

Guideline

Developmental care during transport of the Neonate

1 Scope

For use within the Paediatric and Neonatal Decision Support and Retrieval Service (PaNDR) for the East of England.

2 Purpose

To provide interventions to promote neurodevelopmental support for preterm infants during transport.

To promote their physiologic stability during transport and aim to improve the neurodevelopmental outcome for preterm infants.

3 Definitions and abbreviations

Preterm infant: Infant born at less than 37 weeks gestation

Developmental care: A broad category of interventions and practices designed to minimise stress of the neonatal environment.

4 Introduction

- Developmental care aims to offset the disadvantages of premature birth or perinatal problems by supporting each infant's personal development agenda, ensuring best possible outcomes.
- Developmental care includes a variety of practices designed to manage the environment & promote a stable infant to reduce the stress of transport.
- There are adopted various measures to ensure that infants are positioned, contained, secured and feel safe during what can be a very stressful journey for them.
- Therefore developmental care is viewed as an expansion of neonatology in which evolving infant and family systems interface with the biological, environmental & psycho-emotional risks of preterm birth (1).
- Little *et al* suggested that developmental care interventions should be implemented with thought and consistency during neonatal transport as this may reduce and prevent neurodevelopmental complications.

- They also documented that neonatal transport teams are in a fundamental position to decrease complications and improve outcome in neonates during transfers (2, 3).

5 Supportive positioning

The aim of this is to provide a comfortable and supportive environment for the baby. It should promote optimal physiological, neurological and musculoskeletal development for the preterm and vulnerable infant and influence stability, skin integrity, thermal regulation, bone density, sleep facilitation and brain development(4). Preterm infants have weak muscle tone, which improves at around 36/40 and are unable to maintain flexion. In utero infants are supported by the amniotic fluid and contained by the limited space of the uterus (4).

5.1 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 gravity (4).
- Maintains a comfortable position whilst still allowing movement.

5.2 Positioning aids in transport

- Bendy bumpers.
- Squishon/z flo fluidised mattress -reduce adverse effects of vibration on both baby & tubing (2).
- Prone positioning cushion.
- Dandle Roo2 Neurodevelopmental positioning aid.
- Restraints to maintain infant's position & safety during transfer.

5.3 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 sleep (5, 6). Gastro-oesophageal reflux is reduced and gastric emptying is optimised(1,5).

Prone position has also been associated with changes in cerebral blood flow velocity due to pressure on the vertebral artery caused by neck movement (4, 7).

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.
- Use positioning aids to maintain an effective prone positioning if required on transfer. In prone positioning, gravity has its greatest effect. Lying prone supports the sternum and rib cage. This is beneficial for infants with respiratory compromise as it improves oxygenation, ventilation and lung compliance.
- 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 (8).

Prone positioning aids:



- The cushion is shaped to support the natural curvature of the shoulders and optimum alignment of the head and body. Infants achieve a relaxed, flexed position without exerting too much pressure on the knees and elbows.
- Cut-outs on either side of the cushion allow the infant's bent arms to rest.
- The support provided to the pelvis makes it easier to position the infant's legs.
- Wipe with clinell wipes between infant use.
- **Sizes:** XS: <800g
S: 800g – 1.2kg
M: 1.2kg – 2.0kg

5.4 Z-Flo Neonatal fluidised positioner mattress and squishon mattress



Place the z-flo neonatal positioner mattress/ squishon mattress on top of the transport incubator mattress, then cover them both using a single sheet. Do not use separate sheets for each as this may allow the top mattress to slide in the event of the ambulance driver needing to brake suddenly. The mattress can be contoured and moulded to meet the infant's developmental/positional needs.

- The heat of the mattress is maintained by the incubator temperature. The incubator should always be plugged in, turned on and set to 36°C at base to maintain temperature.
- If the mattress is cold it can be soaked in hot water to reheat quickly.
- Wipe clean with Tristel solution between each transfer.
- Dispose of mattress if it becomes damaged/ split.

5.5 Dandle Roo2 neurodevelopmental positioning aid

For transfer of infants under 1kg in ANTS, single patient use.

If placing infant in prone position:

- Place infant prone so infant's head is nestled against the top boundary.
- Adjust the wings (shorter one first) across the upper extremities/torso to provide support and/ or freedom of movement as needed. Attach longer wing to underside of the base.
- Ensure feet and hips are appropriately flexed and feet are in neutral alignment. Safely arrange all tubing and medical equipment. Bring up pouch over the legs/ buttocks and fasten to the underside of the base. Ensure lower end of pouch is available for foot-bracing.
- Adjust sides of head boundary using fasteners to allow proper placement of tubing and prevent any obstruction to the infant's breathing.
- If brim accessory is used, position it to block out direct light, attach it to outside of head support with velcro tabs.

