

Clinical Guideline:

Authors:

Developmental Care

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East of England Neonatal ODN

(Hosted by Cambridge University Hospitals)

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Factor 3: Positioning

Factor 4: Environment – Lighting Factor 5: Environment – Noise Factor 6: Education of Staff

Factor 7: Parental Involvement

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Exceptional Circumstances Form25

1. Introduction

Neonatal units are stressful, busy environments where infants are cared for who have been born from 22 weeks gestation. The environment of the developing foetus is characterised by a supported flexed posture; containment, limited light and noise exposure, protected sleep cycles and unrestricted access to their mother. This positive sensory environment is crucial for optimum brain development.

This coincides with a period of rapid brain development during which they are vulnerable to neurological damage, which may lead to poor developmental outcomes.

Family involvement in delivering developmental care is essential, as they have the greatest influence on an infant's health and well-being.

The aim of Developmental Care is to support each infant and its family. To maintain infant stability by responding to the infants' cues, handling them carefully, positioning them with support and involving their family in their care from day one. It promotes and supports the premature infants' adaptability to external environmental events and improves bonding and attachment between the infant and their parents.

Preterm infants who receive consistent individualised developmentally supportive family-centred care, from birth, demonstrate fewer behavioural stress cues and improved neurodevelopmental outcomes (Als et al, 2004).

Developmentally supportive care has shown to be associated with:

Improved short-term growth outcomes 1

Decreased respiratory support

Decreased incidence of moderate/severe chronic lung disease

Decreased length of stay

Decreased cost of hospital stay

Improved short term growth (Byers et al, 2006)

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2. Environment

A preterm neonate is inevitably subjected to sensory overload during their stay within the neonatal intensive care unit (NICU). The NICU is a busy, stressful environment which uses advanced technology to support life. This often results in bright lights, loud and unpredictable noise and a number of intrusive, often painful procedures (White, 2005). These can all have a negative effect on the developing neonate at a time that he/she is undergoing rapid brain development as the infant is unable to reject unwanted stimuli (Rodriguez 2016). It is vital that the NICU environment is modified to reduce the harmful effect of stress and to allow optimal neurological development of the neonate, therefore reducing poor developmental outcomes.

2.1.Noise levels

The hearing system is usually complete at about 24 weeks gestation, with movement in response to sound at 27 weeks. Between 27 and 42 weeks the hearing pathways mature to a nearly adult level. Therefore, the preterm infant is exposed to noise whilst hearing development is still ongoing and they become overloaded with stimuli they are not mature enough to cope with (Graven & Browne, 2008).

Noise levels in the neonatal unit are a major source of stress for premature infants, causing increased blood pressure, heart rate and oxygen consumption (Wachman & Lahav 2011). Preterm infants can be exposed to an overwhelming level of noise for weeks or even months during their hospital stay.

The American Academy of Paediatrics (AAP) recommend that noise should be below 45dB not exceed 65dB, whilst Bliss recommend less than 50dB. If noise levels are above 90dB for more than 8 hours it has potential to damage adult cochlea therefore the more immature cochlea is more sensitive to damage (AAP, 1997). Actual noise level in an incubator can range between 56-72db this can be dependent on respiratory support, CPAP and ventilators (Bliss).

2.2.Reducing Noise

Sound EAR or other Noise warning signs system are recommended in each defined area to highlight when noise levels are increasing. Action to help reduce noise:

- Alarms should be set at quietest level and answered promptly.
- Conversations in the room should be low and away from the incubator where possible
- Padded incubator covers to be used where possible.
- Double walled incubators where possible
- Nothing to be placed on top of the incubator
- Shutting the incubator doors and drawers quietly
- Bin lids should close quietly
- Radio's should not be allowed in the clinical area
- Phones should be set to low output if used in the clinical area and answered promptly
- Audio tapes/musical mobiles should be used with extreme caution and individualised to each infant. Be aware of other babies gestation in same area/nearby bed space
- Don't tap the incubator
- Remove water in tubing of ventilators/CPAP
- Don't talk over the incubator
- Ward rounds and handover away from the incubator if possible. Avoid speaking over baby and placing notes on incubators.

2.2Reducing light levels

The retina and visual cortex are the last of the senses to develop. Constant light disturbs diurnal rhythms and arouses the central nervous system.

The iris does not constrict until 32 weeks therefore the infant has very limited ability to reduce light entering the eye, the eyelid is very thin therefore more light can enter the eye even when the eye lids are closed. Poor visual function is a common outcome in very low birth weight children (Cook et al, 2003). High levels of light exposure are thought to be associated with retinal damage and may harm the developing visual system (Birch et al, 2001).

Excessive lighting causes central nervous system arousal and signs of stress including lower oxygen saturation and poor weight gain (Warren & Bond, 2010). Therefore, reducing light levels can facilitate rest, energy consumption and promote organization and growth.

Actions to support reducing light levels:

- Incubator covers (Ensuring the baby can be seen for safety reasons)
- Individual lighting
- Adjustable lighting levels 5
- No overhead lighting preferably indirect lighting
- Dimmer switches to gradually introduce brighter light where needed^{1,27,28,30,31}.
- Opaque curtains and blinds to windows
- Protect eyes post ROP screening.

