Developmental care on newborn intensive care units: Nurses’ experiences and neurodevelopmental, behavioural, and parenting outcomes. A critical review of the literature

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Abstract
Important development occurs in the fetus throughout the final weeks of pregnancy. For infants born before 35 weeks gestation, this development occurs in the newborn intensive care unit (NICU) where they are handled frequently and endure invasive, stressful procedures. Developmental care reduces stressful stimuli by attempting to imitate the intrauterine environment.

This review of the literature proposes that infants who receive developmental care demonstrate improved neurodevelopmental outcomes until the age of two and seem less likely to develop long-term disabilities and behavioural problems by 5½ years of age. Parents report lower levels of stress and seem to develop more mutually understanding relationships with their infants if they received developmental care and nurses observe an improvement in the well-being of these infants. However, the implementation of developmental care can be costly and would require careful planning to avoid some of the difficulties that arise with such a change in practice.

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Introduction

A literature review was conducted to discover the effects of developmental care on preterm infants and their parents, and nurses' experiences of its implementation. Searches were performed through OVID, focussing on neurodevelopmental and behavioural outcome, nurses' experience and family outcomes for infants receiving developmental care compared to those receiving traditional care.

Programmes have been designed which offer highly individualised and family centred developmental care. The most well known is the Newborn Individualised Developmental Care and Assessment Programme (NIDCAP Federation International, 2005). Some of the articles reviewed used NIDCAP and others incorporated individually chosen principles of developmental care.

What is developmental care?

Developmental care refers to practices implemented by neonatal nurses to reduce stressful external stimuli such as noise and light levels, and provide secure boundaries by containing preterm infants in a flexed position that optimises postural development (Symington and Pinelli, 2004). Practices such as kangaroo care (where an infant lies prone with his chest against his parent’s chest) are employed to promote physiological stability and interaction between parents and their infant (Roller, 2005; Dodd, 2005). Interventions that may cause stress, such as blood taking, X-rays, examinations and episodes of care-giving, are clustered together so that infants have long periods when they can sleep undisturbed (Als et al., 1986). The theory behind developmental care is that it optimises every aspect of the infants’ development and minimises the deleterious effects of being born prematurely (Aucott et al., 2002). The involvement of the family in the planning of care is seen as an integral aspect of this approach (Als, 1982). Developmental care is reported to change practice from task-orientated to individually appropriate care that accounts for the needs of the whole family (Prentice and Stainton, 2003).

NIDCAP-The Newborn Individualised Developmental Care and Assessment Programme

Founded by Als (1982), NIDCAP delivers highly individualised developmental care which is structured around observations of each infant. Trained assessors monitor preterm infants during interventions to look for behavioural cues that indicate stress. The observations are divided into systems as follows;

**Autonomic:** Respiration, colour, bowel movements, hiccoughing.  
**Motor:** Posture, tone and movement.  
**State organisation:** Sleep/wake state and transition between these.  
**Attention and interaction:** Ability to take in cognitive and social information and to react to this information.  
**Self regulation:** Strategies used by an infant to return to a calm, balanced state.

Each infant’s plan of care is then structured around their individual needs and responses to intervention on the basis of these observations.

Care-giving is avoided when an infant is fast asleep. When alert, an infant should be spoken to softly, and if they respond well, care-giving can commence slowly. If an infant shows signs of stress during cares, the intervention should be stopped or the level of activity reduced. The infant should then be brought back to a calm state by gentle containment, and care can be recommenced at an appropriate time (Als, 1982).

When performing potentially stressful procedures, the infant should be kept in a flexed position as much as possible, and given time to rest when necessary. Nappy changes are best done in a side position as most preterm infants become stressed when lying supine without support (Als, 1982).

Als (1982) suggests that infants should be given nasogastric feeds when they are alert, and should be cradled by parents or caregivers in a well contained position, to avoid stimulation. She suggests gently talking while feeding an infant, and the use of a dummy to encourage suckling, but only if the infant appears ready for these interactions.