If placing infant in supine position:

- Bring upper extremities into midline flexion with hands near face. Pull the shorter wing over the arms, rounding shoulder forward. Pull the longer wing over the top, rounding shoulders and containing arms. Fasten to underside.
- Flex infant's lower extremities into a neutral midline position.
- Safely arrange tubing and medical equipment.
- Bring pouch up over the legs and feet to help infant stay in flexion.
- If brim accessory is used, position it to block out direct light, attach it to outside of head support with velcro tabs.

If placing infant in side-lying position:

- Place infant side-lying with infant's head nestled against the top boundary.
- Ensure both shoulders are rounded forward and legs and hips are loosely flexed.
- Adjust wings and attach longer wing to the underside.
- Bring up pouch, keeping legs loosely flexed. Ensure lower end pouch is available for foot-bracing. Attach to underside with velcro tabs.
- Adjust sides of head boundary using velcro fasteners to allow proper placement of tubing.



6 Environment

- Loud noise can have a detrimental effect on preterm infants. It can increase stress causing increased blood pressure and heart rate and decreasing oxygen saturations and increased oxygen consumption (9).
- American Academy of Paediatrics recommends below 45dB, not exceeding 65dB (9).
- Above 90dB for more than eight hours has potential to damage adult cochlea therefore the more immature cochlea is more sensitive to damage (9).
- Ototoxic medication increases sensitivity to noise.
- Actual noise level in an incubator can range between 56-72dB this can be dependent on the mode of respiratory support in use i.e. CPAP and ventilators (10). During neonatal transport noise levels may reach higher than recommended for a neonatal intensive care unit. Macnab (9) has suggested that noise levels should not exceed 60dB.
- Zahr (11) and Purdy (12) suggest that infants wearing earmuffs demonstrate improved stability of oxygen saturation levels and sleep pattern is increased (1).

6.1 Reducing noise

- Padded incubator covers to be used where possible.
- Use gauze tucked into eye masks over the ears to reduce noise on transfers or protecting ears by other means.

6.2 Reducing 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 (14).
- Stress responses are demonstrated in these infants to sudden increases in light levels – lower oxygen saturation (15).



- Reduce lighting with the use of incubator covers.
- Adjustable lighting levels where possible (15)
- Protect infant's eyes post ROP screening on transfers using an eye mask.
- Use eye mask to protect preterm eyes from ambulance lighting during transfer.

7 Temperature management

Maintaining a thermal neutral regulation environment for the infant can be challenging during transport. However this is essential in the immediate and subsequent infant management. Failure may result in cold stress or hyperthermia which may cause adverse metabolic effects (16, 17).

- Use of a Squishion mattress/z-flo fluidised mattress.
- Use of a Transwarmer mattress.
- Maintaining infant temperature with continuous monitoring of skin probe temperature during transfers.
- Performing and documenting axilla temperature on arrival to the referring unit, axilla temperature on transfer to the incubator, regular axilla temperature every 30 minutes if temperatures unstable on a unit, every 15 minutes skin mode temperature whilst on transfer and an axilla temperature at the receiving unit.
- Increase or decrease ambulance temperature accordingly to environment temperature.
- Ensure ambulance doors are closed promptly once incubator has been loaded into the ambulance.

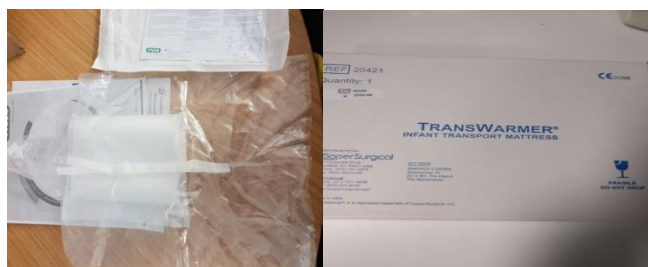
- Ensure heater is on in the ambulance to maintain environment temperature.
- Set incubator temperature according to the referring unit's incubator. Adjust accordingly to infant's temperature.
- Use of a Neohelp™ suit in the extreme preterm infant under 1kg or if unable to maintain thermoregulation.
- Use of a transwarmer where clinically indicated to maintain thermoregulation.

