation survey.

10.2.1 Results

The results, on the 24 NDSC subcategories, confirmed there were no changes in 14 subcategories, an insignificant change ($p>0.05$) in seven subcategories and a significant change ($p\leq 0.05$) on three subcategories for Hospital A (Table 10.1). The significant changes occurred in the following subcategories: parents as active participants ($p=0.03$); visitation ($p=0.00$) and parent support groups ($p=0.01$).

For Hospital B (Table 10.1), the results showed there was no change in 12 NDSC subcategories, an insignificant change ($p>0.05$) in nine subcategories and a significant change ($p\leq 0.05$) in one subcategory: parents as active participants. Negative changes were identified for two subcategories, namely: promotion of rest and sleep ($p=-0.00$), and light ($p=-0.09$).

When comparing the total percentages of NDSC adherence for each NICU's pre- and post-implementation survey results, there was no significant or clinically significant difference for either Hospital A ($p=0.25$; $d=0.34$) or Hospital B ($p=0.72$; $d=0.11$).

Table 10.1: Pre- and post-implementation survey: Hospital A and Hospital B

NDSC Category	NDSC Subcategory	Hospital A			Hospital B		
		Pre-implementation %	Post-implementation %	Chi-square p-value	Pre-implementation %	Post-implementation %	Chi-square p-value
1. NICU design		25	25	1	25	25	1
2. Individualised care	2.1 Observation	25	31,25	0,50	25	25	1
	2.2 Care	50	50	1	25	25	1
3. Family-centred philosophy	3.1 Parents as active participants	46,43	70,83	0,03	25	64,29	0,00
	3.2 Privacy and comfort	25	25	1	25	25	1
	3.3 Visitation	25	62,5	0,00	50	37,5	0,24
	3.4 Parent support groups	25	50	0,01	50	50	1
4. Positioning	4.1 Anatomical infant positioning	58,33	55,56	1	52,5	58,33	0,70
	4.2 Orientation	50	50	1	50	50	1
	4.3 Individualised bedding	75	75	1	75	75	1
5. Handling techniques	5.1 Care according to maturation	25	25	1	25	25	1
	5.2 State changes	25	25	1	25	25	1
	5.3 Promotion of rest and sleep	25	25	1	75	25	-0,00
	5.4 Modified hands-on caregiving	25	25	1	37,5	31,25	0,47
	5.5 Positive tactile stimulation	25	33,33	0,36	31,25	43,75	0,17
	5.6 Movement	50	62,5	0,26	41,67	50	0,47
	5.7 Self-regulation	25	25	1	25	25	1
6. Environmental manipulation	6.1 Noise	36,67	35,71	0,98	29,69	30,77	0,99
	6.2 Light	30,77	26,92	0,69	34,62	32,69	-0,90
	6.3 Olfactory	25	25	1	25	25	1
7. Pain management		25	25	1	25	37,5	0,13
8. Knowledge of infant development	8.1 Staff	50	58,33	0,5	33,33	50,00	0,79
	8.2 Parental education	25	37,5	0,13	25	37,5	0,13
9. Feeding		25	25	1	25	25	1

* $p \leq 0.05$ statistical significance

10.2.2 Discussion

For the majority of the NDSC subcategories, there was no significant change between the pre- and post-implementation survey results for either hospital. The few significant changes identified at both hospitals included items related to the following subcategories: parents as active participants; visitation; parent support groups; and promotion of rest and sleep. On closer investigation, some of these changes could be contributed to a change in practice but also to inconsistencies in the understanding and application of policies and procedures in the NICU.

A change in practice was noticed where the nurse in charge reported support groups for parents in the NICU were started by the nurses. This was, however, not a regular service and was dependent on individual nurses driving the process and taking responsibility for these groups. Another possible change in practice related to the differences seen in items such as parents holding their infants. The scoring of these items was based on observations in the NICU as part of the survey. During the pre-implementation survey, no parents were involved in the care of their infants although there were various parents present in the NICUs at the time of the observations. During the post-implementation survey, most parents present in the NICUs were observed to either hold their infants, change nappies or feed their infants.

Regarding NICU policies and procedures, it appeared staff members potentially understand, interpret or apply some of these differently. This was seen when one of the nurses reported the NICU had quiet times and daily protected sleep between 12:00 and 15:00 (pre-implementation survey) while another nurse, in the post-implementation survey, reported the unit had no quiet times (Hospital B). This discrepancy resulted in a negative change following the implementation of the intervention and will require further investigation. Conversely, positive change was noted on the visitation of parents subcategory for Hospital A. The nurse in charge reported strict visiting times for parents on the pre-implementation survey while, on the post-implementation survey, another nurse reported parents could visit their infants at any time. It is possible that this result indicated a change in practice although written policies on visitation have not yet been adapted.

Regardless of some of the small changes noticed between the pre- and post-implementation survey, overall, there was no clinically significant differences in the

NDSC operationalisation of the two NICUs following the implementation of the training intervention. In Chapter 6 of this thesis the readiness of the MDTs for change was determined prior to the implementation of the NDSC training programme (Objective 1.4). Readiness for change was highlighted as an important factor to consider for the successful implementation of an intervention. An organisation and its individual members who are ready for change, are more likely to implement change (Weiner, 2009; Shea et al., 2014). Although the results of the readiness for change assessment in Chapter 6 indicated Hospital B appeared to be more committed to change and participants felt more capable to implement change, these results did not translate to the post-implementation results.

Possible reasons for the limited change observed in practice could relate to the NICU design, current policies and procedures, the training of all MDT members or the sensitivity of the measurement tool. There was no change in the physical structure or the design of the two NICUs from the pre-implementation to the post-implementation survey. Space in the units was still limited, lights were still bright and the units still had limited equipment to support developmental care principles such as the ideal positioning of preterm infants. Optimally designed NICUs can contribute to the health and safety of, not only patients and families, but also that of staff (O'Callaghan, Dee, & Philip, 2019). Benefits relating to infant outcomes include aspects such as decreased infection rates, increased breast feeding, increased weight gain and decreased length of stay (Domanico, Davis, Coleman, & Davis, 2011; Stevens et al., 2012). Benefits of a well-designed NICU further include aspects such as increased privacy and involvement of parents and better bonding between parents and infants (Beck, Weis, Greisen, Andersen, & Zoffmann, 2009; Domanico et al., 2011) while for staff it includes aspects such as decreased fatigue and stress, and better communication (Bosch, Bledsoe, & Jenzarli, 2012). The risk of infection further increases in overcrowded units with decreased staffing (Leistner et al., 2013). By changing the design of the NICU long-term costs related to extended medical treatment and hospital stay can be reduced. It is, however, important to consider the ongoing financial constraint and limited funding available in the public healthcare sector and to be realistic about what can and cannot be changed.

Similar to the NICU design, policies and procedures in these units have also not changed from the pre-implementation to the post-implementation survey. Although the results for Hospital A indicated change in parents visiting their infants, visitation was still restricted and infection control policies remained a high medical priority in both units. Visitation policies are affected by overcrowding and the present NICU design and this will have to be considered in the long-term. Infection control policies are often in contradiction to developmental care principles, limiting parents in aspects such as skin-to-skin contact (or kangaroo mother care), providing positive olfactory stimulation or providing opportunities for self-regulation. The literature clearly indicates developmental care reduces infection rates in the NICU (Örtenstrand et al., 2010; Domanico et al., 2011; Shahheidari & Homer, 2012; Conde-Agudelo & Díaz-Rossello, 2016). Therefore, if the starting point in these NICUs is neurodevelopmental supportive care, the automatic consequence should be a reduction in infection rates. It is recommended for NICU policies to be reviewed to support the effective operationalisation of NDSC in these units which can contribute to improved infant outcomes.

Another possible reason for limited change in the NICU, is that not all MDT members in the two NICUs attended the training on NDSC. Although a large number of staff at both hospitals received training (61% and 68% respectively), everyone providing services in the NICU needs to be committed and adopt the approach for NDSC to be successfully implemented (Altimier et al., 2015; Milette et al., 2017).

Most importantly, the implementation of any intervention is a process, it takes time and it cannot be expected to see major changes in all areas of NDSC in the short term (Pettigrew, Woodman, & Cameron, 2001; Bertram et al., 2011; Milette et al., 2017). The post-implementation survey was conducted only six months after the implementation of the Little Steps® Introduction to NDSC training programme. It appears there were some changes in the practice of individuals in the NICU but this has not necessarily filtered down to all staff and the unit as a whole. NDSC further is a multi-faceted intervention which will be easier to implement successfully if a step-by-step approach is employed with the necessary support from seniors and management (Belizán et al., 2011; Milette et al., 2017). A gradual change in skill,

attitude and behaviour is needed as part of the implementation process (Belizán et al., 2011).

10.2.3 Conclusion

A change in the operationalisation of NDSC was not evident when comparing the pre- and post-implementation survey results of the two NICUs. Possible reasons for this, included aspects such as structural limitations of the NICUs, policies and procedures driven by a medical model, partial training of the MDTs and the fact that the implementation of any new intervention is a process which takes time. Training of the MDT on developmental care was one of the first steps in the implementation of NDSC in practice. Recommendations for the way forward will be discussed in Chapter 11.

10.3 SUMMARY

This chapter presented the results related to the effect of the implementation of the NDSC training programme. A post-implementation survey was conducted and the results were compared to the results of the pre-implementation survey. It was concluded that there was no significant or clinically significant difference in the operationalisation of NDSC in the NICU following the implementation of the training programme. Possible reasons for this can be linked to the implementation barriers as identified in Chapter 9 of the study. In the next chapter the summary of the findings for each Phase of the study and the relevant objectives will be presented.

CHAPTER 11: SUMMARY OF FINDINGS, RECOMMENDATIONS, LIMITATIONS AND REFLECTION

“How to change the world

#1 Believe that you can”

(Unknown)

11.1 INTRODUCTION

This study was an implementation study which focused on the process of implementation. The intervention which was implemented, was a multidisciplinary training programme on neurodevelopmental supportive care (NDSC) of the preterm infant, in the neonatal intensive care unit (NICU). The implementation of any intervention is a complex process and various factors need to be considered prior, during and following the implementation process. For this reason, the Quality Implementation Framework (QIF) was used as a guide and adapted to fit the aims and objectives of this study.

11.2 PHASE 1

Phase 1 of the study aimed to assess the current state of the NICU with regard to NDSC in two public sector hospitals in Gauteng, South Africa. Prior to the implementation of an intervention, it was important to first determine: the training needs of the MDT related to NDSC, the operationalisation of NDSC in the NICU, if the training programme fitted the identified training needs of the MDT, if the MDT was ready for the proposed change; and to gain the necessary buy-in from stakeholders through pre-innovation session. The following two manuscripts formed part of this phase:

- Adherence to neurodevelopmental supportive care in the neonatal intensive care unit: A survey among the multidisciplinary team
- A readiness for change assessment of two tertiary hospitals in preparation for a neurodevelopmental supportive care training intervention

Objective 1.1: To determine the neurodevelopmental supportive care training needs of the multidisciplinary team, working in two selected neonatal intensive care units in Gauteng

The training needs of the MDT were determined through a survey on their self-reported adherence to NDSC principles in the NICU. The purpose of a training needs assessment was to determine current knowledge, to identify gaps in knowledge and to guide the development of a relevant training programme to address these needs (Cekada, 2010; Salas et al., 2012). From the results of the survey, five of the nine NDSC categories were highlighted by the NICU staff as high-risk practice in the NICU. These categories included: the NICU design, handling techniques, environmental manipulation (noise, light and smell), feeding, and pain management. Mixed results were further obtained for the other four NDSC categories, namely: individualised care, family-centred care, positioning as well as knowledge of infant development. In summary, the MDT did not adhere to NDSC principles in the NICU. This was most probably due to a lack of knowledge of the NDSC approach as 62% of the participants received no NDSC training on an undergraduate level and 80% of participants received no NDSC training on a post-graduate level. It was concluded the NDSC training programme had to include all aspects of the developmental care approach as none of the nine NDSC categories were identified by staff as optimal practice in the NICU. As part of this objective participants could indicate if they were interested to be champions to assist in the implementation process.

Objective 1.2: To investigate the current neurodevelopmental supportive care operationalisation in the neonatal intensive care unit of the two selected public hospitals

Through a pre-implementation survey, the operationalisation of NDSC in the two NICUs was determined. The Implementation of Neurodevelopmental Supportive Care (INDeSC) tool was used to indicate adherence of the NICUs to the NDSC approach and principles. The results indicated eight of the nine NDSC categories were identified as high-risk practice areas, as an adherence of 40% or less was demonstrated for these categories. Positioning was the only NDSC category where the two hospitals demonstrated an adherence of more than 50% (Hospital A: 59%; Hospital B: 54%) but some individual items in this category were also highlighted as

high-risk practice. Individual positive aspects, relating to the other NDSC were also identified at both hospitals and included aspects such as: infants' eyes being covered for phototherapy, mums breastfeeding or being involved in feeding their infants, quiet times being provided on the ward or beds positioned away from traffic. The overall findings, however, indicated poor adherence to NDSC principles (36% for both hospitals) and a clear need for a change in practice.

Objective 1.3: Conduct an intervention fit assessment for the selected hospitals

The results of Objective 1.1 and Objective 1.2 identified the training needs of the MDT and confirmed the NDSC practice in the NICU was problematic and needed to be addressed. Based on these results it was necessary for the training programme to include information on all nine NDSC categories.

In the intervention fit assessment these nine categories were compared to the content and objectives of the Little Steps® Introduction to NDSC training programme, an existing training programme available in South Africa. The Little Steps® Introduction training programme included information on the nine NDSC categories: NICU design, Individualised care, Family-centred approach, Positioning, Handling techniques, Environmental manipulation, Pain management, Knowledge of infant development, as well as Feeding. It was further possible to adapt the course to fit the time and financial resources of the public healthcare sector. This one-day Little Steps® Introduction to NDSC training programme was deemed most appropriate to be implemented as a multidisciplinary NDSC training programme in this study.

Objective 1.4: Determine the readiness of the multidisciplinary team for implementation of the neurodevelopmental supportive care training programme

One of the crucial steps prior to the implementation of any intervention, is to determine the readiness of the team for change. If an organisation is not ready for change it can affect the successful implementation of the intervention. The readiness of the MDT, as a collective, was determined through a survey investigating their change efficacy and change commitment. Change efficacy refers to the team's shared determination to change while change commitment is their

shared belief in their collective capability to implement change. Although Hospital B appeared more committed to change and believed in their capacity to change, the results overall showed an agreement of more than 50% on all change commitment and change efficacy items for both hospitals. Participants from both hospitals demonstrated a degree of readiness for the recommended change, namely the implementation of a NDSC training programme.

Objective 1.5: Develop a pre-innovation session for the critical stakeholders

For the purpose of this study buy-in from the critical stakeholders was obtained through a pre-innovation session. The critical stakeholders were the NICU managers and the heads of the various MDT departments. The pre-innovation session focused on the need for training on NDSC, what the NDSC training programme would entail, the impact of the training on staff, the benefits for the organisation as well as the benefits for preterm infants and their families. The pre-innovation programme was developed by the researcher and presented to the NICU managers and heads of departments. This ensured the necessary buy-in and support from all stakeholders for the implementation of the NDSC training programme. Following the pre-innovation session, the researcher was able to continue with the implementation process at the two public hospitals.

11.3 PHASE 2

Phase 2 of the study focused on the preparation for the implementation of the NDSC training programme by creating an implementation structure. This structure provides details on when, where and how the training programme will be implemented. In this study, Phase 2 consisted of the development of a plan for implementing the training programme.

Objective 2.1: Develop a plan for implementing the training programme

The researcher developed the plan for implementation of the NDSC training programme with the assistance of the champions at both research sites. The World Health Organization's Essential Newborn Care Course (WHO, 2010) was used as a guide to develop the implementation plan for this study. The plan included a list of implementation tasks, the team members responsible for each task, the timeline as well as the expected outcome for each task.

11.4 PHASE 3

This phase entailed the actual implementation of the multidisciplinary, NDSC training programme as well as the evaluation of the implementation process. The implementation process was evaluated by identifying contextual factors (facilitators and barriers) which affected the implementation of the training programme. Additionally, the researcher evaluated the effect of the NDSC training programme on the day-to-day practice of NDSC in the NICU. The following two manuscripts formed part of this phase:

- Perceived facilitators and barriers in the implementation of a neurodevelopmental supportive care training programme in the South African public sector hospitals
- A change in practice following the implementation of a neurodevelopmental supportive care training programme in the South African public healthcare sector.

Objective 3.1: Implementation of the neurodevelopmental supportive care training intervention

The Guideline for Reporting Evidence-based practice Educational interventions and Teaching (GREET) was used to describe how the training programme was actually implemented. The GREET included information on the following: the name of the intervention, why, what, who provided, how, where, when, how much, planned changes, unplanned changes and how well the NDSC training programme was implemented. The original plan was for the implementation of the one-day Little Steps® Introduction to NDSC training programme. It was, however, necessary to adapt the training programme to accommodate the needs and schedules of the various disciplines. This objective was achieved as 125 participants from Hospital A (61%) and 130 participants from Hospital B (68%) attended the training on NDSC. It will be the ideal to train all MDT members providing a service to preterm infants in the NICU but this is more than the recommended training of 30% of staff in a large NICU. The doctors and nurses at both hospitals attended the 2-2½ hour sessions while the allied health professionals (physiotherapists, speech therapists/audiologists, dietitians and occupational therapists) attended the full-day training programme.