It is unclear whether or not NIDCAP is more effective than individually employed components of developmental care. The programme is time consuming and requires creating new, salaried positions and training for a developmental care specialist and a developmental nurse educator. Environmental changes may be necessary and training is required for a multi-disciplinary leadership support team and for nurses (NFI, 2005).
Review of the literature

Neurodevelopmental and behavioural outcomes for infants receiving developmental care

The majority of experimental studies evaluating the effect of developmental care on neurodevelopmental and behavioural outcomes for preterm infants implemented NIDCAP as the intervention (Kleberg et al., 2002; Ariagno et al., 1997; Westrup et al., 2004; Als et al., 2004). The randomised controlled trials included in this review had small samples and as a result the reliability of the evidence is disputed by some (Jacobs et al., 2002; Tyebkhan et al., 1999). However, some strong statistical evidence was provided, indicating that infants who receive NIDCAP demonstrate improved behavioural organisation and cognitive development until the age of two. These results are supported by recent systematic reviews (Symington and Pinelli, 2004; Blauw-Hospers and Hadders-Algra, 2005). Als et al. (2004) propose that the enhanced frontal brain structure seen in the experimental infants in their study may be a factor in the improved behavioural and neurodevelopmental outcome. Westrup et al. (2004) followed up their sample at 5½ years of age, by which time it seemed that cognitive differences that had existed between experimental and non-experimental groups were levelling out. However, they still reported fewer behavioural problems in children who received NIDCAP and a trend toward lower levels of long-term disability, a finding which is supported by further research (Ramey and Landesman Ramey, 1998; Jönsson et al., 1998; Böh and Katz-Salamon, 2003).

Some trials have examined individual components of developmental care for their effect on neurodevelopmental and behavioural outcomes. For example, infants were found to be more behaviourally mature if they regularly received kangaroo care and if they were swaddled (Feldman and Eidelman, 2003; Short et al., 1996). In spite of some contentious results, it appears that positive outcomes outweigh any risks to infants who receive developmental care (Symington and Pinelli, 2004).

Implementing developmental care: the nurses’ experience

Evidence suggests that most nurses eventually favoured a developmental care approach because they were able to observe the improvement it produced in infants (Premji and Chapman, 1997). However, the involvement of parents is an integral aspect of developmental care and nurses reported feeling threatened when parents undertook traditional nursing tasks. As a result they sometimes disempowered parents by discouraging them from tackling certain aspects of their infant’s care (Bruns and McCollum, 2002; Cescutti-Butler and Galvin, 2003). Those nurses who encouraged parental involvement reported satisfaction from seeing parents becoming more autonomous and confident (Stainton et al., 2001; Bruns and McCollum, 2002; Wallin et al., 2005). Many studies found that there were problems with the implementation of developmental care principles if a multidisciplinary approach to training was not adopted, as conflict occurred between staff about optimal treatment (Premji and Chapman, 1997; Heerman and Wilson, 2000; Westrup et al., 2002). In addition, nurses who hadn’t received training in developmental care felt that the quality of their care was judged by those who had (Heerman and Wilson, 2000).

The effect of developmental care on parental outcomes

Als (1982) suggested that most parents’ have an intuitive understanding of their infants’ behavioural signals which is internalised when they are confronted by confident staff and the bewildering NICU environment. It is proposed that NIDCAP restores this knowledge providing a basis for a more understanding and intuitive relationship between parent and child (Kleberg et al., 2000). Some research exists for the effects of specific components of developmental care on parenting outcomes. For example, kangaroo care, has been shown to improve parents’ confidence and acceptance of their preterm babies (Dodd, 2005; Roller, 2005). Specific activities, such as the introduction of a parent education folder, reportedly empowered parents to become active participants in their infant’s care (Costello et al., 1996).

Als et al. (2003) found that parents of infants who received care according to NIDCAP reported lower levels of stress and a greater appreciation of their infant, than parents of control infants. Kleberg et al. (2000) focussed on parent-child interaction at the age of three and found that communication and physical and visual contact were all enhanced in infants who received care according to NIDCAP.
Implications for practice

There is sufficient evidence showing the benefits of developmental care principles, and the lack of harm caused, to confidently apply them to practice (Symington and Pinelli, 2004). In many newborn intensive care units, developmental care is currently implemented at the discretion of the individual nurse (Robison, 2003). However, if developmental care improves outcomes for preterm infants and their families it should be included in every newborn intensive care unit’s philosophy of care (McGrath, 2000; RCN, 1994). Whether NIDCAP is an appropriate programme for implementing developmental care has not been determined. The truly individual nature of NIDCAP may be difficult to replicate. It has been suggested that without this individual approach the benefits to the infant may be lessened (Westrup et al., 2002). However, specific developmental interventions, such as covering incubators, kangaroo care, and clustering activities during infants’ wakeful periods, could be implemented and individually assessed for their effectiveness according to infant response (Byers, 2003).

