Chapter One: Introduction

1.1 Introduction

Developmental care is an approach that was introduced into the care of high-risk neonates in the 1980's. Extensive research between 1972 and 1987 concluded that the neonatal intensive-care environment was over-stimulating for the pre-term infant. Although the need for developmental care was clear, the implementation process was complicated and initial acceptance of this new approach took some time. Developmental care was implemented internationally into neonatal intensive care units (NICU) in several countries, including the United States of America and Sweden, with varied levels of success (Cole, Begish-Duddy, Judas & Jorgensen, 1990: 15; Westrup, Kleberg, Von Eichwald, Stjernqvist & Lagercrantz, 2000: 71; Byers, 2003: 175). The researcher believes that developmental care can be implemented in South African neonatal intensive care to improve the management and outcomes of the high-risk neonate, especially the pre-term infant population in order to minimise short- and long-term developmental sequelae.

1.2 Background and rationale for the study

As technology in the field of health sciences improves, the patient mortality rate decreases. Although this presents as a positive advancement, the pre-term infant still commonly experiences short- and long-term effects that are not as positive as we would like. These babies experience a range of morbidity related to the immaturity of their organ systems and concurrent disease states (Symington & Pinelli, 2002: 1).

In spite of improved technology which reduces the mortality rates of pre-term infants, these infants are commonly exposed to more stressors and present with stress levels above their ability to cope. According to Symington and Pinelli (2002: 3), typical markers of stress in neonates are physiological parameters, for example increased heart rate or decreased oxygen saturation. The growth of the pre-term infant is negatively affected by the increased energy expenditure that occurs during routine care in the NICU. In a study done by Taquino and Lockridge (1999: 65), hypoxia occurs

rapidly in pre-term infants when they are handled for routine procedures or exposed to loud noise and other stressors.

The pre-term infant's rapidly developing brain is known to be particularly vulnerable to a stressful environment. The detrimental effect of environmental stress has both short- and long-term implications for the already compromised neurobehavioural development of the pre-term infant (Symington & Pinelli, 2002: 3). Anand (1998: 3) describes these physiological changes as being of sufficient magnitude and rapidity to produce reperfusion injuries and venous congestion. This in turn leads to periventricular haemorrhage infarction and/or periventricular leucomalacia. Pre-term infants with neuropathology are at greater risk of developing cerebral palsy and developmental problems in later life (De Groot, 2000: 65).

Problems that pre-term infants experience as identified by Bohin, Draper and Field (1999: 12) include cerebral palsy, developmental delays, visual impairment, hearing impairment, impaired growth, epilepsy, lung disease and hydrocephalus. It is common for these children to experience frequent re-admissions for health problems, like those as mentioned above, that are related to pre-term delivery. The short-term sequelae such as fluctuations in heart rate, respiration rate, colour, blood pressure and saturation are specifically related to physiological instability. These infants often require long-term developmental and functional habilitation, including treatment by speech therapists, audiologists, occupational- and physiotherapists.

The negative sequelae listed above can be reduced through developmental care. Developmental care provides a simple and effective method of reducing these complications by modifying the environment to which the pre-term infant is exposed. Developmental care, a relatively new concept in the South African NICU, is described by Symington and Pinelli (2002: 1-2) as a broad category of interventions designed to minimise the impact of the NICU environment. These interventions may include control of one or more elements of the external environment influencing the vestibular, proprioception, gustatory, olfactory, tactile, auditory, and visual systems. Different interventions have been used to modify the extrauterine environment so as to decrease a variety of stressors.

The principles of developmental care include individualised infant care, family-centred care with minimal and appropriate handling and touch of the pre-term infant, initiation of cluster care for nursing activities, specific positioning and swaddling, kangaroo-mother

care (KMC), non-nutritive sucking, pain management and manipulation of the external environment to reduce negative stimuli (including noise and light reduction) and introduce positive smell stimuli. For the purposes of this study, developmental care is taken as referring to all of these principles. These interventions result in reduced stress levels and increased rest periods to the benefit of the pre-term infant (Taquino & Lockridge, 1999: 64-79; Jorgensen, 2000: 3; Byers, 2003: 174-179; Hennessy, 2003: 1-52).

KMC care is a facet of developmental care and follows the developmental care principles. The pre-term infant, dressed only in a diaper, is placed in skin-to-skin contact during kangaroo-mother care, on the chest of the mother (or father) between the breasts in a flexed position. The nutrition of choice is exclusive breastfeeding and early discharge regardless of weight is advocated (Bergman, 1998: 9-10; Van Rooyen, Pullen, Pattinson & Delport, 2002: 7).

Symington and Pinelli (2003: 1-2) conducted a systematic review for the Cochrane Collaboration consisting of 31 randomised controlled trials. The findings of this review indicate that developmental care has advantages for the pre-term infant, including improved weight gain, reduced need for respiratory support, reduction in critical care costs, and decreased periods of hospitalisation as well as improved neurodevelopment at two years corrected age. No detrimental effects of developmental care have been reported.

A number of non-randomised clinical trials found additional advantages (Becker, Grunwald, Moorman & Stuhr, 1993: 214; Als *et al*., 1994: 853; Heller, Constantinou, Van den Berg, Benitz & Fleisher, 1997: 111; Jorgensen, 2000: 1-4; Hennessy, 2003: 1-52). Developmental care produces a reduction of stress levels, resulting in a more physiologically stable infant. Other advantages include a reduction in developmental delays, reduced need for oxygen and decreased use of sedation. These improvements relate to more positive short- and long-term sequelae for the pre-term infant.

Als, Duffy, McAnulty *et al*. (2004: 846), investigated the effects of early experiences on brain function and structure. The experimental group consisted of 16 infants and the control group of 14 infants. The experimental group received the Newborn Individualised Developmental Care and Assessment Program® (NIDCAP) within 72 hours of admission to the NICU. The results showed “consistently better function and

more mature fibre structure for experimental infant compared with their control" (Als *et al*., 2004: 846).

1.3 Problem statement

The initial literature review presented above supports the value of and need for developmental care as a care approach to be implemented into daily care routines in the NICU in order to provide pre-term and sick infants with the best possible outcomes. The implementation of developmental care has been documented and reported as a new way of providing care, but barriers are evident in overcoming the theory-practice gap.

Based on undocumented reflections made during a previous study, the researcher observed problems in the implementation of developmental care, including KMC. The problems identified included resistance to change, a non-caring attitude, unfavourable working conditions, public financial restraints, negative attitudes of some multidisciplinary team members, low levels of knowledge about developmental care and a lack of training on the topic.

Implementation of developmental care in international countries has been successful but problems are still experienced. Robison (2003: 379-380) observes that without effective participation and leadership from management, the quality of the developmental care provided relies on individual care givers' philosophy and emotional status when allocated to infants. This results in inconsistent care and high levels of frustration for medical professionals and families.

It is essential to anticipate these problems and plan possible strategies in order to design a programme for the successful implementation of developmental care. The implementation programme includes strategies to overcome the problems identified in NICUs where implementation of developmental care, including KMC, has taken place. These problems seem to be experienced at the chosen research site as well.

Therefore, the problem statement can be formulated as follows:
Implementation of developmental care in the NICU appears to be problematic.

1.4 Research question

How can developmental care be implemented successfully at a South African public NICU setting?

1.5 Purpose

Following an intervention research design, this study aimed to develop guidelines for the implementation for developmental care through the implementation of developmental care at a South African public NICU. Extant research literature shows that developmental care is a tested health care intervention with positive outcomes for the pre-term infant. This research study therefore does not test the effectiveness of developmental care as an intervention, but rather focuses on the implementation of developmental care as an intervention. Intervention research methodology was used to implement developmental care at the chosen research site, a public tertiary academic hospital.

1.6 Objectives

1.6.1 Objective 1

To analyse and describe the current level of developmental care implementation at the research site and plan the project for implementation of developmental care at a South African public NICU (Problem analysis and project planning).

1.6.2 Objective 2

To identify the factors involved in the implementation of developmental care from national and international examples of developmental care implementation in neonatal intensive care (Information gathering and synthesis).

1.6.3 Objective 3

To design an intervention plan and apply the information needed for the implementation of developmental care at the research site (Design).

1.6.4 Objective 4

To execute the intervention plan for developmental care implementation at a South African public NICU (Implementation).

1.6.5 Objective 5

To refine the intervention plan through monitoring and evaluation at a public NICU (Evaluation and advanced development).

1.7 Conceptual definitions

- Developmental care

  This is a care approach that minimises external stressors in order to reduce the negative effects of stress on the pre-term and sick infant. This definition is supported by Symington and Pinelli (2002: 2), who define developmental care as "an approach that was designed to modify the NICU environment so as to minimize the stress experienced by the pre-term infant."
- Implementation of developmental care

  Implementation of developmental care in the South African public NICU will include evidence of practice or sustainable practice of the developmental care principles on a daily basis by health professionals that are involved in care for the pre-term infant or sick infant.
- Principles of developmental care

  The principles of developmental care used in this study include individualised infant care, family-centred care, appropriate handling and touch of the pre-term infant, specific positioning and kangaroo-mother care, non-nutritive sucking, pain management and manipulation of the external environment to reduce negative

stimuli and introduce positive stimuli (Taquino & Lockridge, 1999: 64-79; Jorgensen, 2000: 3; Byers, 2003: 174-179).

- High-risk neonate

  A newborn infant that is more vulnerable to disease, injury or complications due to the presence of risk factors, and is therefore hospitalised in an intensive care unit.

- Pre-term infant

  As stated by Cronje (1996: 319), "pre-term refers to a foetus or neonate before the thirty-seventh gestational week, calculated from the first day of the last normal menstruation in patients with 28-day cycles."

- Stress

  The *Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing and Allied Health* (1997: 1539-1540) defines stress as the sum of biological reactions to any adverse stimulus, including physical, mental, or emotional stress and internal or external stress, that tends to disturb the homeostasis of any organism. A stressor is further defined as "any factor that disturbs homeostasis, producing stress". These include constant bright light levels, high noise levels, medical interventions, and routine handling during nursing care (Becker, Grunwald, Moorman & Stuhr, 1991: 150).

- Physiological stability

  This refers to parameters remaining steady within acceptable limits for the pre-term and sick infant, for example, a temperature between 36^5 °C and 37^5 °C.

- Physiological instability

  This refers to unstable parameters above or below the acceptable limits for the pre-term and sick infant, for example, a temperature below 36^5 °C or above 37^5 °C.

- Short-term sequelae

  This refers to the current effects of prematurity on the pre-term infant, including factors like physiological instability.

- Long-term sequelae

  This refers to the effects of prematurity on the pre-term infant after discharge, including neurological, cognitive and behavioural abnormalities (Becker *et al*., 1991: 150).

1.8 Methods and procedures

1.8.1 Research design

The study was conducted following an intervention research design. Various research methods were used, and resulted in guidelines for the implementation of developmental care. The intervention plan consisted of descriptive representations of the realities in clinical practice, combining applicable theoretical perspectives to enable the multidisciplinary team to practice developmental care. The formulation of an intervention plan was chosen to bridge the theory-practice gap in the clinical setting with particular emphasis on improving patient care, whilst providing health professionals with concrete implementation guidelines for developmental care (Pearson, Vaughan & Fitzgerald, 1996: 2, 4-5).

Intervention research is described in detail by Rothman and Thomas (1994: 3-23), who identify three types of intervention research (see chapter three: Methodology). This study specifically used intervention design and development as a problem-solving process where interventions are needed for the resolution of social or human difficulties. This model consists of six phases which have been adapted for this study: 1) problem analysis and project planning, 2) gathering and synthesis of information, 3) design of the intervention plan, 4) implementation, 5) evaluation and advanced development, and 6) dissemination (Rothman & Thomas, 1994: 9-12, McEwen & Wills, 2002: 358-359).

When compared to action research, the structure of intervention research provides a more comprehensive framework for active leadership from the researcher, from initiation to the development of implementation guidelines of developmental care. Appropriate methods of data collection and data analysis were conducted during the phases.

1.8.2 Methods and procedures: Phases One to Six

Intervention research design has six phases. Phase Six (Dissemination) of the design is not included in the scope of this study, although recommendations for dissemination

of the implementation guidelines for developmental care are made (see chapter eight). These phases are only discussed briefly here (refer to chapter three for a detailed description).

1.8.2.1 Phase One: problem analysis and project planning

1.8.2.1.a Population and sampling

The current level of developmental care implementation at the research site was analysed and described, and the project for implementation of developmental care in a South African public NICU planned by consulting relevant literature and the multidisciplinary team of the NICU. As the research setting was an academic tertiary hospital with frequent staff rotation, a specific population size was not possible. Members of the multidisciplinary team working in the NICU formed the population, which consisted of a variety of professions. These professions included nursing staff, medical staff, allied health professionals and non-medical support personnel. No specific sampling, other than including these different professions, was done as the researcher aimed to achieve a team approach toward implementation of DC. Environmental audits were performed in the NICU environment to determine the level of developmental care practices before implementation.

1.8.2.1.b Method of data collection

Awareness meetings were held at the research site, where an open ended questionnaire (see Appendix 2) was completed by participants. The first questionnaire collected data to determine the concerns of the population. Data was also collected by means of an environmental audit (see Appendix 4) that described the extent of the developmental care practices.

1.8.2.1.c Data analysis

Questionnaire 1 containing open ended questions was analysed using content analysis for theme identification. The environmental audit was analysed by deductive reasoning and a description of the observed data.

1.8.2.2 Phase Two: information gathering and synthesis

1.8.2.2.a Population and sampling

Identification of factors involved in the implementation of developmental care were established by reviewing available literature (national and international) and other resources including institutions where developmental care and KMC have been implemented, in order to provide a contextual framework for the next phase.

A purposive sampling technique was used for the in-depth individual interviews. Members of the multidisciplinary team who have been involved in the NICU during initiatives for implementation of developmental care and/or KMC were invited to participate in the in-depth individual interviews.

1.8.2.2.b Method of data collection

An extensive literature review was used to construct a practice-based framework of knowledge on implementation of developmental care in national and international sites through deductive reasoning. In-depth individual interviews were used to collect qualitative data. The interviews with members of the multidisciplinary team aimed to identify specific problems and possible solutions as suggested by the relevant parties. In-depth individual interviews were conducted during visits to international sites of developmental care implementation. This type of data collection allows the development of concepts and strategies to combat these problems in a deductive manner (De Vos, 1998: 314). Environmental audits were also done during the visits at the American hospitals to observe developmental care implementation.

1.8.2.2.c Data analysis

A practice-based framework for implementation of developmental care was compiled from the data from all the available sites, national and international, by deductive reasoning and critical analysis of the reviewed literature. This practice-based framework was used in Phase Three for the design of the intervention plan. Factors involved in the implementation of developmental care were also identified from the data collected at the in-depth individual interviews. These were transcribed and their content analysed for theme identification, to identify positive and negative factors. Data

analysis from the environmental audits provided qualitative description of the observed data.

Phases Three to Five utilise the same population as in Phase One(see heading 1.8.2.1.a), data collection and data analysis methods, because of the nature of intervention research where assessment, planning, implementation, evaluation and re-assessment are linked processes. Please refer to Table 1 below.

Table 1: Summary of the phases of intervention research

PHASES	Objective	Population/sample	Data collection	Data analysis	Trustworthiness	Outcome
Phase One Problem analysis & project planning	To describe the problems facing the implementation of DC at the site and the project-planning process To determine current levels of DC in the public NICU	Relevant textual data Public NICU Multidisciplinary team involvement	Awareness meetings Questionnaire 1 Environmental audits	Deductive reasoning Content analysis for theme identification Qualitative description	Credibility of researcher Co-coding of identified themes	Problem analysis and project planning Baseline data
Phase Two Information gathering and synthesis	To identify factors involved in DC implementation	Institutions Relevant textual data Multidisciplinary team members involved in the implementation of DC	Literature review In-depth interviews Environmental audits	Transcribed data from interviews Content analysis for theme identification Qualitative description	Co-coding of identified themes	Contextual information on DC implementation
Phase Three Design	To plan and apply the information to the intervention plan for implementing DC	Public NICU Multidisciplinary team involvement Relevant textual data	Checklists of DC environment Questionnaire 2 Environmental audits Field notes Focus group interviews	Descriptive explanation of trends Content analysis for theme identification Qualitative description	Multidisciplinary team involvement during design of intervention plan Independent facilitators for focus group interviews Co-coding of identified themes	Intervention plan Training programme
Phase Four Implementation	To execute the intervention plan for implementing DC					Training Environmental changes
Phase 5 Evaluation and advanced development	To refine the intervention plan through monitoring and evaluation of DC implementation					Evidence of practice Implementation guidelines for DC

1.8.2.3 Phase Three: design of the intervention plan

1.8.2.3.a Population and sampling

Members of the multidisciplinary team working in the unit were involved in planning and designing the intervention plan for developmental care in the South African public NICU. Appropriate literature on the topic of developmental care was used to compile a training programme.

During the research process, members of the multidisciplinary team working in the unit were involved, in the hope that this would result in their participation during implementation of developmental care in conjunction with the researcher. Not only did this research design allow the specific community to participate in the research, but it also resulted in personal growth through the development of skills, knowledge, behaviour and social interaction (De Vos, 1998: 408), and eventually long-term developmental care practices in the NICU. In this sense, Phase Three contains elements of participatory action research.

1.8.2.3.b Method of data collection

It is imperative for the successful implementation of developmental care that individuals involved in the chosen unit participate from the initial stages of the research until the completion of the study and beyond. This contributes to the empowerment of the health professionals in the public NICU to improve their working environment, as well as improving the outcomes of the pre-term infant. By empowering the members of the multidisciplinary team, the researcher hoped to achieve increased levels of caring, commitment, motivation, energy, decision-making capacity and improved self-worth (De Vos, 1998: 407). These aspects however, were not directly measured in the study. Regular meetings were conducted and field notes recorded for data collection to design and adjust the planned intervention plan.

1.8.2.3.c Data synthesis

Minutes of the meetings and field notes were used to collect qualitative data which was synthesised using content analysis.

1.8.2.4 Phase Four: implementation

1.8.2.4.a Population and sampling

The intervention plan developed in Phase Three was implemented in the public NICU with participation of members from the multidisciplinary team.

1.8.2.4.b Method of data collection

Minutes from regular meetings and field notes were documented during this phase to monitor progress, adjust the intervention plan and identify possible problems and solutions as they arise.

1.8.2.4.c Data synthesis

Data was synthesised using content analysis.

1.8.2.5 Phase Five: evaluation and advanced development

1.8.2.5.a Population and sampling

During the evaluation of implementation, various methods of evaluation were used. Checklists evaluating the DC practices in the NICU were conducted bi-monthly, and a second questionnaire (see Appendix 16) was used to determine the participants' experiences of the DC implementation process.

Four environmental audits were performed in the NICU environment to observe changes occurring in the NICU environment. Two focus group interviews (n=5 and n=6) were held with members of the multidisciplinary team involved in the research study at the public NICU. An open invitation was given to members of the multidisciplinary team and participation is voluntary. The numbers of the participants in each focus group interview was kept low to facilitate individual involvement of all members.

1.8.2.5.b Method of data collection

Data was collected using checklist evaluations. These were completed at regular intervals based on the principles of developmental care already implemented in the

unit. The researcher evaluated the environment in the middle of each month and members of the nursing team were requested to evaluate the environment at the end of each month. The checklists were used to observe for evidence of the implementation of all principles of developmental care, as well as their observable practical implications. Completion of these checklist evaluations allowed the researcher to observe the environment in which the multidisciplinary team functioned in order to determine the effectiveness of the intervention plan without focusing on specific individuals (De Vos, 1998: 128).

The second questionnaire collected data from the participants regarding their experiences of the implementation process. An external independent person evaluated the environment randomly by conducting four environmental audits at different time intervals during the implementation phase. The two focus group interviews were conducted by independent facilitators, and the data were digitally recorded and transcribed *verbatim*.

The intervention plan and guidelines for the implementation of developmental care were refined from data collected during the first four phases.

1.8.2.5.c Data analysis

The checklist evaluations were analysed using qualitative methods for identification of trends. Qualitative content analysis was used for theme identification of questionnaire two. The environmental audits completed were expressed in the form of a qualitative description of the data. Data collected from focus group interviews were transcribed and analysed with qualitative content analysis for theme identification.

1.9 Expected limitations

The NICU is a dynamic environment that can never be controlled, because of the nature of the intensive care delivered to the pre-term infants. Circumstances are not predictable and these can possibly interfere temporarily with the desired environment in the NICU, for example, resuscitation and academic rounds can significantly increase the sound levels in the unit. A consistent level of participation from members of the multidisciplinary team cannot be guaranteed, which can also result in a varied level of

success. The expected limitations were therefore an inconsistent environment and a lack of participation.

1.10 Ethical considerations

The ethical considerations involved in this study included maintenance of anonymity and confidentiality of participants, working within the multi-cultural multidisciplinary team, and obtaining informed consent from the participant, institution, and parents. As developmental care is a tested intervention, only its implementation need be examined for ethical considerations.

Ethical clearance was obtained from the ethics committee at the University of Pretoria before the study commenced. Consent for the research was obtained from the Superintendent, the Head of the Department of Paediatrics, the medical consultants and the nursing management in the NICU at the setting. Individual consent was also obtained from members of the multidisciplinary team involved in neonatal care at the setting. Individual patient consent was also obtained from parents when their infants were included in any photographs. The parents were given the option of requesting their infant's eyes be closed in order to maintain anonymity.

1.11 Strategies to ensure trustworthiness

The researcher is specialised in neonatal nursing science, and her previous research for her MCur degree was conducted in the field of developmental care (Hennessy, 2003: 1-52). She has extensive experience in the NICU environment which enhances the trustworthiness of the study.

Data saturation was enhanced by conducting 27 in-depth individual interviews, to identify possible problems with implementation and possible strategies for dealing with these, at different sites to facilitate data saturation. Triangulation of data sources was used to enhance the quality of the evidence and to add to the trustworthiness of the study. Data sources from national and international examples facilitated triangulation of sources. Triangulation of methods further enhanced the richness of the data and increases the credibility of the research findings (Lincoln & Guba, 1985: 292, 307).

Focus group interviews, questionnaires, checklists and environmental audits were used for data collection, which provides triangulation of methods (Lincoln & Guba, 1985: 305-306). The data collected were also triangulated during the implementation process by means of checklist evaluations and environmental audits conducted by multiple observers. An independent person conducted environmental audits to objectively observe implementation of developmental care. This individual was not involved with the study, thereby improving the data's neutrality. Using multiple investigators, including the researcher, participants and an independent person, trustworthiness of the research findings could be increased (Lincoln & Guba, 1985: 292, 307).

Once the interviews had been transcribed and their themes identified, the process of analysis was repeated to confirm the findings. An independent co-coder validated the analysed data to strengthen the objectivity and confirmability of the collected data and validate the researcher's findings (Polit & Hungler 1997: 378, 380-384).

1.12 Outline of chapters

Chapter 2 Literature review
Chapter 3 Methodology: intervention research
Chapter 4 Phase One: problem analysis and project planning
Chapter 5 Phase Two: information gathering and synthesis
Chapter 6 Phases Three and Four: design and implementation of the intervention plan
Chapter 7 Phase Five: evaluation and advanced development
Chapter 8 Conclusion and recommendations

2 Chapter Two: Literature review

2.1 Introduction

As technology in the wider field of health sciences improves, the patient mortality rate decreases. Although this suggests positive advances across the board, pre-term infants still often experience short and long-term effects that are not as positive as we would like. These infants experience morbidity related to the immaturity of their organ systems and concurrent disease states (Symington & Pinelli, 2003: 1).

In spite of improved technology, pre-term infants tend to present with stress levels above their coping abilities. According to Symington and Pinelli (2003: 2), typical markers of stress are changes in physiological parameters like increased heart rate or decreased oxygen saturation. The growth of pre-term infants is negatively affected by the increased energy expenditure that occurs during routine care in the NICU. In a study done by Taquino and Lockridge (1999: 65), hypoxia occurs rapidly in pre-term infants when they are handled for routine procedures or exposed to loud noise and other stressors. These effects of stress contribute to the negative sequelae of the high-risk neonate.

2.2 Effects of stress on the pre-term infant

The *Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing and Allied Health* (1997: 1539-1540) defines stress as the sum of the biological reactions to any adverse stimulus, including physical, mental or emotional reactions and internal or external reactions, that tends to disturb the homeostasis of any organism. A stressor is further defined as “any factor that disturbs homeostasis, producing stress”. These would include the following: constant bright light, high noise levels, medical interventions, and routine handling during nursing care (Becker *et al*., 1991: 150).

2.2.1 Neurological development

One of the earliest systems to develop in the embryo is the neurological system, which only reaches maturity in adulthood. The pre-term infant is equipped with an immature

and vulnerable neurological system that needs to manage stimuli from internal and external sources. Mounting organised responses to stimuli is a difficult task for the immature pre-term infant to complete. The extra-uterine environment can be overwhelming and disorientating even for adults equipped with mature neurological systems (Barb & Lemons, 1989: 8). Comparing the pre-term infant's immature neurological system to the mature adult system reveals that significant challenges are presented when demands made by the NICU environment can influence the infant's neuropsychological, psycho-emotional, and psychosocial development (Als, 1999: 19).

Brain development of the full-term infant occurs in the protected intrauterine environment where the infant has a constant supply of nutrition and optimal thermoregulation, waste removal and oxygenation. For the infant born too early, the chaotic environment of the NICU replaces this optimal environment.

The most crucial period of rapid brain growth and neuronal differentiation occurs between 28 and 40 weeks gestational age. From 28-32 weeks gestational age, the risk for neurological insults is increased as the germinal matrix is extremely vulnerable and the possibility of haemorrhage is high (Als, 1986: 6; Becker *et al*., 1991: 154; Als, 1999: 21; Glass, 1999: 91-92).

The central nervous system relies on sensory input in order to mature but brain development of the pre-term infant can be modified by abnormal experiences, such as either over-stimulation or deprivation of stimulation. Research has shown that sleep interruptions, supine positioning, routine and excessive handling, loud sounds, unattended crying, reduced sucking opportunities, and social and medical interactions have unfavourable developmental effects (Als, 1999: 30).

A randomised clinical trial conducted by Als and colleagues (2004: 846) investigated the effects of early experiences on brain function and structure. The experimental group consisted of 16 infants and the control group had 14 infants. The experimental group received the Newborn Individualised Developmental Care and Assessment Program (NIDCAP®) within 72 hours of admission to the NICU. These infants were between 28 and 33 weeks gestational age and where assessed at two weeks, and nine months corrected age. The infants were assessed at two weeks corrected age with the following special investigations: electroencephalogram, magnetic resonance imaging and measurements of the transverse relaxation time. Other areas where the infants were assessed included: health status, growth and neurobehaviour. The results

showed "consistently better function and more mature fibre structure for experimental infants compared with their control" (Als *et al*., 2004: 846).

2.2.2 Signs of stress

The neonate shows signs of stress using three main systems, namely the autonomic, motor and state organisation systems. The autonomic system's stress signals include colour changes, hiccupping, sneezing, gagging, spitting up and changes in vital observations including increases or decreases in the following: heart rate, blood pressure, respiratory rate and temperature (Yeo, 1998: 279; Deacon & O'Neill, 1999: 525). Glass (1999: 91) notes additional effects of stress, including apnoea, bradycardia, vasoconstriction, decreased gastric motility and an increased secretion of cortisol, adrenaline and catecholamines. Increased levels of these hormones inhibits optimal repair of damaged tissue and normal growth. The infant also clearly shows stress through the motor system. Generalised hypotonia, flaccidity, hyperextension of extremities or body and splaying of fingers and toes are all due to some level of stress experienced by the pre-term infant. Variation in state organisation is also a good method of determining stress as this often presents in the NICU. When stressed infants exhibit irritable behaviour, sleep disturbances and inappropriate behaviour due to state disorganisation (Deacon & O'Neill, 1999: 525).