Objective 3.2: Identify facilitators and barriers to change practice

Analysing the implementation process is just as important as implementing the intervention itself. By identifying contextual factors (facilitators and barriers) it is possible to determine the reasons for success or failure of the implementation. These contextual factors were determined through focus groups. The purpose of the focus groups was two-fold: to determine facilitators and barriers related to the training programme itself and to determine if the MDT was able to apply their NDSC knowledge to their day-to-day practice.

The MDT experienced the Little Steps® Introduction to NDSC training programme as beneficial and described it as enjoyable, informative and useful. Facilitators which supported the implementation of the training programme included aspects such as: availability of different training options (2½-hours or full-day), on-site training, the inclusion of all disciplines in the training, simple and practical information, inclusion of practical sessions, the use of a reflective tool to evaluate an increase in knowledge (quiz) and the use of a training manual. Barriers included aspects such as: not all staff attended the training impacting on MDT morale, a lack of mixed discipline groups, frequent rotation of staff, one-off short training sessions, more advanced training required for experienced staff, limited access to additional information on NDSC, no real-world practice in the NICU environment and a lack of support from some senior staff and managers.

Applying their knowledge into their day-to-day practice was more challenging. The translation of knowledge to practice was affected by factors such as teamwork, knowledge, resources, support, attitude, motivation and drive. Various recommendations were made based on the results of the focus groups. These will be presented in the Recommendations (Paragraph 11.6). It does, however, appear the MDT became more aware of the effect of their behaviour on preterm infants as well as the effect of environmental factors in the NICU. They felt better equipped following the training and started making small changes in their day-to-day practice. They recognised the importance of the NDSC approach in the NICU and appeared motivated to continue the change process with the necessary support from their seniors.

Objective 3.3: To determine the effect of implementing a multidisciplinary neurodevelopmental supportive care training programme

The last objective of Phase 3 of the study focused on the effect of the implementation of the intervention. The operationalisation of NDSC in the NICU, following the NDSC training, was determined by comparing the pre-implementation and the post-implementation survey results. The MDT members reported changes in their practice in the focus groups but this was not confirmed by the post-implementation results. There were no significant or clinically significant differences in the operationalisation of NDSC in the two NICUs following the implementation of the NDSC training programme. Furthermore, when considering the readiness of the two hospitals, as determined in Objective 1.4, there appears to be no correlation between the MDTs' readiness for change and the effect of the training programme on the operationalisation of NDSC in the NICU. These findings should be interpreted with caution due to the small sample size. Possible reasons for the limited change observed in practice, could be linked to aspects such as: the NICU design which did not change, existing policies and procedures impacting on NDSC, not all MDT members being trained or the fact that implementing an intervention takes time.

11.5 PHASE 4

The QIF has a 4th phase but this study concluded with a reflection and recommendations for future implementation initiatives. By identifying successes, failures, effective and ineffective strategies in the implementation process, can assist in adapting and improving the existing training intervention and guide the development of future implementation interventions. The recommendations, limitations and a reflection of the implementation process are presented below.

11.6 RECOMMENDATIONS

The recommendations below (Table 11.1) pertain to the implementation of a NDSC training programme for the MDT who provides services to preterm infants and their families in the public sector NICUs. These recommendations were identified from the data analysed in Phase 3.

Table 11.1: Recommendations following the implementation of a neurodevelopmental supportive care (NDSC) training programme

Recommendations:

- All new and rotating staff should attend a two-hour basic induction programme on neurodevelopmental supportive care.
- Continuous in-depth neurodevelopmental supportive care training should be provided for all staff.
- Training sessions should include all members of the multidisciplinary team to promote better communication and teamwork.
- Diverse teaching methods should be included to accommodate different learning styles.
- Create a portal of recent and relevant literature and guidelines on neurodevelopmental supportive care which the multidisciplinary team can access.
- Develop an online training programme with an attached evaluation, which can be used as part of an induction programme if team members are unable to attend face-to-face induction.
- Develop brief training sessions on the various NDSC topics which champions can implement on a continuous basis every couple of months.
- Develop a parental training programme appropriate for parents in the public healthcare sector, who have limited resources.
- Experienced staff and champions should provide bedside training in the neonatal intensive care unit.
- Champions in the neonatal intensive care unit should act as role models and support the NICU staff.
- Senior staff and managers should support the MDT to implement NDSC in the NICU.
- Parents should be included as part of the MDT in providing neurodevelopmental supportive care in the NICU.
- Introduce initiatives in the NICU to recognise positive behaviour and motivate staff (e.g. nurse of the week).
- Regular meetings with champions to determine and set realistic goals for implementation of neurodevelopmental supportive care in their units.
- Target undergraduate programmes at universities to introduce neurodevelopmental supportive care in the curriculum.

11.7 LIMITATIONS

11.7.1 Design limitations

According to Almeida (Almeida, 2018) some of the limitations of using a multiphase design in implementation research are that large-scale research experience is recommended; it often requires significant resources; and it is extremely time consuming and expensive (Almeida, 2018). Most implementation studies focus on one phase of the implementation process or a couple of steps. As a single researcher, the researcher probably took on too much in this study and it would have been better to collaborate with other students or researchers or to focus on only one phase of the implementation process. Considering the critique on how long it takes to implement evidence-based interventions in the real world, it is important to reduce this time as much as possible. Collaborations between researchers would most likely reduce the time it actually takes to implement the intervention.

Another design limitation was the lack of ongoing intervention following the initial implementation of the training programme. In hindsight, planning for ongoing intervention during the six-month post-intervention period could have strengthened the research design and ensure clinical application of what was learnt in the training sessions.

11.7.2 Sample size limitations

Another limitation in this study was the small sample sizes especially in the first phase of the study. In the surveys on self-reported adherence of the MDT to NDSC principles in the NICU and the readiness for change assessment, respectively only 23% (n=58) and 19% (n=49) of the 255 participants who attended the training completed these two questionnaires. The researcher made various appointments with the different MDT departments at the hospitals to arrange for face-to-face meetings to complete the questionnaires. Due to the busy schedules of some of the disciplines, it was not always possible to conduct these surveys in person. The researcher was requested to rather email the surveys to potential participants. These emails were repeatedly sent via email but the response rate remained poor at 23% and 19%. It can be argued that the training needs as identified from the

23% (n=58) of the participants and the readiness for change of 19% (n=49) of the participants were not representative of the entire MDT at the two hospitals. It was, however, possible to confirm the results of this part of the study through a pre-implementation survey on the operationalisation of NDSC in the NICU. The results of the pre-implementation survey confirmed the need to include information on all nine categories of the NDSC approach in the training programme.

11.7.3 Measurement tool limitations

The Implementation of Neurodevelopmental Supportive Care (INDeSC) tool was adapted to be used as a questionnaire to determine the self-reported adherence of the MDT to NDSC. With 93 individual items, this tool was too lengthy to be used as a questionnaire especially with the inclusion of additional comment boxes for each category and subcategory. This was, however the only tool previously used in the South African NICU context. It is recommended for the INDeSC to be used as an audit tool rather than a questionnaire. It is further recommended for a shorter self-evaluation questionnaire to be developed from the original INDeSC tool.

11.7.4 Bias limitations

The researcher presented both the training programme and conducted the focus groups, following the implementation of the training. This can be critiqued due to potential social desirability bias. Social desirability bias is when participants respond in a way which they believe is socially acceptable (Bergen & Labonté, 2020). Having a rapport with the participants can, however, facilitate honesty in participants. Furthermore, the researcher's involvement in both the training and the focus groups was beneficial as the researcher had knowledge of how the training content, duration and methods were adapted. This enabled the researcher to prompt the participants during the focus groups on their opinions of the different training sessions which were offered. To further limit bias, the assistant moderator was present in all focus groups, monitoring the group process and ensuring each group was conducted in exactly the same manner.

11.7.5 Contextual limitations

In an ideal world, each and every member of the two MDTs should have participated in the training programme. This was not possible due to constant work pressure and shortages of staff in the public healthcare sector. An additional limitation, linked to the training of all staff, was the rotation of staff, especially the junior doctors who rotated within a period of 3-6 months. This can potentially affect the translation of knowledge into practice and some participants identified this as an implementation barrier. This is, however, the reality and will be an ongoing challenge in the academic, public sector hospitals. The implementation process should be seen as a continuous process and ongoing training will be needed to ensure a complete change in culture and practice in the NICU.

11.8 REFLECTION

Just do it! I am a pragmatist at heart, not a philosopher and not a writer. I want to get things done, identify the problem, construct a plan and make the necessary change. A problem solver. It shouldn't be so difficult. A problem has been identified, i.e. developmental care is not implemented in SA NICUs and staff do not have the necessary knowledge to implement this approach. Solution: provide the staff with the necessary training and voila, developmental care should be implemented in the NICU. This is obviously completely oversimplified, to say the least, but was in essence the initial motivation for this study.

Throughout this study though, it was clear that one cannot always just jump in and get things done. It is sometimes necessary to stop and think; and plan; and then do. And then go back, and think and plan some more. The importance of theory in this study was apparent as it guided the research process throughout and provided a foundation for what to do, how to do it, when to do it and the justification for why it needs to be done. The QIF provided a theoretical framework to guide this study. For a practical person, it made sense to have very specific phases and steps and to follow a set plan. It was, however, much more complicated and definitely not straight forward...

One of the most difficult and challenging aspects was to get participants to agree to participate in the study. The research process was followed to a T and all the

necessary permissions to conduct the study were obtained from all involved parties, but when it came to the actual participation, participants seemed hesitant or even reluctant. There can be various reasons why participants decide not to participate in a study. One possible reason is the fact that the two research sites are academic hospitals, training a multitude of professionals, who often need to conduct research, as part of their studies. These hospitals are therefore bombarded with research applications and it is understandable that the staff are reluctant to participate in every single study. Participation in research is supposed to be voluntary, but the reality is that a lack of participation can affect the validity of the study results and ultimately can cause a study to fail. I argued that implementation research might have been the best design to overcome the lack of participation, but even this design had its limitations.

Another challenging aspect was to get participants to agree on dates for training. Although continuous training is essential in professional development, finding the time in a busy, often understaffed public sector hospital is challenging at the best of times. I often had to adjust the training based on all the different disciplines' needs and availability as discussed in Chapter 8. When considering training in these busy environments, it is vital to be flexible with dates and times as well as offer a variety of training options including: 1-hour sessions, half-day sessions, full-day sessions, on-line teaching (podcasts) or even self-study modules.

As this study formed part of an academic process, to obtain a qualification, I had to collect the majority of the data myself. Implementation research is an extremely complex process and although the idea is to implement best evidence practice in the shortest possible time, the reality is that it can still take between 3 and 5 years due to the multiple phases and steps needed to ensure successful implementation. Although I had support from the champions, at the two research sites, I would recommend for an implementation study to be conducted by a group of researchers, rather than a single person. If this is not possible, it is recommended for the single researcher to decide on a specific aspect of the implementation process to conduct a more detailed and focused study.

Funding for research is limited, not only in the public healthcare sector but also in universities. It is unfortunate that researchers are not always supported financially

by the academic institutions, especially with something like implementation studies which aim to implement the best available evidence in practice. According to the university rules, no funding is provided for students after year three of the study. In implementation research the process of data collection happens sequentially, in stages and it is sometimes necessary for time to pass, before certain steps or phases can be completed, especially when following up on the effect of the implementation of an intervention. It is recommended for the allocation of research bursaries to be awarded based on the research methodology rather than a set time frame.

Through this study, it was evident that neurodevelopmental supportive care was not everyday practice in these units, mainly due to a complete unawareness or a lack of knowledge of this approach and what it entails. A supportive organisation is crucial to ensure successful implementation. The organisation and its members needed to buy into the proposed intervention and its benefits. Once the training commenced, the MDT embraced the information, was motivated and a desire to implement change in their units, was ignited. Opportunities for staff training need to be created to ensure better patient care and outcomes.

Even with all these obstacles, the researcher thoroughly enjoyed the actual training part of the study (the doing). Imparting information about a topic I am passionate about, was exhilarating and very rewarding. What was even more rewarding was the small changes visible in the NICUs following the training: a mum doing KMC, a doctor repositioning a distressed infant, a therapist using containment hold following an invasive procedure, nurses providing information to parents and encouraging them to care for their infants and KMC wraps offered for sale for when the mum goes home with her infant. It is still early days and Rome was not built in a day. We cannot expect to see immediate change, in all areas of developmental care, in these NICUs, but an awareness has been created and the future is exciting.

This is not the end of the journey but merely the beginning. The researcher plans to support the champions of the two hospitals, who will continue to strive for an ideal NICU and quality care for all preterm infants and their families. Meetings have already been conducted with some of the champions, to look at the way forward and to plan realistic, monthly developmental care goals for the units. The

champions are motivated to drive this process and continue to make changes in these units, on a day-to-day basis. The latest version of the Best Practice Guidelines on Neurodevelopmental Supportive Care of The Preterm Infant (Lubbe, 2019) has been distributed to all MDT members, who participated in the study. It is freely available and can be passed on to new staff members and students. The Little Steps® posters on Behavioural states, Stress cues, Handling and positive touch, and Positioning, have been donated to each unit, and recent, relevant journal articles, on developmental care, were made available to the MDT. Ongoing training will also need to be provided due to frequent staff changes. This can be done by the champions of the units with support from the researcher.

The changes are small but it is a step in the right direction and with the application of NDSC principles, the NICU should be a more conducive environment with the evidence speaking for itself, resulting in calmer, more stable preterm infants and satisfied families.

11.9 FINAL CONCLUSION

This was an implementation study which used the Quality Implementation Framework (QIF) as a guide. The QIF consisted of four phases and 14 steps and was adapted for this PhD study. The first phase of this study focused on identifying the training needs of the MDT and determining the operationalisation of NDSC in two public sector NICUs in Gauteng, South Africa. The results confirmed the NDSC approach was not visible in the two NICUs and training on all nine NDSC categories was needed. A fit assessment was conducted to compare the identified training needs of the MDT with an existing NDSC training programme. The Little Steps® Introduction to NDSC training programme was identified as the most appropriate training programme to be implemented at the two hospitals. A readiness for the implementation of a NDSC training programme was conducted and it was determined the two MDTs were ready for the suggested change. A pre-innovation session was developed and presented to gain the necessary buy-in from the stakeholders. In Phase 2 of the study the implementation plan was developed which included specific tasks, team members responsible for the tasks and a timeline. In Phase 3 the NDSC training programme was implemented. Following the implementation, the process was evaluated by identifying contextual factors

(facilitators and barriers) which impacted on the implementation process. Although the QIF has a distinct Phase 4, this PhD study concluded with a reflection and recommendations for future training initiatives in the public sector hospitals in South Africa. Small changes in individual practice were achieved through the implementation of the NDSC training programme which contribute to improved care for preterm infants and their families.

REFERENCES

- Aarons, G. A., Hurlburt, M., & Horwitz, S. M. (2011). Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(1), 4-23. doi:10.1007/s10488-010-0327-7.
- Acevedo, D. H., Becerra, J. I. R., & Martínez, Á. L. (2017). The philosophy of the developmental centred care of the premature infant (NIDCAP): A literature review. *Enfermería Global*, 16(4), 590-601. doi:<https://doi.org/10.6018/eglobal.16.4.263721>
- Adesoye, T., Greenberg, C. C., & Neuman, H. B. (2016). Optimizing cancer care delivery through implementation science. *Frontiers in Oncology*, 6, 1. doi:10.3389/fonc.2016.00001
- African Institute of Health & Leadership Development. (2015). *Minimum data sets for human resources for health and the surgical workforce in South Africa's Health System: A rapid analysis of stock and migration*. Retrieved from https://www.who.int/workforcealliance/031616south_africa_case_studiesweb.pdf?ua=1
- Aita, M., & Snider, L. (2003). The art of developmental care in the NICU: A concept analysis. *Journal of advanced nursing*, 41(3), 223-232. doi: <https://doi.org/10.1046/j.1365-2648.2003.02526.x>
- Albarqouni, L., Glasziou, P., & Hoffmann, T. (2018). medical education in review Completeness of the reporting of evidence-based practice educational interventions: a review.
- Albers, B., Mildon, R., Lyon, A. R., & Shlonsky, A. (2017). Implementation frameworks in child, youth and family services—Results from a scoping review. *Children and Youth Services Review*, 81, 101-116. doi:<https://doi.org/10.1016/j.childyouth.2017.07.003>
- Alberto Alves Carvalhais, C., Vieira Da Silva, M., Silva, J., Xavier, A., & Santos, J. (2018). *Noise in neonatal intensive care units: a short review*. Paper presented at the Euronoise.
- Alexander, J. A., & Hearld, L. R. (2012). Methods and metrics challenges of delivery-system research. *Implementation Science*, 7(1), 15. doi:<https://doi.org/10.1186/1748-5908-7-15>
- Almeida, F. (2018). Strategies to perform a mixed methods study. *European Journal of Education Studies*.
- Als, H. (1982). Manual for the assessment of preterm infants' behavior (APIB) In: Fitzgerald HE, Lester BM, Yogman MW, editors. Theory and Research in Behavioral Pediatrics. Vol. 1. In: New York: Plenum Press.
- Als, H. (1986). A synactive model of neonatal behavioral organization: Framework for the assessment of neurobehavioral development in the premature infant and for support of infants and parents in the neonatal intensive care environment. *Physical & Occupational Therapy In Pediatrics*, 6(3-4), 3-53. doi:https://doi.org/10.1080/J006v06n03_02