3.Understanding infant behaviour

At full term gestation a baby is born ready to communicate with their caregiver. A baby's movements may look random, but every action that a baby makes has meaning. A baby will tell you what they need, and reveal their likes and dislikes through their behaviours⁶ however, the preterm infant develops the ability to participate in reciprocal social and/or environmental interactions gradually, and according to a developmental sequence. They need to attain a certain level of physiological homeostasis before they can begin to seek out and respond to social interaction.

New-born individualised developmental care and assessment program (NIDCAP) is a comprehensive program of systematic behaviour observations methodology. Observations of the infant occur

before and during care giving and are used as a measure of the infant's tolerance to the environment and caregiving activities.

They become the basis for individualised goals and developmental interventions that are aimed at reducing the detrimental effects of a NICU environment ⁷

3.1Behavioural organisation

This refers to the ability of the infant to maintain a balance between the five subsystems:

- Autonomic/physiologic
- Motor
- State organisation
- Attention/interaction
- Self-regulation

Examples would include the infant’s respiratory status, muscle tone, posture, facial expression, colour, visceral responses, and visual attention.

How these behaviours are affected by external stimuli, either positive or negative, give information about the infant’s ability to cope and organise their responses 7

3.2 Cue based care

This is a system of caregiving in response to the infant’s behavioural cues, including the appropriate provision and modification of sensory stimulation 7

While babies may not speak their first word for a year, they are born ready to communicate with a rich vocabulary of body movements, cries and visual responses; all part of the complex language of infant behaviour. Organisation or self-regulation of behaviour helps the infant’s ability to maintain a balance as they deal with the demands of the NICU environment. Example; calming measures to encourage self-consoling ‘self-quieting’, ‘shutting down’ ‘hand-to-mouth movement/action’ and ‘sucking’ have consoling effects 8. Introducing positive touch during cares/procedures is an essential element of care. 6

Parental confidence may be reduced if their baby continually shows signs of stress when they handle them - early parent participation enabling them to learn, recognize and respond to their baby’s behavioral cues will help promote their confidence and also support the parent/infant relationship. Cares, handling and interventions should be adapted and delivered following observation of an infant’s behavioral cues and physiological responses.

3.3 Signs of stability/coping

AVOIDANCE BEHAVIOUR

Examples of Defensive/Avoidance Behaviour that show baby’s sensitivity. These include signs of stress, fending off or withdrawing actions. They tell you that the baby may need help, time out or a change.

Pauses in breathing	Mouth hanging open
Colour changes e.g. dusky, mottled	Sudden movement
Positing	Jerky movement
Straining	Tremulousness
Coughing	Finger splay
Sneezing	Salute
Sighing	High guard hands
Hiccups	Fussing
Yawning	Agitation
Squirming	Whimpering
Arching	Crying
Grimacing	Diffuse states
Tongue thrust	Eye floating
Twitching	Looking away
Limp or stiff posture	Staring

Bracing legs	Glazed look
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APPROACH BEHAVIOUR	
Examples of coping/approach behaviour that tell you how competent the baby is becoming with efforts to settle, to still movements, to get ready to interact with you, to explore.	
Steady breathing	Rooting
Healthy colour	Sucking
Hands together, clasped	Softly flexed posture
Smooth movements	Relaxed, open face
Feet together	Perky attentive expression
Grasping	Orientation to voice or sound
Holding on	Smooth state change
Moving hand to face	Restful sleep
Hand to mouth	Snuggling when held
Hands clasped together	Responsive smiling
Frowning	Easily consoled
Settles self	

From: A Guide to Infant Development in the Newborn Nursery (2010) Inga Warren & Cherry Bond

4.Touch

Premature and sick babies undergo many medical procedures that can cause them some discomfort. As the baby’s parents, they are the best people to balance this with a positive, reassuring touch.

Infants experience touch long before they are born.

Positive touch is a way of communicating parents love and reassurance to their baby and hearing their baby’s needs in return. Babies do communicate, and by watching and listening to the baby you can learn what kind of touch to use and when it is appropriate, safe and pleasurable for your baby.

Sick and preterm infants do not always tolerate handling and can respond in a variety of negative ways. Touch provides the infant with the basis for both complex and intimate communication with the caregiver/parent .

The development of parent-infant relationships in the NICU is complex and includes the progression from touch to holding the infant. There could be days when the infant is tired or sick and contact needs to be kept to minimum in order to keep them well and rested.

4.1Positive touch

Supportive – comfort holding, supportive of the infant synchronising with the infants’ sleep-wake state as well as behavioural cues

Observe how the infant handles during interventions and modify according to their response

Finger grasping – allowing the infant to grasp a finger

It is important to help parents to identify the type of touch that their infant likes and encourage them to become the primary provider of touch.

4.2 Negative touch

Negative behavioural responses to touch and handling of fragile infants can include signs of distress, and can include reflexive responses such as the startle reflex, increased movement, agitation and/or crying and observed avoidance responses 9

Examples of negative touch are:

Stroking, patting, weighing (Wrapping the baby may reduce stress) and Procedures commenced without comfort measures or analgesia.

4.3 Connection without touch

There may be times that the infant may be very ill and will not respond to touch in a good way. During these times it is important that handling is sensitively tuned to the individual baby to avoid stress and deterioration in the infant's vital signs. It is also important to communicate this to parents and show them ways of non-touch comforting 6

Having their hands placed near the infant so they can sense and smell their parent talking calmly to the infant – watching carefully for his/her cues and pacing the interaction of voice/talking/singing/reading to the individual baby.