The National Service Framework for Children (DOH, 2003) states that parents should be involved as partners in care, and research confirms that parents want to be involved in their infant’s care (Mancini and While, 2001; Hopper, 2000; VandenBerg, 2000). Parental involvement is a key principle of developmental care and enhances parents’ confidence in preparation for discharge (Als, 1986; Vecchi et al., 1996). A collaborative approach to care planning can be introduced alongside developmental care to fulfil the recommendations of the National Service Framework in this respect.

A developmental care specialist could be instated to oversee the implementation of developmental care principles (Ballweg, 2001). Accountability for the implementation of developmental care can be placed on individual nurses, with the use of competencies to promote good practice (Robison, 2003). A family-centred approach to care can be encouraged by making nurses document collaborative planning of care and input from parents on each shift (Aita and Snider, 2003; Aucott et al., 2002; Gretebeck et al., 1998). Nurses would need to be trained to educate parents, enabling them to fully understand the theory behind developmental care. To avoid conflict all staff should be trained to the same level (McGrath, 2000). Educational activities and examples of developmentally supportive care for preterm infants can be used to encourage reflection on practice (Brown, 2002). A video differentiating stressful infant behaviour from organised behaviour might be a useful tool for parents and nurses. The video could also demonstrate the appropriate responses to such behaviour from a caregiver. Posters could be displayed with lists of actions which optimise care, such as turning ventilator alarms off before suctioning to reduce noise, and containing an infant during such procedures (McGrath, 2000). Parents need to be educated about appropriate ways of handling their preterm infants and when handling should be avoided (VandenBerg, 2000).

The entire multidisciplinary team must be involved and supportive of a developmental care approach if flexibility is to be adopted towards the timing of care and interventions (Chwo, 2003).

Implications for future research and ethical considerations

Westrup et al. (2003, 2002) discuss the difficulties in conducting research in developmental care because it involves a variety of interventions, and it is difficult to recruit adequate samples. Research could be conducted to discover which specific interventions lead to improved outcomes so that these can be implemented (Symington and Pinelli, 2004; Ariagno et al., 1997).

Further research on the effects of developmental care on the structure of the brain was recommended by Als et al. (2004), with long-term follow-up into adulthood. Long term studies of neurodevelopment could use the same data collection tool at the same age as previous trials to allow for meta-analysis of the results, thus increasing the statistical significance of available research (Symington and Pinelli, 2004).

Given the perceived benefits to infants, the ethics behind withholding developmental care from a control group are questionable. Many nurses are aware of developmental care, and its’ benefits. It is therefore difficult to see how further research can demonstrate a true experimental approach with a control group unaffected by developmental interventions. Westrup et al. (2004) were forced to bring their randomised controlled trial to an end because the nurses involved did not find it ethically acceptable for control infants to be deprived of developmental care. However, research is vital if care is to be changed in line with available evidence (Allen, 2002). To overcome this problem, a before-and-after sampling
approach could be adopted to assess the effect of specific interventions (Kleberg et al., 2000). This would avoid depriving new infants of developmental care (Hek et al., 2004). Care would have to be taken to ensure that history and maturation do not affect the characteristics of the samples, thus reducing the internal validity of the results, and data collection could be designed to ensure that assessors are unaware of a time lag and therefore remain blind to group allocation. There is a need for more qualitative research into parents’ experiences of developmental care to gain insight about whether outcomes for parents are improved (LoBiondo-Wood and Haber, 2002).

Any further quantitative studies should be multi-centre trials to ensure that sufficient data will be collected to produce results that are statistically significant. Allmark et al. (2003) suggest that consent should be carried out in stages, giving parents more information and the opportunity to opt out at each stage.

Conclusion

There is no evidence that developmental care harms preterm infants and it appears to improve outcomes for the whole family. Therefore, family-centred developmental care should be incorporated into the philosophy of care for every neonatal unit. A collaborative approach to the planning of care would ensure parental involvement at every level and would also be instrumental in teaching parents about developmental care principles. Various tools could be manufactured to educate parents and staff, and training should be compulsory for doctors, nurses and any health care professionals who come into contact with infants on the intensive care unit.

References


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