- Als, H. (1997). Earliest intervention for preterm infants in the newborn intensive care unit. *The effectiveness of early intervention*, 47-76.
- Als, H. (2008). Program guide: Newborn Individualized Developmental Care and Assessment Program (NIDCAP®), rev. ed. *South Attleboro (Mass): NIDCAP Federation International*.
- Als, H. (2009). Newborn individualized developmental care and assessment program (NIDCAP): new frontier for neonatal and perinatal medicine. *Journal of Neonatal-Perinatal Medicine*, 2(3), 135-147. doi:10.3233/NPM-2009-0061
- Als, H., Duffy, F., McAnulty, G., Fischer, C., Kosta, S., Butler, S., . . . Ringer, S. (2011). Is the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) effective for preterm infants with intrauterine growth restriction? *Journal of Perinatology*, 31(2), 130-136. doi:<https://doi.org/10.1038/jp.2010.81>
- Als, H., Duffy, F. H., McAnulty, G., Butler, S. C., Lightbody, L., Kosta, S., . . . Ringer, S. A. (2012). NIDCAP improves brain function and structure in preterm infants with severe intrauterine growth restriction. *Journal of Perinatology*, 32(10), 797-803. doi:<https://doi.org/10.1038/jp.2011.201>
- Als, H., Gilkerson, L., Duffy, F. H., Mcanulty, G. B., Buehler, D. M., Vandenberg, K., . . . Ringer, S. A. (2003). A three-center, randomized, controlled trial of individualized developmental care for very low birth weight preterm infants: medical, neurodevelopmental, parenting, and caregiving effects. *Journal of Developmental & Behavioral Pediatrics*, 24(6), 399-408.
- Als, H., & McAnulty, G. B. (2011). The newborn individualized developmental care and assessment program (NIDCAP) with kangaroo mother care (KMC): comprehensive care for preterm infants. *Current women's health reviews*, 7(3), 288-301.
- Altimier, L., Kenner, C., & Damus, K. (2015). The Wee Care neuroprotective NICU program (Wee Care): The effect of a comprehensive developmental care training program on seven neuroprotective core measures for family-centered developmental care of premature neonates. *Newborn and Infant Nursing Reviews*, 15(1), 6-16. doi://doi.org/10.1053/j.nainr.2015.01.006
- Altimier, L., & Phillips, R. (2016). The neonatal integrative developmental care model: Advanced clinical applications of the seven core measures for neuroprotective family-centered developmental care. *Newborn and infant nursing reviews*, 16(4), 230-244. doi:<https://doi.org/10.1053/j.nainr.2016.09.030>
- Altimier, L., & Phillips, R. M. (2013). The neonatal integrative developmental care model: Seven neuroprotective core measures for family-centered developmental care. *Newborn and Infant Nursing Reviews*, 13(1), 9-22. doi:<https://doi.org/10.1053/j.nainr.2012.12.002>
- Altimier, L. B. (2015). Neuroprotective core measure 1: The healing NICU environment. *Newborn and Infant Nursing Reviews*, 15(3), 91-96. doi:<https://doi.org/10.1053/j.nainr.2015.06.014>

- Altimier, L. B., Eichel, M., Warner, B., Tedeschi, L., & Brown, B. (2005). Developmental care: changing the NICU physically and behaviorally to promote patient outcomes and contain costs. *Neonatal Intensive Care*, 18(4), 12-16.
- Anderson, I. (2016). Identifying different learning styles to enhance the learning experience. *Nursing Standard*, 31(7). doi:10.7748/ns.2016.e10407
- Armstrong, E. K., Ball, A. L., & Leatherbarrow, J. (2012). Constructing a programme of change to improve the provision of family-centred developmental care on a neonatal unit. *Infant*, 8(3), 86.
- Attieh, R., Gagnon, M.-P., Estabrooks, C. A., Légaré, F., Ouimet, M., Roch, G., . . . Grimshaw, J. (2013). Organizational readiness for knowledge translation in chronic care: a review of theoretical components. *Implementation Science*, 8(1), 138. doi:<https://doi.org/10.1186/1748-5908-8-138>
- Aucott, S., Donohue, P. K., Atkins, E., & Allen, M. C. (2002). Neurodevelopmental care in the NICU. *Developmental Disabilities Research Reviews*, 8(4), 298-308. doi:<https://doi.org/10.1002/mrdd.10040>
- Aylward, G. P. (2014). Neurodevelopmental outcomes of infants born prematurely. *Journal of Developmental & Behavioral Pediatrics*, 35(6), 394-407. doi:10.1097/01.DBP.0000452240.39511.d4
- Ball, T. M., & Wright, A. L. (1999). Health care costs of formula-feeding in the first year of life. *Pediatrics*, 103(Supplement 1), 870-876.
- Barbosa, V. M. (2013). Teamwork in the neonatal intensive care unit. *Physical & Occupational Therapy In Pediatrics*, 33(1), 5-26. doi:<https://doi.org/10.3109/01942638.2012.729556>
- Baruch, Y., & Holtom, B. C. (2008). Survey response rate levels and trends in organizational research. *Human Relations*, 61(8), 1139-1160. doi:<https://doi.org/10.1177/0018726708094863>
- Bauer, M. S., Damschroder, L., Hagedorn, H., Smith, J., & Kilbourne, A. M. (2015). An introduction to implementation science for the non-specialist. *BMC Psychology*, 3(1), 32. doi:<https://doi.org/10.1186/s40359-015-0089-9>
- Bauer, M. S., & Kirchner, J. (2020). Implementation science: What is it and why should I care? *Psychiatry Research*, 283, 112376. doi:<https://doi.org/10.1016/j.psychres.2019.04.025>
- Beck, S., Wojdyla, D., Say, L., Betran, A. P., Merialdi, M., Requejo, J. H., . . . Look, P. F. V. (2010). The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. *Bulletin of the World Health Organization*, 88(1), 31-38. doi:10.2471/BLT.08.062554
- Beck, S. A., Weis, J., Greisen, G., Andersen, M., & Zoffmann, V. (2009). Room for family-centered care—a qualitative evaluation of a neonatal intensive care unit remodeling project. *Journal of Neonatal Nursing*, 15(3), 88-99. doi:<https://doi.org/10.1016/j.jnn.2009.01.006>

- Begg, C., Cho, M., Eastwood, S., Horton, R., Moher, D., Olkin, I., . . . Simel, D. (1996). Improving the quality of reporting of randomized controlled trials: the CONSORT statement. *Jama*, 276(8), 637-639. doi:10.1001/jama.1996.03540080059030
- Belizán, M., Bergh, A.-M., Cilliers, C., Pattinson, R. C., & Voce, A. (2011). Stages of change: A qualitative study on the implementation of a perinatal audit programme in South Africa. *BMC Health Services Research*, 11(1), 243. doi:<https://doi.org/10.1186/1472-6963-11-243>
- Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *NursingPlus Open*, 2, 8-14. doi:<https://doi.org/10.1016/j.npls.2016.01.001>
- Benzer, J. K., Charns, M. P., Hamdan, S., & Afable, M. (2017). The role of organizational structure in readiness for change: A conceptual integration. *Health Services Management Research*, 30(1), 34-46. doi:<https://doi.org/10.1177/0951484816682396>
- Bergen, N., & Labonté, R. (2020). "Everything is perfect, and we have no problems": detecting and limiting social desirability bias in qualitative research. *Qualitative Health Research*, 30(5), 783-792. doi:<https://doi.org/10.1177/1049732319889354>
- Bertram, R., Blase, K., Shern, D., Shea, P., & Fixsen, D. (2011). Policy research brief: Implementation opportunities and challenges for prevention and promotion initiatives. Alexandria, VA: National Association of State Mental Health Program Directors (NASMHPD).
- Bieleninik, Ł., & Gold, C. (2014). Early intervention for premature infants in neonatal intensive care unit. *Acta Neuropsychologica*, 12(2).
- Birken, S. A., Powell, B. J., Presseau, J., Kirk, M. A., Lorencatto, F., Gould, N. J., . . . Yu, Y. (2017). Combined use of the Consolidated Framework for Implementation Research (CFIR) and the Theoretical Domains Framework (TDF): a systematic review. *Implementation Science*, 12(1), 2. doi:10.1186/s13012-016-0534-z
- Birken, S. A., Powell, B. J., Shea, C. M., Haines, E. R., Kirk, M. A., Leeman, J., . . . Presseau, J. (2017). Criteria for selecting implementation science theories and frameworks: results from an international survey. *Implementation Science*, 12(1), 124. doi:10.1186/s13012-017-0656-y
- Blencowe, H., Cousens, S., Oestergaard, M. Z., Doris, C., Moller, A.-B., Narwal, R., . . . Lawn, J. E. (2012). National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. *The Lancet*, 379(9832), 2163-2172. doi:[https://doi.org/10.1016/S0140-6736\(12\)60820-4](https://doi.org/10.1016/S0140-6736(12)60820-4)
- Borek, A. J., Abraham, C., Smith, J. R., Greaves, C. J., & Tarrant, M. (2015). A checklist to improve reporting of group-based behaviour-change interventions. *BMC Public Health*, 15(1), 963. doi:<https://doi.org/10.1186/s12889-015-2300-6>

- Bosch, M., Tavender, E. J., Brennan, S. E., Knott, J., Gruen, R. L., & Green, S. E. (2016). The many organisational factors relevant to planning change in emergency care departments: a qualitative study to inform a cluster randomised controlled trial aiming to improve the management of patients with mild traumatic brain injuries. *PloS One*, 11(2), e0148091.
- Bosch, S., Bledsoe, T., & Jenzarli, A. (2012). Staff perceptions before and after adding single-family rooms in the NICU. *HERD: Health Environments Research & Design Journal*, 5(4), 64-75.
doi:<https://doi.org/10.1177/193758671200500406>
- Breier, M., Wildschut, A., & Mggolozana, T. (2015). Nursing in a new era.
- Brooke-Sumner, C., Petersen-Williams, P., Kruger, J., Mahomed, H., & Myers, B. (2019). 'Doing more with less': a qualitative investigation of perceptions of South African health service managers on implementation of health innovations. *Health Policy and Planning*, 34(2), 132-140.
doi:<https://doi.org/10.1093/heapol/czz017>
- Brown, J. (2002). Training needs assessment: A must for developing an effective training program. *Public personnel management*, 31(4), 569-578.
doi:<https://doi.org/10.1177/009102600203100412>
- Browne, J. V., & Talmi, A. (2012). Developmental supports for newborns and young infants with special health and developmental needs and their families: The BABIES Model. *Newborn and Infant Nursing Reviews*, 12(4), 239-247.
- Brummelte, S., Grunau, R. E., Chau, V., Poskitt, K. J., Brant, R., Vinall, J., . . . Miller, S. P. (2012). Procedural pain and brain development in premature newborns. *Annals of neurology*, 71(3), 385-396.
doi:<https://doi.org/10.1002/ana.22267>
- Burke, K., Morris, K., & McGarrigle, L. (2012). An introductory guide to implementation: terms, concepts and frameworks.
- Burke, L. A., & Hutchins, H. M. (2007). Training transfer: An integrative literature review. *Human resource development review*, 6(3), 263-296.
doi:<https://doi.org/10.1177/1534484307303035>
- Burns, K. E., Duffett, M., Kho, M. E., Meade, M. O., Adhikari, N. K., Sinuff, T., & Cook, D. J. (2008). A guide for the design and conduct of self-administered surveys of clinicians. *Cmaj*, 179(3), 245-252.
doi:<https://doi.org/10.1503/cmaj.080372>
- Butler, M. L. (2018). *The self-reported perceptions of the multi-disciplinary team regarding standards of neurodevelopmental supportive care in the neonatal intensive care unit.*
- Byers, J. F. (2003). Components of developmental care and the evidence for their use in the NICU. *MCN: The American Journal of Maternal/Child Nursing*, 28(3), 174-180.
- Calciolari, G., & Montirosso, R. (2011). The sleep protection in the preterm infants. *The Journal of Maternal-Fetal & Neonatal Medicine*, 24(sup1), 12-14.
doi:<https://doi.org/10.3109/14767058.2011.607563>

- Campbell-Yeo, M., Disher, T., Benoit, B., Fernandes, A., Streiner, D., Inglis, D., . . . Johnston, C. (2017). Skin-to-skin care for procedural pain in neonates. *The Cochrane Database of Systematic Reviews*, 2017(2).
- Castro, F. G., Barrera Jr, M., & Holleran Steiker, L. K. (2010). Issues and challenges in the design of culturally adapted evidence-based interventions. *Annual Review of Clinical Psychology*, 6, 213-239. doi:<https://doi.org/10.1146/annurev-clinpsy-033109-132032>
- Cekada, T. L. (2010). Training needs assessment: Understanding what employees need to know. *Professional Safety*, 55(03), 28-33.
- Center for Research in Implementation Science and Prevention (CRISP). (date unknown). Dissemination & Implementation Models in Health Research and Practice. Retrieved from <http://www.dissemination-implementation.org/>
- Chan, G., Bergelson, I., Smith, E. R., Skotnes, T., & Wall, S. (2017). Barriers and enablers of kangaroo mother care implementation from a health systems perspective: a systematic review. *Health policy and planning*, 32(10), 1466-1475. doi:<https://doi.org/10.1093/heapol/czx098>
- Chang, E. (2015). Preterm birth and the role of neuroprotection. *BMJ*, 350, g6661. doi:<https://doi.org/10.1136/bmj.g6661>
- Chang, H. H., Larson, J., Blencowe, H., Spong, C. Y., Howson, C. P., & Cairns-Smith, S. a. B. T. S. P. P. A. G. (2013). Preventing preterm births: analysis of trends and potential reductions with interventions in 39 countries. *The Lancet*, 381(9862), 223-234.
- Chaudoir, S. R., Dugan, A. G., & Barr, C. H. (2013). Measuring factors affecting implementation of health innovations: a systematic review of structural, organizational, provider, patient, and innovation level measures. *Implementation Science*, 8(1), 22. doi:<https://doi.org/10.1186/1748-5908-8-22>
- Chawanpaiboon, S., Vogel, J. P., Moller, A.-B., Lumbiganon, P., Petzold, M., Hogan, D., . . . Laopaiboon, M. (2019). Global, regional, and national estimates of levels of preterm birth in 2014: a systematic review and modelling analysis. *The Lancet Global Health*, 7(1), e37-e46. doi:[https://doi.org/10.1016/S2214-109X\(18\)30451-0](https://doi.org/10.1016/S2214-109X(18)30451-0)
- Conde-Agudelo, A., & Díaz-Rossello, J. L. (2016). Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database of Systematic Reviews*(8).
- Cong, X., Cusson, R. M., Walsh, S., Hussain, N., Ludington-Hoe, S. M., & Zhang, D. (2012). Effects of skin-to-skin contact on autonomic pain responses in preterm infants. *The Journal of Pain*, 13(7), 636-645. doi:<https://doi.org/10.1016/j.jpain.2012.02.008>
- Consensus Committee of the Standards, Competencies, & Best Practices for Infant and Family-Centered Developmental Care in the Intensive Care Unit. (2020). Developmental Care Standards for Infants in Intensive Care. Retrieved from <https://nicudesign.nd.edu/nicu-care-standards/>
- Corbetta, P. (2003). *Social research: Theory, methods and techniques*. London: Sage.

- Coughlin, M. (2017). Trauma-informed, neuroprotective care for hospitalised newborns and infants. *Infant*, 13(5).
- Coughlin, M., Gibbins, S., & Hoath, S. (2009). Core measures for developmentally supportive care in neonatal intensive care units: theory, precedence and practice. *Journal of advanced nursing*, 65(10), 2239-2248. doi:<https://doi.org/10.1111/j.1365-2648.2009.05052.x>
- Craig, J., Glick, C., Phillips, R., Hall, S., Smith, J., & Browne, J. (2015). Recommendations for involving the family in developmental care of the NICU baby. *Journal of Perinatology*, 35(S1), S5. doi:<https://doi.org/10.1038/jp.2015.142>
- Craig, J. W., & Smith, C. R. (2020). Risk-adjusted/neuroprotective care services in the NICU: the elemental role of the neonatal therapist (OT, PT, SLP). *Journal of Perinatology*, 40(4), 549-559. doi:<https://doi.org/10.1038/s41372-020-0597-1>
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. London: Sage publications.
- Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2011). Best practices for mixed methods research in the health sciences. *Bethesda (Maryland): National Institutes of Health*, 2094-2103.
- D'Agata, A. L., & McGrath, J. M. (2016). A framework of complex adaptive systems. *Advances in Nursing Science*, 39(3), 244-256. doi:<https://doi.org/10.1097/ANS.0000000000000127>
- Damschroder, L. J. (2020). Clarity out of chaos: use of theory in implementation research. *Psychiatry Research*, 283. doi:<https://doi.org/10.1016/j.psychres.2019.06.036>
- Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implementation Science*, 4(1), 50. doi:<https://doi.org/10.1186/1748-5908-4-50>
- Davidoff, F., Dixon-Woods, M., Leviton, L., & Michie, S. (2015). Demystifying theory and its use in improvement. *BMJ Qual Saf*, 24(3), 228-238.
- Davies, P., Walker, A. E., & Grimshaw, J. M. (2010). A systematic review of the use of theory in the design of guideline dissemination and implementation strategies and interpretation of the results of rigorous evaluations. *Implementation Science*, 5(1), 14. doi:<https://doi.org/10.1186/1748-5908-5-14>
- De Bernardo, G., Svelto, M., Giordano, M., Sordino, D., & Riccitelli, M. (2017). Supporting parents in taking care of their infants admitted to a neonatal intensive care unit: a prospective cohort pilot study. *Italian Journal of Pediatrics*, 43(1), 36. doi:<https://doi.org/10.1186/s13052-017-0352-1>
- Dehghani, K., Vahedian, M., & Salmani, N. (2019). Barriers to Provision of NIDCAP in the Neonatal Intensive Care Unit of Nursing viewpoints. *SSU_Journals*, 27(6), 1628-1637.