Becker *et al*. (1991: 150-151), and Als (1999: 35) discuss these signals as the pre-term infant's attempts to express non-verbally both positive and negative responses, present in addition to the physiologically observable autonomic and visceral responses. From these methods of communication, one can assess the pre-term infant's behaviour as well as the physiological parameters to determine whether medical, nursing or social interventions are beyond the infant's coping mechanisms. The infant's own behaviour supplies its care givers with the best information base in order to make the necessary alterations to care-giving techniques and environment, which can facilitate the reduction of the pre-term infant's stress.

2.2.3 Short and long-term sequelae of stress

Aversive procedures, excessive handling, interrupted sleep, noxious oral medication, high noise levels and bright light are some of the negative stimuli the pre-term infant

experiences while in the NICU. These stimuli are direct causes of stress that result in disorganised stimulation of the developing sensory systems, which may influence morbidity (Glass, 1999: 91). According to Taquino and Lockrigde (1999: 64), the compromised pre-term infant does not have the ability to tolerate such stressors.

The short-term sequelae of increased stress levels, such as disturbed heart rate, respiration rate, colour changes, blood pressure and saturation levels, are specifically related to physiological instability. When observed in an infant, they reflect changes in respiration patterns and temperature instability, and the infant may present with gagging, hiccupping, disturbed motor behaviour, postural tone and facial expressions, and alterations in behavioural states (Becker *et al*., 1991: 151).

Sick and pre-term infants who survive the NICU period have a higher prevalence of cognitive, sensory, motor and developmental problems than infants who do not spend time in the NICU. The healthy pre-term infant is also faced with developmental problems, which manifest during school-going years. Als (1999: 19) and Taquino and Lockrigde (1999: 64) mention the following developmental problems: learning disabilities, lower intelligence proportion, attention deficit disorders, impulsiveness, concentration difficulties, language comprehension and speech difficulties, visual motor impairments, space orientation disturbances, affective vulnerability and altered self-esteem.

Long-term problems related to prematurity identified by Bohin, Draper and Field (1999: 12) include: cerebral palsy, developmental delays, visual impairment, hearing impairment, impaired growth, epilepsy, chronic lung disease and hydrocephalus. Als (1999: 19, 1986: 4) adds the following complications: bronchopulmonary dysplasia, intraventricular haemorrhage, retinopathy of prematurity and necrotising enterocolitis. These complications are reiterated by Bellefeuille-Reid and Jakubek (1989: 93), who also include susceptibility to disease and poor resistance to infection. In addition, insecure attachment relationships, hyperactivity disorders and information processing abnormalities are seen (Pressler, Turnage-Carrier & Kenner, 2004: 14).

It is common for these children to experience frequent re-admissions to hospital for health problems, such as those mentioned above, that relate to a pre-term birth. These infants often require long-term developmental and functional habilitation, including treatment by speech therapists, audiologists, occupational therapists and physiotherapists. Birth weight, gestational age, clinical course and related

complications play a large role in the determination of outcomes for these infants (Taquino & Lockrigde, 1999: 64).

2.3 Developmental care (DC)

The negative sequelae just mentioned can be reduced through developmental care (DC). DC provides a simple and effective method of reducing these complications by modifying the environment to which the high-risk neonate is exposed. DC, which is described by Symington and Pinelli (2003: 2) as a broad category of interventions designed to minimise the impact of the NICU environment, is a relatively new concept in the care of high-risk neonates. These interventions may include control of one or more elements of the external environment influencing the vestibular, auditory, visual, tactile, olfactory and gustatory systems. Different interventions have been used to modify the extrauterine environment so as to decrease a variety of stressors. These interventions contributed to an increased rest periods to the benefit of the infant.

Taquino and Lockrigde (1999: 64) refer to DC as the provision of social interactions and necessary nursing interventions in a manner that facilitates and supports the neurodevelopmental and physiological stability of the newborn infant. DC is an individualised care approach that attempts to manipulate the pre-term infant's environment to reduce external stressors, and to use the infant's unique behavioural and physiological cues as a foundation for interactions and interventions.

The principles of DC include individualised infant care, family-centred care, appropriate handling and touching of the pre-term infant, initiation of cluster care for nursing activities, developmental positioning and swaddling, kangaroo mother care (KMC), non-nutritive sucking, manipulation of the external environment to reduce negative stimuli (noise, light and negative smell stimuli) and introduce positive smell stimuli, and pain management. For the purposes of this study, all of these principles of DC will be investigated. These interventions result in reduced stress levels and increased rest periods, which are beneficial to the pre-term infant (Taquino & Lockrigde, 1999: 64-79; Jorgensen, 2000: 3; Byers, 2003: 174-179; Hennessy, 2003: 1-52).

Making stress alleviation a priority in the NICU enhances the pre-term infant's potential development and improves interpersonal relationships between family and infant (Yeo, 1998: 278). By using information gleaned from stress signals, the care giver can

modify the pre-term infant's environment to promote neurodevelopment and stress reduction.

2.3.1 Historical perspective of neonatal care

The care of high-risk neonates is recorded as early as 1880 in France, where the first primitive incubator was developed. At this time and for many years afterwards, pre-term infants were termed 'weaklings', and so described in the first textbook on neonatal care, written in 1900. The initial care approach was to maintain thermoregulation, promote nutritional status through oral and digestive tube feeding, control infection and minimise handling. Pre-term and sick infants were also put on exhibition to public viewing and profit was made from this practice (Pressler *et al*., 2004: 1).

This approach of minimal handling by medical staff and parents resulted in an environment of sensory deprivation for these pre-term infants, since many important factors were neglected. Problems included incorrect positioning, inappropriate touch and handling, rapid vestibular disturbances as well as a lack of environmental manipulation of sound, light and smell.

Between 1960 and 1970, much technological advancement occurred that improved medical care delivered to the pre-term neonatal population. This included improved thermoregulatory ability facilitated by the radiant warmer, refined ventilatory setting for infants of smaller birth weights, the introduction of total parenteral nutrition and the use of central infusion lines. Specific ground and air transportation teams were also initiated (Pressler *et al.*, 2004: 3).

Early intervention programmes in the NICU grew from a realisation of sensory deprivation, and were first implemented in the 1970's. Early intervention programmes concentrated on providing structured auditory, visual and vestibular stimulation. The theoretical foundation for this approach was the concept of brain elasticity, which suggested that the brain could respond positively to proper stimulation and regulate in abnormal conditions. Much in these programmes were based on interaction with healthy infants. Although this approach was implemented with good intentions, this type of stimulation was not appropriate for the compromised and stressed pre-term infant (Taquino & Lockrigde, 1999: 65).

In the 1980's the intensive care environment was understood to overload the pre-term infant with stimuli. In reaction to over-stimulation, specific aspects of the minimal handling approach were reintroduced and attempts were made to manipulate the environment with regard to visual, auditory, tactile and vestibular stimulation. At this time, studies were undertaken, as discussed by Taquino and Lockridge (1999: 65), which indicated that hypoxia occurs rapidly during routine and excessive handling, as well as episodes of loud noise.

The focus of neonatal care has now moved to neurological preservation and protection in order to allow pre-term or sick infants to reach their optimal potential within their individual circumstances. This focus resulted from assessments of infants at follow-up clinics, who presented with many negative sequelae post-discharge, outcomes which could be related to the NICU stay. The next step was to determine what aspects in the environment could be potentially harmful and then reduce them by manipulating the external environment. Further research observed individual physiological and behavioural stress cues from infants and care delivery became specialised to the needs of the individual infant (Pressler *et al*., 2004: 5).

2.3.2 Theoretical perspective on developmental care

The growth of DC has thus been gradual, involving the work of many researchers. As time progressed, research findings formed a step-by-step path that can be followed through publications from 1890 to 1979 and beyond. These include works by Budin and Maloney, Prechtl, Piaget and Brazelton (Pressler *et al*., 2004: 7-9). Their findings lead us to the fundamental assumptions of infant development that need to be recognised in order to provide optimal DC.

Characteristics of infant development can be summarised as follows (Pressler *et al*., 2004: 10):

- The first five years of life are the period of the most rapid growth for all body systems;
- Development occurs in sequence;
- Development occurs in a cephalo-caudal pattern and progresses from gross to finer maturation;

- Due to the sequence of development, different levels of organisation, integration and differentiation occur;
- Development is continuous from conception to maturation;
- Individuals develop at different rates; and
- The development of an individual takes place within a social environment where infant interacts with the care giver.

Als, a pioneer of individualised DC giving, introduced a non-invasive environmental infant assessment tool called the Newborn Individualised Developmental Care and Assessment Program (NIDCAP®). This tool is based on the characteristics underlying development and the synactive theory. The synactive theory proposes that infants interact continuously with their environment; that behaviour is species-specific and meaningful; and that infants strive "for smoothness of integration, with underlying tensions existing between approach and avoidance" (Pressler *et al*., 2004: 10).

NIDCAP® aims at observing the infant's interactions with his or her immediate environment. This behaviour is then recorded at 2 minute time intervals for 20 minutes before care is rendered, during care, and for at least 20 minutes after care is delivered or alternatively until the infant is calm (Pressler *et al*., 2004: 9). It is suggested that the infant be observed for at least 60 to 90 minutes (Als & Lawhon, 2004: 51).

This assessment of behaviour allows the NIDCAP® trained evaluator, independent from the care giver, to make recommendations for care-giving and environmental manipulation according to the individual infant's needs, thereby reducing the stress experienced by the infant and facilitating the infant's ability to cope with or self-regulate in his or her environment (Pressler *et al*., 2004: 10). In the context of this study, NIDCAP® is ineffective due to the extremely high cost of the international training and research needed, as well as characteristics of the research site such as low staff competencies, time restraints and staffing shortages.

For these reasons, the generic concept of DC will be implemented without conducting individual behavioural assessments as set out in NIDCAP®. The Wee Care™ educational programme provided by Children's Medical Ventures has been used successfully to implement DC in a variety of American hospitals. This multidisciplinary focused programme uses lectures, written material and practical support sessions at

the infant's bedside (Jorgensen, 2002: 6-7). The concept of this more practical method has been adapted in this study.

2.3.3 Principles of developmental care

Many principles make up the concept of DC, including the following: individualised care (includes cluster care), family-centred care, environmental manipulation (includes light, noise and smell manipulation), developmental positioning and swaddling (includes kangaroo care and in-bed positioning), handling, positive touch and vestibular care, and non-nutritive sucking (Hennessy, 2004: 29.33). Walden and Jorgensen (2004: 210) add pain management to this list of principles. Each of these principles will now be briefly discussed.

2.3.3.1 Individualised care

Individualised care is a care approach which regards the high-risk neonate as the focal point, and all care interventions are structured according to that infant's needs. Care delivery is regulated by taking physiological and behavioural cues into consideration before care-giving is rendered and then adjusting the care routine according to what the infant can cope with. By assessing and understanding the unique communication style of the infant, the care giver is flexible and allows the infant to determine his or her own care accordingly, as permitted by his or her health condition (Carrier, 2004: 237; Hennessy, 2004: 29.31).

2.3.3.2 Family-centred care

Family-centred care forms an integral part of DC, where the family is encouraged to participate as an active member of the multidisciplinary care team. This helps to facilitate continuity of care, empower parents during a life crisis, improve parent-infant interaction and bonding, and provide an easier transition from hospital care to the post-discharge home reality (Hennessy, 2004: 29.36; Pressler *et al*., 2004: 23).

By involving parents in decision-making processes and medical decisions, allowing them to participate in routine care and keeping them informed about all problems and

successes, the nurse facilitates the process of adaptation and the parents can then more easily resume their normal roles as parents for their infant. Family-centred care promotes full disclosure of relevant information, emotional support with referral to counsellors if necessary, listening to the parents' observations and opinions, parental participation in care and unlimited access to the infant in accordance with patient care activities. The social environment can be adapted to provide the infant with homely comforts as well as taking parental comfort and visitation into consideration (Harrison, Lotas & Jorgensen, 2004: 240; Hennessy, 2004: 29.37-38).

2.3.3.3 Environmental manipulation

Environmental manipulation consists of controlling three aspects, namely light, noise and smell stimuli. The physical environment is altered by minimising excessive noise, reducing bright overhead lighting, reducing negative smell stimuli and providing positive smell stimuli. These aspects are difficult to control and adequate education is needed to ensure that all staff and family members are aware of the infants needs; the NICU environment is after all the compromised or pre-term infant's bedroom.

2.3.3.3.a Light reduction

The visual system is the last sensory system to develop, which results in increased immaturity if the infant is born prematurely (Lutes, Graves & Jorgensen, 2004: 159). Early stimulation of the immature or compromised visual system resulting from pre-term birth can change the normal course of development of this system, which can then affect the neurological system's ability to provide appropriate behavioural responses. In addition, with later visual-nerve development of this system, any stress episode can have a negative effect (Turnage-Carrier, 2004: 282).

The visual system forms an integral part of learning through recognition and exploration of the external environment. If the normal development is disturbed, the infant can experience developmental challenges regarding learning (Lutes *et al*., 2004: 180). Bright light is not only a stressor for the infant, but also significantly increases his or her risk of developing eye diseases including retinopathy of prematurity (Rossetti, 2001: 184; Pressler *et al*., 2004: 18).

The recommended level of lighting is between 10-600 lux, which is much lower than that found in many NICUs (White, 2003: S15; Harrison *et al*., 2004: 255). Light levels commonly measured in the NICU range between 240-1500 lux with a mean of 470 to 900 lux, but the light level can increase up to 3000+ lux during procedures. Natural lighting (sunlight) also increases the amount of light in the NICU (Harrison *et al*., 2004: 251).

When born prematurely, the infant has eyelids that are extremely thin and allow excessive light to penetrate into the eye. The infant does have the ability to squeeze the eyelids tightly shut in response to bright light, but can only maintain this defensive action for a short period of time. Pre-term infants are at a further disadvantage as they have larger pupils, and only develop a mature pupil reflex ability at 36 weeks gestational age allowing successful constriction of the iris sphincter (McGrath, 2004: 112).

Short-term adverse effects of continuous and excessive light include a reversal in normal day-night amino acid levels, reduced oxygen saturation, increased heart rate and respiratory rate, disturbed sleep patterns and an increase in motor activity (Harrison *et al*., 2004: 253-254).

Full-term newborn infants do not have the visual ability to see any detail when looking at their environment and have no ability to adjust their focus. The pre-term infant is therefore more vulnerable and this emphasises the immaturity of the pre-term infant's visual system and stresses the need for protection thereof (Lutes *et al*., 2004: 179). As strong light may be hazardous for the developing retina, it is recommended that light sources be positioned away from the infant's direct line of sight (White, 2003: S15-16). Reduced lighting in the NICU shows no negative effects if the patient is monitored effectively, is congruent with the uterine environment and may facilitate rest, sleep and physiological stability of the sick and/or pre-term neonate (Carrier, 2004: 248).

Nursing interventions that are generally used to protect the infant from excessive light include direct shielding of the infant's eyes, reducing ambient lighting in the patient care area with blinds and curtains, and covering the incubator with a blanket or quilt. Dimmer switchers and individual lighting are useful resources which allow for low ambient lighting with gradual light changes and concentrated light as needed for each patient respectively (Rossetti, 2001: 185; Bozzette & Kenner, 2004: 80; Harrison *et al*., 2004: 252). If the lights are to be turned on for a short time period, to observe an

infusion site for example, a hand can be held over the infant's eyes until the light is switched off.

The value of reducing lighting to improve pre-term infants' medical outcomes is challenged by Kennedy and colleagues (2001: 527), who conducted a randomised controlled trial to assess the effect of light reduction on neonatal morbidity as a single intervention. 359 pre-term infants with a gestational age of less than 31 weeks were divided into control and experimental groups, where the experimental group were fitted with 97% light reducing goggles within 24 hours of birth. The goggles were removed at 31 weeks gestational age or were used for a minimum period of four weeks.

The findings of the study showed no significant differences between the two groups regarding weight gain, time period receiving oxygen, ventilation duration, length of hospital stay and incidence of intracranial haemorrhage. It was concluded that "continuous light reduction in the first few weeks of life for low birth weight infants showed no effect on medical outcomes" (Kennedy *et al*., 2001: 527-531). Although this may be true when the benefits of light reduction are isolated, the researcher is of the opinion that when taking all the pre-term and sick infant's external stressors into account, exposure to bright light contributes to increased stress in a cumulative effect which is difficult to simulate in a controlled environment.

Structured day-night cycles are almost absent in most NICUs, which have bright lighting for the majority of the day and night. The highest levels of light are observed in areas where the sick and pre-term infants are located. Introducing structured day-night cycles has shown positive effects, such as rapid weight gain, increased sleep periods, improved oral feeding and fewer recorded days on mechanical ventilation (Carrier, 2004: 248).

2.3.3.3.b Noise reduction

The South African Occupational Health and Safety Act (Republic of South Africa, 1993: 2105) states that any person entering an area where noise levels are higher than 85 decibels (dB) must wear protective hearing equipment. It is recommended that noise levels in the NICU be kept at 50dB or lower. The Standards of Newborn ICU Design were initially generated by Dr Stanley Graven at the University of South Florida in the early 1900's. These standards have been updated as the principles of unit design evolved, and recommend that sound levels not exceed 70dB (White, 2003: S18;

Harrison, *et al*., 2004: 261). Previous research has demonstrated the reality of peak levels as high as 120dB, which is sufficient to cause permanent cochlear damage (Bozzette & Kenner, 2004: 80; Pressler *et al*., 2004: 17).

Noise reduction is probably one of the most difficult variables to control because of the dynamic NICU environment. Circumstances and situations related to the NICU environment cause noise build-up very quickly. In order to protect the auditory system of the pre-term or sick infant, the multidisciplinary team needs to introduce practices that will support normal sleep-wake cycles, promote normal development and facilitate optimal bonding between parents and infants. To do this, staff need to reduce the level of background noise, support the infants with the correct type of auditory stimulation, and conduct screening tests for early detection of hearing loss (Carrier, 2004: 248).

The auditory system develops second to last in the order of sensory development. Although this system's structure virtually completed when the foetus starts to hear at approximately 23-24 weeks gestational age, its function is still maturing. If noise damage occurs at this stage of development, this may result in permanent sensorineural hearing loss (Harrison *et al*., 2004: 258; McGrath, 2004: 111). Infants' period of higher sensitivity to hearing loss or damage extends from the sixth month gestational age to a few months after full-term birth (Lutes *et al*., 2004: 177). This increases the pre-term infants' risk for hearing loss, in addition to the environment of the NICU where noise from telephones, staff and machinery also bombards the infant and causes further stress (Rossetti, 2001: 185).

The pre-term or sick infant is therefore at a greater risk of noise damage during this critical period of auditory maturation if they are exposed to a very noisy environment. These infants are at a disadvantage because they have lost the protection of their mother's womb, and are exposed to alarms, incubator noise and many other noise sources. In addition, their medical condition often requires the administration of ototoxic medication like aminoglycosides and certain diuretics which often cause further damage to the already vulnerable hearing structures (Bozzette & Kenner, 2004: 79; Lutes *et al*., 2004:177; Maree, 2004: 31.81-82).

Researchers conclude that many adverse short-term effects can be seen during episodes of loud noise, such as increased heart rate, sleep pattern disruption, irritability, agitation, crying, increased pressure in the anterior fontanel, reduced oxygen saturation, hypoxia, skin colour fluctuation, infant fatigue, apnoea, bradycardia and

increases in activity levels. These results hold true for full-term and pre-term infants. Long-term effects which may present in the pre-term infant include speech and language delays, auditory-language disorders and comprehension and articulation difficulties (Bozette & Kenner, 2004: 79-80; Carrier, 2004: 248-249; Harrison *et al*., 2004: 259; Lutes *et al*., 2004: 178).

Reducing noise can be done in a number of ways: conversations can be conducted away from the infant's bed space, staff can refrain from calling to each other from across the room, doors and drawers can be opened and closed quietly, and the top of the incubators can be kept clear rather than used as a storage area. The physical environment can also be adapted by using plastic instead of metal dustbins, reducing noise levels of telephones and other equipment, and, if funds are available, using acoustic absorbing materials like carpets and acoustic absorbing ceiling tiles. Noise can be monitored by decibel meters which are triggered by high decibel measurement (Harrison *et al*., 2004: 260).

2.3.3.3.c Smell

The olfactory system develops fourth in the order of sensory development and the pre-term infant has been shown to have a sense of smell by 26-28 weeks gestational age (Lutes *et al*., 2004: 159, 174; McGrath, 2004: 111). Smell is responsible for many other links in the brain that produce effects such as motor or emotional responses. For example, when the infant's mother is holding him or her on her chest in the skin-to-skin position, the infant will smell her breast milk, start turning his or her head and show primitive reflexes of rooting and sucking (Lutes *et al*., 2004: 174).

At 28 weeks gestational age, pre-term infants respond to strong odours. This response may take the form of sneezing, grimacing and frowning, physiological stress cues or movement of the head away from the stimulus if the infant has the ability to do so. In the NICU environment, infants are exposed to many negative smell stimuli, for example alcohol swabs, cleaning chemicals, alcohol-based hand rub, oral medications and strong perfume or cologne. These odours need to be reduced or counter balance with positive smell stimuli, like breast milk or a parent-scented item. This will promote emotional security and facilitate bonding between infant and parents, as well as possibly reducing negative smell associations. A negative smell association is, for example, when an infant smells alcohol and anticipates a painful procedure to follow

the smell like venepuncture. In response to this, the infant can desaturate, start crying or have variations in heart rate (Hennessy, 2004: 29.33; Lutes *et al*., 2004: 174-175).

A study by Marlier, Gaugler and Messer assessed the role of olfactory stimulation in the prevention of apnoea in pre-term infants. Although the findings were positive, the sample size was small (n=14). Infants were receiving medication for apnoea but episodes of apnoea still presented. 14 pre-term infants between the gestational ages of 24-28 weeks who experiences recurrent episodes of apnoea were exposed to a slight vanilla smell for a period of 24 hours. The effectiveness of this intervention was observed by comparing frequency and severity of apnoea for three days; pre-intervention day (baseline data), intervention day, and post-intervention day. The results revealed that introducing the pleasant vanilla odour to the pre-term infant's environment had therapeutic value as the infants showed a decrease in frequency and severity of apnoea episodes (Marlier, Gaugler & Messer, 2005: 83).

2.3.3.4 Developmental positioning

Developmental positioning includes appropriate positioning of pre-term and sick infants in their bed, KMC and swaddling. Jorgensen (2000: 1) explains that optimal positioning involves midline orientation, hand-to-mouth activity and foetal flexor patterns which promote self-soothing and self-regulation behaviours. These contribute to the neurobehavioural development of the pre-term infant. The golden rule of positioning is adhering to three principles: (1) containment, (2) flexion and (3) midline orientation. These principles make it possible to simulate the uterine environment and are applied to in-bed positioning, KMC and swaddling.

Due to pre-term birth, the pre-term infant is born lacking physiological flexion. Low muscle tone and static positioning of the high-risk neonate in the incubator are further complicated by gravitational forces resultant in postural pathology (Bellefeuille-Reid & Jakubek, 1989: 93). These infants are predominantly nursed in the supine position during the initial weeks of life due to their increased acuity. This consequently facilitates the development of extensor muscle group over flexor muscle groups (De Groot, Van der Hoek, Hopkins & Touwen, 1993: 72).

When infants are positioned according to developmental positioning principles with regard to short-term sequelae, they appear to have reduced stress levels including

increased stability of vital data and reduced irritability (Hennessy, 2003: 47). Long-term effects of incorrect body positioning include postural deformities, such as hip abduction and external rotation; ankle eversion; retracted and abducted shoulders; and neck hyperextension, shoulder elevation and cranial moulding, which in turn impede developmental milestones of head control rolling, sitting, crawling and walking (Jorgensen, 2000: 1).

Positioning the pre-term infant in the prone position enhances oxygenation, tidal volume and lung compliance when compared to supine positioning. Left and right lateral positions also aid oxygenation and circulation while facilitating rotation of the extremities. Flexion and midline orientation is also accommodated in this manner. Containment of the infant enhances a feeling of security, improves self-regulation and results in a calmer infant who gains weight rapidly and generally has lower medication needs (Bellefeuille-Reid & Jakubek, 1989: 94; Jorgensen, 2000: 1).

KMC follows the DC principles that have been shown to produce a significant reduction in pre-term complications. Parasympathetic vagus stimulation which occurs when the infant is placed in skin-to-skin contact proves to be beneficial for the pre-term infant, producing reduced stress levels, physiological stability with fewer apnoea attacks and less periodic breathing, less energy consumption leading to greater weight gain, temperature stability, reduced nosocomial infection and improved oxygenation levels (Bergman, 1998: 9-10; Van Rooyen *et al*., 2002: 7).

Although KMC has become widely implemented in national and international sites, a review of research literature by McGrath and Brock (2002: 18) suggests that adequate research is not available to advocate KMC for all infants. Literature supports KMC practices with low-risk infants rather than high-risk and intubated infants. Most studies focus on low-risk infants with small sample sizes. Only two studies investigate intubated patients, one of which only has a sample with n=25 and is not scientifically written.

Swaddling is another way of positioning the infant. The infant is swaddled with a blanket or cloth according to the abovementioned three principles. This can be done for an infant that is in a crib prior to discharge, before any painful procedure is performed, during handling or holding of the infant, or during bathing of the infant. The latter is called swaddled bathing, and is described by Fern, Graves and L'Huillier (2002: 3): "the baby is placed in a flexed, midline position, swaddled in a blanket or soft towel,

and then fully immersed in a tub of warm water. One body section at a time is unwrapped, gently washed, rinsed and rewrapped." By swaddling the infant, he/she remains contained during the bathing. Fern *et al*. (2002: 3) cite a study by Peters, which notes that bathing the infant "is an extremely stressful form of stimulation to the critically ill pre-term neonate." Post-bath exhaustion also effects successful oral feeding after the bath (Fern *et al*., 2002: 3).

Although no formal research has been found on swaddled bathing, it is in accord with the DC approach. As occupational therapists Fern *et al*. (2002: 3-4) have observed, benefits for the infant arising from this practice include reduced physiological and behavioural stress cues, less motor actively or flailing limbs resulting in energy conservation, less agitation and crying, visible self-regulatory behaviour and the ability to feed directly after a bath. Benefits are also observed for staff and parents, who feel more confident handling the infant, and improved parent-infant bonding (Fern *et al*., 2002: 3).

2.3.3.5 Handling, positive touch and vestibular care

The tactile system allows the infant to respond to many stimuli and indicates normal neuromotor integration and development. *In utero*, the infant can experience touch from the muscular uterus wall as early as eight weeks gestational age (McGrath, 2004: 111). The tactile system also allows the infant to feel pain, emotional satisfaction and temperature and proprioception sensations. A well-developed tactile system allows the infant to process touch stimuli to provide a response, for example if the baby's arm is pricked with a needle, the infant withdraws the limb (Lutes *et al*., 2004: 167).

Physiologically unstable infants are termed 'hands-off' when they do not cope well with touch and stimulation, but it may not be the amount of touch that is the problem, but rather the quality and type of handling and touch that the infant receives. The infant's gestational age, medical condition and sensitivity to handling also need to be taken into consideration (Rossetti, 2001: 186-187).

For an infant born prematurely, early touch experiences may determine the degree of tactile sensitivity displayed by that infant during the hospital stay and after discharge. If these experiences are positive, positive responses will be seen, but if the stimuli are negative (e.g. oral suctioning or repeated heel lancing), an altered neurological development pattern can result. Repeated oral suctioning is an example of a negative

stimulus and may cause oral aversion. This develops when the normal protective function is over-stimulated and results in tactile defensiveness where the infant avoids any objects near or in the mouth, or shows physiological and behavioural stress cues when the mouth is stimulated (Lutes *et al*., 2004: 168).

One research study demonstrated that pre-term infants weighing less than 1500 grams were handled a mean of 234 times in a 12-hour period (Rossetti, 2001: 187). In a similar study, this frequency was observed to increase with the patient's severity of medical condition (Harrison *et al*., 2004: 229). When taking the premature neurological system into account, the infant does not cope well with this over-stimulation, which happens very quickly in the NICU environment.