4.4 Still touch

A still resting hand can promote a sense of calm and settle an infant. The infant can recognise where they are being touched and aids in the physiological stability. Infants usually prefer firm still holding as it makes them feel secure. Examples of still touch is placing a firm hand on the infants back when in the prone position or placing a firm hand on the infants head when in the supine position 11

4.5 Cradle holding (comfort holding/ facilitated tucking)

Cradle / comfort holding is a developmentally sensitive non-pharmacological comfort measure that can both reduce the stress from procedural pain and also calm an unsettled infant 12

Facilitated tucking has been proven to decrease pain scores in infants needing medical interventions such as blood sampling, NGT insertions, venflon / cannulation insertion and cares 13

Facilitated tucking has also shown to decrease levels of active sleep, motor activity and behavioural stress and can be used by both staff and parents to help elevate the infants stress. This can be achieved by the caregiver 'hand-cradling' the infant by gently placing a hand on the infant's body/head /feet while providing flexion and containment.



5. Kangaroo Care

Kangaroo care (also referred to as skin to skin) is a method of caring for stabilised low-weight or premature babies outside an incubator. Kangaroo Care is skin-to-skin contact when a baby is placed against the parent's chest. Bergman, N. states that the optimal environment for any newborn, but particularly for the premature infant, is skin-to-skin contact with mother or father.

Benefits can include improving physiological stability supporting regulation of temperature, heart rate and breathing which can lead to a reduction in apnoeas and bradycardias and improved oxygenation 39.

Kangaroo Care can be used with babies with high medical needs, but this will require careful planning and collaboration with the neonatal staff 6

5.1 Facilitation of kangaroo care / skin to skin

- Explain to the parents what the process involves and what they can do to help. Also consider advising appropriate clothing to facilitate skin to skin;
- Explain to parents that kangaroo care should take place for at least an hour to be fully beneficial to their baby;
- Reassure parents that all lines and tubes will be secure during the transfer;
- Make sure that parents have privacy whilst having kangaroo care;
- Make sure that all equipment is close by;
- Prepare the baby by getting the parent to talk to the baby before moving him/her ensure that he/she is only wearing a nappy and hat if required;
- Transfer the baby slowly, in lateral (side lying) or prone position to reduce infant stress and avoid changes to intracranial pressures. Take the baby out gently and place on their parent's chest, position his/her head so that an ear is on the chest and wrap the shirt and blanket around the baby and parent. Make sure the baby is moved slowly in a side-lying position and very gradually moved into the lateral position when on the parent's chest in a reclining position to avoid changes in intracranial pressures. Clip any lines to the parent for security and ensure that ventilation tubing is secure;

- Reassure the parent that it may take a few minutes for the baby to settle and that the more relaxed he/she is the more quickly the infant will settle.

5.2 How to prepare parents for kangaroo care

- Talk about Kangaroo care & give information if parents want it from the beginning so parents have time to plan and adjust to the idea;
- Talk about the importance of hand washing, personal hygiene and odours such as strong scents/perfumes/smoking etc;
- Parents wash their hands before picking up their baby, following local guidance/procedures;
- Prepare parents by asking them to wear a front opening top;
- Discuss with them that the baby will be only wearing a nappy and a hat to keep warm and they could bring in hats and a blanket from home;
- Prepare for the procedure by showing the parents with a doll first. If parents wish, place baby on their chest – for women between the breasts;
- Discuss what time of day is best for them and the unit and why they are better to stay for long periods of time and how they can achieve that;
- Wrap a top or blanket around parent and baby;
- Have them sitting in a comfortable chair preferably one that will recline so they can relax .



<p>Before Transferring Infant: Explain to the parents what the process involves and what they can do to help. Also consider advising appropriate clothing to facilitate skin to skin Explain to parents that kangaroo care should take place for at least an hour to be fully beneficial to their baby Reassure parents that all lines and tubes will be secure during the transfer Make sure that parents have privacy whilst having kangaroo care</p>	
<p>Step 1: Approach baby, if they are showing signs they are ready to interact slowly begin to prepare baby for transfer Ensure all wires, tubing and lines are secure. Wrap the baby in a muslin or blanket Ensure all equipment is close by (to prevent pulling on baby and transition is smooth) Ensure parent is ready – they've been to the bathroom, had food or a drink, are comfortable and have loose clothing on.</p>	 <p>Baby showing cues they are ready for interaction</p>  <p>Baby ready, wrapped and wires/tubing secured</p>
<p>Step 2a: For transfer in lateral position</p> <p>Parent/staff member should bring themselves as close to baby as possible, to minimize unsupported movement.</p> <p>Following this transfer the baby slowly, in lateral (side lying) to reduce infant stress and avoid changes to intracranial pressures</p>	  <p>Staff/Parent leans close to baby and slowly moves</p>

them in to their body in lateral position.



Maintain this position and slowly turn to pass to parent/or parent step back and sit with baby

Step 2b: For transfer in prone position

Parent/staff member should bring themselves as close to baby as possible, to minimize unsupported movement.

Following this transfer the baby slowly, in lateral (side lying) to reduce infant stress and avoid changes to intracranial pressures



Staff/Parent leans close. Baby slowly adjusted to supine.