- Domanico, R., Davis, D. K., Coleman, F., & Davis, B. O. (2011). Documenting the NICU design dilemma: comparative patient progress in open-ward and single family room units. *Journal of Perinatology*, 31(4), 281-288. doi:<https://doi.org/10.1038/jp.2010.120>
- Dramowski, A., Aucamp, M., Bekker, A., & Mehtar, S. (2017). Infectious disease exposures and outbreaks at a South African neonatal unit with review of neonatal outbreak epidemiology in Africa. *International Journal of Infectious Diseases*, 57, 79-85. doi:<http://dx.doi.org/10.1016/j.ijid.2017.01.026>
- Durlak, J. A. (2015). Studying program implementation is not easy but it is essential. *Prevention Science*, 16(8), 1123-1127. doi:<https://doi.org/10.1007/s11121-015-0606-3>
- Durlak, J. A., & DuPre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American journal of community psychology*, 41(3-4), 327-350. doi: <https://doi.org/10.1007/s10464-008-9165-0>
- Eboreime, E. A., Eyles, J., Nxumalo, N., Eboreime, O. L., & Ramaswamy, R. (2019). Implementation process and quality of a primary health care system improvement initiative in a decentralized context: A retrospective appraisal using the quality implementation framework. *The International journal of health planning and management*, 34(1), e369-e386. doi: <https://doi.org/10.1002/hpm.2655>
- Eccles, M. P., Armstrong, D., Baker, R., Cleary, K., Davies, H., Davies, S., . . . Leng, G. (2009). An implementation research agenda. In: BioMed Central.
- Eccles, M. P., & Mittman, B. S. (2006). Welcome to Implementation Science. *Implementation Science*, 1(1), 1. doi:10.1186/1748-5908-1-1
- Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. *SAGE open*, 4(1), 2158244014522633.
- Estabrooks, C. A., Floyd, J. A., Scott-Findlay, S., O'Leary, K. A., & Gushta, M. (2003). Individual determinants of research utilization: a systematic review. *Journal of advanced nursing*, 43(5), 506-520. doi:<https://doi.org/10.1046/j.1365-2648.2003.02748.x>
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, 5(1), 1-4. doi:10.11648/j.ajtas.20160501.11
- Farre, A., & Rapley, T. (2017). *The new old (and old new) medical model: four decades navigating the biomedical and psychosocial understandings of health and illness*. Paper presented at the Healthcare.
- Fernandez, M. E., Gill, A., van Lieshout, S., Rodriguez, S. A., Beidas, R. S., Parcel, G., . . . Kok, G. (2019). Implementation mapping: using intervention mapping to develop implementation strategies. *Frontiers in public health*, 7.

- Flaspohler, P. D., Meehan, C., Maras, M. A., & Keller, K. E. (2012). Ready, willing, and able: Developing a support system to promote implementation of school-based prevention programs. *American journal of community psychology*, 50(3-4), 428-444. doi:<https://doi.org/10.1007/s10464-012-9520-z>
- Flodgren, G., O'Brien, M. A., Parmelli, E., & Grimshaw, J. M. (2019). Local opinion leaders: effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*(6). doi:<https://doi.org/10.1002/14651858.CD000125.pub5>
- Flottorp, S. A., Oxman, A. D., Krause, J., Musila, N. R., Wensing, M., Godycki-Cwirko, M., . . . Eccles, M. P. (2013). A checklist for identifying determinants of practice: a systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice. *Implementation Science*, 8(1), 35. doi:<https://doi.org/10.1186/1748-5908-8-35>
- Fontein, W. (2018). Healing Power of Awareness. *International Journal of Clinical Research Trials*, 3, 128. doi:<https://doi.org/10.15344/2456-8007/2018/128>
- Fortes-Garrido, J. C., Velez-Pereira, A. M., Gázquez, M., Hidalgo-Hidalgo, M., & Bolívar, J. P. (2014). The characterization of noise levels in a neonatal intensive care unit and the implications for noise management. *Journal of Environmental Health Science and Engineering*, 12(1), 104. doi:<https://doi.org/10.1186/2052-336X-12-104>
- Fowlie, P. W., & McHaffie, H. (2004). Supporting parents in the neonatal unit. *BMJ*, 329(7478), 1336-1338. doi:<https://doi.org/10.1136/bmj.329.7478.1336>
- Gaffey, M. F., Das, J. K., & Bhutta, Z. A. (2015). *Millennium Development Goals 4 and 5: Past and future progress*. Paper presented at the seminars in fetal and neonatal medicine.
- Galarza-Winton, M. E., Dicky, T., O'Leary, L., Lee, S. K., & O'Brien, K. (2013). Implementing family-integrated care in the NICU: Educating nurses. *Advances in Neonatal Care*, 13(5), 335-340. doi:10.1097/ANC.0b013e3182a14cde
- Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Medical Research Methodology*, 13(1), 117. doi:<https://doi.org/10.1186/1471-2288-13-117>
- Geerligs, L., Rankin, N. M., Shepherd, H. L., & Butow, P. (2018). Hospital-based interventions: a systematic review of staff-reported barriers and facilitators to implementation processes. *Implementation Science*, 13(1), 36. doi:<https://doi.org/10.1186/s13012-018-0726-9>
- Gibbins, S., Hoath, S. B., Coughlin, M., Gibbins, A., & Franck, L. (2008). The universe of developmental care: a new conceptual model for application in the neonatal intensive care unit. *Advances in Neonatal Care*, 8(3), 141-147. doi:10.1097/01.ANC.0000324337.01970.76

- Glasziou, P., Meats, E., Heneghan, C., & Shepperd, S. (2008). What is missing from descriptions of treatment in trials and reviews? *BMJ*, 336(7659), 1472-1474. doi:<https://doi.org/10.1136/bmj.39590.732037.47>
- Glisson, C., & Schoenwald, S. K. (2005). The ARC organizational and community intervention strategy for implementing evidence-based children's mental health treatments. *Mental Health Services Research*, 7(4), 243-259. doi:<https://doi.org/10.1007/s11020-005-7456-1>
- Godarzi, Z., Rahimi, O., Khalesi, N., Soleimani, F., Mohammadi, N., & Shamshiri, A. R. (2018). Nurses' Opinions on the Barriers to Effective Implementation of Developmental Care in Neonatal Intensive Care Units. *نن ین کن نیننن ن کنننن ن کنن*, 11(2), 1-8
- Goldstein, R. F. (2012). Developmental care for premature infants: a state of mind. *Pediatrics*, 129(5), e1322-e1323. doi:<https://doi.org/10.1542/peds.2012-0511>
- Gooding, J. S., Cooper, L. G., Blaine, A. I., Franck, L. S., Howse, J. L., & Berns, S. D. (2011). Family support and family-centered care in the neonatal intensive care unit: origins, advances, impact. *Seminars in Perinatology*, 35(1), 20-28. doi:<https://doi.org/10.1053/j.semperi.2010.10.004>
- Goodyear-Smith, F., Jackson, C., & Greenhalgh, T. (2015). Co-design and implementation research: challenges and solutions for ethics committees. *BMC Medical Ethics*, 16(1), 78. doi:<https://doi.org/10.1186/s12910-015-0072-2>
- Gopichandran, V., Luyckx, V. A., Biller-Andorno, N., Fairchild, A., Singh, J., Tran, N., . . . Maher, D. (2016). Developing the ethics of implementation research in health. *Implementation Science*, 11(1), 161. doi:<https://doi.org/10.1186/s13012-016-0527-y>
- Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: time for a map? *Journal of continuing education in the health professions*, 26(1), 13-24.
- Grant, J. (2002). Learning needs assessment: assessing the need. *BMJ*, 324(7330), 156-159. doi:<https://doi.org/10.1136/bmj.324.7330.156>
- Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, 11(3), 255-274. doi:<https://doi.org/10.3102/01623737011003255>
- Grimshaw, J. M., Eccles, M. P., Lavis, J. N., Hill, S. J., & Squires, J. E. (2012). Knowledge translation of research findings. *Implementation Science*, 7(1), 50. doi:<https://doi.org/10.1186/1748-5908-7-50>
- Grunau, R. E. (2013). Neonatal pain in very preterm infants: long-term effects on brain, neurodevelopment and pain reactivity. *Rambam Maimonides medical journal*, 4(4). doi:<https://doi.org/10.5041/RMMJ.10132>

- Grunewaldt, K. H., Fjørtoft, T., Bjuland, K. J., Brubakk, A.-M., Eikenes, L., Håberg, A. K., . . . Skranes, J. (2014). Follow-up at age 10 years in ELBW children—functional outcome, brain morphology and results from motor assessments in infancy. *Early Human Development*, 90(10), 571-578. doi:<https://doi.org/10.1016/j.earlhumdev.2014.07.005>
- Haidet, P., Levine, R. E., Parmelee, D. X., Crow, S., Kennedy, F., Kelly, P. A., . . . Richards, B. F. (2012). Perspective: guidelines for reporting team-based learning activities in the medical and health sciences education literature. *Academic Medicine*, 87(3), 292-299. doi:10.1097/ACM.0b013e318244759e
- Hamilton, A. B., & Finley, E. P. (2019). Qualitative methods in implementation research: An introduction. *Psychiatry Research*, 280, 112516. doi:<https://doi.org/10.1016/j.psychres.2019.112516>
- Haumont, D. (2014). NIDCAP and developmental care. *Journal of Pediatric and Neonatal Individualized Medicine (JPNIM)*, 3(2), e030240. doi:10.7363/030240
- Haumont, D., Amiel-Tison, C., Casper, C., Conneman, N., Ferrari, F., Huppi, P., . . . Pallas-Alonso, C. (2013). NIDCAP and developmental care: a European perspective. *Pediatrics*, 132(2), e551-e552. doi:<https://doi.org/10.1542/peds.2013-1447C>
- Hendricks-Muñoz, K. D., Prendergast, C. C., Caprio, M. C., & Wasserman, R. S. (2002). Developmental care: The impact of Wee Care developmental care training on short-term infant outcome and hospital costs. *Newborn and Infant Nursing Reviews*, 2(1), 39-45. doi:<https://doi.org/10.1053/nbin.2002.31492>
- Hennessy, A. C. (2007). *Facilitation of developmental care for high-risk neonates: an intervention study*. University of Pretoria,
- Hoffmann, T. C., Glasziou, P. P., Boutron, I., Milne, R., Perera, R., Moher, D., . . . Johnston, M. (2014). Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ*, 348, g1687. doi:<https://doi.org/10.1136/bmj.g1687>
- Holsti, L., Grunau, R. E., & Shany, E. (2011). Assessing pain in preterm infants in the neonatal intensive care unit: moving to a 'brain-oriented' approach. *Pain management*, 1(2), 171-179. doi:<https://doi.org/10.2217/pmt.10.19>
- Holt, D. T., & Vardaman, J. M. (2013). Toward a comprehensive understanding of readiness for change: The case for an expanded conceptualization. *Journal of Change Management*, 13(1), 9-18. doi:<https://doi.org/10.1080/14697017.2013.768426>
- Howson, C. P., Kinney, M. V., & Lawn, J. E. (2012). *Born too soon: the global action report on preterm birth*. Retrieved from Geneva:
- Hutton, J. L., Eccles, M. P., & Grimshaw, J. M. (2008). Ethical issues in implementation research: a discussion of the problems in achieving informed consent. *Implementation Science*, 3(1), 52. doi:<https://doi.org/10.1186/1748-5908-3-52>
- IUSS Norms and Standards Task Team. (2014). *Paediatric and Neonatal Facilities*. Retrieved from www.iussonline.co.za.

- Johnson, J. L., Adkins, D., & Chauvin, S. (2020). A Review of the Quality Indicators of Rigor in Qualitative Research. *American Journal of Pharmaceutical Education*, 84(1). doi:<https://doi.org/10.5688/ajpe7120>
- Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of mixed methods research*, 1(2), 112-133. doi:<https://doi.org/10.1177/1558689806298224>
- Johnson, S., & Marlow, N. (2017). Early and long-term outcome of infants born extremely preterm. *Archives of disease in childhood*, 102(1), 97-102. doi:<http://dx.doi.org/10.1136/archdischild-2015-309581>
- Kaye, S. (2016). Historical Trends in Neonatal Nursing. *The Journal of perinatal & neonatal nursing*, 30(3), 273-276. doi:<https://doi.org/10.1097/JPN.0000000000000200>
- Kirchner, J. E., Smith, J. L., Powell, B. J., Waltz, T. J., & Proctor, E. K. (2020). Getting a clinical innovation into practice: An introduction to implementation strategies. *Psychiatry Research*, 283, 112467. doi:<https://doi.org/10.1016/j.psychres.2019.06.042>
- Kirk, M. A., Kelley, C., Yankey, N., Birken, S. A., Abadie, B., & Damschroder, L. (2015). A systematic review of the use of the consolidated framework for implementation research. *Implementation Science*, 11(1), 72. doi:10.1186/s13012-016-0437-z.
- Kitzinger, J. (1995). Qualitative research: Introducing focus groups. *BMJ*, 311(7000), 299-302. doi:<https://doi.org/10.1136/bmj.311.7000.299>
- Klassen, A. C., Creswell, J., Clark, V. L. P., Smith, K. C., & Meissner, H. I. (2012). Best practices in mixed methods for quality of life research. *Quality of Life Research*, 21(3), 377-380. doi:10.1007/s11136-012-0122-x.
- Koota, E., Kääriäinen, M., & Melender, H.-L. (2018). Educational interventions promoting evidence-based practice among emergency nurses: A systematic review. *International emergency nursing*, 41, 51-58. doi:10.1016/j.ienj.2018.06.004.
- Kumar, S., Kumar, N., & Vivekadhish, S. (2016). Millennium development goals (MDGS) to sustainable development goals (SDGS): Addressing unfinished agenda and strengthening sustainable development and partnership. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*, 41(1), 1.
- Lala, S., Lala, N., & Dangor, Z. (2017). The nursing crisis in paediatrics in South African state hospitals-an unaddressed problem. *South African Journal of Child Health*, 11(2), 64-65. doi:<https://doi.org/10.7196/SAJCH.2017.v11i2.1432>
- Lawn, J. E., Davidge, R., Paul, V. K., von Xylander, S., de Graft Johnson, J., Costello, A., . . . Molyneux, L. (2013). Born too soon: care for the preterm baby. *Reproductive Health*, 10(1), S5. doi:<https://doi.org/10.1186/1742-4755-10-S1-S5>
- Lawn, J. E., Davidge, R., Paul, V. K., von Xylander, S., Johnson, J. d. G., Costello, A., . . . Molyneux, L. (2013). Born too soon: care for the preterm baby. *Reproductive Health*, 10(Suppl 1), S5.

- Legendre, V., Burtner, P. A., Martinez, K. L., & Crowe, T. K. (2011). The Evolving Practice of Developmental Care in the Neonatal Unit: A Systematic Review. *Physical & Occupational Therapy In Pediatrics*, 31(3), 315-338. doi:<https://doi.org/10.3109/01942638.2011.556697>
- Leistner, R., Thürnagel, S., Schwab, F., Piening, B., Gastmeier, P., & Geffers, C. (2013). The impact of staffing on central venous catheter-associated bloodstream infections in preterm neonates—results of nation-wide cohort study in Germany. *Antimicrobial resistance and infection control*, 2(1), 11.
- Liaw, J. J., Yang, L., Ti, Y., Blackburn, S. T., Chang, Y. C., & Sun, L. W. (2010). Non-nutritive sucking relieves pain for preterm infants during heel stick procedures in Taiwan. *Journal of clinical nursing*, 19(19-20), 2741-2751. doi:<https://doi.org/10.3109/01942638.2011.556697>
- Limperopoulos, C., & Majnemer, A. (2002). The role of rehabilitation specialists in Canadian NICUs: A national survey. *Physical & Occupational Therapy In Pediatrics*, 22(1), 57-72.
- Lindorff, A., & Sammons, P. (2018). Going beyond structured observations: looking at classroom practice through a mixed method lens. *ZDM*, 50(3), 521-534. doi:<https://doi.org/10.1007/s11858-018-0915-7>
- Liu, L., Oza, S., Hogan, D., Chu, Y., Perin, J., Zhu, J., . . . Black, R. E. (2016). Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. *The Lancet*, 388(10063), 3027-3035. doi:[https://doi.org/10.1016/S0140-6736\(16\)31593-8](https://doi.org/10.1016/S0140-6736(16)31593-8)
- Lubbe, W. (2009). *Best practice guidelines for neurodevelopmental supportive care of the preterm infant*. (PhD Obstetrical and Neonatal Nursing Science Doctoral dissertation), North-West University (Potchefstroom Campus), Potchefstroom. Retrieved from <https://pdfs.semanticscholar.org/9919/4bdea06b10d3a7facea65f3b1f4c35297be2.pdf>.
- Lubbe, W. (2010). *Best practice guidelines for neurodevelopmental supportive care of the preterm infant*. (Doctoral dissertation), Doctoral dissertation, North-West University, Doctoral dissertation, North-West University.
- Lubbe, W. (2019). *Best Practice Guidelines for Neuro Developmental Supportive Care*. Retrieved from http://www.littlesteps.co.za/index.php?option=com_content&view=article&id=138&Itemid=118
- Lubbe, W., Van der Walt, C. S., & Klopper, H. C. (2012). Integrative literature review defining evidence-based neurodevelopmental supportive care of the preterm infant. *The Journal of Perinatal and Neonatal Nursing*, 26(3), 251-259. doi:10.1097/jpn.0b013e3182650b7e
- Ludwig, S., Steichen, J., Khoury, J., & Krieg, P. (2008). Quality improvement analysis of developmental care in infants less than 1500 grams at birth. *Newborn and Infant Nursing Reviews*, 8(2), 94-100. doi:10.1053/j.nainr.2008.03.011

