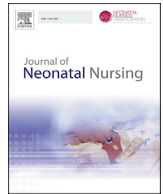




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Review

Does therapeutic positioning of preterm infants impact upon optimal health outcomes? A literature review

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ABSTRACT

The World Health Organisation (WHO) estimates that 15 million babies are born prematurely each year worldwide (WHO, 2015). Early intervention in premature babies is essential to promote their neurodevelopment, comfort, security and growth. This literature review looked at the effectiveness of therapeutic positioning for premature babies as an intervention, which can be carried out as part of family-centred care alongside medical and nursing interventions. Thematic analysis of the literature revealed three themes: the effect of therapeutic positioning on neurodevelopment and the stress response, the effect on sleep state and the effect on physiological stability. The review discusses benefits of therapeutic positioning and highlights implications for nursing practice, including the need to be aware of premature babies' behavioural cues of distress and the role of the nurse in providing reassurance and education to families.

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Introduction

Therapeutic positioning includes placing infants on their fronts (prone), on their backs (supine), on their sides (lateral) and using containment positioning, which involves placing hands on the infant's head and around their feet to provide consolation or using boundaries, such as rolled up towels or positioning aids, to make a "nest" and provide support, reassurance and physiological stability for the infant (Sparshott, 2003). Therapeutic positioning of preterm infants is an important intervention that a nurse can implement with immediate effect and it can be incorporated effectively into family-centred care to positively influence future development of the preterm infant (Zarem et al., 2013). The aim of this paper is to review the evidence base on whether therapeutic positioning of preterm infants in a hospital setting provides positive outcomes for these vulnerable and often fragile babies.

The World Health Organisation estimates that 15 million babies are born prematurely each year worldwide at 37 weeks gestation or

less and that premature birth is the leading cause of death in children under 5 years of age globally (WHO, 2015). Extreme preterm births at less than 28 weeks gestation have an increased risk of motor disability and cognitive impairment later in life. This includes long-term neurological damage, such as cerebral palsy, learning and behavioural difficulties and respiratory problems such as bronchopulmonary dysplasia (Costeloe et al., 2012).

In developed countries Neonatal Units (NNUs) provide intensive and high dependency care for preterm infants, with most countries employing the three-tiered care system of special care, high dependency and intensive care (Hallsworth et al., 2007). This care includes ventilation, close monitoring of blood gases and infection levels, medication and individualised care using programmes such as the Newborn Individualised Development Care and Assessment Programme (NIDCAP). This was developed by Dr Als, who used visual cues from infants to sort behaviour into "approach" or self-regulatory behaviour, such as hand-to-mouth, sucking, hand clasping and distressed or "withdrawal" behaviour such as over-extended limbs, finger splaying, agitation and respiratory pauses. Early intervention for optimal outcomes for premature babies is essential to promote their neurodevelopment, comfort, security and growth. The therapeutic positioning of preterm infants is an effective intervention, addressing different concerns of prematurity, and it can also be a very cost-effective one, as it can reduce the need for ventilatory support, which is particularly relevant for

Abbreviations: NNUs, Neonatal Units; NICU, Neonatal Intensive Care Unit; NIDCAP, Newborn Individualised Development Care and Assessment Programme; NNNS, The NICU Network Neurobehavioural Scale; SIDS, sudden infant death syndrome; LBW, low birth weight.

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developing countries, where this technology may not always be available (Das et al., 2011).

Methods

The literature search was undertaken using Ebscohost Research Databases. Wiley Online Library and Exlibris databases were also accessed if articles were not available through Ebscohost. Boolean phrasing was used for words, such as Position* to find alternatives such as “positioning or positional; Neonat* to find alternatives such as “neonatal or neonates”.

Initial broad literature searches using terms such as “neonates OR preterm OR infant OR newborn” AND “position**”, returned over 800 hits. Therefore more specific keywords and MESH terms were used to narrow searches and reach saturation of the emergent themes. This paper is the product of a final BSc in nursing project, where only the most recent peer-reviewed literature from 2009 up to 2015 was used, including reviews on practice extending well beyond this period. A summary of the search strategy including search terms and the inclusion and exclusion criteria applied can be seen in Table 1.

Premature birth and its associated morbidities and mortality is a global phenomenon (WHO, 2015) and as such, this literature review covers studies carried out in the UK, USA, Brazil, Canada, Israel, Taiwan, Pakistan, Australia and New Zealand. Further background information was obtained from references cited in the evidence selected and also from current international literature, guidelines and legislation regarding neonatal care of premature infants.

