Developmentally accurate body posture of newborn infants: a quality assessment using the neoPAW score

A developmentally supportive body posture for newborn infants admitted to the neonatal intensive care unit is essential yet there is little awareness of how often an infant's body posture is actually supportive. This quality assessment uses the Neonatal Postural Assessment Worksheet (neoPAW) to gain insight into this important topic.

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Key points

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1. It is possible to achieve a supportive body posture in any position (supine, prone or side-lying) and when an infant is receiving respiratory support.
2. The self-regulatory abilities of the newborn infant and/or the competencies of the nurse who positioned it are important in supportive body positioning.
3. To maintain awareness of a developmentally supportive body posture, it is recommended that nurses make regular measurements with the neoPAW.

All newborn babies in need of intensive care, whether term or preterm, are confronted with an abrupt change in their environment that is quite different from their mother's womb or a quiet home together with their parents. A preterm infant, in particular, is not prepared to cope with the demands of a world outside of its mother's womb. The dark, warm, fluid-filled space with its low pitched sounds is unexpectedly exchanged for the cool, dry and draughty world of the neonatal unit, complete with sudden high-pitched sounds and bright lights.[1]

The body of a preterm infant is adapted to move in the amniotic fluid-filled womb with its flexible uterine walls. After birth, this environment may be replaced by a flat and hard mattress without borders and, for movement, a fight against gravity. It is not at all surprising that when facing these challenges, a preterm newborn infant might feel helpless and stressed.[2]

The neonatal intensive care unit (NICU) is vital for survival, however providing an optimal environment for the developmental needs of a newborn infant presents challenges. Infants born at lower gestational ages have increasing survival rates but the long-term outcomes and rates of various disabilities have not improved.[3-7]

Over the last 20 years, developmental care for hospitalised infants has grown from a theory into an evidence-based standard of care for newborns on the NICU.[1, 8-10]

There is evidence that a supportive body posture:[2,11-14]

- aids neurodevelopment
- improves musculoskeletal development
- strengthens motor abilities
- supports sleep and physiological stability
- affects the stress response.

Preterm newborn infants with an unsupported body posture have a tendency to extend their limbs, which increases stress and agitation levels and decreases physiological stability. Regardless of prone, supine or side-lying position, midline orientation should be pursued with the arms and legs in a flexed position, close to each other and to the body; the head in a neutral position with respect to the torso, and the torso in a slightly flexed position (**FIGURE 1**).[1,2]

NICU staff should have an awareness of the importance of body posture and work according to the principles of developmental care, securing a flexed body posture while administering care, which can be immediately adapted if necessary. Body posture support devices, for example, rolls, swaddling blankets, nests, gel pillows or soft cotton pillows filled with polyethylene beads can be used to sustain a comfortable position and to support body posture during and after nursing procedures. These are commercially available or can be custom-made by parents or caregivers.

When an infant is left to rest in a developmentally supportive body posture it is possible that after some time it might move into another non-supportive position. In the authors' NICU there was little awareness of how often the body posture of a newborn infant actually was developmentally supportive, however this knowledge is important to secure or improve the quality of care and affect the short- and long-term outcomes of these

small and fragile babies. In this pilot study the authors attempt to gain an initial understanding of body posture during periods of rest and measure how developmentally supportive body posture actually is.

Methods

A prospective quality assessment was performed in the NICU of Emma Children's Hospital, Academic Medical Centre (EKZ/AMC) in Amsterdam, The Netherlands, from 19 November to 10 December 2015. All newborns admitted to the unit were included except those with a neuromuscular disease or those receiving treatment that might interfere with body posture (eg neuromuscular disease, muscle relaxant medication, a surgical procedure or pneumothorax drainage).

The babies were observed using the Neonatal Postural Assessment Worksheet (neoPAW) (**FIGURE 1**), an update of the Infant Positioning Assessment Tool (IPAT)[1,15] The neoPAW comprises eight items:

1. head
2. neck
3. shoulders
4. scapulae
5. spine/torso
6. hands
7. hips
8. knees/ankle/feet.