- Lynch, E. A., Mudge, A., Knowles, S., Kitson, A. L., Hunter, S. C., & Harvey, G. (2018). "There is nothing so practical as a good theory": a pragmatic guide for selecting theoretical approaches for implementation projects. *BMC health services research*, 18(1), 857. doi:10.1186/s12913-018-3671-z.
- Lyngstad, L. T., Tandberg, B. S., Storm, H., Ekeberg, B. L., & Moen, A. (2014). Does skin-to-skin contact reduce stress during diaper change in preterm infants? *Early Human Development*, 90(4), 169-172. doi:10.1016/j.earlhumdev.2014.01.011.
- Maastrup, R., Weis, J., Engsig, A. B., Johannsen, K. L., & Zoffmann, V. (2018). 'Now she has become my daughter': parents' early experiences of skin-to-skin contact with extremely preterm infants. *Scandinavian journal of caring sciences*, 32(2), 545-553. doi:10.1111/scs.12478.
- Macho, P., & Zukowsky, K. (2017). Individualized developmental care in the NICU. *Advances in Neonatal Care*, 17(3), 162-174. doi:<https://doi.org/10.1097/ANC.0000000000000374>
- Macklin, R. (2014). Ethical challenges in implementation research. *Public Health Ethics*, 7(1), 86-93. doi:10.1093/phe/phu003
- Madlinger-Lewis, L., Reynolds, L., Zarem, C., Crapnell, T., Inder, T., & Pineda, R. (2014). The effects of alternative positioning on preterm infants in the neonatal intensive care unit: A randomized clinical trial. *Research in developmental disabilities*, 35(2), 490-497. doi:<https://doi.org/10.1016/j.ridd.2013.11.019>
- Manyisa, Z. M., & van Aswegen, E. J. (2017). Factors affecting working conditions in public hospitals: A literature review. *International journal of Africa nursing sciences*, 6, 28-38. doi:<https://doi.org/10.1016/j.ijans.2017.02.002>
- Maphumulo, W. T., & Bhengu, B. R. (2019). Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review. *Curationis*, 42(1), 1-9. doi:<https://doi.org/10.4102/curationis.v42i1.1901>
- March of Dimes, PMNCH, Save the Children, & WHO. (2012). *Born too soon: The global action report on preterm birth* (C. Howson, M. Kinney, & J. Lawn Eds.). Geneva: World Health Organization.
- Maree, C. M. (2009). *Model for training of reflective neonatal nurses in a South African context*. (Doctoral dissertation), University of Pretoria, Pretoria. Retrieved from <https://repository.up.ac.za/bitstream/handle/2263/24419/Complete.pdf?sequence=8>
- Martinez, A. M., Khu, D. T. K., Boo, N. Y., Neou, L., Saysanasongkham, B., & Partridge, J. C. (2012). Barriers to neonatal care in developing countries: parents' and providers' perceptions. *Journal of paediatrics and child health*, 48(9), 852-858. doi:10.1111/j.1440-1754.2012.02544.x.
- May, C. (2013). Towards a general theory of implementation. *Implementation Science*, 8(1), 18. doi:10.1186/1748-5908-8-18.
- May, C. R., Johnson, M., & Finch, T. (2016). Implementation, context and complexity. *Implementation Science*, 11(1), 141. doi:<https://doi.org/10.1186/s13012-016-0506-3>

- McAnulty, G., Duffy, F. H., Kosta, S., Weisenfeld, N. I., Warfield, S. K., Butler, S. C., . . . Zurakowski, D. (2013). School-age effects of the newborn individualized developmental care and assessment program for preterm infants with intrauterine growth restriction: Preliminary findings. *BMC pediatrics*, 13(1), 25. doi:10.1186/1471-2431-13-25
- McAnulty, G. B., Butler, S. C., Bernstein, J. H., Als, H., Duffy, F. H., & Zurakowski, D. (2010). Effects of the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) at age 8 years: preliminary data. *Clinical pediatrics*, 49(3), 258-270. doi:<https://doi.org/10.1177/0009922809335668>
- McCrae, J. S., Scannapieco, M., Leake, R., Potter, C. C., & Menefee, D. (2014). Who's on board? Child welfare worker reports of buy-in and readiness for organizational change. *Children and Youth Services Review*, 37, 28-35. doi:10.1016/j.chilyouth.2013.12.001
- McGrath, J. M., Cone, S., & Samra, H. A. (2011). Neuroprotection in the preterm infant: Further understanding of the short-and long-term implications for brain development. *Newborn and Infant Nursing Reviews*, 11(3), 109-112. doi:<https://doi.org/10.1053/j.nainr.2011.07.002>.
- McGrath, J. M., & Valenzuela, G. (1994). Integrating developmentally supportive caregiving into practice through education. *The Journal of perinatal & neonatal nursing*, 8(3), 46-57. doi:10.1097/00005237-199412000-00006
- McHugh, M. L. (2013). The chi-square test of independence. *Biochemia medica: Biochemia medica*, 23(2), 143-149.
- McMahon, E., Wintermark, P., & Lahav, A. (2012). Auditory brain development in premature infants: the importance of early experience. *Annals of the New York Academy of Sciences*, 1252(1), 17-24. doi:<https://doi.org/10.1111/j.1749-6632.2012.06445.x>
- Metz, A., & Bartley, L. (2012). Active implementation frameworks for program success. *Zero to Three*, 32(4), 11-18.
- Meyers, D. C., Durlak, J. A., & Wandersman, A. (2012). The quality implementation framework: a synthesis of critical steps in the implementation process. *American journal of community psychology*, 50(3-4), 462-480. doi:10.1007/s10464-012-9522-x.
- Meyers, D. C., Katz, J., Chien, V., Wandersman, A., Scaccia, J. P., & Wright, A. (2012). Practical implementation science: developing and piloting the quality implementation tool. *American journal of community psychology*, 50(3-4), 481-496. doi:10.1007/s10464-012-9521-y.
- Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., & Walker, A. (2005). Making psychological theory useful for implementing evidence based practice: a consensus approach. *BMJ Quality & Safety*, 14(1), 26-33. doi:10.1136/qshc.2004.011155.
- Mihalic, S., Irwin, K., Fagan, A., Ballard, D., & Elliott, D. (2004). Successful program implementation: Lessons from blueprints. *Juvenile Justice Bulletin*, 2004(July), 1-12.

- Milette, I., Martel, M.-J., da Silva, M. R., & Coughlin McNeil, M. (2017). Guidelines for the institutional implementation of developmental neuroprotective care in the NICU. Part B: recommendations and justification. A joint position statement from the CANN, CAPWHN, NANN, and COINN. *Canadian Journal of Nursing Research*, 49(2), 63-74. doi:10.1177/0844562117708126.
- Milette, I. H., Richard, L., & Martel, M.-J. (2005). Evaluation of a developmental care training programme for neonatal nurses. *Journal of Child health care*, 9(2), 94-109. doi:10.1177/1367493505051400.
- Mirlashari, J., Fomani, F. K., Brown, H., & Tabarsy, B. (2019). Nurses' and Physicians' Experiences of the NIDCAP Model Implementation in Neonatal Intensive Care Units in Iran. *Journal of pediatric nursing*, 45, e79-e88. doi:10.1016/j.pedn.2018.12.014.
- Moher, D., Schulz, K. F., Simera, I., & Altman, D. G. (2010). Guidance for developers of health research reporting guidelines. *PLoS Medicine*, 7(2). doi:<https://doi.org/10.1371/journal.pmed.1000217>
- Mokoena, M. J. (2017). *Perceptions of professional nurses on the impact of shortage of resources for quality patient care in a public hospital: Limpopo Province.*
- Montirosso, R., Del Prete, A., Bellù, R., Tronick, E., & Borgatti, R. (2012). Level of NICU quality of developmental care and neurobehavioral performance in very preterm infants. *Pediatrics*, 129(5), e1129-e1137. doi:10.1542/peds.2011-0813.
- Montirosso, R., Del Prete, A., Bellù, R., Tronick, E., Borgatti, R., & Group, N. A. C. f. Q. o. L. S. (2012). Level of NICU quality of developmental care and neurobehavioral performance in very preterm infants. *Pediatrics*, peds. 2011-0813. doi:<https://doi.org/10.1542/peds.2011-0813>
- Moody, C., Callahan, T. J., Aldrich, H., Gance-Cleveland, B., & Sables-Baus, S. (2017). Early initiation of newborn individualized developmental care and assessment program (NIDCAP) reduces length of stay: A quality improvement project. *Journal of pediatric nursing*, 32, 59-63. doi:10.1016/j.pedn.2016.11.001
- Mörelus, E., Broström, E. B., Westrup, B., Sarman, I., & Örténstrand, A. (2012). The Stockholm Neonatal Family-Centered Care Study: effects on salivary cortisol in infants and their mothers. *Early Human Development*, 88(7), 575-581. doi:10.1016/j.earlhumdev.2011.12.033.
- Morgan, D. L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of mixed methods research*, 1(1), 48-76. doi:<https://doi.org/10.1177/2345678906292462>
- Morris, Z. S., Wooding, S., & Grant, J. (2011). The answer is 17 years, what is the question: Understanding time lags in translational research. *Journal of the Royal Society of Medicine*, 104(12), 510-520. doi:10.1258/jrsm.2011.110180

- Morse, J. M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing research*, 40(2), 120-123.
- Mosqueda-Peña, R., Lora-Pablos, D., Pavón-Muñoz, A., Ureta-Velasco, N., Moral-Pumarega, M. T., & Pallás-Alonso, C. R. (2016). Impact of a developmental care training course on the knowledge and satisfaction of health care professionals in neonatal units: A multicenter study. *Pediatrics & Neonatology*, 57(2), 97-104. doi:10.1016/j.pedneo.2015.04.010.
- Mosqueda, R., Castilla, Y., Perapoch, J., de la Cruz, J., López-Maestro, M., & Pallás, C. (2013). Staff perceptions on Newborn Individualized Developmental Care and Assessment Program (NIDCAP) during its implementation in two Spanish neonatal units. *Early Human Development*, 89(1), 27-33. doi:10.1016/j.earlhumdev.2012.07.013
- Moullin, J. C., Sabater-Hernández, D., Fernandez-Llimos, F., & Benrimoj, S. I. (2015). A systematic review of implementation frameworks of innovations in healthcare and resulting generic implementation framework. *Health Research Policy and Systems*, 13(1), 16. doi:10.1186/s12961-015-0005-z.
- Mwaniki, M. K., Atieno, M., Lawn, J. E., & C, N. C. R. J. (2012). Long-term neurodevelopmental outcomes after intrauterine and neonatal insults: A systematic review. *The Lancet*, 379(9814), 445-452. doi:10.1016/S0140-6736(11)61577-8.
- Naranjee, N., Sibiya, M. N., & Ngxongo, T. S. P. (2019). Development of a financial management competency framework for Nurse Managers in public health care organisations in the province of KwaZulu-Natal, South Africa. *International journal of Africa nursing sciences*, 11, 100154. doi:<https://doi.org/10.1016/j.ijans.2019.100154>
- NCEC, N. C. E. C. (2018). Implementation Guide and Toolkit for National Clinical Guidelines.
- Nelson, A. M., & Bedford, P. J. (2016). Mothering a preterm infant receiving NIDCAP care in a level III newborn intensive care unit. *Journal of pediatric nursing*, 31(4), e271-e282. doi:10.1016/j.pedn.2016.01.001.
- Nelson, K. (2019). Newborn Individual Development Care and Assessment Program (NIDCAP): A Follow-up Systematic Review of the Literature.
- NICE: National Institute for Health and Care Excellence. (2007). How to change practice: Understand, identify and overcome barriers to change. Retrieved from <https://www.nice.org.uk/Media/Default/About/what-we-do/Into-practice/Support-for-service-improvement-and-audit/How-to-change-practice-barriers-to-change.pdf>
- Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of general psychology*, 2(2), 175-220. doi: <https://doi.org/10.1037/1089-2680.2.2.175>
- Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science*, 10(1), 53. doi:<https://doi.org/10.1186/s13012-015-0242-0>

- Nilsen, P., & Bernhardsson, S. (2019). Context matters in implementation science: a scoping review of determinant frameworks that describe contextual determinants for implementation outcomes. *BMC Health Services Research*, 19(1), 189. doi:<https://doi.org/10.1186/s13012-015-0242-0>
- Nyqvist, K. H., Häggkvist, A.-P., Hansen, M. N., Kylberg, E., Frandsen, A. L., Maastrup, R., . . . Haiek, L. N. (2013). Expansion of the baby-friendly hospital initiative ten steps to successful breastfeeding into neonatal intensive care: expert group recommendations. *Journal of Human Lactation*, 29(3), 300-309. doi:<https://doi.org/10.1177/0890334413489775>
- O'Brien, K., Bracht, M., Macdonell, K., McBride, T., Robson, K., O'Leary, L., . . . Levin, A. (2013). A pilot cohort analytic study of Family Integrated Care in a Canadian neonatal intensive care unit. *BMC Pregnancy and Childbirth*, 13(S1), S12. doi:<https://doi.org/10.1186/1471-2393-13-S1-S12>
- O'Callaghan, N., Dee, A., & Philip, R. K. (2019). Evidence-based design for neonatal units: a systematic review. *Maternal health, neonatology and perinatology*, 5(1), 6. doi:<https://doi.org/10.1186/s40748-019-0101-0>
- Ohlsson, A., & Jacobs, S. E. (2013). NIDCAP: A systematic review and meta-analyses of randomized controlled trials. *Pediatrics*, 131(3), e881-e893. doi:10.1542/peds.2012-2121.
- Örtenstrand, A., Westrup, B., Broström, E. B., Sarman, I., Åkerström, S., Brune, T., . . . Waldenström, U. (2010). The Stockholm Neonatal Family Centered Care Study: effects on length of stay and infant morbidity. *Pediatrics*, 125(2), e278-e285. doi:10.1542/peds.2009-1511.
- Østergaard, H., Østergaard, D., & Lippert, A. (2008). Implementation of team training in medical education in Denmark. *Postgraduate medical journal*, 84(996), 507-511. doi:10.1136/qshc.2004.009985.
- Palinkas, L. A., Aarons, G. A., Horwitz, S., Chamberlain, P., Hurlburt, M., & Landsverk, J. (2011). Mixed method designs in implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(1), 44-53. doi:10.1007/s10488-010-0314-z.
- Palinkas, L. A., Mendon, S. J., & Hamilton, A. B. (2019). Innovations in mixed methods evaluations. *Annual review of public health*, 40, 423-442. doi:10.1146/annurev-publhealth-040218-044215.
- Park, J., & Kim, J.-S. (2019). Factors Influencing Developmental Care Practice Among Neonatal Intensive Care Unit Nurses. *Journal of pediatric nursing*, 47, e10-e15. doi:10.1016/j.pedn.2019.03.014.
- Patrício, M., Julião, M., Fareleira, F., Young, M., Norman, G., & Vaz Carneiro, A. (2009). A comprehensive checklist for reporting the use of OSCEs. *Medical teacher*, 31(2), 112-124. doi:10.1080/01421590802578277.
- Pereira, F. L., Góes, F., Fonseca, L. M. M., Scochi, C. G. S., Castral, T. C., & Leite, A. M. (2013). Handling of preterm infants in a neonatal intensive care unit. *Rev Esc Enferm USP [internet]*, 47(6), 1272-1278.
- Peters, D. H., Tran, N. T., & Adam, T. (2013). *Implementation research in health: a practical guide*: World Health Organization.

- Peters, K. L., Rosychuk, R. J., Hendson, L., Coté, J. J., McPherson, C., & Tyebkhan, J. M. (2009). Improvement of short-and long-term outcomes for very low birth weight infants: Edmonton NIDCAP trial. *Pediatrics*, 124(4), 1009-1020. doi:10.1542/peds.2008-3808.
- Petticrew, M., Semple, S., Hilton, S., Creely, K. S., Eadie, D., Ritchie, D., . . . Hurley, F. (2007). Covert observation in practice: lessons from the evaluation of the prohibition of smoking in public places in Scotland. *BMC Public Health*, 7(1), 204. doi:10.1186/1471-2458-7-204
- Pettigrew, A. M., Woodman, R. W., & Cameron, K. S. (2001). Studying organizational change and development: Challenges for future research. *Academy of management journal*, 44(4), 697-713. doi:<http://dx.doi.org/10.2307/3069411>
- Pfadenhauer, L. M., Mozygemba, K., Gerhardus, A., Hofmann, B., Booth, A., Lysdahl, K. B., . . . Rehfuss, E. A. (2015). Context and implementation: a concept analysis towards conceptual maturity. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*, 109(2), 103-114. doi:10.1016/j.zefq.2015.01.004.
- Phellas, C. N., Bloch, A., & Seale, C. (2011). Structured methods: interviews, questionnaires and observation. *Researching society and culture*, 3, 181-205.
- Philips Healthcare Education. (2020). Global Wee Care. Retrieved from <https://www.learningconnection.philips.com/en/course/global-wee-care>
- Phillips, A. C., Lewis, L. K., McEvoy, M. P., Galipeau, J., Glasziou, P., Moher, D., . . . Williams, M. T. (2016). Development and validation of the guideline for reporting evidence-based practice educational interventions and teaching (GREET). *BMC medical education*, 16(1), 237. doi:<https://doi.org/10.1186/s12909-016-0759-1>
- Phillips, R., Goldstein, M., Hougland, K., Nandyal, R., Pizzica, A., Santa-Donato, A., . . . Yost, E. (2013). Multidisciplinary guidelines for the care of late preterm infants. *Journal of Perinatology*, 33(S2), S5. doi:10.1038/jp.2013.53
- Phillips, R. M. (2015). Seven core measures of neuroprotective family-centered developmental care: Creating an infrastructure for implementation. *Newborn and Infant Nursing Reviews*, 15(3), 87-90. doi:<https://doi.org/10.1053/j.nainr.2015.06.004>
- Pickler, R. H., McGrath, J. M., Reyna, M. B. A., McCain, N., Lewis, M. M., Cone, M. S., . . . Best, A. (2010). A model of neurodevelopmental risk and protection for preterm infants. *The Journal of perinatal & neonatal nursing*, 24(4), 356. doi:10.1097/JPN.0b013e3181fb1e70.
- Posner, G. J., & Rudnitsky, A. N. (1994). *Course design: A guide to curriculum development for teachers*. Harlow: Longman.
- Post, A. C., & Maree, C. M. (2009). Guidelines for the implementation of developmental care for preterm and sick neonates: paediatrics. *Professional Nursing Today*, 13(1), 38-40.