Staff/Parent brings baby into prone position on chest

	 <p>Maintain this position and slowly turn to pass to parent/or parent step back and sit with baby</p>
<p>Step 3: Position on Parent's Chest Slowly and gradually transition from lateral position (if used) to prone position on Parent's bare chest. If prone transfer was used parent/baby is already in ideal position,</p> <p>Gently and slowly unwrap baby. Baby's position is comfortable and safe. Wrap the shirt/loose clothing and blanket around the baby and parent. Clip any lines to the parent for security and ensure that ventilation tubing is secure;</p>	 <p>Slowly unwrap baby and reposition</p>
<p>Step 4: Reassure the parent that it may take a few minutes for the baby to settle and that the more relaxed he/she is the more quickly the infant will settle. Ensure parent is comfortable. Footstalls or reclining chair are in position for them.</p>	

6. Taste and Smell

The perception of smell and taste, though present in early development has not previously been considered in the care of pre-term infants. The primary olfactory receptors are formed by gestational week 8, and functional at week 24.⁴³ Smell and taste are known to increase gut motility, insulin secretion and the release of digestive and metabolic hormones.⁴¹ Smell and taste receptors are functional in the foetus, and there is evidence to support antenatal learning of odours.⁴² New-born infants are able to recognise the smell of amniotic fluid, the scent of breastmilk and odour components of human sweat. The sense of smell is very defined at birth⁴⁰ it is therefore important to consider the influence that care givers can have by using strong smelling personal hygiene products and the type of equipment cleaning products used, which the infant is exposed to.

Taste cells begin to form at gestational week 7-8, and are considered fully functional and mature at 17 weeks gestation. Taste and smell is enhanced by sucking. The inhalation and swallowing of amniotic fluid in utero are the first flavour and smell experiences of the foetus.⁴³ Experience of flavour is influenced by experience of smell, a new-born infants taste buds will detect sweetness, bitterness sourness and Umami (found in milk and Meaty flavours), with a preference for sweetness. Saltiness is not detected until about 4 months of age⁴⁰. It is thought this preference to sweetness explains why giving a sugary solution to an infant prior to a painful procedure will have a soothing effect. Encouraging non-nutritive sucking may have a positive impact on taste and smell receptors.

It is known that infants who are extensively nasogastric tube fed/parentally fed on the neonatal unit are disadvantaged from those early taste and smell exposures normally associated with term gestation infants, it is therefore important during nursing episodes to expose the infant to breast or formula milk smells, taste, encouraging non-nutritive sucking where appropriate during a tube feed and skin to skin contact with parent / carers.⁴³ This, alongside invasive perioral and perinasal interventions may adversely affect future perceptions of oral experiences.

Care Interventions:

- Encourage Parent (mothers in particular) to leave a muslin cloth, bonding square or small piece of clothing with their odour next to their baby. The mother can place the cloth near her breasts whilst expressing to obtain her odour. The mother will also be able to experience her baby's odour by taking the other a muslin cloth that has been with her baby, which will support her when expressing milk.
- Encourage regular skin to skin contact so they can experience each other's odour.
- Where possible use expressed breast milk for mouth care (please refer to your local trust Mouth Care Guidelines)
- Offer a dummy dipped in breast milk for non-nutritive sucking, especially during tube feeds and procedures.
- Where available please refer to your local trust – Cue-based feeding' Guideline to ensure feeding is always a pleasurable experience.
- Where possible, give oral medications via NG/OG tube.
- Educate staff and Parents about the need to avoid introducing noxious smell when handling infants; e.g. strong perfumes or cigarette smoke.
- Allow alcohol gel to 'dry' before handling babies.

7. Supported Positioning

There is a need to provide effective, developmentally supportive positioning for neonates within the NICU.

In-utero, the developing infant is contained within an enclosed space with well-defined boundaries. The infant is able to extend his/her limbs, meet resistance and recoil his/her arms and legs into a flexed position (Hunter 2005).

Neurodevelopmental positioning has been shown to have a direct effect on bone and joint development, promote self-regulation and sleep, reduce pain responses in preterm infants, and minimize long-term deleterious effects on sensory and motor development (Hunter, Lee, & Altimier, 2014)

Infants with no positioning support and boundaries, who are unable to provide and maintain their own flexed postures to achieve body alignment, are at risk of depleting their already limited energy supply through attempts to seek boundaries through limb flexion and extension (Altimier 2003, Masterson, Zucker & Shulze 1987).

When preterm infants are positioned in supine, prone or lateral positions, the combined use of a postural support along with containment aids has been shown to improve hip posture up to term-equivalent age (Pichaensathian, 2007). Pichaensathian W, Woragidpoopol P, Baosoung C (2007) Positioning of the preterm infants for optimal physiological development; a systematic review. JBL library of systemic review.

7.1 The aim of positioning strategies:

To promote a comfortable and supportive environment for each individual baby:

- Encourage balance between flexion and extension;
- Stimulate active flexion of trunk and limbs;
- Allow for more symmetrical posture;
- Enhances midline orientation;
- Achieves a more rounded head and permits active head rotation;
- Mimics the physical boundaries of the uterus, encouraging and maintaining a more flexed position;
- Counteract the forces of gravity¹⁶;
- Maintains a comfortable position whilst still allowing movement;
- To prevent musculoskeletal abnormalities;
- To prevent pressure damage from persistently favoured positions;
- To promote positive motor development ;
- To support physiological stability and comfort;
- To facilitate self-regulating/soothing behaviours.