Scoring possibilities vary from 0, representing a poor developmentally-supportive posture, to 1, an adequate posture, and 2, the optimal developmentally-supportive posture. There are pictures and explanatory texts on the neoPAW to aid scoring. There is a maximum scoring possibility of 16 points.

NeoPAW differs from IPAT in that there is the addition of two new items: position of the shoulder blades and the spine/torso. IPAT has an explanatory text only, the neoPAW has pictures added. IPAT has been used in a study previously[15] but, to the authors' knowledge, neoPAW has not yet been used in another published study, nor validated.

All neoPAW observations were performed by the researcher (DD). Prior to the study the researcher was tested for reliability. The simultaneously but independently performed observations by the researcher and a developmental expert (JW) resulted in a weighted kappa coefficient (an index for assessing agreement between raters) to confirm reliability.

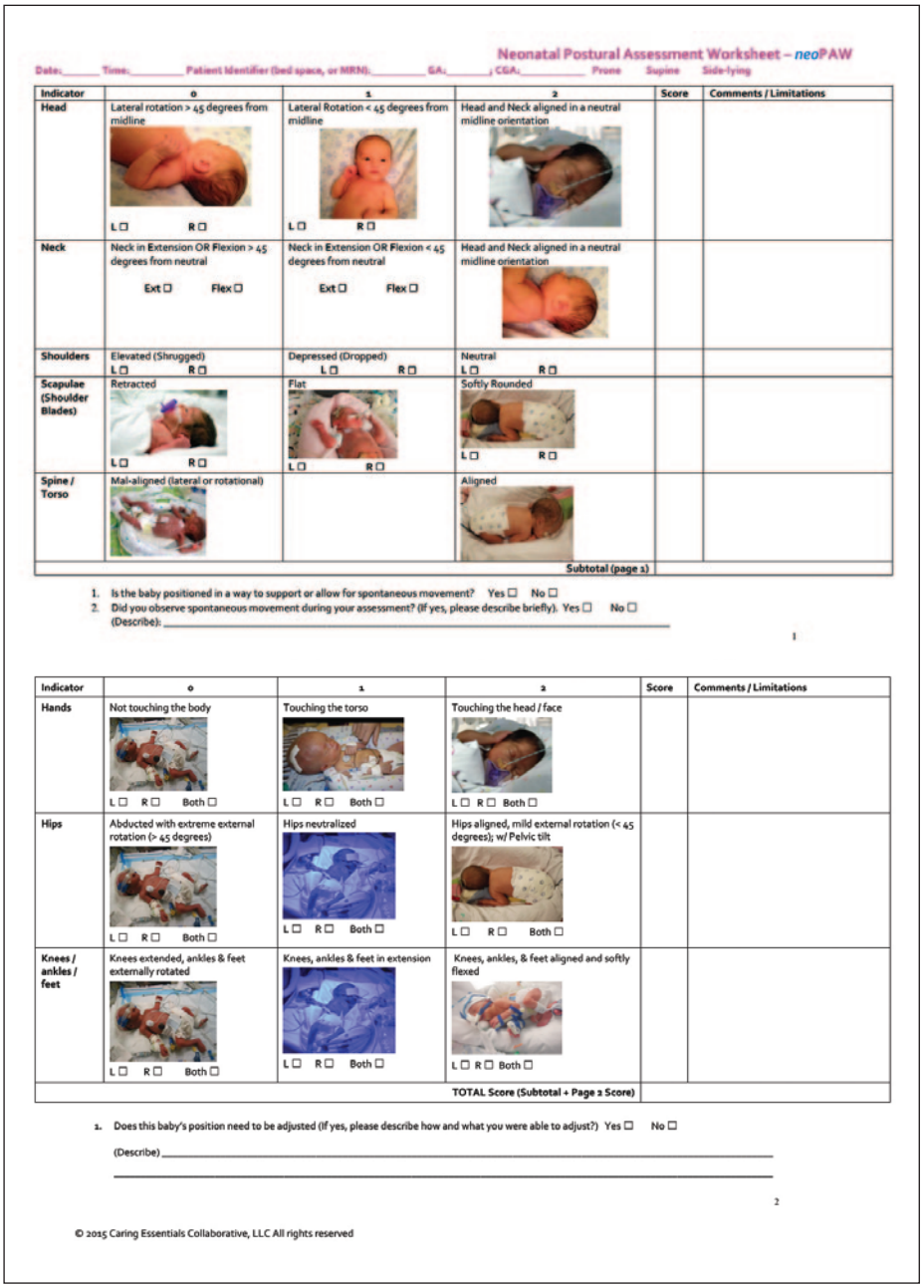

FIGURE 1 The Neonatal Postural Assessment Worksheet (neoPAW) scale. *Reprinted with permission from M. Coughlin/Caring Essentials Collaborative, LLC (www.caringessentials.net).*