- Powell, B. J., Waltz, T. J., Chinman, M. J., Damschroder, L. J., Smith, J. L., Matthieu, M. M., . . . Kirchner, J. E. (2015). A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implementation Science*, 10(1), 21. doi:<https://doi.org/10.1186/s13012-015-0209-1>
- Prager, E. M., Chambers, K. E., Plotkin, J. L., McArthur, D. L., Bandrowski, A. E., Bansal, N., . . . Graf, C. (2019). Improving transparency and scientific rigor in academic publishing. *Journal of neuroscience research*, 97(4), 377-390. doi:10.1002/jnr.24340
- Pratt, B., & Hyder, A. A. (2015). Global justice and health systems research in low- and middle-income countries. *The Journal of Law, Medicine & Ethics*, 43(1), 143-161. doi:<https://doi.org/10.1111/jlme.12202>
- Pratt, B., & Hyder, A. A. (2015). Reinterpreting Responsiveness for Health Systems Research in Low and Middle-Income Countries. *Bioethics*, 29(6), 379-388. doi:10.1111/bioe.12138.
- Proctor, E., Silmere, H., Raghavan, R., Hovmand, P., Aarons, G., Bunger, A., . . . Hensley, M. (2011). Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Administration and Policy in Mental Health and Mental Health Services Research*, 38(2), 65-76. doi:10.1007/s10488-010-0319-7.
- Proctor, E. K., Landsverk, J., Aarons, G., Chambers, D., Glisson, C., & Mittman, B. (2009). Implementation research in mental health services: An emerging science with conceptual, methodological, and training challenges. *Administration and Policy in Mental*, 36(1), 24-34. doi:10.1007/s10488-008-0197-4.
- Proctor, E. K., Powell, B. J., & McMillen, J. C. (2013). Implementation strategies: recommendations for specifying and reporting. *Implementation Science*, 8(1), 139.
- Rakhetla, M. M. E., & Lubbe, W. (2016). Neonatal intensive care units design: Implementation strategies in South Africa. *Newborn and Infant Nursing Reviews*, 16(4), 245-250. doi:<https://doi.org/10.1053/j.nainr.2016.09.032>
- Ramezani, T., Shirazi, Z. H., Sarvestani, R. S., & Moattari, M. (2014). Family-centered care in neonatal intensive care unit: a concept analysis. *International journal of community based nursing and midwifery*, 2(4), 268.
- Ramokolo, V., Mlaba, T., Rhoda, N., Kauchali, S., & Goga, A. (2019). *A landscape analysis on preterm birth in South Africa: Systemic gaps and solutions*.
- Ranchod, S., Adams, C., Burger, R., Carvounes, A., Dreyer, K., Smith, A., . . . Van Biljon, C. (2017). South Africa's hospital sector: old divisions and new developments. *South African health review*, 2017(1), 101-110.
- Ratnapalan, S., & Hilliard, R. I. (2002). Needs assessment in postgraduate medical education: a review. *Medical Education Online*, 7(1), 4542. doi:<https://doi.org/10.3402/meo.v7i.4542>

- Reid, S. J., Peacocke, J., Kornik, S., & Wolvaardt, G. (2018). Compulsory community service for doctors in South Africa: A 15-year review. *South African Medical Journal*, 108(9).
- Rheeder, A., Lubbe, W., & Pretorius, R. (2017). Compliance With Best Practice Guidelines for Neurodevelopmental Supportive Care in South Africa: A Situational Analysis. *The Journal of perinatal & neonatal nursing*. doi:<https://doi.org/10.1097/jpn.0000000000000275>
- Rhoda, N., Velaphi, S., Gebhardt, G., Kauchali, S., & Barron, P. (2018). Reducing neonatal deaths in South Africa: Progress and challenges. *South African Medical Journal*, 108(3), 9-16. doi:10.7196/SAMJ.2017.v108i3b.12804
- Robins, C. S., Ware, N. C., DosReis, S., Willging, C. E., Chung, J. Y., & Lewis-Fernández, R. (2008). Dialogues on mixed-methods and mental health services research: Anticipating challenges, building solutions. *Psychiatric Services*, 59(7), 727-731. doi:10.1176/appi.ps.59.7.727.
- Robison, L. D. (2003). An organizational guide for an effective developmental program in the NICU. *Journal of Obstetric, Gynecologic and Neonatal Nursing*, 32(3), 379-386. doi:<https://doi.org/10.1177/0884217503253536>
- Robison, L. D. (2003). An organizational guide for an effective developmental program in the NICU. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 32(3), 379-386.
- Rodríguez, R. G., & Pattini, A. E. (2016). Neonatal intensive care unit lighting: update and recommendations. *Archivos argentinos de pediatría*, 114(4), 361-367. doi:<https://doi.org/10.5546/aap.2016.361>
- Rogers, E. M. (2010). *Diffusion of innovations*. New York: The Free Press.
- Ross, J., Stevenson, F., Dack, C., Pal, K., May, C., Michie, S., . . . Murray, E. (2018). Developing an implementation strategy for a digital health intervention: an example in routine healthcare. *BMC health services research*, 18(1), 794. doi:<https://doi.org/10.1186/s12913-018-3615-7>
- Salas, E., Tannenbaum, S. I., Kraiger, K., & Smith-Jentsch, K. A. (2012). The science of training and development in organizations: What matters in practice. *Psychological science in the public interest*, 13(2), 74-101. doi:10.1177/1529100612436661
- Sannino, P., Giannì, M. L., De Bon, G., Fontana, C., Picciolini, O., Plevani, L., . . . Mosca, F. (2016). Support to mothers of premature babies using NIDCAP method: a non-randomized controlled trial. *Early Human Development*, 95, 15-20. doi:10.1016/j.earlhumdev.2016.01.016.
- Scaccia, J. P., Cook, B. S., Lamont, A., Wandersman, A., Castellow, J., Katz, J., & Beidas, R. S. (2015). A practical implementation science heuristic for organizational readiness: R= MC2. *Journal of Community Psychology*, 43(4), 484-501. doi:10.1002/jcop.21698.
- Schoonenboom, J., & Johnson, R. B. (2017). How to construct a mixed methods research design. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 69(2), 107-131. doi:<https://doi.org/10.1007/s11577-017-0454-1>

- Schuster, M. A. (2015). Measuring quality of pediatric care: where we've been and where we're going. *Pediatrics*, 135(4), 748-751.
doi:<https://doi.org/10.1542/peds.2014-3082>
- Shah, P. S., Herbozo, C., Aliwalas, L. L., & Shah, V. S. (2012). Breastfeeding or breast milk for procedural pain in neonates. *The Cochrane Library*.
doi:<https://doi.org/10.1002/14651858.cd004950.pub3>
- Shahheidari, M., & Homer, C. (2012). Impact of the design of neonatal intensive care units on neonates, staff, and families: a systematic literature review. *The Journal of perinatal & neonatal nursing*, 26(3), 260-266.
doi:10.1097/JPN.0b013e318261ca1d.
- Shannon-Baker, P. (2016). Making paradigms meaningful in mixed methods research. *Journal of mixed methods research*, 10(4), 319-334.
doi:<https://doi.org/10.1177/1558689815575861>
- Shea, C. M., Jacobs, S. R., Esserman, D. A., Bruce, K., & Weiner, B. J. (2014). Organizational readiness for implementing change: a psychometric assessment of a new measure. *Implementation Science*, 9(1), 7.
doi:<https://doi.org/10.1186/1748-5908-9-7>
- Sheldon, R. E. (2017). Developmental Care for Preemies and their Families: One Neonatologist's Journey toward NIDCAP Practice. *NeoReviews*, 18(10), e568-e575. doi:10.1542/neo.18-10-e568
- Silberstein, D., & Litmanovitz, I. (2016). Developmental care in the neonatal intensive care unit according to newborn individualized developmental care and assessment program (NIDCAP). *Harefuah*, 155(1), 27-31, 68, 67.
- Sizun, J., & Westrup, B. (2004). Early developmental care for preterm neonates: a call for more research. *Archives of Disease in Childhood-Fetal and Neonatal Edition*, 89(5), F384-F388. doi:10.1136/ad.2002.025114
- Smith, G. C., Gutovich, J., Smyser, C., Pineda, R., Newnham, C., Tjoeng, T. H., . . . Inder, T. (2011). Neonatal intensive care unit stress is associated with brain development in preterm infants. *Annals of neurology*, 70(4), 541-549.
doi:10.1002/ana.22545.
- Smith, J. G., Desai, P. P., Sira, N., & Engelke, S. C. (2014). Family-centered developmentally supportive care in the neonatal intensive care unit: Exploring the role and training of child life specialists. *Children's Health Care*, 43(4), 345-368. doi:<https://doi.org/10.1080/02739615.2014.880917>
- Soleimani, F., Torkzahrani, S., Rafiey, H., Salavati, M., & Nasiri, M. (2017). Assessing Factors Influencing the Quality of Developmental Care in Neonatal Intensive Care Units of Tehran. *Iranian Journal of Pediatrics*, 27(1). doi:10.5812/ijp.6733
- Solhaug, M., Bjørk, I. T., & Sandtrø, H. P. (2010). Staff perception one year after implementation of the the newborn individualized developmental care and assessment program (NIDCAP). *Journal of pediatric nursing*, 25(2), 89-97.
doi:10.1016/j.pedn.2009.11.004.
- Spicker, P. (2011). Ethical covert research. *Sociology*, 45(1), 118-133.
doi:<https://doi.org/10.1177/0038038510387195>

- Statistics South Africa. (2017). Recorded live births. Retrieved from <http://www.statssa.gov.za/publications/P0305/P03052017.pdf>
- Stevens, B., Yamada, J., Lee, G. Y., & Ohlsson, A. (2013). Sucrose for analgesia in newborn infants undergoing painful procedures. *Cochrane Database Syst Rev*, 1(1). doi:<https://doi.org/10.1002/14651858.CD001069.pub4>
- Stevens, D. C., Helseth, C. C., Thompson, P. A., Pottala, J. V., Khan, M. A., & Munson, D. P. (2012). A comprehensive comparison of open-bay and single-family-room neonatal intensive care units at Sanford Children's Hospital. *HERD: Health Environments Research & Design Journal*, 5(4), 23-39. doi:10.1177/193758671200500403.
- Sturdivant, C. (2013). A collaborative approach to defining neonatal therapy. *Newborn and Infant Nursing Reviews*, 13(1), 23-26. doi: 10.1053/j.nainr.2012.12.010
- Symington, A., & Pinelli, J. (2006). Developmental care for promoting development and preventing morbidity in preterm infants. *The Cochrane Library*, 19(2), CD001814. doi:10.1002/14651858.CD001814.pub2.
- Symington, A., & Pinelli, J. M. (2002). Distilling the evidence on developmental care: a systematic review. *Advances in Neonatal Care*, 2(4), 198-221.
- Tabak, R. G., Khoong, E. C., Chambers, D. A., & Brownson, R. C. (2012). Bridging research and practice: models for dissemination and implementation research. *American journal of preventive medicine*, 43(3), 337-350. doi:10.1016/j.amepre.2012.05.024.
- Taylor, R. R. (2017). *Kielhofner's research in occupational therapy: Methods of inquiry for enhancing practice*. Philadelphia: FA Davis.
- Teddlie, C., & Tashakkori, A. (2010). Overview of contemporary issues in mixed methods research. *Handbook of mixed methods in social and behavioral research*, 2, 1-41.
- Teo, S. T., Pick, D., Newton, C. J., Yeung, M. E., & Chang, E. (2013). Organisational change stressors and nursing job satisfaction: the mediating effect of coping strategies. *Journal of Nursing Management*, 21(6), 878-887. doi:10.1111/jonm.12120.
- Tjora, A. H. (2006). Writing small discoveries: an exploration of fresh observers' observations. *Qualitative research*, 6(4), 429-451. doi:<https://doi.org/10.1177/1468794106068012>
- Tolle, E. (2005). *A New Earth* (p. 99). New York, London etc: Penguin Group.
- Turnock, C., & Gibson, V. (2001). Validity in action research: a discussion on theoretical and practice issues encountered whilst using observation to collect data. *Journal of advanced nursing*, 36(3), 471-477. doi: <https://doi.org/10.1046/j.1365-2648.2001.01995.x>
- Ullenhag, A., Persson, K., & Nyqvist, K. H. (2009). Motor performance in very preterm infants before and after implementation of the newborn individualized developmental care and assessment programme in a neonatal intensive care unit. *Acta Paediatrica*, 98(6), 947-952. doi:10.1111/j.1651-2227.2009.01258.x.

- UNICEF, U. I.-A. G. f. C. M. E. (2017). Levels and trends in child mortality: Report 2017. from United Nations Children's Fund.
- Vakola, M. (2013). Multilevel readiness to organizational change: A conceptual approach. *Journal of Change Management*, 13(1), 96-109. doi:<https://doi.org/10.1080/14697017.2013.768436>
- Vakola, M. (2014). What's in there for me? Individual readiness to change and the perceived impact of organizational change. *Leadership & Organization Development Journal*, 35(3), 195-209. doi:<https://doi.org/10.1108/LODJ-05-2012-0064>
- Valizadeh, S., Hosseini, M., Jafarabadi, M. A., Mirnia, K., Saeidi, F., & Jabraeeli, M. (2017). Comparison of 2 Methods of Light Reduction on Preterm Infants' Sleep Pattern in NICU: A Randomized Controlled Trial. *Crescent Journal of Medical and Biological Sciences*, 4(4), 211-216.
- Van den Berg, K. A. (2007). Individualized developmental care for high risk newborns in the NICU: a practice guideline. *Early Human Development*, 83(7), 433-442. doi:<https://doi.org/10.1016/j.earlhumdev.2007.03.008>
- VERBI Software. (2018). MAXQDA 2018, computer program, Berlin.
- Vergara, E., Anzalone, M., Bigsby, R., Gorga, D., Holloway, E., Hunter, J., . . . Roley, S. S. (2006). Specialized knowledge and skills for occupational therapy practice in the neonatal intensive care unit. *American Journal of Occupational Therapy*, 60(6), 659-668. doi:10.5014/ajot.60.6.659
- Victora, C. G., & Rubens, C. E. (2010). Global report on preterm birth and stillbirth (4 of 7): delivery of interventions. *BMC Pregnancy and Childbirth*, 10(Suppl 1), S4. doi:<https://doi.org/10.1186/1471-2393-10-S1-S4>
- Vohr, B. (2014). *Speech and language outcomes of very preterm infants*. Paper presented at the Seminars in Fetal and Neonatal Medicine.
- Waitzman, K. A. (2007). The importance of positioning the near-term infant for sleep, play, and development. *Newborn and Infant Nursing Reviews*, 7(2), 76-81. doi:<https://doi.org/10.1053/j.nainr.2007.05.004>
- Wakida, E. K., Talib, Z. M., Akena, D., Okello, E. S., Kinengyere, A., Mindra, A., & Obua, C. (2018). Barriers and facilitators to the integration of mental health services into primary health care: A systematic review. *Systematic reviews*, 7(1), 211. doi:10.1186/s13643-017-0561-0.
- Wallin, L., Ewald, U., Wikblad, K., Scott-Findlay, S., & Arnetz, B. B. (2006). Understanding work contextual factors: a short-cut to evidence-based practice? *Worldviews on Evidence-Based Nursing*, 3(4), 153-164. doi:<https://doi.org/10.1111/j.1741-6787.2006.00067.x>
- Wandersman, A., Chien, V. H., & Katz, J. (2012). Toward an evidence-based system for innovation support (tools, training, technical assistance, quality improvement/quality assurance) for implementing innovations with quality to achieve desired outcomes. *American journal of community psychology*, 50, 445-459.
- Wandersman, A., Duffy, J., Flaspohler, P., Noonan, R., Lubell, K., Stillman, L., . . . Saul, J. (2008). Bridging the gap between prevention research and practice:

- The interactive systems framework for dissemination and implementation. *American journal of community psychology*, 41(3-4), 171-181.
doi:10.1007/s10464-008-9174-z
- Warren, I. (2017). Family and Infant Neurodevelopmental Education: an innovative, educational pathway for neonatal healthcare professionals. *Infant*, 13(5), 200-203.
- Warren, I., Mat-Ali, E., Green, M., & Nyathi, D. (2019). Evaluation of the Family and Infant Neurodevelopmental Education (FINE) programme in the UK. *Journal of Neonatal Nursing*, 25(2), 93-98.
doi:<https://doi.org/10.1016/j.jnn.2018.11.004>
- Weiner, B. J. (2009). A theory of organizational readiness for change. *Implementation Science*, 4(1), 67.
- Weiner, B. J., Amick, H., & Lee, S.-Y. D. (2008). Conceptualization and measurement of organizational readiness for change: A review of the literature in health services research and other fields. *Medical care research and review*, 65(4), 379-436. doi:10.1177/1077558708317802.
- Weiner, B. J., Lewis, M. A., & Linnan, L. A. (2008). Using organization theory to understand the determinants of effective implementation of worksite health promotion programs. *Health education research*, 24(2), 292-305.
doi:10.1093/her/cyn019.
- Welch, C. D., Check, J., & O'Shea, T. M. (2017). Improving care collaboration for NICU patients to decrease length of stay and readmission rate. *BMJ Open Qual*, 6(2), e000130.
- Wensing, M., Oxman, A., Baker, R., Godoycki-Cwirko, M., Flottorp, S., Szecsenyi, J., . . . Eccles, M. (2011). Tailored implementation for chronic diseases (TICD): A project protocol. *Implementation Science*, 6(1), 103.
doi:10.1186/1748-5908-6-103
- Western Cape Government. (2012). *Department of Health Annual Performance Plan 2012/2013*. Cape Town: WC-DoH.
- White, R. D., Smith, J., & Shepley, M. (2013). Recommended standards for newborn ICU design. *Journal of Perinatology*, 33(S1), S2.
doi:<https://doi.org/10.1038/jp.2013.10>
- Whitelaw, A., & Sleath, K. (1985). Myth of the marsupial mother: Home care of very low birth weight babies in Bogota, Colombia. *The Lancet*, 325(8439), 1206-1208. doi:10.1016/s0140-6736(85)92877-6.
- Whitworth, J., Sewankambo, N. K., & Snewin, V. A. (2010). Improving implementation: Building research capacity in maternal, neonatal, and child health in Africa. *PLoS Medicine*, 7(7), e1000299.
doi:<https://doi.org/10.1371/journal.pmed.1000299>
- WHO. (2002). *Community Noise- Environmental Health Criteria Document, External Review Draft*. Geneva: WHO Publishing.