In descriptive studies, researchers have observed the following effects of handling and touch on pre-term infants: a reduction in tissue oxygenation after routine care-giving, elevation in intracranial pressure, increased blood pressure, agitation and increased frequency of apnoea and bradycardia (Bozzette & Kenner, 2004: 80-81). Additional adverse effects include disturbances in sleep patterns, hypoxia, increases in heart rate and respiration rate and more behavioural stress cues (Harrison *et al*., 2004: 229).

Positive touch stimuli should be provided for the infant to counterbalance the negative and often noxious stimuli received on a frequent basis. These can include skin-to-skin contact as provided during KMC, and still gentle touch (positive touch) where the hands are placed on the head and lower back or abdomen (Bozzette & Kenner, 2004: 81; Harrison *et al*., 2004: 230).

Some research findings for the clinical significance of positive touch reveal positive effects such as reduced sleep activity levels, fewer behavioural stress cues during the positive touch intervention, and less motor activity. These finding are contradicted by other studies, which conclude that positive touch does appear to have physiological effects but that these are not clinically significant. Additional positive effects of positive stimuli include increased weight gain, promotion of regular respiration and a calmer infant (Harrison *et al*., 2004: 230-231).

2.3.3.6 Non-nutritive sucking

Non-nutritive sucking occurs when the infant sucks on a pacifier or thumb with a repetitive mouthing action. It is used by pre-term and sick infants to encourage the

development and maintenance of a normal sucking reflex (McGrath, 2004: 332). Pinelli and Symington (2005: 2) describe the rationale for this intervention, saying that "non-nutritive sucking facilitates the development of sucking behaviour and improves digestion of enteral feeds." Non-nutritive sucking is used during nasogastric tube feeds and at other appropriate opportunities (Pinelli & Symington, 2005: 2).

Non-nutritive sucking also has a calming effect on the infant and can be used as a non-pharmacological pain management method where the infant shows less behavioural pain responses during minor painful procedures (Walden & Jorgensen, 2004: 209). Non-nutritive sucking improves feeding alertness and readiness, improves transition to oral feeding, improves weight gain, reduces oxygen demands, facilitates faster discharge and reduces hospital costs (Hennessy, 2004: 29.33; McGrath, 2004: 326, 332, 337; Pickler, Reyna & McGrath, 2004: 414).

Although improved weight gain is shown in some studies to be a positive benefit of non-nutritive sucking, a well-controlled prospective study showed that non-nutritive sucking is not associated with improved weight gain (Pickler *et al*., 2004: 415). A systematic review of available literature was conducted by Pinelli and Symington (2005: 1) for the Cochrane Library, and looked at whether non-nutritive sucking promoted physiological stability and nutrition in pre-term infants. A variety of variables were observed to determine the effect of non-nutritive sucking on the following: weight gain, energy intake, heart rate, oxygen saturation, length of hospital stay, intestinal transit time, age at full oral feeds or any other clinically significant outcomes (Pinelli & Symington, 2005: 2-3). Of 21 studies used for the review, 15 studies were randomised control trials. No long-term data was available. Positive effects of non-nutritive sucking found included significantly reduced length of hospital stay, improvement in transition from tube to bottle feeding, and improved performance and behaviour during bottle feeds. This systematic review did not find consistent evidence that supported the other identified variables. No short-term negative effects of non-nutritive sucking were reported, although the potential for a negative influence on breastfeeding was identified (Pinelli & Symington, 2005: 2-4).

Benis (2002: 259) addressed this issue when investigating whether pacifiers were associated with early weaning from breastfeeding. The literature reviewed in this study showed that only one randomised controlled trial looked at long-term pacifier-use related to early weaning from the breast, and that the negative influence of pacifiers on breastfeeding was based on observational association (Benis, 2002: 261).

A method of examining the literature called Critically Appraised Topic was used to evaluate the available randomised controlled trials in the study of Benis (Benis, 2002: 260). 258 mothers with healthy full-term breastfeeding infants were randomised into a control group (n=131) and an experimental group (n=127). Both groups were given basic breastfeeding information including calming options, but mothers in the experimental group were given advice to avoid the use of pacifiers. "A strong observational association was found between pacifiers and early weaning; however, when data was analysed by randomised allocation, no such association was found" (Benis, 2002: 262). These findings suggest that the use of pacifiers may be an indicator of breastfeeding problems or decreased motivation to breastfeed instead of the 'cause' of early weaning. A limitation was highlighted preventing the findings from being generalised to pacifier use in pre-term infants (Benis, 2002: 262-263).

2.3.3.7 Pain management

The myths of yesteryear regarding neonates' lack of pain have definitely been proven incorrect. Any person that has had to inflict pain on an infant for a medical procedure can vouch for this. Research has been conducted on the physiology of pain, behavioural responses to pain and management of such pain. It is well known that the short-term effects of pain experienced during painful procedures cause alterations and adaptation in the cardio-respiratory system, metabolic and hormonal systems and immune system (Walden & Jorgensen, 2004: 199).

Short-term effects of pain on the infant include increases in heart rate, respiratory rate, blood pressure, and intracranial pressure with a greater risk for intracranial haemorrhaging; and decrease in oxygen saturation. Long-term sequelae related to repeated painful stimuli include reduced or increased sensitivity to general everyday childhood pain, touch aversion and long-term structural alternations to the brain and spinal cord. Although this information is in hand, practices of inadequate pain management are widely recognised (Walden & Jorgensen, 2004: 197, 199).

Pharmacological and non-pharmacological methods are available to reduce pain for the infant. For the purpose of this study, non-pharmacological methods like swaddling, containment holding, non-nutritive sucking and sucrose solution will be used (Walden & Jorgensen, 2004: 208).

Stevens, Yamada and Ohlsson (2001: 3) conducted a systematic review of available literature that satisfied the inclusion criteria as stated by the Neonatal Collaborative Review Group. 17 studies were reviewed and the reviewers concluded that the use of sucrose is safe and effective for reducing the pain experienced by infants during single painful events, such as venepuncture and heel lancing. Decreases in physiological and behavioural pain indicators were found. An optimal dose for sucrose administration could not be identified as sucrose dosage varied between 0.012g to 0.12g (0.05ml to 0.5ml of 24% sucrose solution) (Stevens, Yamada & Ohlsson, 2001: 4).

2.3.4 Outcomes of developmental care

A study done by Becker *et al*. (1991: 150) attempted to determine the outcomes of developmental nursing care for very low birth weight infants. The results of this study demonstrated that the developmental approach has a positive impact on infants' progress during hospitalisation. When the experimental group was compared to the control group results indicated improved respiratory status, earlier transition from nasogastric tube to oral feeds, increased self-regulatory abilities, physiological stability, reduced morbidity, diminished length of hospitalisation and improved behavioural organisation.

A systematic review of previous research was conducted by Symington and Pinelli (2003: 1-47) for the Cochrane Collaboration. 31 randomised controlled trials were reviewed. The findings of this review indicate that DC has advantages for the pre-term infant, including improved growth and weight gain, reduction in cost of hospitalisation, reduced need for respiratory support, reduction in critical care costs, and decreased period of hospitalisation, as well as improved neurodevelopment at two years corrected age. No detrimental effects regarding DC have been reported.

Many interventions were implemented simultaneously in the reviewed studies, which makes it difficult to determine single effects of individual interventions. Research findings are also often based on a few small trials. Meta-analysis was only conducted on two trials for individual advantages. An identified methodological fault is the lack of blinding of assessors. Blinding in these randomised controlled trails is problematic due to the visual nature of the DC intervention. The approach is either done and evidence of practice is seen or it is not done with poor or no evidence visible in the practical

setting. Symington and Pinelli (2003:1-47) conclude that further research is needed to determine more short- and long-term outcomes of DC interventions as well as studies to determine the economic impact of implementation and the maintenance of such practices.

A commentary by McGrath and colleagues (2002: 46) reflects that there are barriers to DC due to reluctant support from the medical community. They state that DC principles "are not easy to quantify but appeal to more qualitative forms of research instead of the golden standard randomised controlled trials" (McGrath *et al*., 2002: 46). They also question the ethics involved in withholding DC: "nurses raise the issue that randomised control trials would be unethical since the developmental care studies to date show that the influence on infants is positive" (McGrath *et al*., 2002: 47).

Research studies not using randomised clinical trials have found additional advantages. DC provides a reduction of stress levels resulting in a more physiologically stable infant. These advantages include a reduction in developmental delays, reduced need for oxygen and decreased use of sedation. These improvements relate to more positive short- and long-term sequelae of the pre-term infant (Becker *et al*., 1993: 214; Als *et al*., 1994: 853; Heller *et al*., 1997: 111; Jorgensen, 2000: 1-4; Hennessy, 2003: 1-52).

When comparing nursing costs for pre-term infants receiving conventional care versus DC, Petryshen, Stevens, Hawkins and Stewart (1997: 143) found that, on average, pre-term infants nursed conventionally were less stable in comparison to those in the DC group throughout the first 35 days of hospitalisation. Nursing cost was reduced due to the lower complexity of care needed by the DC group directly relating to their physiological stability. Total days of acute intensive care intervention for the conventional care group exceeded that of the DC group, which resulted in greater hospital cost. These research findings support the implementation of DC for the very low birth weight infants (Petryshen *et al*., 1997: 143-144). Similar results were also found by Hendricks-Muñoz, Prendergast, Caprio and Wasserman (2002: 42-44), where hospital stay and hospitalisation costs were reduced by implementation of DC.

Rossetti (2001: 276) quotes a statement from research done by Van den Berg: "Developmental care is no longer optional. It is mandatory if we are to provide optimal care for low-birth-weight infants and those surviving the NICU". McGrath *et al*. reiterate this conviction by concluding that DC facilitates the provision of holistic care and calls

attention to the need for human caring where technology many not be sufficient to maintain meaningful life (2002: 46-47).

2.4 Developmental care implementation

DC, including KMC, was introduced as a new care approach into neonatal terminology in the 1980's. Extensive research between 1972 and 1987 concluded that the neonatal intensive care environment was over-stimulating the pre-term infant. The need for implementing DC was clear although the initial acceptance of this new approach took time. DC was implemented internationally into neonatal intensive care units in the United States of America and Sweden with varied levels of success (Cole *et al*., 1990: 15; Westrup *et al*., 2000: 71; Byers, 2003: 175).

Considering the meaning of DC implementation necessitates a new concept or plan being brought into effect in a NICU. When changing the care approach in a NICU from the standard medical model of care to a more 'preemie-friendly' model of care, where the care paradigm shifts to a family-centred and infant-focused approach, all facets of care-giving need to be re-evaluated and re-organised. Changes need to be made to routine care practices by all multidisciplinary members of the team, including ways of thinking about the patient and the work environment, development of policies and procedures, acquiring of medical equipment and interpersonal interactions between staff and families. This change cannot be accomplished without problem analysis, planning, education, and implementation. This process of change takes time and quick results should not be expected (Pressler *et al*., 2004: 25).

For added success, Als and Gilkerson (1997: 186) recommend a developmental specialist and/or DC nurse educator in the unit to provide the knowledge and training needed for DC. The responsibilities of such an educator include in-service training, mentoring, leading the DC committee, observing and evaluating progress, consulting in difficult patient care problems, interdisciplinary communication and conflict management and family support.

Implementation of DC in other countries has been successful to various extents but problems are still experienced. Robison (2003: 379-380) observes that without effective participation and leadership from management, the quality of DC provided relies on individual care givers' philosophy and emotional status when allocated to

infants. This results in inconsistent care and high levels of frustration for health care professionals and families.

Based on the researcher's personal undocumented observation during a previous study, many factors influence the implementation of DC. Problems experienced include resistance to change, a non-caring attitude, unfavourable working conditions, financial restraints, negative attitudes of some multidisciplinary team members, low levels of knowledge about DC and a lack of training on the topic. These barriers are confirmed by Carrier (2002: 32), who includes staff resistance, frequent rotation of staff, high staff turnover, raised patient acuity, staff shortages, anxiety associated with change and a lack of knowledge and inconsistency of care givers.

Carter (1996: 30) discusses the barriers to implementing research findings into practice, found in cases where research findings and recommendations are available but nurses still do not put this new knowledge into practice. The process of change is also discussed, and the fact that health professionals may resist change as they feel threatened or victimised pointed out. Carter (1996: 35-36) cites a study by Closs and Cheater, which suggests that any intervention proposing change will be met with much resistance, in order to maintain the current status. Carter concludes that for such barriers to be successfully overcome, the following have to be in place: good communication, wide-ranging managerial support, staff empowerment through increased autonomy and flexibility, and a "bottom-up approach" positively influencing ownership among staff (Carter, 1996: 38).

The Colorado Consortium of Intensive Care Nurseries took an initiative to implement DC into the nurseries in their state. As a result of this process, six steps were proposed to monitor the units' level of progress in the implementation process. Each successive step had to be completed satisfactorily before the next step could be reached. Regression was seen in some situations, and some units had difficulties in conquering a more complex step (Browne & Smith-Sharp, 1995: 21).

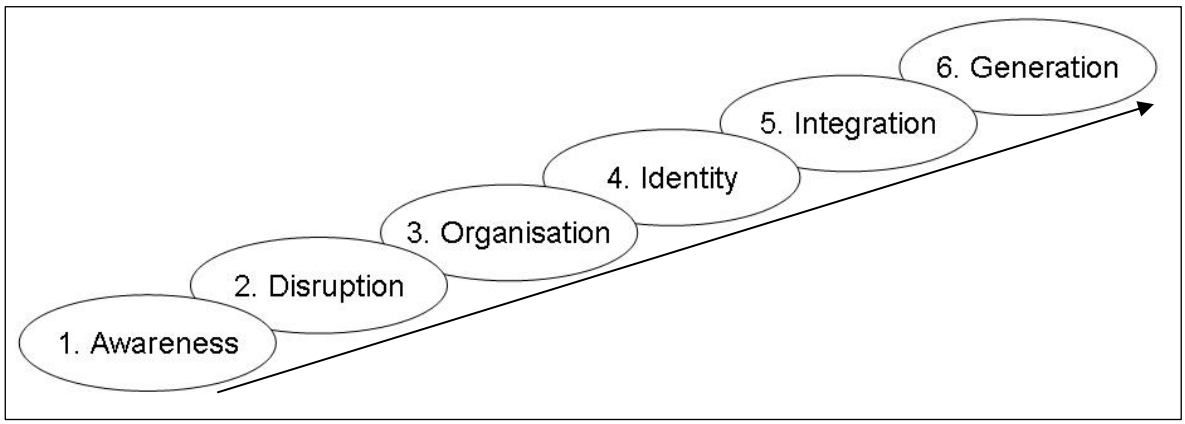

Figure 1: Schematic representation of the six steps of implementation progress (Brown & Smith-Sharp, 1995: 21-22)

Step one is **awareness** of the DC implementation initiative, where much enthusiasm and excitement is experienced by staff faced with a new challenge. Step two involves the **disruption** that occurs when the implementation is begun and resistance to change is experienced. **Organisation** is the third step, where the unit approaches the implementation of DC in an organised manner, shown by actual practices in the unit. Once the step of organisation has been mastered, **identity** follows. Identity occurs when the unit adopts DC practices into written documentation, for example policies and procedures, and makes aspects of the care approach mandatory. **Integration** is the fifth step and includes a more individualised infant approach, but resistance and internal conflict is still seen between staff beliefs and implementation goals. The sixth and final step is **generation**. Generation occurs when the unit can satisfy all the goals of DC, and incorporate them into everyday routine practices on an advanced level. This involves flexible practice and alteration of the unit's care philosophy, as well as integration of DC into other areas in the hospital, for example labour rooms and theatre deliveries (Browne & Smith-Sharp, 1995: 21-22). These six steps would have been ideal to determine progress of the intervention plan for this study, but unfortunately no additional information could be found regarding the criteria used to classify each step.

2.5 Conclusion

DC can be implemented in South Africa to improve the management and outcomes of the pre-term infant population in order to minimise short- and long-term developmental sequelae. The researcher hopes to implement DC successfully into the chosen hospital. By implementing this care approach into the NICU, the researcher hopes to improve the quality of medical care rendered to the infants as well as to reduce stress

levels, thereby protecting the delicate neurological system of the pre-term and sick infants through DC. This will result in physiologically stable infants, and then in great reductions in developmental delays, reduction in ventilation time, reduced need for oxygen, faster weight gain, decreased use of sedation, reduction in hospital costs and shorter hospitalisation periods. These effects relate to more positive short- and long-term sequelae in the management and outcomes of the pre-term and sick infants with a reduction in complications related to disease states.

3 Chapter Three: Methodology - intervention research

3.1 Introduction

Intervention research was chosen as the research design for this study as it is classified under applied research methods. The purpose of this research implicated a definite intervention strategy aiming to provide possible solutions to problems in a practical setting (Fouché, 2002: 112). As shown in the literature review, DC as a care approach has been proven effective. Infants exposed to a less than optimal environment are at risk of many developmental and neurological complications, and so DC implementation is vital. Using the intervention research method, the researcher followed a step-by-step process to develop an intervention plan to implement DC at the chosen research site.

Schilling (1997: 174) describes an intervention as an action carried out by an individual or individuals in order to enhance or maintain the normal functioning and well-being of a specific population. Within the context of a caring profession, intervention research allowed the study to fulfil its aims, to use developed knowledge and previously utilised research as a framework for the theoretical and practical aspects of DC. In this study, evidence-based knowledge was implemented in a practical setting, and provided a site-specific case-study reflection on the implementation process of DC. These fundamental aspects aimed to bridge the practice-theory gap evident in practice (De Vos, Schurink & Strydom, 1998: 6).

3.2 Historical aspects of intervention research

Intervention research was pioneered by Edwin J. Thomas and Jack Rothman. They focused on how the research methodology used in non-medical fields to produce and advance technology could be adapted to the social sciences and caring professions including medicine, allied health professions and social work. The work that arose from their collaborations on developmental research is collectively known as intervention research and consists of three research models (Thomas & Rothman, 1994: 3; De Vos, 2002: 395; Fouché, 2002: 112).

The first model, intervention knowledge development, addresses empirical research aimed at developing knowledge about human behaviour. The second, intervention knowledge utilisation, addresses how this newly developed knowledge can be used in practice. The third model, intervention design and development, includes research to develop technology or technological items (Thomas & Rothman, 1994: 4-6; De Vos *et al*., 1998: 11; De Vos, 2002: 394).

Although these different models have their own objectives, methods and outcomes, each facet is interrelated (Rothman & Thomas, 1994: 4-6). The researcher used the intervention design and development model to implement DC. The intervention, DC, is a product of previous research where intervention knowledge development and intervention knowledge utilisation were used to refine the intervention. This knowledge gained, mainly on an international level, was adjusted to facilitate implementation of DC in a South African public NICU. This chapter focuses on intervention design and development as used in this study.

3.3 Intervention design and development

The intervention design and development research model consists of six phases that are interrelated and interconnected, and although they are discussed individually, each phase continued after the next phase is initiated. As the model suggests, design and development is a continuous process leading to re-evaluation and refinement during all phases. This therefore allows phases to circle back upon each other. Each phase had characteristic activities that must be completed to meet the requirements of that phase (Rothman & Thomas, 1994: 9).

The six intervention design and development phases were as follows: 1) problem analysis and project planning; 2) information gathering and synthesis; 3) design; 4) early development and implementation; 5) evaluation and advanced development; and 6) dissemination (Rothman & Thomas, 1994: 9). For the scope of this study, phases one to five were included in the research, with phase six to follow on as post-doctoral activities. The purpose of this methodology chapter is to give an overview of all phases. Particular details about the different activities and qualitative methods used in the phases are discussed individually in the chapters that follow.

Figure 2 is a schematic presentation of the different phases, as adapted from Thomas and Rothman for the purposes of this study.

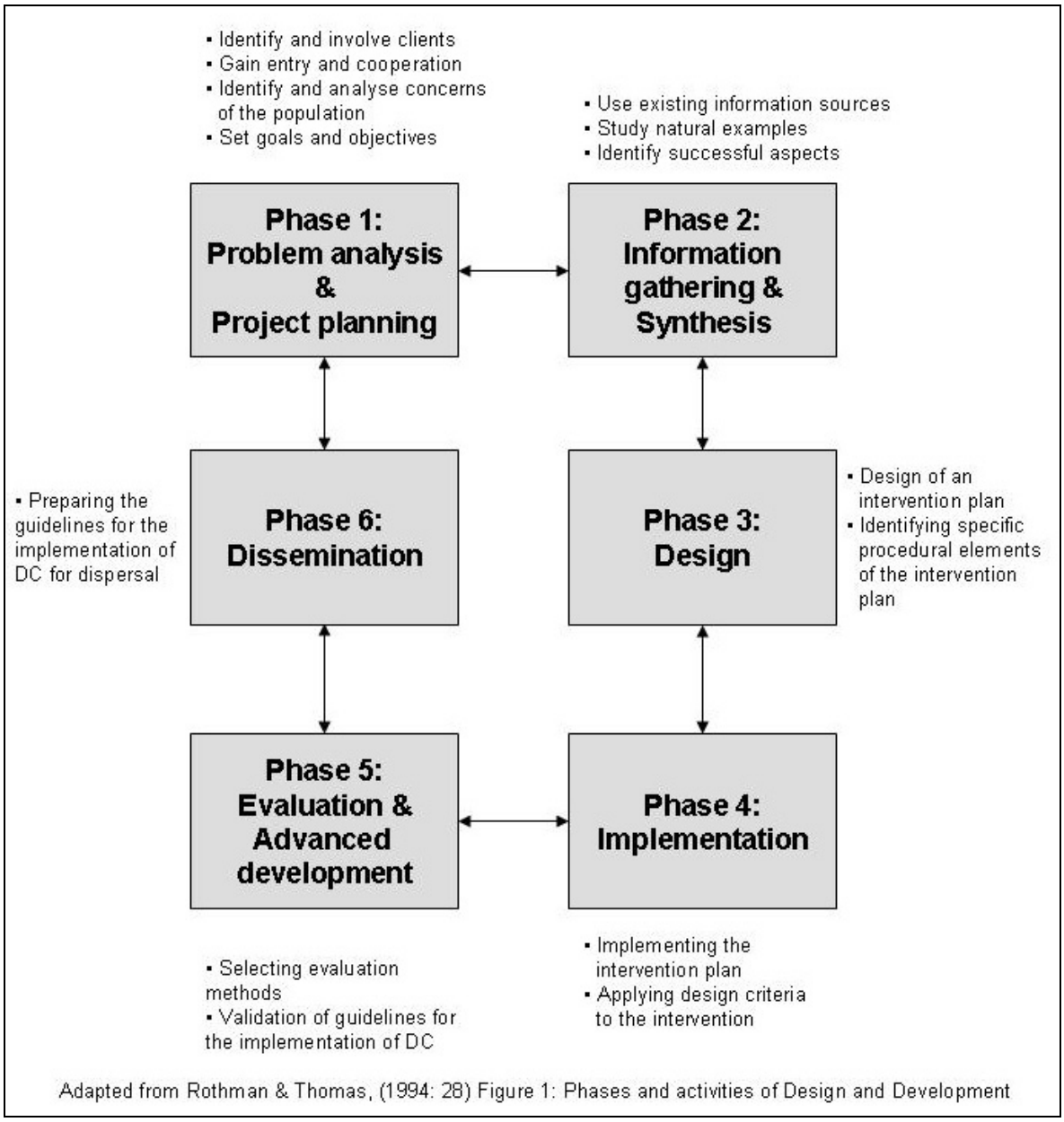

Figure 2: Phases and activities of the research process

Each phase had specific activities that should take place in order to facilitate the implementation process. This is described in Rothman and Thomas's book, *Intervention Research: Design and Development for Human Service* (Fawcett *et al.*, 1994: 27-31).

3.3.1 Phase One: problem analysis and project planning

Phase One involved determining the state of existing DC implementation at the study site, the components of the problem and the possible promoting or inhibiting factors influencing DC implementation. Problem analysis and project planning (see chapter four) included the following activities (Fawcett *et al*., 1994: 27-31):

- identifying an appropriate population, in this study the multidisciplinary team of the NICU, and involving clients in setting target goals for the intervention (DC);
- gaining entry to the chosen setting, and co-operation and collaboration from the key informants and participants by active participation in awareness meetings and establishing a DC committee for the NICU;
- identifying the concerns of the population through the use of questionnaire (1);
- analysing identified problems and determining their impact and scope; and
- setting goals and objectives for the intervention in terms of programme, policy and practice.

3.3.2 Phase Two: information gathering and synthesis

Phase Two aimed at gathering information (see chapter five) on the particular intervention from existing sources, which included historical and current examples of the intervention, in this case DC. Existing information was culled from available literature as well as the study of natural examples. The study of the natural examples involved interviews conducted in four hospitals abroad where DC had been implemented. Once the information had been gathered, positive and negative aspects that were seen as solutions or hindrances, or aspects that contributed to the success or failure of the intervention were identified. The aim of this phase was to compile a list of positive aspects that could be incorporated into the design (Phase Three) and implementation (Phase Four) of the intervention to facilitate success (Fawcett *et al*., 1994: 32-33).

3.3.3 Phase Three: design

Design of the intervention plan included two important activities (see chapter six):

- designing an intervention plan where the guidelines for the implementation of DC are included; and

- specifically describing the procedural steps or planning within the intervention plan (Fawcett *et al*., 1994: 34-35).

3.3.4 Phase Four: implementation

Phase Four involved the commencement of active implementation (see chapter six), where the design (Phase Three) was further refined. The following activities were included:

- implementing the intervention plan at the research site; and
- applying design criteria to the intervention, to guide the development and refinement of the intervention (Fawcett *et al*., 1994: 36-37).

3.3.5 Phase Five: evaluation and advanced development

Evaluation and advanced development included three applicable activities (see chapter seven):

- choosing evaluation methods for the monitoring and evaluation of the DC principles implemented;
- collecting and analysing that data; and
- refining the intervention by validation of guidelines for the implementation of DC (Fawcett *et al*., 1994: 37-39).

3.3.6 Phase Six: dissemination

As only a portion of this phase fell within the scope of this study, it will only be briefly discussed. The guidelines for the implementation of DC were prepared for dispersal. Recommendations are made (see chapter eight) for dispersal of the guidelines, including publishing results, post-doctoral research and publication, policy and/or procedure formation, and conference presentations.

3.4 Conclusion

Although this research methodology is multifaceted and poses challenges for the researcher, including a labour-intensive process, the difficulty of monitoring change

over time, and the uncertainty of positive results in the real-life situation, the structure of the intervention design and development model gave the researcher a framework in which to conduct the research effectively by using the phases described above. The product of this intervention research included an intervention plan with guidelines for the implementation of DC.