Transwarmer Mattress

Temperature when activated 40°C (24°C from start)

activate:

- The mattress should be activated and used according to the manufacturer's instructions.
- Locate metal disc and grasp with thumb and forefingers of both hands.
- Flex (bend) disc rapidly until crystals begin to form.
- Massage pack to soften and to increase the activation rate.
- After pack is fully activated, indent centre with palm to form a small nest.
- Lay infant in nest on the non-woven fabric surface.
- Regularly check infant's skin for redness and monitor infant's temperature.
- Transwarmer should not be used in conjunction with another heat source (BAPM safety issue Jul 2019)



8 Monitoring compliance with and the effectiveness of this document

The PaNDR team will monitor compliance with this document by undertaking regular audits which will be reported back to the consultants and PaNDR team. The effectiveness of providing developmental care on transfers will be monitored and audited for service performance and criteria for best practice.

9 References

1. Ranganna, R. (2011). Reducing noise on the neonatal unit. *Infant* 7(1) 25-28.
2. Watts C, Trim E, Metherall J, Lightfoot E. (2008) Neonatal transport-the comfort zone. *Infant* 4 issue 1.
3. Little D., Riddle B., Soul C. The power in our hands: Intergrating developmental care in neonatal transport. *Neonatal Network* 1994; 13(7): 19-22.
4. Gray K, Dostal S, Ternullo-Retta C, Armstrong MA. (1998) developmentally supportive care in a neonatal intensive care unit: a research utilization project. *Neonatal Network*. March;17(2):33-38. [IIb]
5. Symington, A. & Pinelli, J. (2006) Developmental care for promoting development and preventing morbidity in preterm infants. *Cochrane Database of Systematic Reviews*, Issue 2.
6. Chang, Y.J, Anderson, G.C and Lin, C.H (2003) Effects of prone and supine position on the sleep state and stress responses in mechanically ventilated preterm infants during the first postnatal week. *Journal of Advanced Nursing*, Vol 40, No2, pp161-69.
7. Hemingway M, Oliver S. (2000) Preterm infant positioning. *Neonatal Intensive Care*. October; 13(6):18-22. [IIa]
8. Reid T, Freer Y. (2000) developmentally focused nursing care. In: Boxwell G. *Neonatal Intensive Care Nursing*. Routledge. London. [IV]
9. Macnab A., Chen Y., Gagnon F., Laszlo C. vibration and noise in paediatric emergency transport vehicles: A potential cause of morbidity? *Aviat Space Environ Med* 1995; 66(3): 212-19.
10. Saunders A.N. Incubator noise: A method to decrease decibels. *Paediatric Nurse* 1995; 21:265-68.
11. Zahr I.K., Traversay J de. Premature infant responses to noise reduction by earmuffs: Effects on behavioural and psychological measures. *Perinatol* 1995; 15(6).
12. Purdy I.B., Wiley D.J. Magnetic resonance imaging and the neonate. *Neonatal Network* 2003; 22(1) 9-18.
13. Salama H (2012) The impact on earmuffs on Vital signs in a Neonatal Intensive Care Unit. *Neonatology Today*. Volume 7. Issue2. February 2012.



14. Young J. (1996) Ch 3. The Visual System. (pp29) In: Developmental Care of the Premature Baby. Baillière Tindall. London. [IV]
15. Blackburn S. (1996) Research Utilisation: Modifying the lighting of the NICU environment. Neonatal Network. 15(4):63-66. [IV]
16. American Academy of Pediatrics 1997. Noise; a hazard for the fetus and newborn paediatrics. October 100(4) 724-727.
17. Cinar N.D., Filiz T.M. Neonatal Thermoregulation. JNN 2006; 12 (2): 69-74.
18. BAPM safety issue – Transwarmer Mattress. <https://www.bapm.org/articles/44-safety-issue-transwarmer-mattresses>

10 Associated documents

- Bliss, 2014. Your special care baby; a guide for parents.
- BLISS, 2016. Available at <https://www.bliss.org.uk/about-neonatal-care>
- Boxwell Neonatal Intensive Care Nursing. Routledge. London.[IV]
- Clinical Guideline Developmental Care EOE 2019
- Cooper surgical Transwarmer Warming Infant Transport Mattress
- Dandle Roo2 user notes – supplied with positioning aids
- Draegar Incubator User's Manual
- Poppy report 2009. Parents of premature babies project
- Z-Flo mattress user notes – supplied with mattress

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