Positioning aids:

- Gel pads/ head positioners
- Bendy bumpers
- Rolls
- High sided (folded not rolled) Nests
- Gel wedges
- Squishon

7.2 Supported side-lying (Lateral position)

This is a natural position for self-calming movements that allows for maximum flexion. The hands can be brought up towards the mouth, with the knees and hips flexed towards the abdomen. Ideally the neck should be slightly flexed top shoulder rounded slightly forward, and hips and knees flexed¹⁷. Left lateral position is thought to reduce gastro-oesophageal reflux¹⁹. However, frequent use of this position may result in flattening of the sides of the head.

This position should not be used for infants close to discharge, who should be placed on their backs to sleep, according to national guidelines.

**Method:**

Assess the infant to ensure that this position is appropriate. Ensure that monitoring is in place. Support back and head in midline. Head positioned midline to less than 45 degrees to the left or to the right¹⁸.

Support arms and hands in midline Hips aligned and softly flexed¹⁸.

Knees, ankles and feet are aligned and softly flexed¹⁸.

7.3 Supine position

This position may be necessary when a baby is receiving therapeutic hypothermia. In stable preterm infants it has been found that there is higher overall cerebral oxygenation in the supine position when compared to prone¹⁹. However this position can be stressful and should be avoided if possible in the sick neonate. In supine position the work of breathing is increased, gastro oesophageal reflux is more likely, and energy expenditure is thought to be increased²⁰¹⁸.

**Method:**

Support head in the midline with a high sided nest (i.e. chin in line with sternum).

Avoid lateral extension, where head falls towards shoulders (use gel pillow ring or wedge pillow). Shoulders should be softly rounded and assisted with support, to attain a flexed position towards the chest. Head positioner can be used if required, in order to assist the position.

Hands are drawn forward to each other to encourage and allow for hand/mouth co-ordination¹⁸. Create a nest supporting either side of the body.

The hips need to be aligned in a flexed position, where they are drawn towards the abdomen. Avoid hip abduction.

Ankles and feet should be softly flexed

Provide plantar surface contact in neutral position on the boundary sheet/towel.

7.4 Prone position

This position is thought to be preferable when compared to supine, in that it aids digestion, minimises reflux, stabilises the chest wall and improves the quality of sleep¹⁹. Frequent use may result in flattening of the sides of the head¹⁷. Prone position has also been associated with changes in cerebral blood flow velocity due pressure on the vertebral artery caused by neck movement^{20, 21}. This position is not to be used for infants close to discharge; these infants should be placed on their backs to sleep, according to national guidelines⁴⁴

Method:

- Assess the infant and make sure that this position is suitable. Ensure that monitoring is in place.
- The infant lies on his chest with the hands flexed towards the face, shoulders softly rounded, knees tucked under the abdomen and bottom in the air.
- Hips aligned and softly flexed
- The baby should be on a soft mattress or 'Squishon' to prevent head moulding.
- Deep boundaries should be provided. The ideal position is with arms and legs flexed into the body, hands free to touch the face and rolls or 'snuggler' placed along both sides and around the flexed legs for containment and flexion if baby needs a high level of support^{19,16,22}.



7.5. Wrapped weighing

Swaddling, or wrapping an infant, is known to have beneficial effects on preterm babies by improving the stability of physiological parameters and reducing behavioural stress signs (Kenner and McGrath, 2004). Wrapped weighing is recommended as a way to improve the weighing experience for the baby, by supporting physiological stability and behavioural organization.

Potential hazards to preterm infants during weighing have been recognized. Benefits of wrapped weighing include less physiological stress, reduced visceral activity, such as hiccupping and greater self-regulatory behaviour. They also showed improved motor organization with reduced arousal from conscious level with less motor activity and any movement that occurred was smoother, resulting in reduced general energy expenditure.

Neu M. & Browne J.V. Infant physiologic and behavioural organisation during swaddling versus unsaddled weighing. *Journal of Perinatalogy* 1997; 17(3):193-98

7.6. Lumbar Puncture Hold

Lumbar punctures are sometimes required to aid diagnosis and plan effective care. It can be an uncomfortable procedure for the baby as it is vital the baby is held still in order for the CSF (cerebrospinal fluid) to be obtained.

The aim of a lumbar puncture is:

To provide containment and comfort to the baby throughout the procedure.

Description:

The baby is wrapped in a sheet or muslin, using a figure of 8 and held still throughout the lumbar puncture. The baby should be more comforted by the security of the wrapped figure of 8.



Figure 8. Lumbar Puncture Postion

8. Non-nutritive sucking

8.1 Definition

Non-nutritive sucking (NNS) occurs in utero and premature infants can suck intermittently on a pacifier as early as 27-28 weeks' gestation. The suck –swallow-breath coordination is not usually developed before 34 weeks. Non-nutritive sucking on a dummy or pacifier, an emptied breast or infants own fingers is for comfort, but not to receive nutrition. It is important to assess the infants readiness for feeding individually. NNS is at a faster rate than nutritive sucking (2:1). The slower rate for nutritive sucking allows for swallowing and breathing to occur (Eichler et al, 2001).

8.2 Background

Non-nutritive sucking is recommended for preterm infants to assist digestion, to make the baby comfortable, especially during difficult procedures, and to satisfy suck demand when the mother is not available. Soother use at bedtime is associated with a lower risk of cot death in early infancy. In fact, it has been suggested that babies who are not exposed to non-nutritive sucking may lose the sucking reflex.