- WHO, W. H. O. (Producer). (2010). WHO: Essential newborn care training course. Retrieved from http://www.who.int/maternal_child_adolescent/documents/newborncare_course/en/
- WHO, W. H. O. (2012). Born too soon: the global action report on preterm birth.
- Wilson, J. R., Allen, J., & Pfalzer, S. M. (1996). Providing a seamless service system from hospital to home: The NICU training project. *Infants & Young Children*, 8(3), 77-84.
- World Health Organization, W. (2015). WHO recommendations on interventions to improve preterm birth outcomes.
- Wu, K.-S., Chen, Y.-S., Lin, H.-S., Hsieh, E.-L., Chen, J.-K., Tsai, H.-C., . . . Sy, C. L. (2017). A nationwide covert observation study using a novel method for hand hygiene compliance in health care. *American journal of infection control*, 45(3), 240-244. doi:10.1016/j.ajic.2016.10.010.
- Wyber, R., Vaillancourt, S., Perry, W., Mannava, P., Folaranmi, T., & Celi, L. A. (2015). Big data in global health: improving health in low-and middle-income countries. *Bulletin of the World Health Organization*, 93, 203-208. doi:10.2471/BLT.14.139022
- Zarem, C., Crapnell, T., Tiltges, L., Madlinger, L., Reynolds, L., Lukas, K., & Pineda, R. (2013). Neonatal nurses' and therapists' perceptions of positioning for preterm infants in the neonatal intensive care unit. *Neonatal network: NN*, 32(2), 110. doi:<https://doi.org/10.1891/0730-0832.32.2.110>
- Zhang, X., Lee, S.-Y., Chen, J., & Liu, H. (2014). Factors Influencing Implementation of Developmental Care Among NICU Nurses in China. *Clinical nursing research*, 1054773814547229. doi:<https://doi.org/10.1177/1054773814547229>
- Zhang, X., Lee, S.-Y., Chen, J., & Liu, H. (2016). Factors influencing implementation of developmental care among NICU nurses in China. *Clinical nursing research*, 25(3), 238-253. doi:10.1177/1054773814547229.

APPENDICES

Appendix A: Information letter



Information letter and consent form

Good day,

My name is Lizelle Jacobs, a PhD student registered at the University of the Witwatersrand. I would like to invite you to participate in my study titled: *The implementation of a multidisciplinary neurodevelopmental supportive care training programme related to preterm infants in the South African public healthcare sector.*

Research indicates that the neonatal intensive care Unit (NICU) environment is not supportive of the needs of the preterm infant. Neurodevelopmental supportive care (NDSC) is a range of interventions designed to minimise the stress that preterm infants often experience in the NICU environment and has been highlighted as best practice in the NICU. The NDSC approach emphasises individualised care and includes aspects such as lighting, sound, positioning, handling of preterm infants and reading stress signs of preterm infants. It is recommended internationally that this approach should be implemented to meet the unique needs of the preterm infant.

The World Health Organization (WHO) endorses implementation research to bridge the gap between research and practice. It contributes to the process of applying evidence-based interventions into the real world. Implementation research does not only focus on the implementation of the intervention but also on the contextual factors which can facilitate or hinder the process of implementation.

The researcher will aim to implement a multidisciplinary NDSC training programme with the ultimate goal of a wider adoption of the NDSC approach in the NICUs in South Africa.

Implementation of any programme is a complex process and includes various pre-and post-implementation stages such as determining training needs, conducting an intervention fit assessment, determining the multidisciplinary team's (MDT) readiness for change and assessing the implementation process following the implementation. The study is based on the four phases of the Quality Implementation Framework (QIF).

You are invited to participate in the following phases and stages of the study:

Phase 1:

- To determine the training needs of the MDT on NDSC
- To determine the readiness of the MDT for implementation of the NDSC training programme

Phase 2:

- To develop a structure for implementation

Phase 3:

- Participation in the multidisciplinary NDSC training programme
- To identify barriers and facilitators in the implementation process

Informed consent will be obtained from all multidisciplinary team members (doctors, nurses, physiotherapists, occupational therapists, speech therapists, audiologists and dietitians) who are currently providing a service in the NICU and who are willing to participate in the study. Confidentiality will be maintained at all times through the use of subject codes and the subject codes list will be kept separate from all data collected. Participation in the study is voluntary.

If you have any queries, please feel free to contact me on 082 334 2308. Please direct any ethical queries to the chairperson of the Wits Research Ethics Committee, Prof P. Cleaton-Jones on telephone number (011) 717 1234.

If you are willing to participate in the study, please read and sign the attached consent form.

Thank you

Lizelle Jacobs

Supervisor:

Name: Prof Daleen Casteleijn

Phone: (011) 717 3701

Email: daleen.casteleijn@wits.ac.za

Researcher:

Name: Lizelle Jacobs

Phone: (011) 717 3701

Email: lizelle.jacobs@wits.ac.za

I, _____, agree to participate in the study: *The implementation of a multidisciplinary neurodevelopmental supportive care training programme related to preterm infants in the South African public health sector*, as outlined in the information sheet.

Signature: _____

Date: _____

Appendix B: Ethical clearance certificate



R14/49 Mrs Lizelle Jacobs

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M160120

NAME: Mrs Lizelle Jacobs
(Principal Investigator)
DEPARTMENT: Occupational Therapy



PROJECT TITLE: The Implementation of a Multi-Disciplinary, Neurodevelopmental Supportive Care Training Programme Related to Preterm Infants in the South African Public Health Sector

DATE CONSIDERED: 29/01/2016

DECISION: Approved unconditionally

CONDITIONS:

SUPERVISOR: Prof Daleen Casteleijn

APPROVED BY: 
Professor P. Cleaton-Jones, Chairperson, HREC (Medical)

DATE OF APPROVAL: 12/05/2017

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 Secretary in Room 10004, 10th floor, Senate House/3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/We fully understand the conditions under which I am/we are authorised 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 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 January and will therefore be due in the month of January each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature _____

Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix C: Demographic questionnaire

Subject code: _____

Hospital				
Profession				
Year qualified				
Qualification (s) obtained (degree/diploma/other)				
Number of years' experience in NICU				
Number of years working in current NICU				
Undergraduate training on NDSC				
Post graduate training on NDSC				
Would you be interested to be part of the NDSC training programme planning and implementation process (champion)	Yes		No	

* NICU: Neonatal intensive care unit; NDSC: Neurodevelopmental supportive care

Appendix D: The adapted Implementation of Neurodevelopmental Supportive Care (INDeSC) tool

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

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

Appendix E: Analytical framework for the qualitative analysis of the Implementation of Neurodevelopmental Supportive Care (INDeSC) survey including new codes

CATEGORIES (NDSC CATEGORIES)	CODES (NDSC SUBCATEGORY)
1. NICU design	
2. Individualised care	2.1 Observation
	2.2 Care
3. Family-centred philosophy	3.1 Parents as active participants
	3.2 Privacy and comfort
	3.3 Visitation
	3.4 Parent support groups
4. Positioning	4.1 Anatomical infant positioning
	4.2 Orientation
	4.3 Individualised bedding
5. Handling techniques	5.1 Care according to maturation
	5.2 State changes
	5.3 Promotion of rest and sleep
	5.4 Modified hands-on caregiving
	5.5 Positive tactile stimulation
	5.6 Movement
	5.7 Self-regulation
6. Environmental manipulation	6.1 Noise
	6.2 Light
	6.3 Olfactory
7. Pain management	
8. Knowledge of infant development	8.1 Staff
	8.2 Parental education
9. Feeding	
NEW CATEGORIES AND CODES	
10. Resources	10.1 Staff shortages
	10.2 High workload
	10.3 Equipment or materials
11. Medical interventions of issues	11.1 Medical care rather than developmental care

Appendix F: The Implementation of Neurodevelopmental Supportive Care (INDeSC) tool

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
1. ICU 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					
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 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.					
3. 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 Mothers 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 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 Privacy is provided for parents Information is shared between professionals and parents regarding their infant's developmental needs.					
	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, (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. Positioning	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) Containment: The infants are contained with the use of individualised bedding and positioning tools to contain the infant in flexion and the hips neutral. Midline: The head should be positioned in midline and in line with the body - especially in acutely ill infants to promote hands to face. Flexion: Limbs and shoulders should be flexed (bent) during positioning with postural support using firm boundaries.	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. The infants are contained The infants have firm boundaries that fit snugly 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. 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.					

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	
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 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 hands accessible for exploration of the face.	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 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 (Kinesthetic 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						

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
6. 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. Immediate infant environment: The infant space is not noisy, sound reduction equipment is used with minimal noise around 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.	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/drums 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					
			Noise reduction incubator covers are used.					
6.2	Immediate infant bed space: Light reduction strategies are in place to protect the infant from direct bright light. 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.	Soft ear plugs or covers are used.						
		Closed incubator portholes are closed quietly by using the latch						
		Sound levels are measured in the incubator						
		Ventilator tubes are emptied regularly, no water build-up						
		Minimal background noise at the infant						
		Charts and stock items are placed next to incubators, not on top.						
		Staff keep their voices down and away from the infant's bedside						
		Ambient light is reduced/dimmed						
		Blinds are closed during daylight hours						
		Activity levels are kept as low as possible						
6.3	Olfactory stimulation: positive smells are provided. Observe smell of cleaning materials, hand disinfectants etc.	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						
		The unit provides cycled light						
7. Pain management	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.	Day/night cycle is provided with 12 hours of low light and sound at night.					
			Positive olfactory stimulation is provided, such as mom's smell inside the incubator.					
7. Pain management	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					
			Non-nutritive sucking is provided during painful minor procedures					
8. 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 training and are able to read infant cues and behaviours					
			Knowledge is shared between professionals					
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.	The unit applies a multidisciplinary team approach						
		Parents are taught preterm infant behavioural cues and stress signs.						
9. Feeding	9	Observe if infants are prepared for feeding by wrapping and positioning her 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 20cm away from the caregiver to provide containment and visual stimulation.	Parents are taught how to interact with their preterm infant based on the cues and behaviours.					
			Preterm infants are prepared for feeding.					
9. Feeding	9	Observe if infants are prepared for feeding by wrapping and positioning her 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 20cm away from the caregiver to provide containment and visual stimulation.	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 G: Organizational Readiness for Implementing Change (ORIC) measure

Organizational Readiness for Implementing Change (ORIC)
 (The 10 items that performed well in our reported psychometric assessments)
 Items #1-5 measure change commitment
 Items #6-10 measure change efficacy

	1	2	3	4	5
	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree
1. People who work here are committed to implementing this change.	1	2	3	4	5
2. People who work here will do whatever it takes to implement this change.	1	2	3	4	5
3. People who work here want to implement this change.	1	2	3	4	5
4. People who work here are determined to implement this change.	1	2	3	4	5
5. People who work here are motivated to implement this change.	1	2	3	4	5
6. People who work here feel confident that they can handle the challenges that might arise in implementing this change.	1	2	3	4	5
7. People who work here feel confident that they can keep track of progress in implementing this change.	1	2	3	4	5
8. People who work here feel confident that they can coordinate tasks so that implementation goes smoothly.	1	2	3	4	5
9. People who work here feel confident that the organization can support people as they adjust to this change.	1	2	3	4	5
10. People who work here feel confident that they can manage the politics of implementing this change.	1	2	3	4	5

Appendix H: Focus group script and questions

Focus Group Script

Facilitators and Barriers to Implementation of Neurodevelopmental Supportive Care

Introduction

Good morning/afternoon. It is lovely to see you all. The last time I saw you was at the Neurodevelopmental Supportive Care training in May. My colleague, _____ is here to help me with some of the practical aspects such as managing the tape recorders and cell phones. I would like to start off by thanking each one of you for taking the time out of your busy schedule to participate today.

I'm going to lead our discussion and will be asking questions and encouraging and moderating our discussion. We'll be here for about an hour but no longer than 1.5 hours.

To allow our conversation to flow more freely, I'd like to go over some ground rules.

1. Only one person speaks at a time. This is doubly important as our goal is to make a written transcript of our conversation today. It is difficult to capture everyone's experience and perspective on our audio recording if there are multiple voices at once.
2. Please avoid side conversations.
3. Everyone doesn't have to answer every single question, but I'd like to hear from each of you today as the discussion progresses.
4. This is a confidential discussion in that I will not report your names or who said what to your colleagues or supervisors. Names of participants will not even be included in the final report. It also means, except for the report that will be written, what is said in this room stays in this room.
5. We stress confidentiality because we want an open discussion. We want all of you to feel free to comment on each other's remarks without fear your comments will be repeated later and possibly taken out of context.
6. There are no "wrong answers," just different opinions. Say what is true for you, even if you're the only one who feels that way. Don't let the group sway you. But if you do change your mind, let me know.
7. Please feel free to be honest in expressing your views whether it is positive or negative.
8. Let me know if you need a break. The bathrooms are _____. Feel free to enjoy a beverage and a snack.
9. Are there any questions?

The reason I am doing this focus group is to gather information on 1.) your experience of the Neurodevelopmental Supportive Care training you attended and 2.) to identify facilitators and/or barriers of applying this knowledge in your day to day practice.

Just a brief reminder of the main topics of the training. We looked at: Fetal development, the NICU environment (and how this environment is very different from the womb), neurosocial development of the infant (and the different sleep states of the infant), the disorganised infant (including stress signs), management of the preterm infant in the NICU (including aspects like noise, light and handling) and the role of the MDT in the NICU. The training further included some practical sessions such as positioning and Kangaroo Mother Care.

Part 1: (part 1 and part 2 can be fluid)

So, let's start by talking about the training....

1. What were the highlights of the training for you?
2. What were lowlights of the training?
 - anything specific you did not find useful/enjoyable/relevant? Please elaborate?
 - length of the training session?
 - depth of information?
 - opinion on the lectures versus the practical sessions?

Part 2: Facilitators and barriers related to a change in practice

1. From your perspective what changes could you implement and what facilitated that?
2. From your perspective what changes could you not implement and what were the barriers?

Ending the session

Is there anything else you would like to add?

Again, thank you very much for participating in this focus group.

Appendix I: Focus group information letter



Department of Occupational Therapy
Wits Education Campus

Good day,

Focus Group Letter and Consent Form

My name is Lizelle Jacobs, a PhD student registered at the University of the Witwatersrand. I would like to invite you to participate in my study titled: *The implementation of a multidisciplinary neurodevelopmental supportive care training program related to preterm infants in the South African public health sector.*

You attended the Little Steps® Neurodevelopmental Supportive Care Training Programme in May 2019. Training does not always translate into a change of practice due to various factors and it is therefore important to determine the barriers as well as the facilitators when implementing a training programme.

I would like to invite you to participate in a focus group to discuss the potential contextual factors which can facilitate or hinder the process of implementation and the translation of training into practice.

If you have any queries, please feel free to contact me on 082 334 2308. Please direct any ethical queries to the chairperson of the Wits Research Ethics Committee, Prof P. Cleaton-Jones on telephone number (011) 717 1234.

If you are willing to participate in the study, please read and sign the attached consent form.

Thank you

Lizelle Jacobs

I, _____, agree to participate in the study: *The implementation of a multidisciplinary neurodevelopmental supportive care training program related to preterm infants in the South African public health sector.*

I understand my participation will remain anonymous. No one will be able to identify me when the results are reported and my name will not appear anywhere in the written report.

I agree to have my verbal responses tape-recorded and transcribed for further analysis with the understanding that my responses will not be linked to me personally in any way. Responses will be kept in the strictest confidence.

I understand the data collected will be stored safely and securely.

I agree the researcher may use anonymous quotes in her thesis.

I may choose not to participate or withdraw at any time during the study.