Results

Ten pieces of evidence were selected for this review comprising of quantitative randomised controlled trials (RCT) and cohort studies. These were critically analysed and three main themes emerged; the effect of therapeutic positioning on

neurodevelopment and the stress response, the effect of therapeutic positioning on sleep state and the effect of therapeutic positioning on physiological stability. Therapeutic positioning appears to be a relatively under-researched area of neonatal care, despite the awareness of the neurodevelopmental needs of very preterm babies to be supported and contained, to simulate in utero conditions.

Discussion and findings

Neurodevelopment and the stress response

During the last trimester in the womb an infant's brain undergoes rapid development, allowing a full-term baby to filter stimuli appropriately (Ladewig et al., 2014). However; a preterm infant struggles to organise environmental stimuli as this refinement has not taken place and the infant may show signs of neurological abnormality due to overwhelming stressors in the NNU (Adams and Hubbard, 2010). The full-term infant in the womb is crowded as it increases in size and this promotes a flexed position with arms and legs bent and joints aligned in symmetry, allowing them to perform self-regulating movements to reduce stress and support neuromuscular development (Madlinger-Lewis et al., 2013). The preterm infant may not be able to self-regulate due to lack of muscle tone or immature neurological organisation and this leads to distress behaviours (Als et al., 1995).

A randomized crossover clinical trial in a Brazilian NICU (Cormaru and Miura, 2009) was carried out to determine if they could reduce distress and pain in preterm infants during nappy change by providing consistent postural support. The aim was to reduce exhaustion and distress along with the subsequent physiological sequelae such as bradycardia, tachycardia, oxygen desaturations, flaccidity and disturbed sleep. Support was provided by making a “nest” with rolled up towels around the baby to support a lateral position with arms and legs flexed towards the midline; this was maintained for all regular nursing care. The sample size was calculated to give a statistical significance of probability (P) <0.05 when comparing signs of distress between the two groups (Cormaru and Miura, 2009), a strong indication that this is a direct effect of care and not a result of chance (Aveyard and Sharp, 2012). Infants were assessed for stress by monitoring heart rate and oxygen saturations and coding specific movements associated with stress and pain, such as finger splaying, facial grimaces, arching and tongue protrusion. The findings support their hypothesis that postural support reduces stress and pain reactions in preterm infants and provides physiological stability.

This hypothesis of supporting midline positioning and flexion to reduce stress and improve neurobehavioural outcomes is echoed in a RCT carried out in the USA (Madlinger-Lewis et al., 2013). They included 92 preterm infants of less than 32 weeks gestation in their trial and randomly split them into two groups. One group used traditional positioning methods (nests, swaddling and bumpers) and the other group used a new positioning device, which consisted of a structured blanket for wrapping the torso, a pouch for the legs and a head support for extremely preterm babies. Staff and parents were educated in the use of the new device to provide consistent positioning of the infants. The NICU Network Neurobehavioural Scale (NNNS), (Lester and Tronick, 2004) was used to assess signs of distress as well as quality and symmetry of movement. All positioning devices were removed 5 min before the infant's behaviour was evaluated, thus providing blinding for the trial and removing bias (Madlinger-Lewis et al., 2013). The findings supported the use of the alternative positioning device to promote symmetry of movement and improve neuromuscular development during the infants' stay on NICU. According to the NNNS less

Table 1
Search strategy.

| | |
|-------------------|---|
| Sampling strategy | Purposive sampling: Samples from specific disciplines, years and databases (see below) Inclusion: Search terms (combined with AND/OR): neonate, preterm, premature, infant, newborn, low birth weight, postural support, position, supine, prone, posture, nest, sleep, thermoregulation, developmental care, stress. Electronic search only. Exclusion: Infants older than one month. Hand searches. |
| Type of studies | Inclusion: primary human research which included quantitative randomised controlled trials (RCT) and cohort studies written in English only. Exclusion: Duplicates and trials using the same population for different studies. Non English written studies. Literature reviews. |
| Range of years | Inclusion: 2009–2015 Exclusion: before 2009 |
| Sources | Ebscohost Research Databases including Academic Search Premier, MEDLINE, Psychology and Behavioural Sciences Collection, PsychINFO, SPORTDiscus, CINAHL (The Cumulative Index to Nursing and Allied Health Literature) Plus with Full Text. Wiley Online Library and Exlibris databases |

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