4 Chapter Four: Phase One - problem analysis and project planning

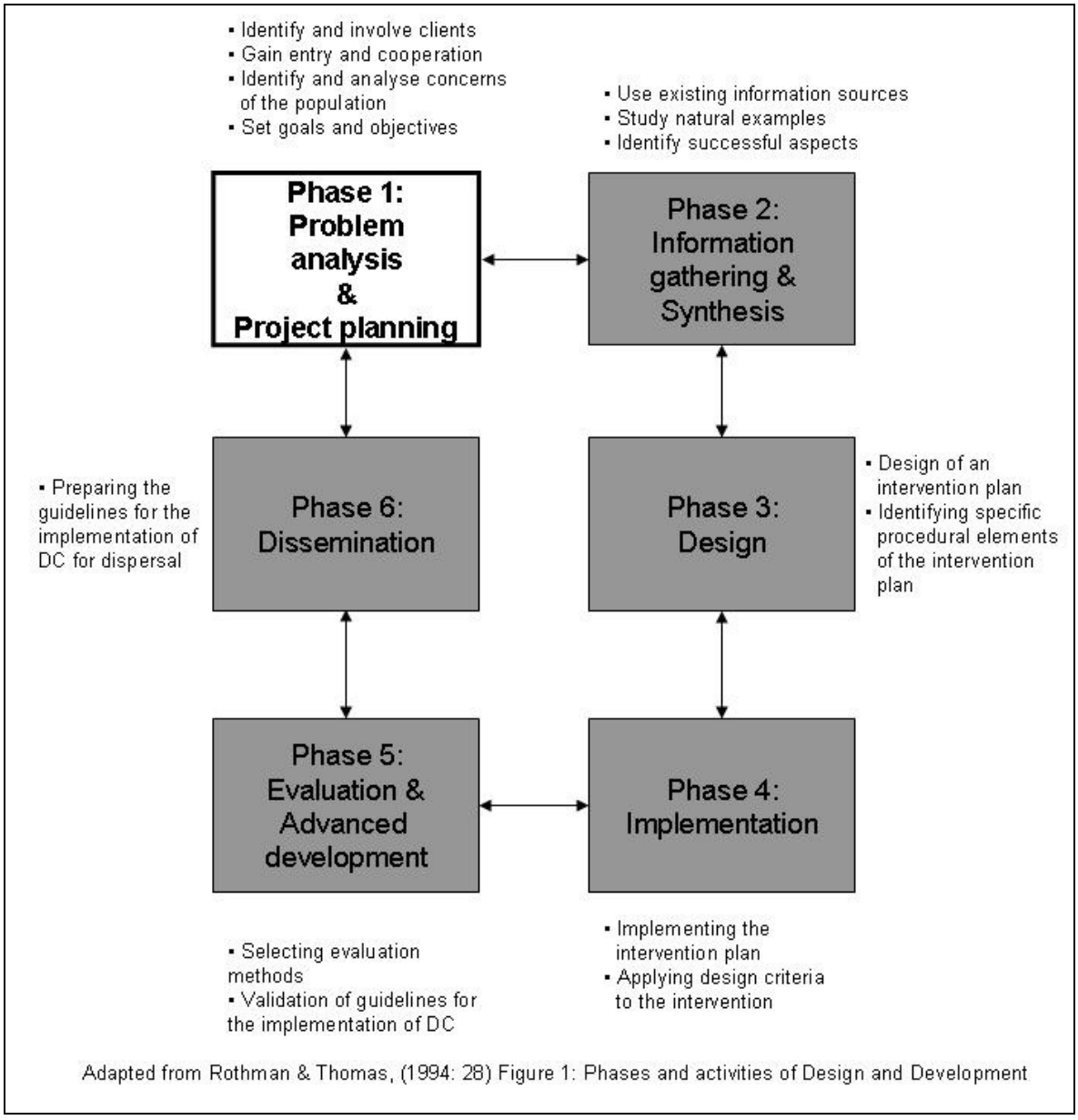

Figure 3: Overview of phases and activities of the research process (1)

4.1 Introduction

The first phase of this intervention research project involved problem analysis and project planning. As discussed in chapter three, each phase of this methodology had specific activities that had to take place so that the research question could be answered. The activities making up the first phase of this study, discussed in this

chapter, include the following: identifying and involving clients, gaining entry and cooperation from the setting, identifying the concerns of the population, analysing identified problems and setting goals and objectives (Fawcett *et al*., 1994: 27).

4.2 Aim of Phase One

Although some of the aspects that will be mentioned below surfaced in the literature review, this phase was vital in enabling the researcher to determine the state of existing DC implementation in the study site, the components of the problem and possible influencing or inhibiting factors influencing DC implementation. The risks involved with implementation and necessary resources were also identified in this phase (De Vos, 1998: 386-387).

The researcher achieved this aim of Phase One by identifying the problem, analysing it and then planning to improve the situation. It was evident from the literature that DC exists as a concept of care and is beneficial to pre-term and sick infants (as discussed in chapter two). It was also clear that implementation of DC implies change, and therefore meets with barriers, as does any change.

Little evidence of implementation of this form of care approach can be found in South African NICUs. Due to a lack of research on implementation of DC in South Africa, most data were collected from the American hospitals regarding the implementation process, contributing and inhibiting factors and perceived success of the implementation. Two South African examples were used where KMC, an aspect of DC, was implemented. These are discussed in the next chapter (Phase Two).

The first activity in Phase One, to begin the processes of problem analysis and project planning, was identifying and involving clients.

4.3 Identifying and involving clients

A 30-bed neonatal intensive care unit in a tertiary public hospital, serving an economically challenged community, was chosen as the site for implementation of DC because the researcher completed her undergraduate training and post-graduate working experience at the chosen site, which gave her increased knowledge of and

familiarity with the challenges facing the multidisciplinary team and the population served by this hospital. As the benefits and effects of DC became more apparent, the researcher thought it an ideal project to improve the quality of care delivered, the working environment by implementing DC and, above all, an opportunity to work on an implementation project.

The Assistant Director of Nursing, the Chief Executive Officer (Hospital Superintendent), the Head of the Department of Paediatrics and the Neonatologist responsible for the unit of the hospital were approached and permission was requested from them to conduct the research study before access was gained to the setting. Verbal and written consent (see Appendix 5) were given by all approached, and the study received ethical approval from the Ethics Committee at the University of Pretoria (see Appendix 21).

4.4 Gaining entry and cooperation from the setting

Access to the setting was achieved in March 2004, six months before the actual implementation phase (phase 4) commenced. This initial access took place after institutional consent was obtained from top management. Owing to the researcher's previous working experience in the chosen unit, gaining entry and cooperation from the setting was relatively easy. The researcher was familiar with the institution's structure and functioning, including daily unit activities, practices and policies. The personnel were familiar with the researcher and some relationships had been previously established.

Introductory meetings to heighten awareness of DC were held with the maternity division's nursing management, which included nursing managers from antenatal, perinatal and neonatal units in the maternity hospital. During these meetings, the concept of DC and the research proceedings were explained in terms of content, course and possible implications.

The implementation project targeted the multidisciplinary team where medical, nursing, allied health professionals and non-medical support personnel were involved in the process of implementation. Specific targets and goals for the project were identified and set for the unit by the researcher; which included improvement of the quality of care rendered, reduced developmental delays for pre-term and compromised infants

and an improved working environment for the multidisciplinary team. On a personnel level, the targets were to increase the knowledge and skills of the staff, and to improve staff morale and job satisfaction (Fawcett *et al*., 1994: 27). During the initial meetings, all targets and goals set by the researcher were discussed with the research participants and an opportunity for them to give input was provided. This information was captured by making detailed minutes of each meeting held.

Key informants from the multidisciplinary team who have an influential role in the unit were identified by the researcher and the maternity division's nursing management team; these informants included nursing staff from both the day and night shifts, a member of the cleaning team, a radiographer, an occupational therapist and a neonatal medical consultant. These individuals were relied upon for all initial correspondence and planning.

A collaborative relationship was formed during the meetings and feedback was held openly, where concerns and ideas were shared. Minutes were documented for all meetings held. Although active involvement and participation from the key participants was initially limited, all ideas and planning was relayed during regular DC committee meetings where these participants had the opportunity to become more actively involved. These collaborative relationships aimed to facilitate acceptance and 'buying in' to the project (Fawcett *et al*., 1994: 29). The researcher observed that the key informants involved had a very positive attitude towards the study and welcomed the idea of DC and the benefits it could bring.

The initial key informants did not all participate to the end of the study. One neonatologist, the occupational therapist and a speech therapist left the institution during the research time period. A doctor who appeared to be very eager and supportive, and who had international experience in Australia filled the neonatologist's position after a six-month vacancy period, and the occupational therapy position was also filled with a similar time delay. The speech therapist was replaced immediately. The radiographer was involved during the initial planning from March 2004 and start of implementation in September 2004, after which she no longer attended further meetings. The location of the radiology department was based off-site, approximately two kilometres away from the unit, and this could have influenced attendance. The member of the non-medical support services also stopped attending the scheduled meetings.

Once entry to the research site and cooperation from the setting was gained, the concerns of the population had to be identified.

4.5 Identifying concerns of the population

Browne and Smith-Sharp (1995: 21-22) identify six steps of progress experienced during DC implementation, as discussed in the literature study. The first step is awareness, followed by disruption, organisation, identity, integration and generation. During the awareness stage, the participants at the chosen research setting were exposed to the concept of DC and the impact of the change on their daily practices (see chapter two). Awareness was increased and the concerns of the population identified by conducting twelve awareness meetings with nursing management, nursing staff, allied health professionals, medical staff and non-medical support services over a time period of one month. The awareness meetings were scheduled during day and night shifts to ensure that all multidisciplinary members were included. The number of attendees attending varied from a group of 18 participants to one or two people, according to the shift schedule. 48 participants attended the awareness meetings. Each meeting consisted of an explanation of DC, a summary of the research study, and then the handing out and completion of a consent form for participation in the study (see Appendix 1), a questionnaire consisting of five questions (see Appendix 2) and a commitment certificate (see Appendix 3). The questionnaire and an analysis of it are discussed below.

On completion of the meeting and the questionnaire (1), the participants were given a commitment certificate (see Appendix 3), which was signed voluntarily. The commitment certificate expressed the individual's willingness to be involved in the study. Each signed certificate had the particular participant's name printed on it and was then laminated. The certificates were displayed on a wall in the neonatal unit dedicated to the DC implementation project, with the aim of motivating the staff to participate, accept ownership of the project and feel proud of the display of certificates on the wall. Additional information on DC and the research project were displayed on the dedicated wall to maintain awareness and advertise the project.

4.5.1 Data collection: participant observation and field notes

During the awareness meetings, the researcher made use of participant observation and field notes on the responses of participants and the effects of the meetings on the unit. The researcher was the programme coordinator of the implementation project and therefore became part of the group. In order to observe the participants as an insider, she had to use participant observations (Babbie & Mouton, 2001: 293). Any observation of social behaviour that could possibly influence the study was documented in a research diary as soon as possible after the meetings (De Vos, 1998: 284). Observational notes as well as theoretical notes, including the researcher's interpretation of the observations, were documented (De Vos, 1998: 285-286). Babbie and Mouton (2001: 294) describe the researcher's presence as the greatest advantage of participant observation, as thinking about or interpretation of an observed action occurs on site and analysis begins during data collection.

4.5.2 Data analysis: participant observation and field notes

Various types of verbal and non-verbal behaviour were seen from the different multidisciplinary team members as they responded to the idea of DC implementation. For example, one participant paged through the consent document and verbalised that she did not see the project succeeding at this research site. Overall, according to the researcher's observations, the medical staff tended to be sceptical, while the allied health professionals including radiographers, dieticians, occupational and speech therapists were positive but concerned about the likelihood of attitudinal changes and role differentiation among staff in the unit. Cultural diversity and personality differences within the multicultural team that work together in the unit could also cause conflict.

The majority of the nursing staff had a positive response (see heading 4.5.4 below) but some resistance was experienced. For example, one member refused to attend the awareness meeting, but did this discreetly so that staff attendance of that particular meeting did not seem to be influenced. An important observation made after the first awareness meeting suggested that the nurses were feeling interest and enthusiasm towards the project: after the meeting, all the infants in the unit had some form of positioning boundary created with available linen. This initiative clearly arose from the nurses.

Some participants mentioned some concerns that related to the potential lack of success of the project at the chosen site due to circumstances like staff shortages and consistent statistics exceeding 100% bed occupancy.

4.5.3 Data collection: methods and procedures for questionnaire 1

According to the intervention research methodology, this step in Phase One concentrates on identifying the concerns of the population. The researcher used a questionnaire (1) (see Appendix 2) for this purpose but felt that it was important to investigate not only the population's concerns (question 4), but also to include additional questions (1, 2, 3 and 5) in order to achieve a greater understanding of the perceived importance and value of the research study (Fawcett *et al*., 1994: 29; De Vos, 1998: 158).

The questionnaire (see Appendix 2) consisted of two closed questions where 'YES', 'NO' or 'UNSURE' could be answered, and three open questions, which enquired about the individual's opinion on the possibility of successful implementation in their unit, their contribution to the success of the project, their expectations, their concerns and the resources needed to achieve success. The five questions identified were validated by two experts and then finalised. The questionnaire was formatted on one A4-page with tick-box answers for the closed questions and writing space provided for the open questions (De Vos, 1998: 156-157, 160).

The questionnaire was a personal questionnaire, which was handed to the participants by the researcher, completed by the participants at the awareness meetings and collected immediately. The researcher was at the site while the participants were completing the questionnaire. Clear instructions on anonymity and individual completion were given to the participants before they completed the questionnaires and explanations were given to clarify uncertainties (De Vos, 1998: 155).

4.5.4 Data analysis: questionnaire 1

The responses to the three open ended questions were analysed according to the principles of qualitative content analysis (Babbie & Mouton, 2001: 492-493). The data collected from the questionnaires was ordered by open-coding the responses per

question into themes and sub-themes. After the raw data had been classified, the data was re-checked by the researcher and then co-coded by an independent person qualified in Advanced Neonatal Nursing to ensure trustworthiness in terms of the credibility of the identified themes and sub-themes (Babbie & Mouton, 2001: 277).

The responses to questions 3, 4, and 5 were related to the population's expectations and concerns about the research project and the anticipated resources that would facilitate implementation of DC. The identified themes and sub-themes are summarised in Table 2. A discussion of these themes and sub-themes follows from heading 4.5.5.3.

4.5.5 Findings: questionnaire 1

48 members (n=48) of the multidisciplinary team completed questionnaires given out during the 12 awareness meetings. A distribution and summary of the participants in terms of professions is reflected in the pie diagram below (Figure 4).

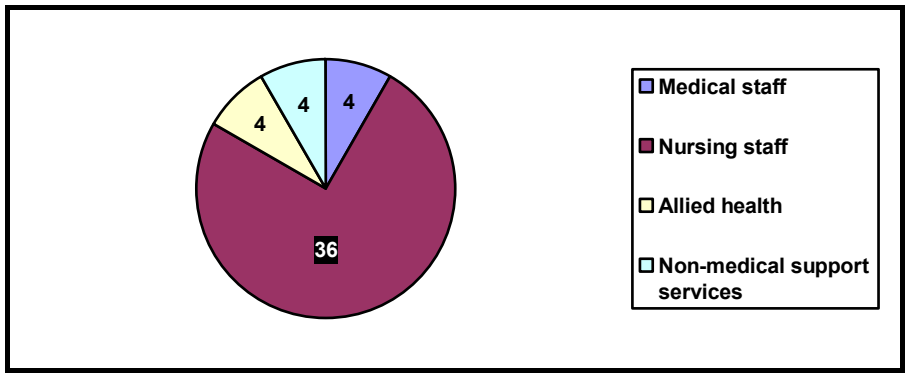

Figure 4: Distribution of multidisciplinary participation for questionnaire 1

The first two closed questions, discussed below in heading 4.5.5.1 and 4.5.5.2, aimed at establishing the level of enthusiasm towards the study. Participants (n=48) were requested to give a 'YES', 'NO' or 'UNSURE' answer for these questions. This nominal data will now be described.

4.5.5.1 Prospect of successful implementation

When asked, 'Do you think that DC can be implemented successfully in your unit?' 42 participants responded in the positive. One participant responded in the negative and five participants were unsure.

4.5.5.2 Contribution to the success of the study

The second question addressed the participants' participation in the study, and read, 'Do you think that you can contribute to the success of this project?' No negative responses were given, and 45 positive. Two participants were unsure and one participant did not give an answer.

Table 2: Main themes and sub-themes identified from questionnaire 1: questions 3-5

Main themes and sub-themes identified		
Question 3: What are your **expectations** for this project?	Question 4: What are your **concerns** about this project?	Question 5: What **resources** will you need to achieve the success of this project?
Project expectations • Project success • Participation / staff involvement	Project concerns • Lack of resources • Prospects of failure • Existing problems identified	Project related resources • Educational resources • DC resources
Organisational expectations • Nursing care • Long-term benefits	Organisational concerns • Working conditions • Frequent staff rotation	Organisation-related resources • Staffing issues • Material resources
Patient expectations • Improved patient outcomes • Family involvement	Patient concerns • Patient safety • Patient recovery • Obstacles regarding family involvement	
Personal expectations • Professional growth & development (knowledge & skills)	Personal concerns • Lack of participation & motivation • Resistance to change • Lack of knowledge & skills • Personality & cultural differences	Personal resources • Committed multidisciplinary team • DC facilitator

4.5.5.3 Expectations

The third question, 'What are your expectations for this project?', aimed to determine the participants' expectations for the project. Four main themes were identified, namely project expectations, organisational expectations, patient expectations and personal expectations.

4.5.5.3.a Project expectations

Sub-themes identified under project expectations included project success and participation or staff involvement. Participants expressed their expectations of successful implementation of DC into their unit, as well as anticipating a "positive impact on neonatal care even if it is only small changes" and an increased "awareness of [the] importance of developmental care among both nursing and medical personnel".

In this public neonatal care unit, the nursing staff consists of various ranks including registered nurses, enrolled nurses and nursing auxiliaries. Participation and staff involvement were expected from all ranks, with emphasis placed on the importance of "all nursing personnel to be involved including lower categories". The lower categories felt excluded regarding training opportunities, and expected that the "how, importance and continuous practice" of DC be taught to them too. It was further mentioned that they expected full support, participation and "people to co-operate with the research".

4.5.5.3.b Organisational expectations

Organisational expectations included aspects involving the neonatal unit and the hospital. Sub-themes of nursing care and long-term benefits emerged here. 12 participants shared an expectation that the implementation of DC would "improve [the] nursing care" delivered to patients. Other long-term benefits expected from the project included:

- Formulation and institution of practice guidelines for DC,
- Maintenance and continuation of the project, and
- An improvement in the unit's standard of health care provision.

4.5.5.3.c Patient expectations

Two sub-themes were identified related to the patients, namely improved patient outcomes and family involvement. Responses from participants indicating expected improvement of patient outcomes included the following:

- "Earlier discharge from hospital",
- "Shorter hospital stay of patients",
- Better support of a "speedy recovery of our infants in the unit",
- Fewer developmental problems, due to meeting the infants' "developmental needs",
- Improved weight gain, helping infants "to grow well", and
- Reduced infant stress levels and "stress cues".

Obstacles regarding family involvement were expected to decrease with more attention being paid to parental satisfaction and information and parents' participation in the routine care of their infants. Responses from two participants cited "involving the parents and keeping them informed" and "happier parents to ensure parent-bonding takes place as soon as possible" (freely translated from Afrikaans).

4.5.5.3.d Personal expectations

Personal expectations were grouped into professional growth and development, including knowledge and skills. Responses regarding professional growth and development demonstrated a desire to "improve skills" and "gather more knowledge", as well as to participate in passing on acquired knowledge to colleagues to ensure that the importance of DC was highlighted to all.

A general expectation was for the transfer of knowledge and skills to play an important role; one participant expected to be "well equipped with information which will be used for training staff members" by means of "in-service" training and practical demonstrations to facilitate successful implementation of DC. One participant highlighted the importance of evaluation in the implementation project and continuous practice of DC.

Five participants also made positive points about their motivations for the project, which included an expectation to make a difference, and to "bring [back a] caring feeling and commitment" to the neonatal environment. One response read as follows: "To uplift nursing spirit and the joy that it will bring when you are totally committed".

4.5.5.4 Concerns

Question 4 asked, 'What are your concerns about this project?' The responses from the participants were again divided into main themes and then into sub-themes. The main themes included project concerns, organisational concerns, patient concerns and personal concerns.

4.5.5.4.a Project concerns

Three sub-themes were identified as concerns regarding the project:

- Lack of resources (including knowledge and skills),
- Prospect of failure, and
- Existing problems identified.

Although a lack of resources could be considered as an organisational concern, the resources mentioned by the participants relating specifically to the research study itself are included here. The lack of resources in the unit was referred to in general, but a lack of knowledge and skills was specifically mentioned as a concern for the nursing staff. One participant said that "more knowledge should be taught to the nursing personnel."

The fear of failure was evident from some of the participants' responses. The responses included uncertainty of success, "fear of its not being effective", questions like "will all our efforts have good results", fear of a motivated start being followed by a lack of progress, and concern "that expectations [about project success] might be too high".

Existing problems identified by the participants that could affect the project included the noise levels in the unit. One respondent said, "there are instances where the personnel cannot be controlled as far as noise is concerned". Another response referring to noise levels translated freely from Afrikaans was, "noise – personnel speak loudly and it increases the infants' stress levels".

4.5.5.4.b Organisational concerns (including unit and hospital)

These responses reflected concerns involving the organisation with regard to working conditions, confidentiality and the effect of frequent staff rotation.

Concerns relating to working conditions included the following:

- Unfavourable physical structure of the unit,
- "Environment [is] not suitable [due to] overcrowding" with high infection statistics,
- "Staff shortages [with a staff-to-patient ratio of up to] 1:5",
- "Shortages of … linen", especially over weekends,
- "No [lodger] facility [for the practice of continuous] KMC", and
- "The unit might not be up to standard for this project".

Confidentiality was also raised as a concern, but in the context of the questionnaire the responses were unrelated to the project; the focus was rather related to general care delivered to the patients, for example "confidentiality, correct accurate record keeping".

Due to the fact that the hospital is used as a training facility for students from the Faculty of Health Sciences and various nursing colleges, multidisciplinary team members rotate on a regular basis. This was highlighted as a problem that could affect continuity of care with focus on medical doctors' rotation every four months ("continuity – medical staff rotating four monthly"), nursing students' every four to eight weeks and medical students every week during paediatric blocks. The allied health professionals also have students rotating in the unit but continuity of care seems to be a lesser issue due to constant presence and supervision by qualified members.

4.5.5.4.c Patient concerns

Five participants were concerned with the impact of the project on patient safety and medical-legal risks. An additional concern parallel to patient safety was patient recovery. Two respondents commented on the vulnerability of the sick and pre-term infant and the importance of ensuring a rapid recovery.

Concerns were expressed regarding family involvement. It was evident from the responses that family involvement is problematic. The distances and travelling obstacles some families have to overcome to visit their infant restricts the frequency of visitation due to financial constraints, as confirmed for example by one response, which reads, "Others staying far can't afford to come". Two participant's responses indicated that parents are not involved because staff shortages mean that participants do not have time to educate parents. Their responses follow: "Work[ing] with five babies …

makes it impossible to teach mothers", and "[Not] enough time to inform parents on handling and supervision."

4.5.5.4.d Personal concerns

Personal concerns were divided into four sub-themes:

- Lack of participation and motivation,
- Resistance to change,
- Lack of knowledge and skills, and
- Personality and cultural differences.

A general concern was the level of commitment that would be achieved from the participants, with some respondents worrying "that all the personnel in the unit might not participate up to the end". Although the hospital management supports the research project, its success is expected to depend directly on the participation and activities of the multidisciplinary team. Issues were raised about personal and team commitment, and/or a possible lack thereof. Internal motivation regarding the reason for being in the unit could also be an influencing factor. Some participants may not have chosen to work in the neonatal unit but were placed there due to the organisation's rotation system or for other reasons. This could result in negativity towards the implementation of DC because of a lack of interest in the field.

Resistance to change is a concern when any new intervention begins. A "lack of moral support", "some [staff] are very negative" and "resistance to change since … change [of current practices] will be done" were highlighted as concerns.

Responses relating to a lack of knowledge and skills included the following:

- Difficulty in learning new care techniques e.g. it "can be difficult to learn",
- Worry that knowledge and insight are not "distributed" evenly among staffing categories,
- Questions about the willingness of participants to learn new care techniques, and
- Need for demonstrations before new practical skills can be put into practice.

Personality and cultural differences formed the last category. Although this category only had two applicable responses, their contribution was regarded as valuable in light of the challenges faced.

These responses, translated from Afrikaans, read as follows:

- "How do we change a person's attitude, approach and loyalty?" and
- "One must be realistic regarding [the level of implementation achievable] due to personality differences and cultural differences".

4.5.5.5 Resources and processes

The last question, 'What resources will you need to achieve the success of this project?' aimed to determine what resources would be needed according to the participants. The answers given by the participants did not only include resources, but processes as well. These processes are interactions related to the mentioned resources, for example, training as the resource and learning as the process. The responses were classified into three main themes related to the project, organisation and personal resources and processes.

4.5.5.5.a Project-related resources and processes

Project-related resources and processes had to be applicable to the study and within the scope of the researcher's role in the study. Project-related resources and processes included sub-themes related to education and DC.

The educational resources and processes included the need for "communication", "awareness", and education and training as integral resources, for example "meetings", "workshops", demonstrations, "in-service training", available "articles" and training manuals or "study guides".

DC resources and processes that the participants anticipated as important included the following:

- Funding for necessary resources,
- Positioning nests or additional linen,
- Blankets and infant clothes,
- Pacifiers for non-nutritive sucking,
- Sucrose solution for pain management, and
- Adjustable lighting.

4.5.5.5.b Organisation-related resources and processes

Resources and processes that could influence the success of the project but could not be influenced by the researcher were called organisation-related resources and processes. As the site chosen is a public NICU, human and material resources are limited, resulting in an environment that may not be optimal for the implementation of DC. Two sub-themes were identified, namely staffing issues and material resources. 14 participants mentioned that more personnel were needed in order to facilitate implementation of DC.

Many responses regarding material resources included medical equipment as a means for patient monitoring. These are fundamental facilities needed for the optimal care of a neonatal patient admitted to an intensive care unit, but the hospital does not have enough of these resources. Although these comments highlight a definite need in the unit, they are not controllable by the researcher as part of the study.

4.5.5.5.c Personal resources and processes

Very few personal resources and processes were identified but the responses reflected levels of commitment from the multidisciplinary team. Necessary personal attributes mentioned included:

- "Willing personnel" to participate,
- "Positive attitudes",
- "Dedication",
- "Committed staff", and
- Enthusiasm.

An additional personal resource that was mentioned was the need for a DC facilitator to maintain the process of implementation. This response was freely translated from Afrikaans: "A very enthusiastic person who is passionate about DC should be there to support [the implementation process]".

The data gathered using the questionnaire demonstrated enthusiasm and a willingness to comply from the participants but concerns were raised about the success of the project on an organisational and personal level. From the data received, the researcher viewed the answers to be an accurate account of reality in the unit.

Once the awareness meetings had introduced the concept of DC into the study site and collected data regarding the concerns of the population, environmental audits were done to determine the current level of DC practices in the NICU.

4.6 Environmental audits

To determine the level of DC practiced in the unit before implementation, baseline data was collected in the form of environmental audits before the commencement of phase four (implementation phase). These audits were intended to enable the researcher firstly to determine the level of current DC practices in the research setting, and secondly to draw a comparison of the level of DC practices before and after the implementation phase.

4.6.1 Methods and procedures

The environmental audit instrument was a 14-page document (see Appendix 4) divided into three sections: (1) the health-care facility; (2) developmental care principles; and (3) orientation, training, participation and documentation. The content of the environmental audit instrument was based on information gained from available literature about what should be in place to indicate the practice of DC. The environmental audit instrument was then interpreted within the researcher's field and validated by a research expert. Changes were made according to the expert's input. Two neonatal nursing experts then validated the environmental audit instrument. The recommended alterations were made and the environmental audit instrument finalised.

Three environmental audits were conducted by the researcher in the NICU after the initial awareness meetings were held and before phase three began. As the NICU environment is dynamic and changes from one minute to the next, the audits were conducted at different times during the morning, afternoon and evening in order to get a complete picture of practices throughout the day at the chosen site. The days and times for the audits were chosen at random and no notice of the evaluation was given to the participants. Bias was reduced by collecting baseline data repetitively, stating observable items as either present or absent, and carrying out unscheduled environmental observation.

The researcher completed the environmental audit by observing and recording the specified information. The environmental audit had tick-box options noting whether specified items were absent or present. Additional writing space was provided for details. If additional information was observed, field notes were made as part of the audit. To fulfil some requirements of the audit, verbal and written information and copies of documentation were required. Examples of documentation include available policies, guidelines and procedures that promote DC implementation. Verbal information was obtained by asking staff questions during the environmental audit. The findings of the three audits will now be discussed.

4.6.2 Data analysis

The data collected from the environmental audits was analysed by deductive reasoning and a qualitative description of the observed data is described below.

4.6.3 Findings

Overall, these findings indicate a lack of DC practices in the NICU before commencement of the implementation phase.

4.6.3.1 Section one: health-care facility

Section one of the environmental audit enquired into the health-care facility's details, including: date of audit, unit manager's contact details, DC implementation date, bed capacity of the unit, number of patients at the time of the audit, the estimated staff-patient ratio, and the acuity levels of neonatal care provided.