Pickler RH, Wetzel PA, Meinen-Derr J, Tubbs-Cooley HL, Moore M. Patterned feeding experience for preterm infants: study protocol for a randomized controlled trial. *Trials*. 2015;16(1):1

NNS reduces behavioural distress due to interventions and helps organize physiological stability. Non-nutritive sucking;

Helps facilitate the digestion of enteral feeds as stimulation of vagal mechanisms and stimulation of nerve fibres in the oral cavity, increases levels of gastrin and somatostatin, which aid acid secretion, gastric motility and the growth of intestinal mucosa²⁴.

Facilitates easier transition from gastric tube feeding to full oral feeding²⁵

It is a benign intervention and can have a calming effect and improve the development of sucking behaviour.

This leads to a significant decrease in the length of stay in hospital as the transition from tube feeding to full suck feeding is improved and there have been no reports of negative outcomes²⁵.

NNS reduces pain scores more than routine care during heel-stick procedures²⁶.

Helps to support parents to develop interaction with their infant and establish parent- infant bonding ^{27, 29}.

The instigation of NNS is simple and effective and has been proven to have significant benefits to preterm infants²⁵.

8.3 Consent for NNS

It is important to gain parental consent before giving infants NNS as some parents have strong views about soothers. If it is explained that this is only for whilst their infant is in need of support on the

neonatal unit and the reasons why NNS would be beneficial to their infant, most parents are willing to consent.

9. Applying Developmental Care on Transport

All infants should receive the same level of developmental care during a transfer, as they would be given in a NICU where possible. The goal should be to maintain comfort and safety of the infant in a stable, protective environment and prevent any stress caused by the transfer. One parent is usually invited to travel in the ambulance with their infant.

Strategies to ensure the comfort of infants travelling in transport incubators:

Contain infant in a supportive nest with boundaries to enable the infant to lie in a range of supported positions. Nurse on a 'Squishon' mattress to absorb some of the vibrations during the journey.

Ear protectors can reduce the sound levels to at least 7 decibels.

Incubator covers can reduce noise and lighting levels inside the incubator and provide privacy whilst being transferred between hospital departments and the ambulance²⁹.

Offer a pacifier (with parental permission) to reduce pain and stress if the baby needs/wants it. Use a Trans warmer mattress to reduce thermal stress if the incubator temperature is not sufficient²⁸.

Non-ventilated infants can remain clothed and be swaddled in the position most comfortable for their individual needs.

(Caution: no infant with an umbilical or peripheral arterial line should have line covered by blankets or swaddling)

On arrival at the receiving unit ensure that the staff are aware of the infants' developmental care needs.

10. Parent involvement

Parents of premature or sick babies can experience a grief-like reaction to their infant being in a NICU. Bonding by holding and touching is often difficult as their infant is unwell and in need of critical care support. Parents often feel that the nurses know their baby better than they do which can undermine their confidence and parenting skills. Getting to know their baby in the busy and very public environment is not easy.

The practice of neonatal critical care may result in the isolation of infants from their families, therefore nursing and medical staff need to ensure that contact between infant and parent is maintained. The parent's ability to tune into their baby's behaviour is the essence of attachment and successful parenting, ³⁹ the aim is to facilitate/support the parents in caring for their infant through education and support.

NICU Parents experiences navigate through five stages of adaption, where the responsibility moves from nurse, to nurse and parent, then parent.³⁹

Fear – Being afraid to touch their baby, separation is physically painful. Watch – Gazing at their new baby for long periods.

Touch- Parents need time to watch before they touch, and then may only dare to place hands in incubator near to baby.

Comfort- As parents become more confident about touch they feel able to comfort their baby.

Care – parents become increasingly involved in caregiving, starting with activities that do not involve much movement

Greater involvement in their infant's care reduces anxiety/depression and improves parent-infant interaction^{32,33,34,35}

10.1 Encouraging successful parenting

- Promote Family-integrated care to achieve optimal health outcomes³⁵.
- Educating parents about the NICU environment, their infant's condition and relevant procedures helps facilitate their active participation in family-medical discussions³⁵.
- Congratulate the parents on the birth of their infant.
- Encourage them by giving positive feedback when they've performed their infant's cares.
- Show the parents how their baby is responding to them, how the baby calms if the parents are handling him/her.
- Teach the parent(s) how to recognise their own infant's cues Understanding when their baby has had enough stimulation
- Observe with parents in watching for baby's individual milestones that their infant has reached - each step forward is part of the process of getting home.
- Parent information leaflets help parents understand their infant's condition and any proposed treatment in order to make informed choices
- Encourage parents to contact parent support groups ³⁵.
- Provide information for BLISS and on line information bliss.org.uk. Provide and encourage parents to keep memory boxes.
- Make visiting hours for siblings and other family members as flexible as possible.^{37,38}