In this pilot study neoPAW was used to assess the quality of the developmental body posture one hour after caregiving. To prevent bias, the nurses were not informed about the purpose of the study.

Interpreting the scores

The scores can be interpreted as follows:[16]

- a total score of <6 indicates a poor position
- a score between six and 10 reflects an adequate positioning
- a score >10 reflects optimal positioning.

Mean and standard deviation (SD) for total score and all individual scores were calculated. The data was processed using IBM SPSS Statistics 24 software.

Results

Thirty newborn infants were included in the study. The median gestational age was 30^{+5} weeks (interquartile range 28^{+1} to 35^{+2}); the median birth weight was 1,413g (interquartile range 1,040-1,960g).

The neoPAW was scored at a median age of 34^{+6} weeks (interquartile range 31^{+5} to 36^{+3}) and the median weight at the time of measurement was 1,815g (interquartile range 1,525-2,290g). Seventeen of the newborn infants had a gestational age of between 26^{+1} and 32 weeks; eight between 32^{+1} and 37 weeks, and five were >37 weeks. At the time of the study no infants of less than 26 weeks' gestation were admitted to the NICU.

During measurement, 18 newborns were positioned on their side; six in supine, and six in prone position. Thirteen newborns were swaddled; five newborns were lying in a commercially available nest. All but one infant had a commercially available body posture support device in use and were covered with a blanket in the incubator. The incubators were fully protected from external light.

Respiratory support was variable. Ten newborn infants did not have any respiratory support, three had low flow oxygen, six had high flow oxygen support, nine had nasal continuous positive airway pressure (nCPAP) with closed loop oxygen therapy, one newborn had high frequency oscillatory ventilation and one had conventional mechanical ventilation (**TABLE 1**).

The mean total neoPAW score for the whole sample was 12.6 points (SD=2.26). The group of gestational age 26^{+1} to 32 weeks had a mean score of 12.3 points (SD=2.42); the group of gestational age 32^{+1} to 37 weeks had a mean score of 14.3 points (SD=1.39), and the group of gestational age >37 weeks had a mean score of 10.8 points (SD=0.84) (**TABLE 1**). The distribution of the item scores of the total population is shown in **FIGURE 2**.

Newborn infants resting in the side-lying position (n=18) had a mean neoPAW score of 13.6 points; those in the prone position (n=6) had a mean neoPAW score of 10.7 points and those in supine position (n=6) had a mean neoPAW score of 11.3 points (**TABLE 1**).

Overall 24 newborn infants could be classified as having 'optimal' developmental body posture in rest (neoPAW score >10). Six newborn infants scored in the 'adequate' category (6-10 points on the neoPAW score).

Discussion

The aim of this pilot study was to gain insight into the body posture of newborn infants on the NICU and whether it is developmentally supportive between two caregiving activities. Areas for improvement would be highlighted.

On the NICU of EKZ/AMC care is provided in line with the teachings of the Newborn Individualized Developmental Care and Assessment Program (NIDCAP; http://nidcap.org). Professional caregivers all receive a basic training in developmental care; four nurses are NIDCAP certified and they support the professional caregivers and parents in executing the principles. It is expected that all caregivers are aware of developmental care principles so that newborn infants will not be disturbed unnecessarily in their sleep and are assured a good developmentally supportive body posture.