As expected, most of these details remained constant but variation was seen in the staff-patient ratio according to patient acuity and staff availability. The unit's bed capacity is 30 patients and during the three audits patient occupancy was constant at 27 patients (90% bed occupancy). The approximate staff-patient ratio for each area was as follows: intensive care (ventilated, nasal continuous positive airway pressure, unstable condition) 1:2; high care (no ventilation, stable condition) 1:4/5; and low care (pre-discharge) 1:5. This unit does not have a step-down care facility but patients can

be transferred to KMC-care facilities at two secondary facilities. If patients are not transferred to a KMC facility, they are discharged from the same unit into their primary care giver's care.

4.6.3.2 Section two: developmental care principles

Section two focused on the seven different principles of DC: individualised care, family-centred care, positioning, handling techniques, environmental manipulation, non-nutritive sucking and pain management (as discussed in chapter 2). Each of these principles have particular observable details that vary according to the principles, and were marked in the audit for example with 'YES', 'NO', 'UNSURE' or 'NOT APPLICABLE', 'SPECIFY' or 'BRIEFLY DISCUSS'. The degree of implementation of each of principles in the unit before the implementation phase will now be briefly discussed.

4.6.3.2.a Principle one: individualised care

No individualised patient care plans were observed in the nursing records and no evidence of cluster care was seen. Routine aspects of patient care, such as vital data monitoring and position changes, were performed two hourly in the intensive-care area, and three hourly in the high-care and low-care areas. Suctioning was done as needed according to the patient's condition. A lack of individualised care was seen as the infants were exposed to frequent disruptions from different members of the multidisciplinary team. Care was not coordinated during times when the infants were awake, and so the patients have little resting time.

Patients' individual bed spaces did not contain personal belongings as the high staff-patient ratio and frequency of rotating staff results in increased risk of loss belongings. Parents were not prevented from bringing their own belongings but safety of the items was not guaranteed and this practice was therefore discouraged.

As individualised care is patient-driven, recognition of physiological and behavioural stress cues is important. Although participants were able to observe physiological stress cues, the researcher repeatedly observed that the nurses' responses to the patients were delayed. A contributing factor that could have influenced response time was the lack of functional monitoring equipment. In the intensive-care area, the five

vital data monitors available did not have saturation monitoring probes, which meant that no continuous saturation monitoring was available for those patients. Two functional saturation monitors were available in the intensive-care area that allowed recording of a saturation reading two hourly for six intensive-care patients. One saturation monitor was available for monitoring of the 21 patients in the high-care and low-care areas.

As this was unexpected, the researcher investigated this issue further and found that an additional twelve saturation monitors were in the unit but were non-functional. The duty of maintaining the equipment had apparently not been delegated to a specific individual. The current system relied on the nursing staffs' completion of maintenance requests as needed, and no system was in place for the follow-up of these maintenance requests.

During the environmental audits, several incidences of behavioural stress cues were observed by the researcher but were not recognised by staff. This resulted in no response or alteration in care delivery to infants' demonstration of behavioural stress cues.

4.6.3.2.b Principle two: family-centred care

The available facilities for parents and grandparents in the unit were observed. Comfortable chairs were available for parents but there were not enough for one visitor per patient. Refreshment facilities were not available in the unit but there was a person selling sweets and chips who circulated through the hospital during the day only. Drinks were available from a vending machine on the ground floor of the hospital (the NICU is on the first floor of the hospital). Restroom facilities were also outside the unit.

The information about the visitation policy collected during the environmental audits was later observed to conflict with actual practice. When asked, the nursing staff initially said that parents were allowed unlimited access to their infants except during nursing staffs' shift-change times, which were between 06h45 and 07h15, and 18h45 and 19h15. It was later observed that parents were only allowed to visit their infants after 10h00 in the morning due to doctor's rounds, performing of painful procedures and routine morning cleaning of the unit. Visiting time ended at 20h00 in the evening. No siblings were allowed into the unit and grandparents were only allowed in on the

day of admission and then on Sundays for a short period of time. A glass window was available to show a stable infant to others outside the NICU.

The low staff ratio resulted in encouragement of family involvement and parents often assisted in providing routine care for their infants, as one nurse often looked after five patients. Parents were motivated to get involved when visiting, which facilitates parent-child bonding, but due to a low number of staff trained in neonatal care (four registered nurses) and the high illiteracy level among parents, parents were not always informed in detail regarding their infant's condition. This observation is congruent with responses made by the participants regarding patient concerns (questionnaire 1).

When practices of informed consent for treatment were enquired into as specified in the environmental audit, the staff confirmed that that they do inform the parents about their infants' condition and related aspects. This however was not observed or verified by records. In general, parents were not involved in most decisions made about their infants. This only became a reality for specific procedures. Due to the financial circumstances of some parents, which keep their visits infrequent, their ability to make informed decisions is limited.

No verbal or written informed consent was routinely obtained for minor procedures, such as blood sampling or x-rays, and these procedures were done as needed. It was verified from documentation that written informed consent was obtained for major procedures, such as surgery and administration of blood transfusions, but this information was contradicted by a verbal response from a participant. This participant noted that if parents were absent, central lines (Broviacs) would sometimes be inserted without informed consent, although if the parents were visiting at the time, they would be asked. According to Browne and Smith-Sharp (1995: 19), the goal of family-centred care is 'to leave the power with the family'. It was therefore seen that parental empowerment was not a reality in this environment, as parents were not empowered to make informed decisions about their infant's care (Harrison, 1993: 645; Ballweg, 2004: 37).

4.6.3.2.c Principle three: positioning

After the initial awareness meetings, the nursing staff positioned the infants with boundaries made from linen. Evaluation of positioning during the audits yielded the results shown in Table 3.

Table 3: Summary of positioning evaluation for environmental audits 1-3

Items	Environmental audit 1	Environmental audit 2	Environmental audit 3
Number of patients evaluated	27	27	23
Number of patients correctly positioned	1	0	0
Number of patients incorrectly or inefficiently positioned	22	21	19
Number of patients with no evidence of positioning	4	6	2
Number of patients in KMC	0 One mother verified that she does do KMC	0	3

As indicated in Table 3, optimal positioning for the infants was not maintained and the generalised pre-term 'frog' position was observed, with limited flexion of extremities, straight backs without rounded shoulders, hyperextension of extremities, presence of stress cues, mainly supine and prone positioning, limited midline orientation and ineffective boundaries provided for containment.

Although sustainable practice of KMC was difficult to determine as few mothers were doing KMC at the time of the audits, one mother verified that she did do it twice a day for time periods of around one and a half hours, and three infants were seem in the KMC position.

4.6.3.2.d Principle four: handling techniques

During the audits, a total of 15 staff-patient interactions were observed during routine care delivery or medical interventions. All interactions showed ineffective handling of

the patients with no positive touch or transitional touch observed. Fingertip touch was used instead of palmar touch and no containment or smooth movements were provided during positional changes. The researcher saw the 'preemie-flip' (rapid 180˚ turning of the infant) being done as well as individuals pulling an infant's hand or foot to change position.

4.6.3.2.e Principle five: environmental manipulation

The principles of environmental manipulation include light, noise and smell. The lights in the unit were on and the curtains were closed, but no protective barriers over the eyes of the infants were seen. There were no dimmer switches in the unit. Some patients had individual lighting available at the bedside, especially patients in the intensive care area, but use of this lighting was not observed.

Regarding noise in the unit, the radio was tuned to a radio station and was playing music, the telephone ringing volume was on full and could not be adjusted, staff-generated noise was exceptionally high with hands banged on top of the incubators, incubator doors slammed, patient care files dropped on top of the incubator and under the radiant warmer, and patient care items kept on top of the incubator due to a lack of available working surfaces.

Strong cleaning chemicals were used for cleaning with infants still in the incubators. Alcohol hand spray was applied directly before touching infants and no time delay was given for drying purposes. No positive smell stimuli were observed, for example breast milk on cotton wool near an infant's face.

4.6.3.2.f Principle six: non-nutritive sucking

No pacifiers were available in the unit, but bottle teats were used for non-nutritive sucking in some cases. In the first audit, bottle teats were seen in three patients' beds but none were being used. The second audit found bottle teats in three patients' beds and two in use at the time of the observation. The third audit found no pacifiers or bottle teats in use or in the patients' beds.

4.6.3.2.g Principle seven: pain management

In order to determine the level of pain management, the researcher observed the use or absence of oral sucrose during painful procedures as well as intravenous pain

medication practices. With regard to non-pharmacological pain management, no sucrose was provided for infants during painful procedures, and heel lancing was done without containment. With regard to pharmacological pain management, critically ill infants and infants needing sedation received Morphine Sulphate and Midazolam as prescribed.

4.6.3.3 Section three: orientation, training, participation and documentation

The last section of the environmental audit addressed orientation, training and participation in the unit regarding DC practices, as well as available DC documentation. The information gathered for section three was consistent in all three audits.

4.6.3.3.a Orientation

Non-permanent staff (nursing students and medical students) rotated internally on a weekly to a monthly basis, with medical doctors rotating approximately four monthly. No orientation about DC was given to rotating staff.

4.6.3.3.b Training

Permanent nursing staff trained in neonatal nursing care totalled four persons, of which only one provided DC for her patients. No documentation such as a protocol or policy was available to ensure that all participants were adequately trained in the principles of DC.

4.6.3.3.c Participation

The only members of the multidisciplinary team involved in some level of DC implementation were the nursing staff, and this involvement was impartial, receiving equally little support or resistance. The hospital superintendent granted consent for the research project but no further involvement of top-level management was observed. Middle management at the maternity division was initially involved during the awareness meetings and later supported the project in a less active manner. Lower management's commitment was initially uncertain as the individual manager did not enforce or stress the importance of DC to her staff. (As the project progressed, however, her input and commitment increased remarkably.) However, the general

impression on routine application of DC principles in the unit before the implementation phase was poor.

4.6.3.3.d Developmental care documentation

There was no proof of DC implementation evident from the unit records, which included the unit register, nursing records, medical records and individualised patient care plans. The philosophy, mission and vision were general to the hospital and made no reference specifically to the NICU or to DC. No policies on DC or KMC were available. Guidelines and procedures for DC implementation were also not available. Information available to parents with infants in the unit was restricted to a few posters and pictures on the walls. No information sheets, books, pamphlets or other sources of information were available.

4.6.4 Conclusion

The environmental audits done show that there is little or no evidence of implementation of the principles of DC at the chosen site. Individual attempts were seen but appeared to rely on the individual nurse's care philosophy. No documentation supported the implementation of DC or KMC. Overall, therefore, a lack of DC practices was observable at the chosen site. Other problems that could negatively influence the implementation efforts of this project were also identified: (1) a lack of DC practices could increase the risk of morbidity for the high-risk neonate; and (2) a lack of trained and educated staff working in the chosen site could increase the risk of medico-legal hazards.

4.7 Postulation of additional problems: a personal reflection

As already mentioned, the researcher's previous and current exposure to the chosen site's environment allowed postulation of additional problems present in the unit:

- The cultural diversity among the multidisciplinary team members in the unit results in many differences. These include language, culture, race, values, norms and beliefs. Babbie and Mouton (2001: 271) predict that all these aspects form barriers between the researcher and the participants in a study.

Such barriers are confirmed and were experienced in an intervention study by Janse van Rensburg (De Vos, 2002: 401).

- There are varying levels of education and training among the staff in the unit, and only four nursing staff members have an additional neonatal nursing qualification. This results in a questionable level of in-depth neonatal knowledge. This poses additional problems when limited neonatal trained staff members have to teach students and staff with fewer qualifications the correct way to practice.
- A particular problem that the researcher experienced was inconsistency between verbal and non-verbal communications and observed practices. In spite of the fact that various participants can verbalise knowledge about DC, these participants were not observed putting this knowledge into practice. For example, a registered nurse in an authoritative position spoke very highly of DC and the impact on the NICU but when the positioning evaluation was done, the infant she was caring for was not positioned correctly and did not have the necessary eye protection in place.

4.8 Analysing identified problems

Concerns about the population and the actual practice of DC in the unit have now been described, and these problems can now be analysed. Fawcett *et al*. (1994: 30-31) describe problem analysis as a critical part of the first phase, and provide key questions to facilitate problem analysis. The following questions are taken directly from Fawcett *et al*. (1994: 30-31) and adapted according to the study to facilitate problem analysis in this phase. The questions have been answered based on the researcher's background, participant observation, the environmental audits and analysed data from the questionnaire 1.

4.8.1 Questions that help to categorise the problems with developmental care implementation in terms of behaviour of key persons and resultant outcomes

4.8.1.1 What is the nature of the discrepancy between developmental care practices in the unit and the recommended developmental care practices?

- DC principles have not been implemented as part of the standard care delivered to the patients, but instead practices rely on the philosophies of individual multidisciplinary team members.
- Some of the problems raised are actual conditions that can be changed, but others are not directly applicable to the project although they have a definite effect on its outcomes, for example staff shortages and overcrowding.

4.8.1.2 Whose behaviour or lack of behaviour causes a lack of developmental care implementation?

- One particular individual cannot be held responsible for the lack of DC, as it is a relatively new concept in South Africa and very few participants have been trained regarding DC.
- Before the implementation study, one nursing sister trained in DC did try to implement and teach others but reported much resistance and sabotage from the nursing staff. The concerned individual lost hope for larger implementation and focused her attentions on the patients delegated to her care.
- There is a general lack of awareness about the benefits of DC in society, and much ignorance about the DC approach.

4.8.1.3 Whose behaviour or lack of behaviour maintains a lack of developmental care implementation?

- Again, the responsibility cannot be laid on one individual but on the multidisciplinary team as a whole.

4.8.2 Questions that explore the consequences of a lack of developmental care implementation

4.8.2.1 For whom is a lack of developmental care a problem?

- Due to the benefits resulting from the approach, as detailed in the literature review (chapter 2), the patient is at a disadvantage if DC is not provided, as well as the parents.

- A lack of DC is primarily an ethical problem. Once one is aware of a beneficial care approach, it becomes unethical to withhold it particularly from a vulnerable population of pre-term and compromised neonates.
- Thus there is an obligation to educate staff and implement DC for the benefit of all involved, including patients, their families, the organisation and the multidisciplinary team.

4.8.2.2 What are the negative consequences of a lack of developmental care?

- Longer period of hospitalisation of infants with increased morbidity and mortality.
- Greater risk of complications and developmental delays for infants.
- Increased psychosocial strain on the parents of the pre-term or sick infant due to greater risk of infant morbidity and the financial implications of habilitation.
- Possible negative influences on parent-infant bonding and attachment behaviours, which can result in parents abandoning their infants, emotional detachment and breakdown of other family relationships.
- Unsatisfied clients who are aware of the benefits associated with DC.
- Greater hospitalisation costs for the organisation and parents.

4.8.2.3 What are the negative consequences of a lack of developmental care for the community?

- Increased societal burden of infant, toddlers and children with developmental problems.
- Financial implications for longer hospitalisation, follow-up care and habilitation therapies.

4.8.2.4 Who (if anyone) benefits from a lack of developmental care?

- No one benefits if DC is not implemented.

4.8.3 Questions that allow a broader look at precipitating factors that influence developmental care implementation

4.8.3.1 Who should share responsibility for solving the problem of implementing developmental care?

- All members of the multidisciplinary team, which includes medical practitioners, nursing staff, allied health professionals, and the non-medical support services, should be involved.
- Top, middle and lower organisational management should also provide support and encouragement.

4.8.3.2 What behaviours (of whom) need to change for the implementation of developmental care to be successful?

- Top, middle and lower organisational management should view DC as a necessity and provide the resources needed to facilitate implementation.
- The multidisciplinary team members need to become aware of the benefits of DC through training as well as obtaining the necessary skills for implementation. This will increase the level of knowledge and skills through information transfer.
- Multidisciplinary team members should desire to make a difference in the lives of their patients.
- The need for a paradigm shift in routine infant care must be recognised by the multidisciplinary team members, and the challenge should be welcomed since it will improve the optimal potential and developmental outcomes of the sick and pre-term infants.
- As benefits of DC become apparent, ownership of knowledge and skills accomplished should take place.
- Although the non-medical support services have no direct patient contact, they should be aware of DC particularly regarding environmental manipulation.

4.8.3.3 What conditions need to change to establish or support the implementation of developmental care?

- Necessary resources need to be provided and maintained, for example positioning aids and linen.
- Staff should have positive attitudes, and be encouraged and motivated.
- Family involvement should be promoted to facilitate family-centred care.
- Cultural aspects should be addresses in a sensitive manner.

- DC should be implemented in a non-threatening environment.
- A developmental culture should be created among the multidisciplinary team members where DC is seen as standard practice in the NICU.

4.8.3.4 What is an acceptable level of change?

- 100% implementation of DC is the ideal but unrealistic as implementation is a process and changes occur over time. Evidence of DC in practice, permeating both verbal and non-verbal practices, would be an acceptable level of change within the time period of the research study.

4.8.4 Questions that help to guide the formulation of intervention research goals

4.8.4.1 At what level should the lack of developmental care be addressed?

- Support from management is a necessity.
- Implementation of DC takes place in the neonatal unit where the multidisciplinary team members will be involved.

4.8.4.2 Does the lack of developmental care reside in the behaviour of key individuals, in the immediate physical or social environment, with broader structural conditions such as chronic staff shortages or with governmental policies?

- The lack of DC is multifaceted. It definitely has a human element that determines success or failure of implementation but the immediate environment and other factors are very influential.
- Key individuals are very influential. For example, one individual in a management role within the unit supports the implementation of DC verbally but does not practice the learned skills in the unit, resulting in poor implementation of DC principles when the individual is the shift leader.
- The physical environment in terms of structural layout and unit design inhibits implementation. For example, noise levels are higher because of limited space and there is a lot of bumping of incubators and metal trolleys, especially during

the cleaning and polishing of floors and the moving of patients in incubators from one care area to another.

- The organisation is a training facility and there is a high rotation of all training staff, which influences the functioning of the multidisciplinary team.
- The NICU has a chronic staff-shortage problem.
- Organisational issues, including lack of available funding and of managerial support, could restrict successful implementation.

4.8.4.3 Is this a multi-level problem requiring action at a variety of levels of change?

- Superficially, it can appear that DC implementation aims only to alter the NICU, but a deeper understanding of the DC approach shows that the principles of change permeate through all levels of maternal and newborn care. It can therefore be said that the lack of DC is a multi-level problem, but for the scope of this study, implementation will only take place in the NICU.

4.8.4.4 Is it feasible to make changes at each identified level including antenatal care, intra-partum care, post-partum care and neonatal care, and within different disciplines?

- It would be feasible for changes to be made in all care areas as education and training are the key factors, but management in these different areas would have to take the initiative and responsibility for these changes.
- It would be ideal for changes to be made in all care areas with all disciplines involved, but for the scope of this study changes will only be attempted in the NICU.
- Although DC can be implemented with limited resources, managerial support is be imperative, especially with regard to the budget and delegation of funds for acquiring necessary resources like linen and 'developmentally friendly' equipment.
- Feasibility would also depend on the commitment level of the different multidisciplinary team members, especially members in senior positions. For example, if the neonatal consultant supports DC, the rotating medical staff reporting to that consultant will be more ready to put the principles into practice. If not supported, the participation of the medical staff could limit the success of implementation.

- DC can be implemented without many resources or much funding. In essence, the principles require only basic resources, like linen, for positioning and light reduction. Linen, although limited, is already available in the hospital environment. Further necessary resources and processes are then training and learning, resulting in the practicing of new skills.

4.9 Project planning

Project planning is the next step in Phase One. Once the problem is analysed, the project can be planned accordingly. The researcher decided to take a staggered approach to the implementation of DC, since a variety of interventions were needed for each new principle and the researcher was the sole trainer. The seven principles were divided so as to add a new concept each month to the previously implemented DC principles. As long-standing practices needed to be altered, this staggered approach, which takes one step at a time, seemed to be the most effective tactic.

The sequence of implementation of the DC principles was chosen based on the provision of resources that would facilitate enthusiasm and result in an immediate change to the NICU environment. These resources included donated positioning aids, blankets and quilts. One particular aspect (swaddled bathing and weighing) included both positioning and handling principles, and was therefore addressed as a separate topic for the month of February. The programme planned and followed is shown in Table 4.

Table 4: Developmental care implementation schedule

Month	**Design planning (Phase 3: researcher's activities)**	**Developmental care principle (Phase 4: implementation involving the multidisciplinary team)**
September 2004	Planning for positioning	
October 2004	Planning for light manipulation	Positioning
November 2004	Planning for noise	Environmental manipulation: light

Month	**Design planning (Phase 3: researcher's activities)**	**Developmental care principle (Phase 4: implementation involving the multidisciplinary team)**
	manipulation	
December 2004	Planning for appropriate handling and touch	Environmental manipulation: noise
January 2005	Planning for swaddled bath and weighing	Appropriate handling and touch
February 2005	Planning for individualised care	Swaddled bath and weighing (part of handling and positioning)
March 2005	Planning for non-nutritive sucking and smell manipulation	Individualised care
April 2005	Planning for pain management	Non-nutritive sucking and environmental manipulation: smell
May 2005	Planning for family-centred care	Pain management
June 2005		Family-centred care
July 2005		Comprehensive – all principles
August 2005		Comprehensive – all principles

4.10 Setting goals and objectives

During this phase, goals and objectives were set by the researcher with consensus from the participants. This concluded the problem analysis and project planning. Setting a main goal and objectives for the project gave some structure to the next phase of information gathering and synthesis. The goal focused on the broad conditions that the project aims to achieve whereas the objectives were specific to areas needing change for the purpose of implementing DC. The objectives for this

phase covered the implementation of DC at the levels of programmes, policies and practices. The objectives facilitated achievement of the goal (Fawcett *et al*., 1994: 31).

4.10.1 Goal

- Before the end of 2005, there will be evidence of developmental-care practice during routine infant care by multidisciplinary team members in the research setting.

4.10.2 Programme objectives

- By November 2004, a planned sequence for the implementation of DC principles will be designed.
- All staff will attend some form of training sessions according to the intervention plan.
- Resources will be supplied to satisfy the particular principles of implementation according to the implementation programme.
- Participation and involvement of multidisciplinary team members should be noticeable.

4.10.3 Policy objectives

- By the end of 2005, DC will be included in the unit policy as well as the unit vision, mission, and philosophy.
- By the end of the implementation phase, DC practice guidelines will be available in the unit.

4.10.4 Practice objectives

- Evidence of DC implementation will be seen in the public NICU during the implementation phase and continue thereafter.
- Evidence of DC implementation will be evident when comparing the pre-implementation environmental audit and the post-implementation environmental audit.

4.11 Conclusion

This first phase of intervention research methodology, problem analysis and project planning revealed not only that there was a lack of implementation of DC practices in the chosen site, but also other problems that could negatively influence the implementation efforts of this project.

The main problems can be summarised as follows:

- A lack of developmental-care practices, which increased the risk for morbidity in the pre-term and sick neonate;
- A lack of trained and educated staff working in the chosen site, which highlighted the risk of medico-legal hazards; and
- Organisational problems including difficult working circumstances with staff shortages and overcrowding of patients, as well as a lack of resources.

Despite the problems identified in the research setting, change could be implemented successfully. As the research setting is an academic environment, new trends and tendencies are often introduced to enhance practice and care rendered to the neonatal population. As a new trend, DC had great potential for successful implementation at the research site.

In chapter five, Phase Two addresses information gathering and synthesis. The synthesis of gathered information allowed for the identification of functional elements of successful models of DC implementation.

5 Chapter Five: Phase Two – information gathering and synthesis

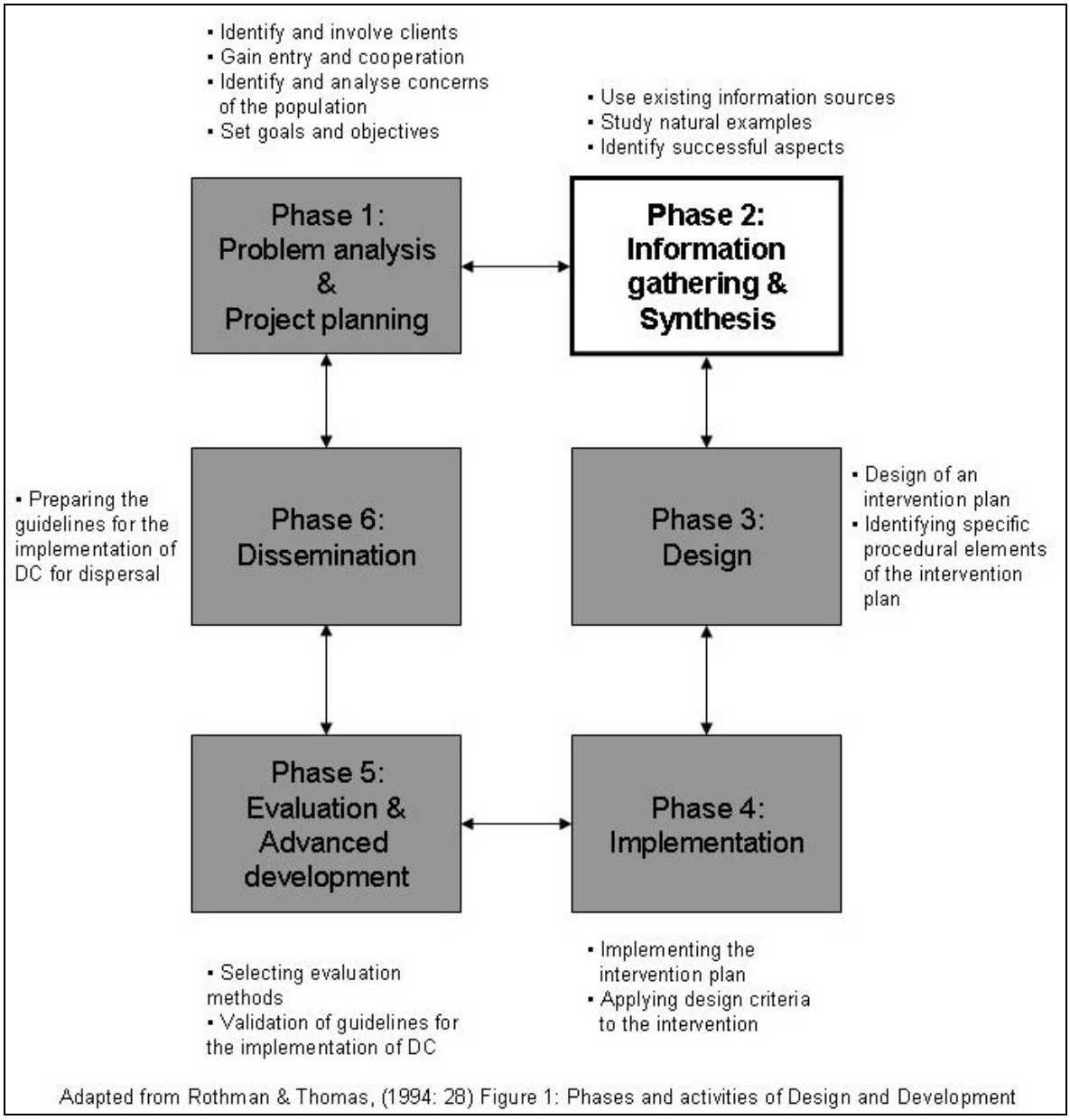

Figure 5: Overview of the phases and activities of the research process (2)

5.1 Introduction

The second phase of this intervention research study consisted of information gathering and synthesis. The synthesis of gathered information enabled identification of functional elements of successful models for the implementation of DC. As

discussed previously, each phase of this methodology consisted of specific activities, the performance of which completed the phase, and helped to answer the research question. The activities involved in the second phase which are discussed in this chapter included the following: using existing information sources, studying natural examples, and identifying functional elements of successful models (Fawcett *et al*., 1994: 29).

5.2 Aim of Phase Two

Understanding previous individuals' work on the implementation of DC revealed potential elements necessary for successful implementation, elements which can facilitate the implementation of DC in this setting. Phase Two aimed to reach such an understanding through studying natural examples where DC is implemented, and through an extensive literature review of previous research on DC implementation.