Name of participant: _____

Signature: _____

Date: _____

Appendix J: Analytical framework for the qualitative analysis of the focus groups including new codes

NO	CATEGORIES	CODES
1.	Knowledge and understanding of neurodevelopmental supportive care (NDSC)	
2.	The multidisciplinary team (MDT)	2.1 Team effectiveness and communication
		2.2 Abilities, skills and confidence
3.	Complexity of change or neurodevelopmental supportive care (NDSC)	
4.	Staff commitment and attitude	
5.	Leadership/support	
6.	Organisation	6.1 Behaviour, beliefs, culture
7.	Attitudes towards change	7.1 Positive
		7.2 Negative
8.	Current state of the neonatal intensive care unit (NICU)	8.1 Physical structure
9.	Resources	9.1 Staff, caseload, time
		9.2 Equipment
NEW CATEGORIES AND CODES		
10.	Training itself	10.1 Training manual
		10.2 Ideas for future training
		10.3 Support from supervisors
		10.4 Dedicated time for training
		10.5 Lectures versus practical aspects
		10.6 Depth of training
		10.7 Duration of training
11.	Negative experience of training	11.1 Unable to remember
		11.2 Awareness
		11.3 Frustration
		11.4 Time
12.	Positive experience of training	12.1 Favourite things
		12.2 Change in practice – small things
		12.3 Change in practice – caregiver awareness
13.	Awareness and Realisation	13.1 Your duty

Appendix K: Permission letter from the hospital Chief Executive Officers



Tel : [REDACTED]
Fax : [REDACTED]
Email : [REDACTED]

Occupational Therapy Department
University of the Witwatersrand

Dear Ms. Jacobs

RE: THE IMPLEMENTATION OF A MULTI-DISCIPLINARY, NEURODEVELOPMENTAL SUPPORTIVE CARE TRAINING PROGRAMME RELATED TO PRETERM INFANTS IN THE SOUTH AFRICAN PUBLIC HEALTH SECTOR.

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,

A handwritten signature in black ink, appearing to be "S. Jacobs", written over a black rectangular redaction box.

Clinical Manager
2016:06:13

ADDRESS [REDACTED]



GAUTENG PROVINCE

HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

PERMISSION TO CONDUCT RESEARCH

Date: 26 May 2016

TITLE OF PROJECT: The implementation of a multi-disciplinary, neurodevelopmental supportive care training programme related to preterm infants in the South African public health sector

UNIVERSITY: Witwatersrand

Principal Investigator: L Jacobs

Department: Occupational therapy

Supervisor (If relevant): D Casteleijn

Permission Head Department (where research conducted): Has been applied for

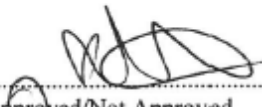
Date of start of proposed study: May 2016

Date of completion of data collection: Dec 2019

The Medical Advisory Committee recommends that the said research be conducted at [REDACTED]
[REDACTED] The CEO /management of [REDACTED] is accordingly informed and the study is subject to:-

- Permission having been granted by the Human Research Ethics Committee 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: 26 May 2016


Approved/Not Approved
Hospital Management
Date: 28/05/16

Appendix L: Permission letter from the Heads of the Neonatal Intensive Care Units



Department of Occupational Therapy
Wits Education Campus

To whom it may concern,

RE: PERMISSION TO CONDUCT A PHD STUDY

I, Lizelle Jacobs am currently registered as a PhD student at the University of the Witwatersrand. I would like to conduct a study titled:

The implementation of a multidisciplinary neurodevelopmental supportive care training program related to preterm infants in the South African public health sector.

Research indicates that the Neonatal Intensive Care Unit (NICU) environment is not supportive of the needs of the preterm infant. Neurodevelopmental Supportive Care (NDSC) is a range of interventions designed to minimise the stress that preterm infants often experience in the NICU environment and has been highlighted as best practice in the NICU. The NDSC approach emphasises individualised care and includes aspects such as lighting, sound, positioning and handling of preterm infants and reading stress signs of preterm infants. It is recommended internationally that this approach should be implemented to meet the unique needs of the preterm infant.

The World Health Organization (WHO) endorses implementation research to bridge the gap between research and practice. It contributes to the process of applying evidence-based interventions into the real world. Implementation research does not only focus on the implementation of the intervention but also on the contextual factors which can facilitate or hinder the process of implementation.

The researcher will aim to implement a multidisciplinary NDSC training programme with the ultimate goal of a wider adoption of the NDSC approach in the NICUs in South Africa.

Implementation of any programme is a complex process and includes various pre-implementation stages such as determining training needs, conducting a training-needs-and-subject-matter-fit and determining the multidisciplinary team's (MDT) readiness for change. The study is based on the four phases of the Quality Implementation Framework (QIF).

Phase 1 of the study will focus on determining the MDT's training needs, the current practice of neurodevelopmental supportive care in the NICU, conducting an intervention fit assessment, determining the MDT's readiness for change and getting buy-in from the critical stakeholders through a pre-innovation session.

Phase 2 will entail the development of a structure for implementation. The development of the structure will be facilitated by the researcher and identified champions will assist with the planning of the implementation which include the listing of tasks required for implementation, establishing a timeline for implementation tasks, and assigning implementation tasks.

In Phase 3 of the study the researcher aims to implement the NDSC training programme, determine the barriers and facilitators impacting on successful implementation as well as determine the effect of the implementation of training programme on the operationalisation of NDSC in the NICU. This is an important phase as the information gained from this phase can inform future implementation efforts in other public sector NICUs in South Africa.

Informed consent will be obtained from all multidisciplinary team members (doctors, nurses, physiotherapists, occupational therapists, speech therapists, audiologists and dietitians) who are currently providing a service in the NICU or to preterm infants and who are willing to participate in the study. Confidentiality will be maintained at all times through the use of subject codes and the subject codes list will be kept separate from all data collected. Participation in the study is voluntary.

If you have any queries, please feel free to contact my supervisor, Daleen Casteleijn or myself. Please direct any ethical queries to the chairperson of the Wits Research Ethics Committee, Prof P. Cleaton-Jones on telephone number (011) 717 1234.

Thank you in anticipation

Lizelle Jacobs

Supervisor:

Name: Prof Daleen Casteleijn

Phone: (011) 717 3701

Email: daleen.casteleijn@wits.ac.za

Researcher:

Name: Lizelle Jacobs

Phone: (011) 717 3701

Email: lizelle.jacobs@wits.ac.za

Appendix M: The Guideline for Reporting Evidence-based Practice Educational Interventions and Teaching (GREET) checklist

INTERVENTION

Little Steps® Introduction to neurodevelopmental supportive care (NDSC) training programme

WHY? - this educational process

1. Intervention:

An existing one-day Little Steps® Introduction to NDSC training programme, was adapted and presented to the multidisciplinary team (MDT), who provide services to preterm infants and their families, in two public sector NICUs. The course fit the training needs of the MDT as identified from Phase 1 of the implementation study. The course includes information on all NDSC categories but is brief enough to fit the workload and schedules of the MDT.

2. Theory:

This course is based on Als' Synactive Theory (Als, 1986) and the developmental care approach (Symington & Pinelli, 2006).

3. Learning objectives:

The learning objectives of this one-day course include the following:

No	Topic and Objectives
1.	Fetal Development and Neonatal Intensive Care Unit
1.	Explain the importance of the intrauterine environment to support fetal development
2.	Understand the process of development of the sensory systems in utero
3.	Identify the role and function of myelination in the maturation of the nervous system
4.	Identify the normal values for vital signs in the premature infant
5.	Understand the impact of the NICU environment on the extrauterine fetus

No	Topic and Objectives
2.	Neurososocial Development
	1. Understand the Model of Synactive Organization of Behavioral Development as developed by Dr. Heidelise Als 2. Describe the three stages of neurosocial behaviour according to Peter Gorski 3. Identify the five subsystems of infant development and their defining characteristics 4. Recognise an organised / self-regulated infant 5. Identify when an infant needs protection and when stimulation
3.	Disorganised Infant
	1. Describe the different sensory systems and the impact of the environment on the extrauterine fetus 2. Demonstrate the ability to identify stress signals in the preterm infant 3. Understand how stressful events may influence the infant's short- and long-term development
4.	Developmentally Supportive Management
	1. Describe what neurodevelopmentally supportive care is 2. Know how to prevent disorganisation in the fragile infant 3. Demonstrate how to support the infant to a level of self-regulation by means of handling, positioning and changes in care 4. Model appropriate handling and positioning techniques to colleagues
5.	Skin-to-Skin Care
	1. Know what skin-to-skin is / Kangaroo Mother Care (KMC) 2. Understand the history of KMC 3. Describe the benefits of Kangaroo Mother Care 4. Understand the physiology behind Kangaroo Mother Care

4. Evidence-based practice content:

The content of this course is based on the best evidence-based practice for preterm infants and their families in the NICU. Information on nine essential components of the NDSC approach, based on an integrative literature review, are included in the course (Lubbe et al., 2012).

WHAT?

5. Materials:

Little Steps® One-Day Introduction on NDSC training programme focusing on: the NICU, Fetal Development, Neurosocial Development, Disorganised Infant, Introduction to the management of the preterm infant and the role of the MDT in the NICU. PowerPoint presentations and manuals were provided.

More information on the course can be obtained from the Little Steps® website:

<http://www.littlesteps.co.za>

6. Educational Strategies:

A top-down implementation strategy was used as educational material was shared through lectures and practical sessions. Additional teaching strategies used in the educational intervention included quizzes, discussion groups, demonstrations and videos.

7. Incentives:

The course has been accredited by the South African Medical Association (SAMA) (Appendix N) for seven continuing professional development (CPD) points. Permission was further obtained from SAMA to adapt the course and present a concise 2-hour session to the doctors and nurses (2 CPD points). Participants received a CPD certificate on completion of the training.

WHO PROVIDED?

8. Instructors:

All training was provided by the researcher. The researcher is an Occupational Therapist with a Masters degree and a special interest in paediatrics, development, neurology, developmental delay, the NICU and the preterm infant. The researcher was further a lecturer at the University of the Witwatersrand with 7 years' experience in teaching on both an undergraduate and postgraduate level. The researcher completed the four-day Little Steps® training programme in 2014 and taught and presented on various platforms to various disciplines. The researcher met with two experienced presenters prior to the implementation of the training programme to

ensure a thorough understanding of the content and to ensure the content is delivered as intended. All training material was updated by the researcher with recent and relevant references.

HOW?

9. Delivery:

Training was provided face-to-face in a group setting. The size of the groups varied from 3 to 20 participants per group. Due to day and night shifts, staff shortages and workload, participants were able to decide on a suitable date to attend the training. An extensive number of training dates were provided by the researcher stretching over a period of 5 weeks.

WHERE?

10. Environment:

Two venues were used for the training at Hospital A and two venues was used for the training at Hospital B.

All rooms were dedicated training rooms with tables, chairs, a data projector and a screen. The rooms had sufficient space, lighting and ventilation.

For the nursing staff at Hospital A the training had to be conducted in the NICU at the nurses' station. This was not ideal as the NICU is a busy and noisy environment. For Hospital A's doctors, their meeting room was used. For the second training session with the doctors, this room was too small as the group was too big (participants did not divide themselves equally between the two sessions and most participants preferred to attend the second session).

WHEN? and HOW MUCH?

11. Schedule:

The number of times the training intervention was delivered over the period of time including the number of sessions, the duration and who attended these sessions are indicated in the table below:

Number of times training was delivered	8 times in the first 3 weeks 14 times in the following 2 weeks
Period when training was presented	5 weeks
Number of sessions	Eight x 1-day sessions for the dietitians, physio-, speech- and occupational therapists (8:30 – 16:00)
	Two x 2-hour session for two groups of doctors: Hospital A (8:00 – 10:00 and 10:30 – 12:30)
	Two x 1-hour sessions for the same group of doctors: Hospital B
	Five x 30 min sessions for nurses (total 2.5 hours) – Hospital A (presented twice)
	6 x 2.5-hour sessions for nurses – Hospital B

12. Time spent in face-to-face contact:

The full duration of the different training sessions (as described in the table above) were spent face-to-face with the learners.

PLANNED CHANGES

13. Adaptation of the educational intervention:

Due to institutional limitations (staff shortages, shifts and service delivery needs), it was necessary to adapt the training programme for the doctors and nurses. It was too difficult for all the doctors and the nurses to attend a full-day training programme.

For the doctors at Hospital A, the training was condensed and presented in two 2-hour sessions. Half the doctors attended the first session and the other half attended the second session. This ensured wards were still covered and service delivery was uninterrupted. A meeting room (which is also used as a training room) was used with a data projector and a screen.

The nurses from Hospital A work in 5-day shifts with 3 days on and 2 days off. For these nurses the programme was adapted to a 10-day rolling programme of 30-minute training sessions per day. The programme ran for 10 consecutive days, to make sure both shifts of nurses were able to attend all 5 sessions of the training. It was further necessary to present the training in the NICU at the nurses' station. The content remained the same.

The nursing manager at Hospital B preferred for the nurses to attend one 4.5-hour session rather than a 30-minute session daily. The same venue was used as for the full-day training programme and the content remained the same.

The shorter training sessions obviously allowed for less time for group discussions, demonstrations and practising practical aspects or skills.

UNPLANNED CHANGES

14. Modification of the educational intervention:

There were no unplanned changes during the course of the study and the educational material was not modified in any way.

HOW WELL?

15. Attendance:

For Hospital A, 125 participants (61%) attended the training while for Hospital B, 130 participants (68%) attended. Buy-in for the implementation of the training programme was obtained from the heads of departments and the unit managers prior to the implementation. Some of the heads of departments or unit managers also attended the training.

16. Delivery of educational intervention as originally planned:

Existing Little Steps ® PowerPoint presentations were used for all training sessions and presented as intended.

17. The delivery of the educational intervention as scheduled:

The schedule for the delivery of the educational intervention was adapted to suit the different disciplines' schedules and was therefore presented as described in item 11.

Appendix N: South African Medical Association accreditation



THE SOUTH AFRICAN MEDICAL ASSOCIATION

Tel: +27 (0)12 481 2000 | Fax: +27 (0)12 481 2100 | www.samedical.org
 Block F | Castle Walk Office Park | Nossob Street | Erasmuskloof | Ext 3 | Pretoria | 0183
 PO Box 74789 | Lynnwood Ridge | 0040
 Reg No 1927/000136/08 | NPC

23 January 2019

Dear Annelie

CPD (Continuing Professional Development) Certificate of Accreditation

On behalf of the SAMA CPD Unit I am pleased to inform you that your application for accreditation of HPCSA registered medical professionals Doctors and Specialists, within their scope of practice has been successful. Accreditation of the activity is awarded subject to the conditions below. Thank you for accrediting your CPD activity with us. Breakdown of your point allocation below.

Should your application waiver from HPCSA guidelines after approval of application, the onus is on the applicant to inform SAMA. Please note that SAMA CPD Committee Members may attend conferences to monitor and audit events.

The CPD activity listed below is duly accredited as a single activity. Please use the reference numbers below for all communications. Please note that the HPCSA has the right to revoke accreditation.

ACCREDITATION NUMBER: Please use this number on all correspondence relating to this CPD activity (Delegate Certificate)	MD8015/158/01/2019
APPLICANT:	Ethics Simplified
ACTIVITY TITLE:	Intro to Neuro Dev Supportive Care
DATE OF ACTIVITY:	2019
CPD POINT ALLOCATION FOR ATTENDEE: LEVEL 1	7 Clinical
CPD POINT ALLOCATION FOR REGISTERED HPCSA MEDICAL PROFESSIONAL PRESENTER/S : LEVEL 1	<i>"Presenters can be allocated double CEUs when presenting, eg. if attendee receives one CEU, presenters can get two"</i> <i>Presenters attending other lectures on the programme will be allocated regular delegate points.</i>
SAMA ACCOUNT REFERENCE NUMBER:	BOO1025/35
CONDITIONS: Any additional information or changes on this program activity must be sent through to SAMA. Acceptance of the ethical guidelines sponsorship in relation to CPD programmes/activities INCLUDING no product promotion in room or on enduring materials (e.g. course documents, invitations, programmes). No combining of level 1 and 2 activities at a single activity. (Questionnaires and Lectures) You may not issue points for attending an event and a questionnaire. Please only issue accreditation for the event or the questionnaire, not both. Maximum of 3 questionnaires to be completed at any activity or linked to any activity.	
RECORDS: - You must maintain adequate records of attendance for administrative reference and send copies to your accreditor. - You must keep records in prescribed format (e.g. CPD Portfolio document) and submit these to Continuing Professional Development / CPD when necessary. - Until further notice you will have to ascertain the CPD accreditation of the international congress/CPD activity. - The program hereby accredited is subject to periodic review and on notification. - Please ensure that you use your approved attendance register and certificate template that contains all the required fields as per the guidelines. Providers are to ensure that delegates participating are unique.	

Thank you,
 SA Medical Association CPD Officer/cpd@samedical.org

Appendix O: Turnitin report

ORIGINALITY REPORT

14%

SIMILARITY INDEX

6%

INTERNET SOURCES

5%

PUBLICATIONS

11%

STUDENT PAPERS

PRIMARY SOURCES

1

Submitted to University of Witwatersrand

Student Paper

3%

2

dspace.nwu.ac.za

Internet Source

1%

3

Submitted to University of Melbourne

Student Paper

<1%

4

Submitted to Grand Canyon University

Student Paper

<1%

5

Submitted to University of Auckland

Student Paper

<1%

6

Submitted to University of Newcastle

Student Paper

<1%

7

congress2018.wfot.org

Internet Source

<1%

8

Submitted to University of Dayton

Student Paper

<1%

9

www.childsafetyeurope.org

Internet Source

<1%