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Indicator	24-27 weeks	28-32 weeks	33-36 weeks	37 weeks plus
Behavioural Development	<ul style="list-style-type: none"> Behavioural states poorly differentiated Response to handling results in physiological instability Diffuse ranging signs of instability from typical stress signs to exhausted collapse 	<ul style="list-style-type: none"> Behavioural states more distinct by 32 weeks Quiet/deep sleep increases around 30 weeks Response to handling results in physiologic instability Shows more typical signs of stress 	<ul style="list-style-type: none"> Behavioural states more distinct Smoother transition between states Quiet/deep sleep continues to increase May arouse for feeding Stress response to noxious stimuli varies but physiological instability still evident 	<ul style="list-style-type: none"> Behavioural states well defined with clear transitions Tolerance of handling and interventions usually increase Periods of alertness for socialisation with development of longer attention spans
Motor Development	<ul style="list-style-type: none"> Movements are mainly jerks, twitches and startles that can increase with stressful input Weak muscle tone. Decreased flexion in limbs, trunk and pelvis Unable to control posture, movement and tone 	<ul style="list-style-type: none"> Twitches and startles common at 28 weeks leading to more controlled movements by 32 weeks. Muscle tone weak but develops slowly over this gestational period Leg movements increase with the start of flexion in the hips and legs 	<ul style="list-style-type: none"> Smoother more controlled movements Stronger flexion of knees and hips during rest with further development of tone in the lower extremities Can turn own head from side to side Has improved capability to use posture and movement to self-regulate 	<ul style="list-style-type: none"> Demonstrates a wide range of movements Controlled movements increase Trunk and extremities usually flexed at rest Can self-regulate behaviour with movement and posture
Light and Vision Development	<ul style="list-style-type: none"> Eyelids may be fused at 23-25 weeks Cornea hazy until 27 weeks. Pupil reflex is absent Limited ability to maintain lid tightening in response to light Eyes may open but do not focus 	<ul style="list-style-type: none"> Sluggish pupil response to light Able to maintain lid tightening in response to bright light Eye opening increases in dim light May focus briefly on visual stimuli Rapid uncoordinated eye movements 	<ul style="list-style-type: none"> Increased ability to maintain lid tightening in response to bright light Eye opening and alert state are facilitated by low lighting Infant may have difficulty breaking gaze on a highly stimulating object 	<ul style="list-style-type: none"> Generally shows preference for human face Sees best at a distance of 20 - 25cm. Sight is still immature with much development to follow at 0-6months.

	Responds to light/visual stimulus with behavioural and physiological signs of stress			
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<p>Sound and Hearing Development</p>	<ul style="list-style-type: none"> • Inner ear has attained full adult size and function • Infant may respond to soft voice and sound and may show preference for mothers' voice • May demonstrate physiological instability to noise/auditory activity 	<ul style="list-style-type: none"> • Middle ear and transmission section of auditory system is complete • Orientation to soft sounds develops during this period • Infant can quickly fatigue to auditory stimulation • Infant is sensitive to loud noise and can demonstrate physiological instability to noise/auditory activity 	<p>Sensory and transmission portions of the auditory system are functional</p> <ul style="list-style-type: none"> • Increasing responsiveness to voice stimuli with a preference for a soft human voice • Responses to noise and auditory environments begin to organise • Startle response with loud noise still evident 	<ul style="list-style-type: none"> • Response to noise is more consistent and organised • Can localise and discriminate sounds • Stress behaviours may still be displayed to certain loud sounds • Gradual onset of auditory stimuli preferred.
<p>Non-nutritive Sucking Development</p>	<ul style="list-style-type: none"> • Immature gastrointestinal system • Gag reflex present at 26 weeks • Sucking may appear but not synchronised to swallow 	<ul style="list-style-type: none"> • Rooting reflex present but a delayed response can occur • Poor suck, swallow and breathe coordination that matures over this period 	<p>Suck, swallow and breathe coordination maturing with some rhythmicity but coordination can be inconsistent</p> <ul style="list-style-type: none"> • Rooting reflex emerges • Can nuzzle at the breast 	<ul style="list-style-type: none"> • Suck, swallow and breathe coordination becomes more consistent and organised • Endurance for oral feeding increases
<p>Smell and Taste Development</p>	<p>Taste and smell receptors are thought to be functional across all gestations from 24 weeks</p>			

Developmental Indicators from Preterm to Term <http://adhb.govt.nz/newborn/Guidelines/Developmental/DevC>

Score relates to practice in (unit):	
Scored by:	Date scored:
<p>Statement: Developmental care is the humane counterpart to high tech medical and pharmacological care in the neonatal unit. It aims to offset the disadvantages of premature birth or perinatal problems by supporting each infant's personal development agenda, ensuring the best possible outcomes¹. Developmental care includes a variety of activities designed to manage the environment and individualise the care of the premature infant based on behavioural observations. The goal is to promote a stable, well-organised infant who can conserve energy for growth and development².</p>	
<p>Standards: All staff within neonatal services will modify the environment and care-giving technique to support these vulnerable infants³. Neonatal nursing practice is provided based on the monitoring and control of the physiological stability of infants and decision making in relation to interventions, including controlling the neonatal environment⁴.</p>	
Patient Group: Any infant nursed within the neonatal environment	
Triggers for the development of the benchmark:	
<p>Criteria for scoring: Criteria for scoring: Scoring to take place on day and night shift for 4 babies each shift. Activity levels will be documented; scoring may be done through observation of staff/parents, discussion and documentation.</p>	

Key Factors		Individual scores	Possible total
F1	There is an evidence-based guideline to support clinical practice.		3
F2	Care		16
F3	Staff Education		9
F4	Parent/Carer Education and Involvement		4
	Overall Score		32

Factor 1: There is an evidence-based guideline to support clinical practice.

Evidence based practice guidelines ensure that care delivered to the infant is of the highest standard.

Clinical guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific circumstances, statements about different aspects of the patients' condition and the care to be given.

The aim of the guideline is to provide evidence-based information to enable the Health Care Professional to deliver individualised care, relevant to age and stage of development of the infant, to provide optimal outcomes¹.