The study of natural examples was conducted in South Africa, where key role players in the facilitation of KMC implementation were interviewed, and internationally in eastern America where environmental audits were done in four units and in-depth interviews conducted with members of multidisciplinary teams. The questions asked during the interviews focused on the process of implementing DC, and investigated: (1) how DC/KMC was implemented in the hospital, (2) the success of this implementation, (3) factors promoting implementation and (4) factors inhibiting implementation, and (5) possible advice for successful DC implementation.

International natural examples were used because of the lack of national examples of DC implementation. An American DC consultant chose the sites in eastern America. She was involved in the Boston City Hospital's implementation of DC, and was the unit manager of the NICU at the time of implementation. This particular person was identified to assist in this matter as she is regarded as an expert on DC and its implementation, as well as being one of the ambassadors for introducing DC to South Africa. She chose sites that were good natural examples of DC implementation showing expertise and specific advances in DC practices.

5.3 Review of existing information sources

Information was collected using the MEDLINE data base and from available sources including journals and textbooks. The language preference was for literature in English, and the key terms used were: DC, KMC, implementation process, pre-term infant and development. Previous research on DC, both national and international, was found to be limited, particularly with reference to the South African context. Although no published examples of a complete approach for DC implementation was available, that is, an approach including all of the DC principles, literature on the implementation of KMC, an aspect of DC, in South Africa was available. These examples will be included in the literature review that follows.

Research articles and additional sources were collected at the University Information Service with the use of an inter-library loan system which links affiliated universities. The information found on DC implementation was inadequate for thorough analysis. In eastern American, the DC consultant's personal collection of information was made available as well as access to a university library and extensive electronic Internet sources. These sources were used to gather additional information during a study tour undertaken by the researcher. A total of four days were available during the study tour for gathering information not accessible in South Africa.

5.3.1 Literature on the implementation of kangaroo care

As KMC is regarded as a facet of developmental positioning and follows the DC principles, its implementation as found in national and international sources is discussed here. The South African examples are discussed first.

5.3.1.1 The Kalafong kangaroo care experience (Gauteng, South Africa)

The article that reported the Kalafong KMC experience (Van Rooyen *et al*., 2002: 6-10) was published by the Medical Research Council (MRC) Maternal and Infant Health Care Strategies Research Unit, in conjunction with the Departments of Paediatrics, Obstetrics and Gynaecology and Nursing Science affiliated to the University of Pretoria, Gauteng, South Africa. The study assessed the value of KMC at Kalafong Hospital after an 18-month implementation period from August 1999 to January 2001.

Kalafong Hospital is a large academic training hospital that has a ward dedicated to KMC practices. The unit has 25 beds and provides a safe and cost-effective step-down facility for stable high-risk infants from intensive care and high care. The method of KMC was implemented when the hospital had to solve the problem of limited availability of step-down beds, increased numbers of high-risk infants born at the hospital and outbreaks of virulent nosocomial infections (Van Rooyen *et al*., 2002: 6-7).

The kangaroo unit was opened on 6 July 1999. 20 mother-infant pairs could be admitted as well as five patients in bassinets for conventional nursing care. Intermittent and continuous KMC is provided by mothers, as well as conventional low-risk care for some pre-discharge infants in special circumstances. The unit is manned by nursing staff and a medical intern who receives support from a medical paediatric consultant. The mothers are encouraged and empowered to take care of their infants. Central heating ensures an ambient temperature of 28˚C to facilitate optimal thermoregulation. A follow-up clinic forms an integral part of the early discharge regardless of weight practices (Van Rooyen *et al*., 2002: 6-7).

Stable infants receiving full oral feeds are admitted to the unit from various high-care areas. Infants are also referred from other public health facilities. No special weight requirements have to be met before admission. Oxygen-dependant infants weighing less than 1400 grams receive intermittent KMC with conventional care in incubators to ensure optimal weight gain and thermoregulation. Oxygen-dependant infants weighing more than 1400 grams receive continuous KMC (Van Rooyen *et al*., 2002: 7).

Initially infants were discharged when they weighed 1800 grams, but as the implementation progressed, infants were discharged regardless of weight when breastfeeding (or an alternate nutrition method) was successful and weight gain was optimal. The discharge criteria include the mother's ability to be the infant's care provider. All discharged infants are seen at the follow-up clinic within a week of discharge (Van Rooyen *et al*., 2002: 8).

The study finds that the KMC unit is cost effective and relieves some of the pressure of patient load on the high-care areas. A low mortality rate was seen in the unit during the18-month period of the study, with only one death due to a nosocomial infection. Mothers are empowered to care for their own infants with support from nursing and medical staff. In a society where infant abandonment is a reality, no infants were abandoned. Regarding nutrition, 85% of mothers' breastfeed their infants. Exclusive

breastfeeding is part of the KMC approach, but the 15% of mothers who chose formula nutrition included HIV-positive mothers (Van Rooyen *et al*., 2002: 9-10).

This study addressed the value of KMC implementation in quantitative terms but did not focus on the process of implementation or which positive or negative factors were apparent during the implementation phase. It is therefore not clear as to what implementation strategies were used, or which factors were most responsible for the study's statistically positive results.

5.3.1.2 The KwaZulu-Natal kangaroo care experience (South Africa)

KMC was implemented on a province-wide scale in Kwazulu-Natal, South Africa (KwaZulu-Natal Department of Health, 2003: 1-12). The Maternal, Child and Women's Health division of the KwaZulu-Natal Department of Health published the results.

With approximately 200000 births occurring each year in the province and approximately 30000 of these newborn infants weighing less than 2500 grams, a method of care was needed to reduce perinatal mortality among these infants, as transport services, bed availability and overcrowding are real problems. The vision for the implementation of KMC was to improve the quality of neonatal care received, providing optimal health outcomes for the high-risk neonate, enhancing parent-infant bonding and promoting effective utilisation of available resources (KwaZulu-Natal Department of Health, 2003: 3).

A commitment statement indicating the importance of KMC is included in the report. KMC "is accepted as an integrated part of the continuum of neonatal care, particularly for low birth weight babies. Various studies have indicated the advantages …which go beyond the mere survival of the infant" (KwaZulu-Natal Department of Health, 2003: 3). The KwaZulu-Natal Department of Health committed to systematically implementing KMC into all health care facilities in the province where pre-term and low birth weight infants were admitted. This implementation effort formed part of a strategy to "improve the care of neonates and relieve the pressure on neonatal services" (KwaZulu-Natal Department of Health, 2003: 3-4).

A core team of institutions and organisations was formed by collaboration of the best available resources in South Africa with experience in KMC. These included the

KwaZulu-Natal Department of Health's Subdirectorate policy and programme coordinator for the Maternal, Child and Women's Health division; the individual hospitals; the Department of Paediatrics at the University of Natal; a facilitator from the University of Cape Town; the MRC; the Directorate of Health Informatics from the KwaZulu-Natal Department of Health; and sponsorship from the Italian Cooperation (KwaZulu-Natal Department of Health, 2003: 4-5).

The implementation plan adopted an implementation package rather than "face-to-face communication and continuous on-site support', because of cost implications (KwaZulu-Natal Department of Health, 2003; 5). The implementation package was developed by the MRC's Research Unit for Maternal and Infant Health Care Strategies, and had low cost implications. Successful implementation strategies were also integrated into the package. The KMC implementation package included an implementation workbook, a compendium of kangaroo literature, posters, brochures, videos and examples of records and documents (KwaZulu-Natal Department of Health, 2003: 5).

All hospitals in the province were invited to participate in the programme. Participation was voluntary and initially only 37 out of the 47 hospitals in the province responded positively. At the launch of the project in February 2002, the additional ten hospitals (Group D) who did not initially respond, expressed their willingness to participate. This group was given the implementation package but was not included in the trial. Three hospitals used telefacilitation in conjunction with the implementation package (Group C). Groups A and B were randomly allocated with n=17 in each group according to urban or rural location and number of births per year at the particular facility. Group A received only the implementation package, and group B received the implementation package and regional facilitation. This was decided by flipping a coin (KwaZulu-Natal Department of Health, 2003: 6).

The core team monitored the progress of implementation efforts, and hospital visits were conducted in most of the participating hospitals eight months after the launch of the project. During each visit, a checklist was completed where the hospital could receive a total score of 30 points. The hospital was then plotted accordingly onto a progress monitoring model which consisted of six steps, namely (1) creating awareness, (2) adopting the concept, (3) taking ownership, (4) evidence of practice, (5) evidence of routine and integration, and (6) sustainable practice (KwaZulu-Natal Department of Health, 2003: 7-8).

The results showed that the combined approach of the implementation package and regional facilitation (Group B) had the best results, with all 17 hospitals reaching step four, and seven of these reaching step five, indicating evidence of routine and integration of KMC practices (KwaZulu-Natal Department of Health, 2003: 9). As Group B's level of implementation success was higher with the results expected for face-to-face facilitation, the importance of the programme coordinator was stressed as vital to facilitate further success (KwaZulu-Natal Department of Health, 2003: 11).

In addition to the completed checklist, two external evaluators visited 11 hospitals in order to get an in-depth perspective on the positive and negative factors involved in the process of implementing KMC. Barriers experienced by the hospitals during the implementation process were also identified (KwaZulu-Natal Department of Health, 2003: 9).

Factors that were viewed as "vital determinants" for implementation success are: "good internal communication", "strong management", "team work between doctors and nurses", "integration with other initiatives" and the facilitative role of a programme coordinator. Barriers that reduced the level of success experienced included: "high staff turnover", "too much rotation of key staff", and "lack of proper record-keeping on kangaroo mother care" (KwaZulu-Natal Department of Health, 2003: 10-11). See Table 5 for a summary of these factors.

Table 5: Promoting and inhibiting factors from the KwaZulu-Natal kangaroo care experience (South Africa)

Promoting factors	**Inhibiting factors**
Good internal communication	High staff turnover
Strong management	Rotation of key staff
Team work between doctors and nurses	Lack of proper record-keeping on KMC
Integration with other initiatives	
Facilitative role of a programme coordinator	

This research report makes a valuable contribution to the design (phase three) of the implementation planning that was used in this study as the barriers mentioned that

reduce the level of implementation success are similar at the chosen research setting. Also, this report represents a South African context.

5.3.1.3 The Maricopa Medical Center experience, Phoenix, Arizona (United States of America)

Some of the nursing staff in the NICU at the Maricopa Medical Center started to implement KMC in an informal manner as information about KMC reached them from literature, conferences and from other neonatal nurses. As the implementation was done according to individual nurses' philosophies, preference and competencies, problems arose regarding inconsistencies and confusion among staff members and parents. According to the authors of the report, these problems resulted in fewer KMC practices in the unit. The institution's nursing and medical role players supported the practice and decided to use an organised approach where research findings were used as the framework for decision-making to introduce skin-to-skin holding techniques as standard NICU care (Bell & McGrath, 1996: 388).

Previous research was used to identify and determine criteria for patients' eligibility for KMC, and methods of safe and appropriate implementation of KMC. Once this information was consolidated, the current NICU policies and procedures for skin-to-skin holding were reviewed (Bell & McGrath, 1996: 388). A multidisciplinary approach was adopted where all role players were included at their routine monthly practice meeting, where the drafted policy and procedure were refined. The team felt it necessary to establish a critical pathway for the pre-term infant which included KMC as a standard intervention during their period of hospitalisation (Bell & McGrath, 1996: 394).

Families in the NICU were educated by means of flyers on KMC, which were made available in two languages, and a more structured teaching plan was provided that included more detailed information about KMC. Staff education and involvement were encouraged using an informative newsletter on implementation planning. The newsletter described the new policy and procedures, included research abstracts on the advantages of KMC, and gave recognition to staff successfully practicing and supporting KMC. A notice board was also assembled that included the policy and procedures, parental handouts, the parent's teaching plan including parent and infant benefits, the consolidated research information in table form, and special considerations necessary for implementing KMC (Bell & McGrath, 1996: 394-395).

Staff members were required to complete an evaluation tool about the information displayed on the notice board. This aimed to encourage participation and increase staff involvement (Bell & McGrath, 1996: 399).

Bell and McGrath (1996: 399) attribute smoother implementation of KMC to the six-month time-period of awareness prior to active implementation. Implementation of sustainable practice of KMC took an additional eight months. Two additional factors that promoted successful implementation included support from the whole management team and staff, and research information, made available in user-friendly tables, which supported the decision-making process during implementation. Once implementation was successful, the NICU made a poster of this implementation strategy as a visible reminder that KMC is now standard practice (Bell & McGrath, 1996: 401). See Table 6 for a summary of promoting and inhibiting factors in the implementation process.

Table 6: Promoting and inhibiting factors from the Maricopa Medical Center experience, Phoenix, Arizona (United States of America)

Promoting factors	Inhibiting factors
Longer awareness period prior to implementation	Inconsistent practices among staff due to different levels of knowledge of KMC
Management team and staff commitment	
Multidisciplinary approach	
User-friendly research information	
Visible awareness and education material	

5.3.2 Developmental care implementation

5.3.2.1 The Boston City Hospital experience, Massachusetts (United States of America)

In 1990, an article was published which reported a process of change in the Boston City Hospital's NICU environment in Massachusetts (Cole *et al*., 1990: 15). The Boston City Hospital implemented DC using a comprehensive, multidisciplinary model to facilitate change in the neonatal environment. Although this model aimed to include

all disciplines, the nursing staff proved to be the most effective change agents due to their familiarity with the environment and close relationship with the infant and family.

The Boston City Hospital Model consists of a variety of components, including staff education, developmental rounds, in-service posters, maternal and child education series, one-on-one teaching model, and inclusion of the role of the developmental specialist and physical and occupational therapists. Staff education consisted of an orientation course for new staff members, which included theoretical and practical aspects of DC, and one-on-one training at the infant's bedside. Developmental rounds were initiated where an infant with developmental or behavioural concerns was presented to the multidisciplinary team. The team would then compile a comprehensive plan for future care of that infant (Cole *et al*., 1990: 16).

Educational in-service posters were introduced to address a new topic each month. Posters were colourful and non-threatening, and provided an informal staff and parent information source. The sources used for the posters were identified and this information augmented available information in the unit's library. A maternal and child educational series was presented twice monthly to hospital staff on applicable topics, providing an opportunity to share information and knowledge. On-the-spot training focused on the bedside nurse and the patient, and members of the multidisciplinary team including the infant developmental specialist, the physical therapist and the occupational therapist, carried out one-on-one teaching of DC skills. These allied health professionals formed a critical component of the model in order to provide a team approach when caring for pre-term and sick infants (Cole *et al*., 1990:19).

The nursing staff reported that they felt empowered by the training they received in DC, and that they now made more autonomous decisions according to their individual patient's needs. This model was implemented over a three-year period, with the outcome of developmental and behavioural concepts integrated into everyday care of the infants. No direct reference was made to positive or negative factors that influenced the DC implementation process, although the abovementioned strategies had a positive effect (Cole *et al*., 1990: 21-22).

5.3.2.2 The Colorado Consortium experience (United States of America)

The Colorado Consortium of Intensive Care Nurseries provided the impetus to the neonatal units in the Colorado state for state-wide implementation of DC, with specific focus on the principle of family-centred care. In total, 17 neonatal units of the 20 in the state agreed to participate in this endeavour, which aimed to improve health care and long-term outcomes for the neonatal population, their families and professionals (Browne & Smith-Sharp, 1995: 18-23).

Through this venture, the consortium wanted to achieve the following goals: enhance practices of DC to the neonatal population in the Colorado state; assist with implementing a family-centred care philosophy; and "enhance the identification and referral of infants needing transition to community-based developmental and family support services" (Browne & Smith-Sharp, 1995: 19).

A working team was established in each unit, consisting of a consortium member, the neonatal unit manager, a registered nurse, a parent of an ex-pre-term infant, and a member from community services. The teams encouraged the attendance of additional members who were identified as committed and interested in the project. Monthly meetings were held where the team worked towards the consortium goals and the individual neonatal unit's goals for implementation. The consortium staff member provided support and educational resources, and facilitated networking between the different neonatal units (Browne & Smith-Sharp, 1995: 19).

Three strategies were used to promote the achievement of an individual and state-wide level of DC. These strategies were frequent consultation, communication links with other units, and the identification, sharing and solving of problems common to the participating units. After joining the consortium, each neonatal unit was evaluated according to its environment, routine infant practices, policies and procedures, and attitudes within the unit towards DC and family-centred care. Goals were then set for each individual unit and for the consortium (Browne & Smith-Sharp, 1995: 19-20).

The formation of communication links between the units instilled a sense for working together toward a greater good. Knowledge was provided in the form of literature, educational opportunities and activities occurring in other units. Much sharing of information occurred informally between units and at the consortium's annual meeting. Although the methods of knowledge sharing are not specified in the report, it seems to

have been facilitated by the consortium staff. A newsletter was used to spread additional news. Collaboration allowed common concerns to be addressed and confronted. This resulted in changes in the consortium's policies and procedures (Browne & Smith-Sharp, 1995: 20).

During their efforts the consortium identified both positive and negative factors. Positive change agents included key visionaries whose "passion enables them to weather the storm of implementation"; the neonatal unit's "commitment to value the individual infant and his or her family in the delivery of intensive care"; "planned strategies and investment in progress"; and "mutual respect for each team member's contribution" (Browne & Smith-Sharp, 1995: 22). Despite the support given by the consortium to the neonatal units, however, the following negative components influenced the implementation progress strongly: changes in management policies, staffing changes, changes to staff-patient ratios and physical relocation. "These "bridges of inactivity over chaotic waters" allowed nursery staff to "attend to the issues at hand, and then return to work toward their goals with fresh resolve" (Browne & Smith-Sharp, 1995: 23). The promoting and inhibiting factors mentioned in the report are summarised in Table 7.

Table 7: Promoting and inhibiting factors from the Colorado Consortium experience (United States of America)

Promoting factors	**Inhibiting factors**
Key role players	Changes in management policies
NICU's commitment to patient care	Staffing changes
Planning strategies and investment in progress	Changes to staff-patient ratios
Mutual respect for team member's contribution	Physical relocation of the NICU

The Colorado Consortium compiled a six-stage plan (as mentioned in chapter two: literature review) that was followed during the implementation of DC in the individual neonatal units. Progress through these six stages varied from unit to unit. In some units, the initial stages were mastered easily but the later stages proved more troublesome. In other units, the initial stages were more difficult but the later stages were easily accomplished. These differences can be attributed to the different working

cultures, role players, problem-solving abilities and circumstances in each unit (Browne & Smith-Sharp, 1995: 21).

5.3.2.3 The Royal Hospital for Women experience, Sydney (Australia)

The nursing staff at the Newborn Care Centre at the Royal Hospital for Women in Sydney, Australia, implemented research-based changes over a three-year period "to incorporate a DC model into the intensive care of high-risk newborns" (Stainton, Prentice, Lindrea, Wise & Dando, 2001: 7). Although DC was recognised as a multidisciplinary approach, the nursing staff made the major changes to initiate DC practices (Stainton *et al*., 2001: 8).

The implementation site was a level III tertiary referral centre that could accommodate a total of 34 infants from intensive care through to pre-discharge care. Participatory action research was used and four main aspects of DC were implemented simultaneously. These main aspects included preparing staff, adapting the environment, individualising infant care and incorporating parents in infant care (Stainton *et al*., 2001: 8).

A project team was used to drive the implementation. Early assessment of nursing staff was done through observation and interaction, to investigate their level of knowledge about DC and their readiness for change. Staff education sessions were then begun. Formal and informal training, including in-service training and posters, were used as well as feedback sessions. Educational sessions also allowed for discussion on nursing-parent issues, which provided opportunities for reflection and possible change (Stainton *et al*., 2001: 8, 9 & 11).

A DC committee was formed consisting of nurses who provided feedback to the project team. Their role was to find ways of incorporating DC practices into daily routines. The project team met weekly for continuous cyclical analysis of the implementation process (Stainton *et al*., 2001: 9).

For adapting the environment, clear guidelines were established and posted in the unit to encourage new practices. Members of the multidisciplinary team were informed of these changes, and involved in coordinating care and making compromises to satisfy all staff without sacrificing the best interests of the patients (Stainton *et al*., 2001: 9-10).

Senior nursing staff adapted easily and became mentors and role models for less experienced nurses. Managerial support and unit management support were seen as essential in facilitating change. Their support led to financial assistance for purchasing positioning aids and sending experts for training (Stainton *et al*., 2001: 11-12).

"The most powerful facilitators of change were the infants themselves" (Stainton *et al*., 2001: 13). Buy-in from staff was observed as the infants responded positively. One particular infant's response was highlighted: "His obvious response to the different approaches in care and subsequent dramatic progress encouraged staff to change their practices in areas such as positioning and physical handling of the babies and interactions with parents" (Stainton *et al*., 2001: 13). This project highlights the importance of the essence of caring, and shows that if the need for caring can be included into the implementation process, buy-in and active involvement from nursing staff will improve (Stainton *et al*., 2001: 13). No negative aspects of implementation are mentioned in this report except resistance to change.

5.4 Natural examples

The extant literature on the implementation of KMC and DC has been reviewed, and now natural examples of implementation are addressed. Studying the implementation of DC at other sites as natural examples yielded insight into the implementation process and variables that could affect the success level of implementation (De Vos, 1998: 391). The natural examples were investigated using (1) national and international in-depth interviews and (2) environmental audits conducted at four eastern American hospitals. Consent was obtained from the eastern American hospitals before any data collection took place, and the necessary documentation was signed (see Appendix 5).

5.4.1 In-depth interviews

5.4.1.1 Sampling

A total of 27 multidisciplinary members were interviewed. National (n=2) and international (n=25) sites, chosen using non-probability purposive sampling, were used

as the natural examples. Two experts in KMC implementation were chosen as participants for the national interviews (South Africa). The participants from the international interviews (America) were chosen from members of the multidisciplinary teams that were available on the days the interviews were conducted (Babbie & Mouton, 2001: 166).

5.4.1.2 Data collection

During the in-depth interviews, data was collected using five open ended questions. If additional information was needed, further questions were posed to retrieve in-depth data. Appointments were scheduled with the participants and they completed informed consent documentation (see Appendix 6) before the interview commenced. The questions asked were as follows: (1) How was DC/KMC implemented in your unit?; (2) How would you describe the success of this implementation?; (3) What factors promoted DC/KMC implementation?; (4) What factors inhibited DC/KMC implementation?; and (5) What advice could you offer for successful DC/KMC implementation?

5.4.1.3 Data analysis

The interviews were digitally recorded and transcribed *verbatim*. The transcripts were examined using qualitative content analysis and the editing analysis style described by Polit and Hungler (1997: 378, 380-384). Open coding allowed the main themes and sub-themes to be identified. This process of analysis was repeated to confirm correct coding and an independent co-coder validated the analysed data, which strengthened the trustworthiness of the identified themes and sub-themes in terms of confirmability (Babbie & Mouton, 2001: 278). The independent co-coder who validated the analysed data was an expert in Advanced Neonatal Nursing Science, and has a post-graduate Magisters qualification.

5.4.1.4 Findings from South African interviews

Two experts in the implementation of KMC were interviewed to collect data from South African natural examples. As one participant was the driver of the implementation

process, and the other participant provided technical support without being actively involved in the implementation process, a different focus was obtained from the two participants due to their different roles. The data will be integrated in the discussion to achieve an overall view.

Nine main themes were identified in the transcripts: preparation for implementation, managerial support and resources, motivation, education and empowerment, driver of the implementation process, progress monitoring and evaluation, role of the nursing staff, influencing factors for sustainability and institutional benefits. These themes and their sub-themes are now discussed.

5.4.1.4.a Preparation for implementation

Preparation for implementation is the first main theme identified. The participants indicated that they consulted previous research and literature to broaden their knowledge about KMC, the implementation process and change management. Before implementation was started, proper planning was carried out, including formation of a contingency plan: "What are the processes that will be involved, thinking about alternatives, anticipating possible problems, anticipating what we can do if this happens?" Both the participants said that the needs of the particular settings were identified as well as influential role players.

An important aspect of preparation that both the participants mentioned was general awareness of the implementation project, which facilitated buy-in into the implementation of KMC. One participant commented, "I think that was very important to get this awareness going to management and get their support and buy-in into the project." The other stated, "You have to sell the idea very well and I think we did that correctly". It also seemed important to create awareness throughout the hospital where as many people as possible were informed. "In one hospital …they had a campaign one day and all the doctors and the nurses put dolls in KMC positions and they had songs and things, and they had a road show through the whole of the hospital to tell them this is what we are now doing."

5.4.1.4.b Managerial support and resources

This theme focuses on the stage following preparation, in which awareness leads to managerial support and the provision of available resources. One participant

mentioned that senior management designated a unit that could be used for KMC and provided finances from the hospital's emergency funds to make the necessary alterations to the unit. There were already-existing lodger facilities for the mothers of pre-term and sick infants that facilitated intermittent KMC before the unit was complete.

Support from management was seen by both participants as essential for the implementation process, but in some cases management was supportive but seemed to take on a passive role. As one participant put it, "We also had the support of the management, not that they actively did anything. They just said they are willing that we do it." Other managerial support was intra-departmental, with the head of the Paediatric Department particularly mentioned, and the site was affiliated with the Research Unit.

A problem the participants identified was high rates of staff turn over and rotation through the unit. One participant requested that staff rotation stop until KMC was well established, with positive results; she said, "I had the cooperation of the managers and they said that they could do it." Staff continuity and stability was seen as important as staff rotation caused a loss of skilled, trained staff, hindering the implementation process. "Unfortunately most of those staff were already rotated away … I get nurses who did all the orthopaedics and surgery and they do not really have that background", said one participant, and the other stated, "What we found is very detrimental is all the staff rotation … staff rotation and turn-over are probably one of the big problems."

5.4.1.4.c Motivation

The participant who was the driver of the implementation process felt that awareness also led to motivation, so that, she said, "People were enthusiastic and they were willing to help us." Another quote illustrates the level of emotional involvement:

> I still remember, one of the people from the works department said they would definitely change it as soon as possible for us. He was so emotionally worked up about these small little babies being cared for by mothers on their skin, skin-to-skin, because we had the photos that we showed. It is amazing how people become emotionally involved with it.

The other participant more involved in technical support indicated that the motivation should come from within the institution, saying, "We are not implementing, you are

implementing … they had to take responsibility for the implementation." Technical support provided encouragement and positive reinforcement:

> Like in one hospital, … we came there for the first visit. Nothing had happened, and then everybody was up in arms … On the second visit they just had done miracles … When we asked how come things had not happened and then all of a sudden, they are still now a model in their district, so they said, 'We realised that you were not going to go away'.

5.4.1.4.d Education and empowerment

Before the implementation process could take place, education and training was a priority. Education and training of the staff was provided "at the beginning" before implementation was started, because a lack of knowledge and empowerment was identified. As one participant put it, "I realised that there was such a vacuum of knowledge on KMC and nobody knew about it."

Both participants identified resistance to training as a problem and decided on an adaptive strategy:

> We then had to educate the nursing staff in the KMC unit about kangaroo-mother care, telling them the benefits, what it is and so forth. At first we had sessions in a hall, a seminar room here, but the people did not come. Then I decided the best way of getting them is to get a captive audience. We went to the unit; they could not run away, they had to be there.

Empowerment of mothers is a prominent sub-theme. As one participant said, "The mothers also then got the information at the same time as the nursing staff. We combined the two outreach strategies as to educate the patient as well as educating the nursing staff." The lack of maternal empowerment was also noted as the nursing staff "do not really give examples of education and teaching of skills and support of mothers to learn how to become primary care givers."

Both participants mentioned various methods of education and presentation used to teach and learn about KMC. Some of these methods included the following:

- Workshops,
- Sessions on implementation,
- Conferences,

- Implementation package (problem-based learning),
- KMC presentations,
- Posters,
- Provision of basic information,
- Supplying of information and documents as requested or needed, and
- Publications for lay and professional people.

Other ways used to spread education and empowerment that were mentioned included the active involvement of the multidisciplinary team and an emphasis on team work. Influential key role players were identified, and as many people as possible were involved at committee and regular meetings. Progress monitoring and feedback were given as well as technical and continuous support.

One of the participants mentioned that at her hospital, indirect involvement from other departments in the form of student training facilitated awareness and buy-in as more support was given from external sources:

> The other thing that was also good is the involvement of student training. I do not know how many years ago we started training the medical students in the unit as well as …the communications pathology department … For the past two or three years they have been doing practical training in the unit. And I think that it has been beneficial for them and also it is beneficial to us because there are outside people involved supporting the processes. You will find that people are more compliant to doing KMC and so forth and it also just gives an input to the nursing staff to continue doing their best.

Thus as far as technical support goes, the hospitals were encouraged to have the community driving the process.

5.4.1.4.e Driver of the implementation process

The participant who was the driver of implementation of KMC said that a trial period of KMC took place because the unit was not yet ready. Intermittent KMC was initially implemented in the NICU and then, once the unit was completed, continuous KMC was started. The implementation approach was staggered and certain details evolved, such as documentation, KMC criteria and empowerment of mothers: “As our

confidence grew, we realised that the mothers were capable of taking care of their babies; we started discharging sooner."

Both participants stressed the need for somebody to drive the implementation process. As the one participant said,

> I think I was the driving factor. I would not accept no for an answer. I think it may not have happened if there was not somebody like me driving the process… being enthusiastic. I think what is also the crux of the matter is that you should try and pass the enthusiasm that you have on to somebody else, that they also have the same vision that they are striving towards and they could work towards accomplishing that.

The participants experienced the unit managers as very supportive and reported that with consistent staffing, staff members began to see the benefits. Multidisciplinary involvement again was highlighted by one participant, who said, "I also had a multidisciplinary team that supported me; the dieticians were involved, the occupational therapists and so on." Progress was monitored by statistic sheets and audit figures, as a participant reported, "It was also important for me that we keep good statistics and that we could do an audit and because of that I can now show you precisely what went on in the unit."

One participant mentioned that technical support provided an outsider's perspective to the process as only technical support was given. As implementation was done within the different hospitals, the ownership of the implementation was different: "We were the technical support for implementation and the province was responsible for implementing, so in a sense we have a different kind of ownership of the project." Another aspect mentioned was implementation time: "Make sure that one is not too ambitious in too short a time."

The lack of an internal process driver was identified by one participant as being a hindrance to implementation: "A person being asked to drive the process, being put on night duty for a couple of months in the middle, and then it stops. If it stops when that person is still on night duty you know it is still Pinky's project; it is not a team thing that everybody is on board yet." A good team was beneficial, as well as "good communication lines" and accurate record-keeping.

The implementation package given to the hospitals included a problem-based workbook, an information reader, picture posters, two videos, examples of documentation and parent pamphlets, information on the package and additional resources. In one participant's opinion, KMC should be included into a unit's vision, mission and philosophy, as well as into routine day-to-day practices and documentation and feedback to management. Only one province in South Africa has a KMC policy: "Their policy was, KMC must be implemented." The other provinces do not have policies in place.

"It becomes part of the continuum of neonatal care, like whatever you do; it is like eating and sleeping," said one participant. Staff members were also

> encourage[d] … to have [developmental care] on the agenda of all the meetings, especially in the implementation phase. They have to give report back to the matrons every morning on the babies in KMC. It becomes part of the usual record-keeping, the usual report functions and communication channels and so on.

5.4.1.4.f Progress monitoring and evaluation

The participants mentioned that a consistent record of statistics allowed auditing, which monitored progress and evaluated the implementation of KMC. Good record keeping as well as other necessary documentation reinforced sustainable practice. Evaluation of the implementation process allowed for improved practice and patient-care delivery: "When I evaluate the unit each year to see that maybe in some practices we should change or we should add something or whatever, and also to help with clinical practices, improvement of the care that we deliver to the babies."

Other ways mentioned for monitoring progress and evaluating the situation included questionnaires, local and provincial meetings, constant feedback and in-service training records proving that staff orientation took place. Certain resources were also looked at, for example a lodger facility for mothers or a unit for the practice of continuous KMC. Walk-through visits were carried out and a checklist was completed which evaluated these aspects.

To determine the success of implementation, one participant described a useful distinction. She said, we

> looked at success and we made a difference between outcome and impact. Outcome was whether they implemented or not. Did they have documentation? Was there a special room? Do they have figures that they would be able to use in a year's time for audit purposes? Did they have in-service records that they could verify that they give staff orientation? Impact, we looked at … what effect did it have on child survival or on the child's health?

5.4.1.4.g Role of nursing staff

Both participants saw the nursing staff as the "biggest component of KMC and when practising KMC they were the people, the really nitty gritty people involved." Specific problems were experienced with the nursing staff that influenced the implementation process and its progress. One participant emphasised nurses' commitment to their patients, cultural issues and low quality of training as problems. She said,

> The biggest problem is the nursing staff and the quality of their training and their commitment to their patients. I do not think they realise that it is important really to support and to educate people as well … I feel that they kind of forget that that is part of their professional work and that they just take care of babies … I find that as a medical doctor, that you always educate constantly, educating all kinds of health professionals and I just feel that that is just not part of their culture.

This statement also implies that aspects of Regulation 2598, the Scope of Nursing Practice (SANC, 1984) were not being adhered to. Other comments by the participants suggest a lack of professionalism, such as,

> There is a lot of background history that plays a role as well and, like I said, I am not quite sure what is the real problem. I think they really need to do research and investigation as to what is the problem with our nurses in South Africa. Why are they not powered to be a nurse or why they are not professional and act like professional people but like children? And things that go on between them are more important than their patients.

Both participants also highlighted a lack of active involvement, in statements such as, "None of them [were] really involved in the research or actively in the audit and so on. You inform them about things but they are kind of always spectators, they are not actively involved." This was a trend seen with management as well.

The lack of initiative in training colleagues and transferring the knowledge gained about KMC with others also had cultural roots, in the opinion of the participants:

> They expect you to train the doctor, not the nursing staff doing in-service training. Their understanding of in-service training is if you work with me then you know what to do and if the person who has been working here for a year is not on duty then the new person is on duty without knowing what to do. I feel that is really bad.

Once the nurses had been trained, "they were supposed to go back and train but very few go back and train … There is also a culture of keeping stuff for yourself because that means you might be promoted or whatever the case may be. There is not much of a culture of sharing, not all places but in some places."

5.4.1.4.h Institutional benefits

Both participants referred to many institutional benefits resulting from the implementation of KMC. The impact of KMC improved the quality of care delivered to pre-term infants, and had a positive effect on child mortality. One statement noted how

> …something like this, something very simple, could change the quality of care. This cost effective method of infant care became a "show case" for the hospital and many external visitors came to visit the unit. The kangaroo care unit as a new concept increased research opportunities that ran parallel to implementation. The kangaroo care implementation project was also awarded by the province as the best new project for that year.

5.4.1.4.i Influencing factors for sustainability

Some factors for sustainability have already been mentioned, including education, support, external interest in the kangaroo unit and active research on KMC during the implementation process. Hospitals that had already experienced an implementation process, like the Baby Friendly Hospital Initiative, were more receptive to change.

Another factor that influenced sustainability as identified by the participants was the impetus behind the initiative. If the provincial Department of Health asked for technical support for the implementation of KMC, they were then responsible for the implementation. As one participant put it, "They called all the training sessions; they did all the organisational things." Motivating factors for the implementation were different if

the impetus had to come from one individual within an organisation. As one participant noted:

> They do fill in all the forms that they are expected to do and so on. From that aspect of the process is sustainable but how good quality it would be if you are not always consistently there checking up and talking to the staff, complaining about mistakes and things that are not done, I am not sure how well it would function.

This statement also stresses the importance of constant supervision and the continuous nature of an implementation process.

Both participants also identified continuous training for sustainability as essential: "You have to constantly retrain the staff and make them aware and try and get their support so that they would continue doing KMC." A greater degree of success was seen at institutions that had more active technical support, though all of the hospitals that received face-to-face visits showed evidence of practice when evaluated. This reinforces the need for an active driver in the implementation process.

Both participants mentioned that the implementation process was definitely impeded by underlying problems within the individual hospital or unit. Both participants referred to this as a point of concern, with comments like, "Especially if you do not always understand what is going on in the unit and there are lots of other underlying problems and struggles and so forth, then that would stay the more important, and they would never buy in"; or "Other factors are what I call sinking hospitals, that you first have to rectify before you can implement anything, never mind what it is."

Whenever a group of people have to work together, human traits play a role. The influencing factors mentioned by one participant include hierarchy, power play, managerial styles, personality differences, interpersonal relationships and group dynamics. These factors can either have a positive or a negative effect.

5.4.1.5 Findings from American interviews

25 in-depth interviews were conducted in June 2004 with participants from multidisciplinary teams. The four neonatal units visited had implemented DC

successfully using Wee Care™, an educational programme provided by Children's Medical Ventures, a Novametrix company.

Representatives of a variety of different disciplines were included in order to obtain an interdisciplinary view of DC implementation (Figure 6). The interviewees included the following professionals: DC specialists (3), neonatal unit managers and registered nurses (10), patient care assistants (2), neonatal nurse practitioner (1), medical doctors (3), and allied health professionals (6, of which occupational therapists (3), respiratory therapists (1), parental coordinators (1) and lactation consultants/care coordinators (1)).

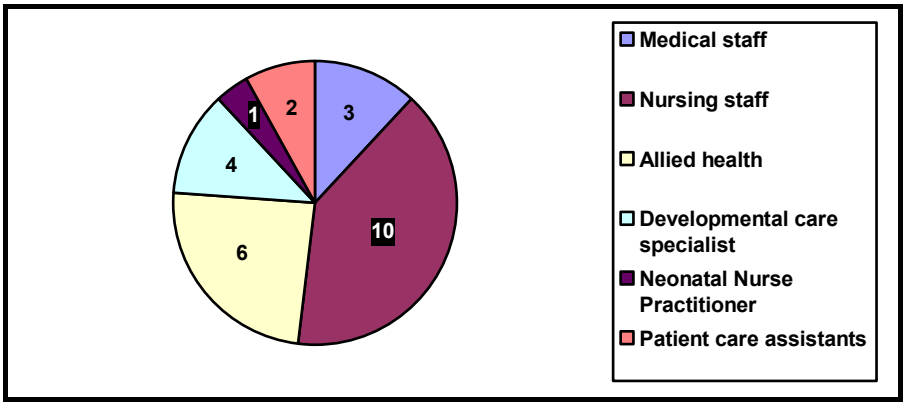

Figure 6: Distribution of multidisciplinary participation for American interviews

As Children's Medical Ventures did most of the pre-implementation planning, "preparation" was therefore not identified as a main theme. "Influencing factors for sustainability" were also not observed, since all the neonatal units showed evidence of sustainable practice. Eight main themes were identified, namely managerial support and resources, education, motivation, patient benefits, the implementation process, staff issues, progress monitoring and evaluation, and institutional benefits. These themes and their sub-themes will now be discussed.

5.4.1.5.a Managerial support and resources

The decision to use the Wee Care™ DC programme was made in consultation with senior management and administrative services. It was important for management and administration not only to support but also to be actively involved in the implementation process, which demonstrated managerial buy-in: "The whole staff has to buy into it … With administration supporting you know it is a good idea."

Within the unit, the unit manager's support was important, as well as the management styles used. One participant noted that "The nurse-in-charge is very conscientious of the noise level within the unit and she will kind of make us aware of it. I do not think it is done in a punitive way; just let us return back to keeping things quiet again." Another participant commented that her unit manager "was phenomenal with staying on top of it … and showing you and not like, why did you not think of that, but let us try, oh, good, that worked."

Authoritative support was seen as essential from management as well as within the unit. The training programme was made mandatory for all staff entering the neonatal unit, as reported by one participant: "It was mandatory; it was not like, 'I am sorry, it is my day off'. [Management] was kind enough … as they paid the girls to come to the class so that they would get the education." Within the unit, the participant mention examples of support from senior staff: "Having somebody among them that can say, you know it is really not right, you should really not have that music on full blast…, or that diaper is way too big, or that pacifier is not appropriate"; "If staff nurses are making these changes, there has to be someone behind her who can help push it through and make people realize this is not an option"; and "So you have to have someone that can make it an expectation."

Certain levels of practice were expected from the staff in their implementation of DC. One nurse said, "It is in your competency–based evaluation program that all the nurses have to pass every year. It is a performing standard. It is in the job description, it is in the flow sheet, [and] the critical pathway which is what every baby is on."

The practice of DC became expected by all employees involved in neonatal care. One participant said, "Since we had the Wee Care™ educational group come, from that point on there was no excuse not to be practising developmental care." Also, "It is not something that they can do when they want to, when staffing is good, when they feel like it. The change your unit has committed to make and it is made. It is not about whether the nurses want to do it or not. It is no longer an option just for the people who want to do it." Another comment highlights the core of this understanding. The participant said you have:

> …to get across to people the concept that the NICU is for the babies and that nothing else is more important, not the comfort levels of the staff, or the light or the inconvenience of not shouting across the room but walk to the next person. So get your staff to buy in that the NICU is really the babies' room, not ours.

> That is where the baby resides and now you have to make him as comfortable as possible.

In one hospital, a cut-off date was stipulated by which time all staff members were expected to be participating fully. If participation was not satisfactory, the particular staff member was asked to leave the unit:

> We expected that there would be one or two strugglers [at] the end of the year and our decision was, by the end of that time they could not practice in this manner, then maybe they were in the wrong place. We were not going to amend things for them. They needed to move on.

Two other hospitals agreed with this approach: "We did end up changing the performance standards based on Wee Care™ and really accepting the fact this is part of your competencies now and if you do not meet this competency, we end up terminating some people." A medical director stated, "We have spent a lot of time and spent a lot of money, so if you are not doing this, then you cannot work here. That will be eventually the consequence."

As DC was implemented, the need for additional health care professionals was identified. In the occupational therapy department, three more therapists were appointed for the neonatal patients and high-risk follow-up programme. A DC specialist position was created to coordinate the on-going implementation of DC as well as any purchasing of equipment. New ventilators that made less noise when in operation were installed:

> [The] products we are using now are looking at how they are going to affect developmental care. That has made a big difference too. The ventilators that we use are really, really loud and we just, developmentally, we are worried about noise. What can we do about these really loud ventilators? So they went and got ones that were quieter or muffled the sound.

In some units, the financial support for the educational programme and resources came from the hospital, but in other units fundraising efforts and community donations made up the money needed for implementation. One participant reported that, "A corporation actually paid for over half of our program. So the support was from the community."

Two units re-modelled and made structural changes to their units to incorporate DC into their every-day care. Other resources mentioned by participants include positioning aids; blankets and quilts; gel pillows and water mattresses; small diapers; acoustic floor, ceiling and wall material; decibel sound meters; portable individual nurses' phones; dimmer switches; oblique lighting; windows covered with blinds; privacy screens and recliner chairs for parents; mirrors for infant observation during KMC; pacifiers for non-nutritive sucking; larger cribs for co-bedding; and web-cam technology for parents and infants in different hospitals.

Many other resources were mentioned that eased the implementation of DC, but several participants pointed out that DC is a principle-based care approach, which can be implemented with few resources. For example, one said, "You do what you can do but you can still have the same outcomes. It just takes a little more effort."

5.4.1.5.b Education

As previously mentioned, the Wee Care™ DC educational programme was used in all four hospitals for the training of staff. The Wee Care™ approach is an evidence-based programme targeting all staff members entering the unit, regardless of their formal profession. One participant described the programme: "It was not just their theory that they would do better in different positions, it was information based on facts. I would say just those people were… awesome, [offering] the information to back us up. …You could say, wait a minute, statistics have proven [this]." The training included staff from housekeeping to medical staff: "We educated over 250 people that included housekeeping, dietary, OT [occupational therapy], PT [physiotherapy], speech therapy, surgical, physicians, cardiac."

A positive aspect mentioned by the participants was the benefit of having all staff trained by the same people, which resulted in the same message being taught to all: "Everyone has to be on the same page in order to make it work". This broad training approach promoted awareness about DC and buy-in into the implementation process: "But once it was known that that is what we were going to do, I think everybody really got excited about it and got involved in it."

Participants also stressed the importance of both the theoretical and practical components. Theory included the benefits and outcomes for the patient, and the rationale as to why DC was so important. This was complemented by hands-on

demonstrations and practical accompaniment, which are crucial, because of the practical nature of DC. This information was transferred through courses, videos, pictures and practical workshops. The educational programme was completed before the implementation phase started.

Continuous re-training and orientation for new staff was also mentioned as essential: "Every six months we would do… an eight-hour [training] day for anybody who was new and had that need." Staff also attended regular updates and opportunities for professional development, like neonatal conferences and seminars. Guest speakers were invited to talk on particular topics. In-service training was available whenever a need for information was identified and problem-sharing discussions were held, which allowed for learning through experience. Current research literature was mentioned as important for keeping updated with new trends.

Mentors and preceptors were appointed to answer any educational needs or questions. Staff members who were trained were expected to spread knowledge. Peer teachers within professions were beneficial, as well as peer relationships that development between the various hospitals implementing DC.

5.4.1.5.c Motivation

All the participants described the implementation of DC as successful within their units, and the implementation process as a positive experience. Although resistance to change was evident (see the responses of the driver of the implementation process), when the staff saw how the patients benefited from the new care approach, they were convinced about the need to change their practice. As one participant put it, "I think people in general just don't like change but once they see the benefits of developmental care, how could you not like it?" Another participant commented, "They have to see that it works, see the results, before they really buy into it."

One doctor discussed how DC complicated their lives until they saw its benefits: "The negative is how it complicates our life. Well, we have to be quiet. The lights get turned off. When we examine the baby we have to unwrap the baby and all that. The staff said it takes more time and we are busy, but [then] they saw [that]… the babies just actually look more comfortable. The baby appeared to be less stressed." Another doctor had the same experience: "Certainly, it is not convenient for the medical staff,

they would tell you that with absolute certainty, but you have to have everybody all convinced that it is an important process."

In one hospital, some staff attended a conference on DC before Wee Care™ was contracted. They came back to the unit with a positive attitude and were enthusiastic about implementation. Once the training was done, the excitement of this particular group of staff played an important role in motivating other staff. As knowledge spread through the unit and DC practices became more visible, this continued as a ripple effect.

Attitude changes occurred during the implementation process. As one participant put it, "You just see it at first but you have people complain, oh the lights are down, I can't see. Now when the lights go on people really get upset, [saying,] what are you turning the lights on for?" Another participant described the changes in her unit. DC, she said, "just made a world of a difference, I would say, from nursing attitudes all the way to the baby's comfort and in that time too they brought in more about family interaction and family care. The whole attitude just changed in the unit."

One staff member really tried to understand the infant's experience by putting herself in the baby's position when drinking from a bottle with a teat. She describes her experiment:

> The best thing that happened to me was putting myself in the baby's shoes, basically. I have fed babies for fifteen years, [so when they said], we are going to teach you another feeding technique,… I thought, you are out of your mind. I have been feeding babies for fifteen years, you are not going to tell me you feed a baby any better this way and it was. I became a true believer after I tried to drink the bottle with my head back and it is pouring down my throat. You can just imagine the baby feeding like that with respiration issues, his breathing fast, maybe because of a lung disease.

Staff members also started to view the infants as individuals with individual needs. As one participant said,

> Think about what is going on with the baby developmentally, with the baby inside mom. And then put yourself in that position like having bright lights shining in your face or to have your arms and legs strapped out while somebody is sticking your heel. You have no way to almost defend yourself. You feel vulnerable.

The DC approach was seen as the right thing to do: "I could not picture that they would go back and that is what you will hear from most units… that you can't go back. [It] would be unethical to go back to the old way of providing care."

Motivation and enthusiasm was promoted by moving into units which had undergone structural changes. These units also attracted external visitors and positive comments from professionals not permanently placed in the unit. As one participant put it,

> I think what changed a couple of them is when they would bring residents up to see the unit and the comments… start[ed] coming from these people that did not belong here, [like] "Wow, we cannot believe this is an intensive care unit because it is so quiet'." These had a positive effect on motivating staff that had not yet bought into the concept of DC.

5.4.1.5.d Patient benefits

Some participants described their unit and its day-to-day practices before DC was implemented. The following quotes illustrate the comparison that can be drawn between pre- and post-implementation.

- "I also ran the high-risk follow-up clinic. I see those babies come there with increased tone in their shoulders, their legs spread out because we used the big diapers and all that." "We are used to strap them in positions like this for hours and days with arms and legs restrained."
- "When I first started working here, our babies were in open bed warmers. I [used to] feel that I had to apologise every time a parent came in and saw their child lying on it… We could use a lot more of our little immobilizers… They call them restraints, we would call them immobilizers… When [the infants] get their tubes, [they] extubate themselves or even pull out NG [nasogastric] tubes or anything, [the nurses] would use the immobilizers and [the babies] would just lie on their backs or [with] their arms strapped down. Some of the nurses… tried to make them more comfortable but others felt this is how we provide care… Even if the baby is in the isollettes it just looks so naked and so cold."
- "Whenever they had any ET [endotracheal] tube in or umbilical lines and when they first took those restraints away, we were very uncomfortable because we believed that they will be pulling everything out. Once you find they are in a developmentally ideal position, they are calm, not thrashing as much. I think you use less sedation; we used to paralyse kids and now we do not."

Many patient benefits were remarked on by participants as resulting from DC. Some of these observed benefits were based on statistics and research findings from within the unit, and others on the participants' own observations. These are some of the benefits mentioned during the interviews:

- Short-term benefits:
  - Decreased length of stay,
  - Decreased number of special investigations,
  - Quiet unit,
  - Better ventilation and less respiratory support,
  - Lower oxygen needs,
  - Calm and comfortable infants,
  - Feeding tolerance,
  - Increased breastfeeding,
  - Infant-driven care,
  - Less pain medication and sedation,
  - Reduced environmental stress,
  - Reduced stress cues,
  - Better weight gain,
  - Stable thermoregulation,
  - Less tube displacement, and
  - More stable infants;
- Long-term benefits:
  - Decreased incidence of retinopathy of prematurity and intraventricular haemorrhage,
  - Fewer developmental delays,
  - Reduced cranial moulding, and
  - Better muscle tone and development;
- Family benefits:
  - Parental empowerment,
  - Family satisfaction,
  - Sibling care programme,
  - Improved parent-infant bonding,
  - Open visitation policy,
  - Increased privacy, and
  - Parent support (family care network).

Parental empowerment stood out as a strong sub-theme. One participant said, "The parents feel confident, they feel good about themselves if they have fed the baby. They are not scared of the baby. You cannot just throw the baby at them and say, feed him in a side-lying position." One nurse had a pre-term child of her own in the unit in which she worked. She described how a colleague "even made a list of what my daughter was doing at that time…. Today [she can] suck on a pacifier…. As a parent [it] was huge to know what success this tiny little baby had achieved."

5.4.1.5.e Driver of the implementation process

In one hospital, the implementation of DC had initially been a nursing initiative before Wee Care™ was contracted. In another hospital, the initiative was taken by the medical director and an occupational therapist. Introductory conferences and workshops were attended by identified role players and then the resources were collected for the Wee Care™ developmental-care training programme.

Implementation of DC occurred at different times at the visited hospitals. The first hospital's implementation date was October 1997, and the last's was March 2000. Wee Care™ came and trained all the staff members at the sites. The different disciplines and professions attended courses and practical workshops that varied in intensity. For example, the nurses' training was longer and more detailed than that received by the housekeeping staff. The way forward after the Wee Care™ training had to be planned and the goals set were realistic.

For the implementation process, a positive driver with good interpersonal skills was seen as essential. Two units had designated positions for DC specialists. One such specialist said, "I was … like the mother as an older nurse in the unit. While I was here they pretty much tried to be quieter, do whatever needed to be done and then I would have a few days off and I would come back, they would tell me what happened."

Interventions were introduced in a manner that was non-threatening and non-critical. Trainers tried to stay positive, creative and attentive to detail. The driver was instrumental in identifying problems or areas needing attention and more training. One unit had preceptors for clinical practice, which helped with on-the-spot training and feedback to the driver.

Although some hospitals followed initial training with the simultaneous implementation of all DC principles, others promoted staggered implementation. Implementation was generally slow and some principles were implemented better than others. One participant noted, “To me it has been a long slow process but I think that is how it is in all the NICU’s.” Another participant mentioned time as an important commodity which allowed for staff buy-in.

Participants described implementation as a continuous process where constant support and supervision was needed for progress to be made. A registered nurse commented that the swaddled bath “is a little different and little harder to do until you get used to doing it”, and so they were still working at it. This comment shows the sub-theme of implementation as a continuous process, since this particular unit implemented DC five years before the interview. Consistent staff also facilitated the process.

The importance of role players and role models was stressed because, as one participant said, “If you have a core group of staff that are dedicated to it, it is very difficult to stop it,” and as another commented, “If you can get some really positive people to lead the way then more will follow.”

The participants mentioned that communication was essential both during the implementation and the maintenance phases of DC practices. Staff meetings were held regularly and different committees and sub-committees were formed, such as, in the words of a participant, “a developmental care committee… a primary nursing committee and now… a lactation committee.” Feedback from these committee meetings was then shared with the multidisciplinary team. All information was communicated by e-mail, newsletters, posters, bulletin boards and individual post boxes. One unit formed a DC task team.

Team work was mentioned as a necessity, with involvement from as many disciplines as possible. The multidisciplinary team had to learn to work together in order to coordinate the care provided to the infants. In one case, communication was improved by having a mediator between team members and a care coordinator. The participant reported,

> We try to coordinate our care as much as possible rather than giving our specific respiratory antidote. We come in if we can while the nurse is doing routine care, doing whatever we can to change the oxymetry probe and assess the respiratory status at the same time…, and then… let the baby alone [to]

> develop. Two of my babies today had 'minimal stimulation only' [signs, saying] 'See nurse before touching the baby'.

Another reported that

> We did have some doctors that were very concerned that we were not going to be assessing the kids…. We are not telling them not to touch the baby…. I would be doing the assessment at eight or nine, why do you not try to be around at eight or nine? Don't wait until I get my baby totally snuggled back in, then you arrive and flip the baby all open again. It was very hard for them to get the concept. You really need to start cluster care. You know when you are going to come and do this physical assessment. Why do you not call me ahead of time and then I can delay my assessment so that we can do it at one time? Instead,… I am going to do my assessment [and] settle my baby; after 15 minutes you are going to come in and do your assessment, then I settle the baby again for 15 minutes and someone else comes.

Classes on DC were provided for the parents, and bedside teaching aids were available at each infant's bed. Parents were viewed as part of the team and feedback was obtained from them as well. Parents were also invited to participate in the doctor's rounds. Patient care rounds and management rounds also helped to observe the extent of DC at the bedside and in the unit as a whole.

To maintain interest in the implementation process and to provide encouragement, incentives were given to reward efforts. Contests were also held. Feedback on these activities was also given. Active participation was promoted, and staff members were positively acknowledged when goals were achieved. One participant said, "I think some things that we did initially… helped implementation…. We took pictures of things when they were done well and put them up [with a comment] like, 'A great job at positioning, thanks to nurse', whoever that was that day".

The need to refine current practice was as a sub-theme identified once implementation was complete. In one case, this refinement was actually carried out. The participant said, "We had made some changes. Initially when I came here all the babies were completely assessed every three hours and then we changed it from every three hours to a 'hands-on hands-off' time … every six hours the babies had assessments." Newly implemented practices also had to be refined sometimes. For example, one participant said, when positioning aids were used for optimal positioning of the neonates,

> We started putting them in the snuggle-ups™…. As things have progressed and [the infants] are ready to go home, they do not need that any longer. Then [the team] had to work with changing the rules because we need to say at one point that the baby no longer needs the snuggle-up™ a lot, at what point do they no longer need the gel pillow, etc.

During implementation, research was actively participated in and some hospitals formed a research network. One participant noted, "All the tiny babies here get a follow-up assessment between 18 and 22 months because we are part of the research network. So we will have data on quite a few babies the past few years." Another said, "We did the Vermont-Oxford, so where all of your kids under 1500 g we have at least to look at the outcomes before and afterwards. So we took one year prior and one year after the entire process was complete, to at least look at those outcomes."