Factor 2: Care

The ultimate goal of intervention strategies in the neonatal setting is to facilitate and promote infant growth and development¹⁵. Caregivers must be alert and responsive to the needs of the infant, and medical/nursing procedures should be timed to minimise stress¹⁷.

(Positioning) Increasing evidence suggests that supportive positioning and handling of sick and premature infants may promote more normal motor development and minimise the chances of developing abnormal movement patterns¹. Incorrect positioning of very preterm infants can have a deleterious effect on long term motor development and may also affect neurodevelopment¹

(Environmental –Lighting)To minimise the potential adverse effects of prolonged, intense and unvarying light exposure, approaches should be developed to protect the infant from these stimuli²². Careful observation and monitoring will provide clues about the impact of lighting on a baby. For example light may affect the quality of the baby's sleep and awake states with a compound effect on physiological stability and attentive behaviour¹.

(Environment – Noise)Noise levels in the neonatal setting are a major source of environmental stress for premature/sick infants²⁷Neonatal unit noise originates from three sources, the environment itself, patient care equipment and caregivers²⁵.

Factor 3: Staff Education

Developmental care is necessary to achieve an optimal outcome for sick and preterm infants therefore education of the multidisciplinary team is essential. Education plays a key role in moving staff toward the philosophic change necessary for long term commitment and progress in the developmentally supportive care for infants and their families⁴¹.

Factor 4: Parent/Carer Education and Involvement

The parent/ carer/infant relationship is the most important developmental intervention, as it is this relationship that will have the greatest impact on long term outcomes¹⁷.

The family are the most consistent caregivers in the infant's life. By promoting support and education to the family the infant's development will be optimised^{27,28,29} .

The notion of partnership between the healthcare professional and the patient whereby the patient and the professional meet as equals with different expertise, must be adopted by Health Care professionals in all parts of NHS including hospitals.



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Benchmarking Score Sheet: Developmental Care

Date of benchmarking activity.....

Data to be collected on a minimum of 4 babies Y= Yes

N= No N/A= Not applicable

Key factors & criteria	Notes 1	Notes 2	Notes 3	Notes 4	Notes 5	Notes 6
<p>1. There is an evidence-based guideline to support clinical practice:</p> <p>1. The guideline is evidence-based and referenced², 2. The guideline is reviewed regularly according to trust policy. 3. The guideline is supported and used by all members of the multi-disciplinary team.</p>						
<p>2. Care:</p> <p>1. There is documented evidence of the following:</p> <ul style="list-style-type: none"> • Deviations to planned care¹⁶ • The infants’ response to intervention¹⁶ • Actions taken to minimise discomfort and stress^{17,18}, <p>2. Positioning should demonstrate a balance between flexion and extension, midline orientation and allow hand to mouth action,^{1,19,20}.</p> <p>3. Positions should be changed when the baby appears uncomfortable (to prevent head moulding and help maintain skin integrity) and variances should be documented.</p>						

4. Infants are positioned with support aids which reflect their developmental needs^{20,21}.
5. Dimmer switches are provided and used to achieve lower levels of lighting and allow for a gradual increase to full lighting,²².
6. There is provision for individual variable cot side lighting,²³.
7. Nursery windows have opaque curtains or blinds that are used at times during the day and at night. Infant's eyes are protected from direct light sources with the use of covered incubators or tinted head boxes¹.
8. The infant's eyes should be protected while receiving phototherapy and measures taken to limit the exposure of infant's who are adjacent to the light²³.
9. Light levels are reduced at night to promote the development of diurnal cycles^{24,25,26}.
10. Monitor alarms and telephones are set to the lowest audible level and are answered promptly³⁶. Conversations and unit rounds are conducted away from the cot side or outside the care giving area if possible,^{28,29}.
11. Talking is reduced to a whisper by cot sides²⁸.
12. Opening and closing of incubator ports, nursery doors, drawers and disposal bins is done with care^{28,30}.
13. Collections of water are removed from ventilator tubing promptly²⁸. Nursery floors are mopped not vacuumed
14. Thickened incubator covers are used to dampen sound^{28,31}. Items are not placed on incubator surfaces³¹.
15. Radios removed from care areas³².
16. Noise levels are monitored by a device manufactured for the neonatal setting such as a sound



ear and it is observed that staff are responding to reduce noise as appropriate.

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3. Staff Education:

All staff receive information about developmental care during induction, to include:

1. Physiological and behavioural organisational states
2. Effects of the environment
3. Positioning and handling
4. Parent teaching
5. Resources and guidelines are available on the neonatal unit

All staff are taught that:

7. All touch episodes should be infant led and individualised whenever possible³⁵. To look for signs of stress in infants and use positive touch to help them Cope^{36,16}.
8. To document infant responses to touch/social interaction
9. To touch infant gently prior to all handling/interventions¹⁷

4. Parent/Carer Education and Involvement:

1. Parents are taught all aspects of Developmental Care for their babies individual needs (as assessed by asking parents):
 - Positioning
 - Behavioural cues
 - Environmental aspects – noise / light / heat
 - Touch and interaction
2. Parents are provided with supporting information digital or paper format.
3. There is documented evidence that parental education has taken place.
4. The developmental needs of both infant and parents are met by encouraging. Kangaroo care³³, containment²³ or non-nutritive sucking²

Statements to justify scores/local action plans:



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Form to be completed in the exceptional circumstances that the Trust is not able to follow ODN approved guidelines.

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Rationale why Trust is unable to adhere to the document:	
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