Many comments were made about resistance to change. Some examples of these comments are given, in full rather than in summary so as not to detract from the participants' experiences:

- "I was like the mother but when I was not here [developmental care] was gone."
- "I have been working here for years, and I can feed a rock."
- "We have a few here and when I told them that we were not going to touch the baby for six hours it was like that is never going to happen, I have to be able to see my baby, I have to get in there and do whatever, and it took about six months for this one particular woman, who said, 'I cannot believe I fought you on this because it makes such a big difference'."
- "Some people come with the idea that they did not understand why it is important or they did not care about the baby exceptionally. The baby is sprawled over the bed so that you can see everything when they are telling you to snuggle it all up and you cannot see anything. This is sometimes hard."
- "The lack of some physicians' support made it a little inconsistent. They made their own service that people were a little less … interested about how they positioned, whether they cover up the babies' eyes or whether they just did their care because they knew some of the physicians were going to be frustrated by that extra little minute that it took to do something or covering the isollette when he wanted it off. I would say mostly it is the nurses that really have been here for some time and there were a few of them that had a little trouble with some of the positioning things because they felt like they could not see the baby as well."

- "In the beginning there were people that would come and take it all back out because they just did not like it or they wanted that nice flat bed with nothing in it. So I think it was more just some staff, more personality or history issues that slowed a few things."

However, the participants also made many statements showing that sustainable practice had been achieved, and comments about the sustainability of DC practices. Some examples include:

- "This is part of our care and that is how we deliver care and so it is not tolerable that we do not follow these steps."
- "I think it worked correctly because it's something that's constant."
- "This is something that is just part of care…. There is no question that this is just what we have to do."
- "I think people eat, drink and sleep it now. They see pictures that were taken of babies in our unit, you see them in literature from before and they came running to me and they are just astounded. 'Look at this baby. I cannot believe we did this!' You see news stories, magazines from other units where it is bright lights and the baby is all stretched out and they bring it in to show me that. They cannot believe that one would practice like that; a few short years ago that was them. They did not see it as separate things. They just see it now as the only way to practice."
- "We do not really want developmental care to be a niche. We want it to be pervasive through everything we do. We do not want it to be a separate event. But you still have to have preceptors to teach the new orientees that still can get that message across. That is a culture now. This is how we live and breathe in our unit."

5.4.1.5.f Staff issues

Participants indicated that the implementation of DC did result in some conflict within the multidisciplinary team. One said,

> We got into trouble with radiology actually, because they wanted to bring [a pre-term infant] down for an x-ray. She was just about 600g and such that she could not go down, just in case something went wrong. So the radiologist came up and I'm usually the one in trouble. I'm advocating for the babies. So they did not take her out of the room, they brought the machines down and the baby did fine.

Multidisciplinary conflict was also experienced between different professional roles. One participant explained, “In general some of our physicians do not necessarily see the importance of an occupational therapist and their role in things like feeding-readiness and developmental care.”

In some cases, comments were made about some disciplines trying to sabotage the implementation process. Examples include “Everybody can kind of sabotage it if they are not brought into it”, and “The other thing that I can see often as a negative is sabotage from different disciplines that [do not believe] that developmental care makes a difference and that can be very difficult.”

Positive staffing issues were also mentioned. Nursing colleagues supported each other in DC practices, and interdisciplinary support was also seen, specifically between a neonatal nurse and registered nurses, as well as from medical staff. One participant said, “I think the nurses did a wonderful job at positioning babies…. I was … left in the dust there because I am not good at positioning a baby. I am not as practiced at it as the nurses are but I think they had done a really good job implementing it.”

A paradigm shift emerged as a strong sub-theme as individuals had to alter their own practices. One participant was quite open about this:

> That was something I had to get used to. I came here trying to do the procedures within the isollette and then that certainly is not comfortable for the operator, surely not comfortable for the ideal positioning of your catheters and things…. It was much easier for me to say, ‘Put that baby on an open bed warmer’, or ‘We are just going to do it this way’.

Another said,

> Some of the physicians might not have bought in but I think when I saw that pretty much overall the nursing staff was buying it and the families were much more comfortable, the families were much more supported, the kids looked more comfortable, they were much more appreciative and started to support it much more.

Thus patient advocacy was mentioned as occurring more once the benefits for the infant became apparent. Another participant also mentioned this, saying, “People [are] really… willing to be a patient advocate”.

Once the nursing staff were trained and the initial implementation phase was completed, DC became part of the nurses' competency tests. Staff also had to be accountable for their own DC practices. One participant said, "You have to hold people accountable. That's the way we are in practice now, and this is part of the nursing care." Another participant commented,

> It is not acceptable that you flip babies; it is not more acceptable that giving the baby the wrong dose of medicine. Everybody agrees you cannot give babies the wrong dose of medicine, you cannot give babies another mother's milk, you cannot run an IV ten times faster than written. This is the same.

Benefits for staff arising from DC were also highlighted and included professional growth, change of morale among staff, decreased workload, increased time for paper work and parents, and increased job satisfaction.

Many statements also mentioned job satisfaction, for example,

- "When you do get home you are more satisfied…. You know what you've done, the babies are happier, you're calmer. It makes a big difference."
- "[The unit] will be so much more pleasing to work in afterwards; [the staff] will be so much more rewarded themselves. They will go home less stressed, they will have more time to do the things that really matter. They spent so much time calming their babies down and getting the babies settled because the babies are not settled. Once they start to see that, letting the parents be their other set of hands to help with their work, they will see the benefits to themselves. It is a much less stressful event."
- "Just very, very nice. Wonderful. I really like my work."

One nurse commented that DC

> is not extra work. It actually decreases your work load. You know, if the baby is not upset, thrashing and desaturating all the time…, you can actually do some paper work or do some… extra teaching of the parents and encourage them about developmental care… and also… sit and explain, you know, what will happen to the baby down the road as opposed to, 'I'm sorry, I have to silence this alarm' or, 'Sorry, I have suction' or, 'I'm sorry, I have to move you out of the way because I don't know what it going on'. So it definitely has cut down the involved work, so that's a good thing.

5.4.1.5.g Progress monitoring and evaluation

Participants said that progress monitoring and evaluation took various forms, but gave no specific details beyond mentioning assessment of current practice, follow-up, reviews, discussions and a high-risk follow-up programme in place to monitor discharged patients. One participant reported, "We review things and to educate them further as they absorb the initial education, but then as time has gone by, it would become second nature and then add it up with their knowledge that helped to keep [implementation] successful."

One of the DC specialists advised that goals be set for the implementation of DC. One goal should be achieved at a time and these goals should be celebrated once achieved. The specialist said, "It does have to be very realistic so that [staff members] feel they can attain the goal…. Set up small little successes along the way and celebrate those successes."

5.4.1.5.h Institutional benefits

Reductions in hospital cost were mentioned as an institutional benefit arising from a decrease in infant hospitalisation. One participant said, "So they were interested in seeing the reduction in length of stay to save them money, and it was calculated for them to get their investment back." Another said, "And really, if we look at our length of stay on average, every category of kid has gone down from 25 days to 14 days on average... so… we look at that kind of savings."

The two units that were remodelled became show cases for those hospitals. One participant stated that the care rendered had been improved by the implementation of DC, saying, "I think that we actually improved our care to get people to pay attention to details."

5.4.1.6 Conclusion: in-depth interviews

The functional elements of successful models will be discussed later in this chapter (see heading 5.5). In brief, however, the interviews highlighted the following outstanding positive factors that facilitated the implementation of DC:

- Enthusiastic driver,
- Education and training,

- Support and buy-in,
- Multidisciplinary team involvement,
- Staggered implementation approach,
- Hospital benefits,
- Accurate record-keeping,
- Research opportunities,
- Communication,
- Documentation, and
- Constant feedback.

The participants also indicated several factors that could be seen as hindering implementation, including:

- Passive managerial support,
- Staff rotation and high turn-over,
- Resistance to change,
- Lack of empowerment of staff and mothers,
- Lack of professionalism,
- Existing problems at the site,
- Lack of knowledge and transfer of knowledge to others, and
- Multidisciplinary conflict and sabotage.

5.4.2 Environmental audits

5.4.2.1 Methods and procedures

The second part of the study of natural examples consisted of environmental audits conducted to determine the level of DC practiced in the chosen American hospitals. One environmental audit was done at each site, yielding a more complete picture of the DC practices in these units than that given by the data collected from the in-depth interviews alone. The environmental audit was completed in June 2004, with observation and recording of specified information. Additional information was observed in field notes made as part of the audit.

The same environmental audit instrument (see Appendix 4) and methods and procedures of data collection discussed in Phase One (see heading 4.6 Methods and procedures) were used here. Some sections of the environmental audit required verification from written documentation, but this documentation was unobtainable in terms of the Health Insurance Portability and Accountability Act of 1996 (U.S. Department of Health and Human Services, Office of Civil Rights:1), which protects health information and privacy for hospital patients.

5.4.2.2 Data analysis

The environmental audits were analysed using deductive reasoning for a qualitative description of the DC practices observed. The findings are described below.

5.4.2.3 Findings

In the following description of the four environmental audits conducted in America, the hospitals are coded with the capital letters B, C, D, and E. The findings indicate that sustainable practice of DC has been achieved at the visited hospitals. These findings are discussed in general, with specific examples highlighted from individual hospitals.

5.4.2.3.a Section one: health-care facility

Environmental audit findings

Section one of the audit consisted of the health-care facility's details, including the date of audit, unit manager's contact details, DC implementation date, bed capacity of the unit, number of patients at the time of the audit, estimated staff-patient ratio and acuity levels of neonatal care provided.

Hospitals B – E implemented DC at different times. Hospital E began implementation first, in October 1997, and hospital D last, in March 2000. The neonatal units varied in size. The smallest unit in terms of bed capacity was B, with 38 beds, and the largest was D, with 50 beds. The number of patients varied from 21 at E to 42 at B.

Estimated staff-patient ratio was determined by the patient acuity. Unstable patients and patients receiving extracorporeal membrane oxygenation (ECMO) ventilation were

nursed on a ratio of 1:1. Stable intensive-care patients were nursed on a ratio of 1:2. High-care patients were nursed on a ratio of 1:2 or 3 and low-care 1:3 or 4. The hospitals delivered all levels of care, but only B had a step-down facility for infants needing low care. Hospitals C, D and E admitted patients to the NICU and discharged them home from the NICU into the care of their primary care givers.

A summary of field notes for participant observation

The registered nurses' role was mainly patient care, and several disciplines were involved in the care delivered to the neonates. For example, the bedside nurse was responsible for basic care of the patients and administration of medications. The respiratory therapists' role was to evaluate the respiratory status of the patient, change the saturation probe, do arterial blood gases, suction the patient, intubate and extubate patients, and arrange the setting-up and changing of settings of any ventilation equipment. The peripheral intravenous access team inserted intravenous infusion. The blood sampling team drew any blood for special investigations. The lactation consultant helped mothers with breastfeeding, and the dietician calculated and monitored feeding status and weight gain. The occupational therapist and physiotherapists looked at optimal development and early intervention when abnormalities were detected. This multidisciplinary system of care delivery allowed each profession to focus on their particular role, resulting in an organised and effective way of patient care.

To quote a specific example, hospital C had the following members on its multidisciplinary team present during patient rounds: bedside nurse, dietician, neonatal-nursing practitioner, member of the developmental-care committee, neonatologist, residents, case manager and unit manager.

Greater success was achieved when the implementation initiative was led by the nursing staff, as was the case in hospitals B, C and D. The implementation at hospital D was led by the medical director and an occupational therapist, and the buy-in from the nursing staff at this hospital was noticeably less than optimal.

5.4.2.3.b Section two: developmental care principles

Section two of the audit focused on the seven different principles of DC, namely individualised care, family-centred care, positioning, handling techniques, environmental manipulation, non-nutritive sucking and pain management (as discussed

in chapter 2). Each of these principles had particular observable details which were scored as, for example, “YES”, “NO”, “UNSURE”, “NOT APPLICABLE”, “SPECIFY” or “BRIEFLY DISCUSS”.

Principle one: individualised care

Individualised care plans were set up by the nursing staff on the nursing charts. Procedures were carried out according to the infants’ needs. For example, B had a suctioning policy which called for two people to be involved, one to contain the patient and one to suction the patient. Cluster care was carried out by all multidisciplinary team members, with care coordinated to allow for longer sleep and rest periods. Although D did have visible evidence of individualised care practices, no care plans were available.

Infants’ bed space was individualised with pictures and toys. Parents were encouraged to make their infant’s bed-space as homely as possible. Staff members at C had decorated their unit with a garden motif that emphasised growth and nurturing.

Physiological and behavioural stress cues were observed by staff, who responded to these cues by changing the care administered at that particular time. B and C provided containment and altered care to give “time-outs” so that patients could recover from stressors. Staff at D observed stress cues but did not modify care to reduce stress; rather, they completed work and then left the infant to recover.

Principle two: family-centred care

Facilities for parents, siblings and grandparents were available in the hospitals. B provided a parent’s lounge and a children’s play area. Adequate chairs were provided. Refreshment facilities were available downstairs in the cafeteria. C provided wooden rocking chairs for parents and smaller wooden rocking chairs for siblings. A miniature basin for children’s hand-washing was also available. A sibling care centre was available for children to play under supervision while parents visited their infant.

Visitation policies varied. B and D allowed parents and grandparents to visit at any time of the day or night, and siblings older than three years were allowed to visit for 15 minutes if their immunisations were up to date. C and E allowed parents and grandparents access to the unit at any time, and catered for siblings and any other visitors if accompanied by the parents.

Family involvement and empowerment were facilitated by the staff. B encouraged parents to be involved as far as they felt comfortable. Parents were informed about their infant's condition and other relevant aspects of care. B also had multidisciplinary parent conferences where the care and/or problems that the infant was experiencing were discussed. C included parents in all care and decisions made, and also had a "Family Care Network" in place that provided support for parents from parents who had already passed through the unit. Educational programmes were held for the parents and cardio-pulmonary resuscitation was taught before discharge of the infants. A grieving room was a valued resource in the hospitals, which allowed parents to exit the unit after the loss of their child without having to walk past other patients. If parents were not in the unit, they were contacted by telephone if any positive or negative information had to be communicated. Information was given to parents only, and to no other family members. This was to ensure that parents were involved in the medical decisions made about their infant. One nurse commented that "we keep no secrets" about the infant's condition. E made a copy of the medical records available to the parents if desired, and had a designated area to discuss infant care with family and health care professionals.

Parent-child bonding was also facilitated by staff, who promoted KMC and if necessary confronted parents and helped them to hold their infant and be involved with care. Staff also went out of their way to accommodate the needs of the parents. A lack of parent-child bonding was observed at D when an unsure mother was not attended to due to shortage of staff.

Verbal informed consent was obtained for minor procedures like x-rays and blood sampling. This was seen as part of NICU care and therefore did not require additional documentation. C had a video on the routine procedures of the NICU which the parents had to watch before signing consent. Written informed consent was obtained for major procedures like blood administration and surgery. A copy of this documentation was put into the patient's file.

Principle three: positioning

Hospital B had 42 patients at the time of the environmental audit. All patients except for one were positioned correctly. One patient had moved himself but was now sleeping and was therefore not disturbed. Infants were positioned in flexion, with midline orientation and containment. Most of the containment boundaries were in place, although some of the top boundaries around the head were missing. KMC was

not seen during the audit but evidence of practice was seen from information boards and their training programme. Positioning aids were used to facilitate correct infant positioning.

26 patients were observed for positioning at hospital C. 23 infants had been positioned correctly and three patients had evidence of attempted but ineffective positioning. Two patients had moved out of their positioning aids and therefore did not have correct flexion, and one patient positioned in the prone position had hyperextension of the shoulders which prevented correct flexion and midline orientation. All infants had some level of containment but this was not achieved on a three-dimensional level as the head was left open in most cases. The feet and body were well contained. Intermittent KMC was practiced and resources like KMC recliners, mirrors to observe the infant's face, and privacy screens were observed. Co-bedding for twins and triplets was seen.

Hospital D had 35 patients of which 16 were positioned correctly according to the principles, 17 had evidence of positioning and two patients had no evidence of positioning efforts. Although efforts at flexion were good, more attention was needed for rounding the shoulders to prevent shoulder retraction. Half of the patients did not have correct midline orientation and the containment boundary around the head was missing in 17 cases. The two patients without positioning had no containment and were in an extended "frog" position. KMC practices were not seen at the time of the audit but staff confirmed that intermittent KMC was carried out but was not popular.

The positioning of 21 patients was observed at hospital E. Positioning according to principles was evident in 15 cases. Ineffective application of the principles was seen in six patients, where the boundary around the head was not present. In general, flexion and midline orientation were good. Hospital E had a "back to sleep" campaign and larger infants were positioned in this way to prepare for discharge.

Principle four: handling techniques

In hospital B, only one patient was seen being handled during the time of the audit. The patient was handled correctly. Positive touch was provided by containment and positive oral stimulation. Although touch was observed to be firm and done with the palmer surface of the hand, some stroking was also observed. Cluster care was observed, providing care suited to the needs of the patients.

Handling techniques were observed at C where hands-on containment was given to an infant to calm him down after his mother had left. Cupping of the head and buttocks was also seen as well as the providing of finger grasping during interaction.

Two patients were handled correctly at D, with evidence of hands-on containment and providing finger grasping to aid self-regulation but a lack of skin-to-skin contact and transitional touch was seen. A lack of correct routine touch was observed when intravenous access was gained without containing the infant.

Hospital E showed a lack of skin-to-skin contact, since all staff wore gloves for any patient contact, and no transitional touch or containment was provided during interaction and positional changes.

No specific rest times were observed as care was infant-driven. Day-night cycling was not observed but was built into routine care where longer rest periods were provided during the night and more light during the day.

Although positional changes were not seen during the audit at C, containment during positional changes and slow motion were included in the unit policy, the training manual and the pictures on the information boards. At D, a “preemie-flip” was observed, showing a lack of correct positional changes.

Principle five: environmental manipulation

A definite effort to reduce light was seen in all the hospitals. Patients had individual bedside lighting, protective barriers were provided to shield the eyes, windows were covered with blinds, indirect lighting was used and, at C, incubators were covered with quilts with each patient’s name and date of birth embroidered on them. C provided natural lighting for infants from 34 weeks gestational age. D did not have dimmer switchers or adequate individual lighting but all incubators were covered. Much natural light entered the unit due to the double-volume ceiling.

Efforts to reduce noise levels were also observed, including decibel monitors, individual staff telephones, absence of a radio, individual patient music therapy, shift hand-over carried out away from the patient’s bedside, plastic dustbins, quiet shoes and strobe telephones. No protective barriers for ears were seen at hospital B. C had traffic dividers made of acoustic absorbent materials along access points to reduce noise. Noisy areas, such as the secretarial area and the general office space for medical staff

and nursing management, were also situated outside of patient care areas. Noise levels at D were high, with alarms volumes set on high, a general hospital intercom system in the unit, and a high level of conversational noise.

Smell manipulation was also seen. Alcohol wipes were opened away from the patient, no perfume or perfumed lotion was worn by staff, parents were advised not to wear perfume, and parents were encouraged to sleep with a cloth or soft toy for smell transfer, which could then be left with the infant. C preferred to use saline wipes instead of alcohol wipes. D liked to dilute oral medications with some breast milk or formula milk to make the taste more pleasant. E did not clean their incubators on a daily basis but rather replaced dirty or seven-day-old incubators with clean ones. Dirty incubators were cleaned in a separate room so that infants were not exposed to strong chemicals.

Principle six: non-nutritive sucking

All patients had their own size-appropriate pacifiers in their beds which were used during feeds, for self-regulatory needs and at any other appropriate time. Some were in use at the time of the audits.

Principle seven: pain management

Pain management interventions were observed. Non-pharmological interventions like positioning (swaddling and containment) and sucrose were used. The sucrose solution used was in stock and use during painful procedures was verified by the bedside nurses and the DC specialist. Two people were required to be present at painful procedures. Pharmological interventions were given if necessary. At E, a painful procedure (blood sampling) was observed where no sucrose was given.

5.4.2.3.c Section three: orientation, training, participation and documentation

The last section of the audit addressed the topics of orientation, training and participation in the unit, as well as available developmental-care documentation.

Staff remained relatively constant but positions were refilled when necessary. An orientation programme that included DC was mandatory for all new staff. This orientation programme used both verbal and written material, and was verified in in-service training records. Staff members in the unit had been specifically trained in DC. A protocol or policy ensuring that all staff were adequately trained in developmental

principles was not available at B, but the staff viewed DC as part of the hospital policy, and so saw themselves obliged to comply with developmental-care practices.

C and D had a low staff turn-over with no internal rotation; only residents rotated monthly and they were orientated before entering the unit. A 12-week orientation programme including DC was available for new staff, preceptors were available and staff had to sign off their competencies. Peer review of staff performance was also required for annual financial increases. C had a policy in place for developmental-care practices. Although D had an orientation programme for new staff, the time period of the training was shorter than at the other hospitals.

All categories of staff were involved in DC including medical staff, nursing staff, allied health professionals, non-medical support services and parents. Much support and involvement was seen from the multidisciplinary team, although this did change at specific times when the unit was busy or when other activities became a priority.

Management was supportive in terms of providing resources and training opportunities for the NICU staff, as well as being actively involved on management rounds. Although D's management were supportive of DC, their involvement was not active. The general impression on the routine application of DC principles was good for hospitals B, C and E. D was rated as average due to incorrect handling techniques and elevated noise levels.

Some documentation was unavailable, as mentioned previously. Hospitals B and E said they did not have documentation because DC was accepted practice in their units, making additional documentation unnecessary. Forms for individual care plans were available but no specific policies were in place. Guidelines and procedures for the implementation of DC were not available but the approach was included in the unit's algorhythms, and in-service training was provided with refresher courses every six months. Parents were given the opportunity to attend an educational class and resources like books were available for their use.

Hospital C had documentation to support their developmental-care practices. Proof of DC was seen in the basic bed chart and an individualised care plan was completed for each patient. DC, including KMC, was part of the C and D units' visions, missions and philosophies. Policies for both were also available. Guidelines and procedures were

available to all persons and information for parents took on all forms from videos to pamphlets.

5.5 Functional elements of successful models

As in Phase One (see chapter four), this phase of the study used the set of questions given in Fawcett *et al*. (1994: 33) to facilitate critical analysis of the information gathered above. These questions were used directly from the source, with relevant adaptations for the study.

5.5.1 Is there a model programme that has been successful in the implementation of developmental care?

Two main approaches for implementation were observed. The first approach was to use an organised educational programme called Wee Care™ for educating all staff members. Implementation was then left in the unit's hands with follow-up and evaluation from Wee Care™. The second approach was to handle all training and implementation from within the unit without external influences.

5.5.2 What made the programme effective?

- The approaches used were effective because they employed a multidisciplinary approach where as many staff members as possible were trained according to their level of involvement.
- Managerial support was essential, providing the resources needed for sustainable practice.

5.5.3 What *factors* caused implementation to be less successful?

Many factors emerged that contributed to periods of limited success:

- High staff turnover,
- High staff rotation,
- Lack of proper record-keeping,

- Sporadic practices based on individual philosophy, resulting in inconsistency and confusion,
- Changes in management policies,
- Physical relocation of the NICU,
- Increases in staff-to-patient ratio resulting in more patients per nurse,
- Lack of training,
- Lack of professionalism,
- Lack of active involvement,
- Lack of initiative to train others or share knowledge,
- Cultural issues,
- Lack of empowerment of mothers,
- Resistance to change,
- Existing problems at the site, and
- Multidisciplinary team conflict.

5.5.4 Which *events* appeared to be critical to success or failure?

- Awareness was seen as imperative before the training or implementation began.
- Once awareness of DC was heightened, an important function like a project launch attracted buy-in.
- Education was on the whole seen as very important.

5.5.5 What *conditions* (e.g. organisational features, client characteristics, broader environmental factors) may have been critical to success or failure?

- If management were supportive and actively involved, staff saw DC as a good idea and buy-in was facilitated.
- Management support also led to resources' being made available for the practice of DC.
- Authoritative support in the unit allowed staff to be held accountable as problems were identified.

- Hospital benefits like cost reduction and a show case unit to stimulate external interest was beneficial.
- A person to drive the implementation process or a programme coordinator was very important.
- Some hospitals created a full-time position for a developmental-care specialist to ensure continued practice.
- Buy-in from the nursing staff was seen as important as the nursing staff contributed greatly to the success of implementation.
- The level of caring also played a role in staff buy-in.
- The function of role players in taking the lead was important for spreading enthusiasm and knowledge.
- Multidisciplinary involvement and team work were imperative for success.
- Some sites had a specific project team or task team that was mainly responsible for implementation.
- Developmental-care committees and sub-committees shared some of the responsibilities with the project team and feedback was regular.
- Education was provided to all or as many staff members as possible.
- Visible educational material and signage was important.
- Feedback indicated that user-friendly research information was helpful.
- Communication lines had to be effective.
- Members of the multidisciplinary team had to be prepared to compromise in the best interests of the patient.
- The implementation process was facilitated by the integration of other initiatives, for example the Baby-friendly Hospital Initiative.
- The level of commitment to patient care was also seen as important.
- Planning strategies and investing in the progress of implementation helped staff motivation and encouragement.

5.5.6 What *specific procedures* were used in the programme?

The following specific procedures were important:

- Development of documentation,
- Development of discharge criteria,
- Initiation of a follow-up programme,
- Guidelines for developmental-care practices,

- Progress monitoring,
- Feedback,
- Accurate record-keeping,
- Training, and
- Re-training.

5.5.7 Was *information* provided to clients or change agents about how and under what conditions to act?

- In one case, an implementation package was provided that included all the necessary information for implementation to take place.
- Specific criteria and guidelines were established and put into place.
- Policies on KMC and DC were initiated.
- One article used a structured teaching plan for education of staff.
- Evidence-based education based on current research was used.
- Current research literature was made available in the unit's library for staff and parents.
- Orientation was given to all new staff members and any other members needing a refresher course.

5.5.8 Were modelling, role playing, practice, feedback or other *training procedures* used?

The following training procedures were used:

- Statistics,
- Audits,
- Feedback,
- Regular meetings,
- Developmental rounds,
- Patient care rounds,
- Hospital-linked network,
- In-service training,
- Posters,
- One-on-one training,

- Hands-on demonstrations,
- Practical accompaniment,
- Mentors, and
- Preceptors.

5.5.9 What positive *consequences*, such as rewards or incentives, and negative consequences, such as penalties or disincentives, helped establish and maintain desired changes?

- Incentives were given to staff for jobs well done.
- Contests were held and prizes awarded to deserving staff.
- A decrease in work load provided more time for other aspects of care.
- A greater amount of job satisfaction was experienced.
- Professional growth through knowledge and skills gained was experienced.
- Staff were held accountable for their actions.
- DC was made part of annual competence evaluations that had to be passed.
- Staff had peer review opportunities when salary increases were approaching.
- DC became part of the performance standards for all nursing staff in the unit.
- DC was also incorporated into the nurses' job descriptions for new appointments.
- A few of the units visited adopted a policy that, "If you cannot adapt your practices to be developmentally orientated, then you need to leave the NICU".

5.5.10 What environmental barriers, policies, or regulation were removed to make it easier for the changes to occur?

- In one hospital, staff rotation was stopped to allow for consistent staffing during the implementation phase.
- One hospital experienced multidisciplinary coordination as problematic, which resulted in conflict. As a solution, a care coordinator was employed to schedule care and mediate between staff members.
- Policies and procedures were changed to be more baby-friendly in terms of family participation and involvement, and introducing a gentler approach to all existing policies and guidelines.

- Two units what were not developmentally sound were restructured to incorporate DC into all patient care.

5.6 Conclusion

The aim of Phase Two was to gather and synthesise information in order to determine the functional elements of a successful implementation programme. This information was gathered by reviewing extant information sources on DC and KMC implementation; and by studying natural examples through in-depth interviews and environmental interviews carried out both nationally, and internationally (as four eastern-American hospitals). The data collected was analysed, and provided rich information for identifying functional elements of a successful implementation programme. These functional elements were incorporated into the design of the intervention plan in the following chapter.