During the study there were no poor scores (<6 points), however there were six adequate scores. Three of these newborn infants were in prone position, two in supine and one was side lying. Four of these six had respiratory support and two did not. The infants in prone position had a lower, but still optimal, mean score (10.7 points) compared to the supine or side-lying position (11.3 vs 13.6 points). The difference appears to be the result of lower scores on the head and hands items. Often these newborn infants were not lying with their hands near their mouth and/or body, and their heads had a lateral rotation of more than 45 degrees from the midline. The infants in supine position were not always supported by developmental body posture support devices, however in prone position rolls were used under the belly and these rolls were made and applied correctly.

It would appear that the nurses on the unit were capable of assessing the self-regulatory competencies of the newborn infant and could support them with proper supportive devices.

The need for respiratory support did not appear to influence body posture. All scores awarded during respiratory support – invasive or non-invasive – were optimal. Neither respiratory support nor gestational age revealed a risk for less adequate support. A supportive body posture did not depend on positioning (supine, prone or side-lying) nor was it affected by the need for respiratory support, rather it depends on the self-regulatory competencies of the newborn infant and the competencies of the nurse who positions it.

Limitations of the study

The study is relatively small: 30 newborn infants were assessed due to the low

neoPAW mean (SD)			Positioning			Respiratory support					Swaddled	
			Side-lying	Supine	Prone	None	Low flow	High flow	CPAP	Ventilation	Yes	No
Total group	**n=30**		18	6	6	10	3	6	9	2	13	17
		12.6 (2.26)	13.6 (1.85)	11.3 (1.50)	10.7 (2.42)	12.2 (1.99)	14.7 (0.58)	13.8 (1.72)	14.1 (1.45)	11.0 (1.41)	13.3 (2.21)	12.0 (2.21)
26-32 weeks' gestation	**n=17**		10	2	5	2	15				5	12
		12.3 (2.42)	13.8 (1.54)	10.5 (0.71)	10.0 (2.00)	12.5 (2.12)	12.3 (2.52)				14.6 (0.53)	11.3 (2.23)
32-37 weeks' gestation	**n=8**		6	1	1	3	5				3	5
		14.3 (1.39)	14.3 (1.63)	14	14	14.3 (1.53)	14.2 (1.48)				15.3 (1.16)	13.6 (1.14)
>37 weeks' gestation	**n=5**		2	3		5					5	
		10.8 (0.85)	10.5 (0.71)	11.0 (1.00)		10.9 (0.84)					10.8 (0.84)	

TABLE 1 The neoPAW scores. Mean scores are given with the standard deviation in brackets. Key: SD = standard deviation, CPAP = continuous positive airway pressure.

admittance rate at the time of the study.

According to Dutch national agreement and the unit protocol, newborn infants should not be swaddled yet 13 of the 30 newborns were swaddled. All swaddled infants had higher scores than the non-swaddled newborns. Swaddled babies are 'forced' to lie in a certain position, which could have influenced the neoPAW scores.

The lack of extreme preterm newborns (<26 weeks' gestation) is a limitation of this pilot study but this will be addressed in follow-up studies.

The neoPAW appears to be a good measurement tool to gather insight on how developmentally supportive the body posture of the newborn is. However there are no other studies to compare the results with. The authors question whether the scoring categories (poor, adequate and optimal) and the chosen cut-off points are perhaps too lenient.

Recommendations

The neoPAW is a tool that could guide nurses in appropriate developmental positioning in daily clinical practice. To maintain awareness of the importance of developmental body posture of newborn infants it is recommended that neoPAW measurements are performed regularly and any inadequacies in posture are discussed with the relevant nursing staff to allow for improvement. It is important to have an open culture so that the nursing staff feel free to discuss their choices.

Regular group sessions discussing and reflecting on body posture and available devices and appropriate use of these devices, are recommended. There is a new app from the Caring Essentials Collaborative, LLC (neoPAL, the neonatal postural alignment app), which could support the positioning of (preterm) newborn infants and guide nurses as well as parents.[17]

Conclusion

This small study shows that nurses (who were not pre-informed of the study) were aware of the need for a developmentally appropriate body posture for newborn infants and that the babies in their care were lying with an adequate developmentally supportive body posture, although ideally the aim should be to achieve an optimum score rather than settle for adequate.

Some groups of infants (for example, those born at >37 weeks' gestation, infants in a prone or supine position, and those receiving respiratory support) may need more attention. An extensive multi-centre study is now under consideration.

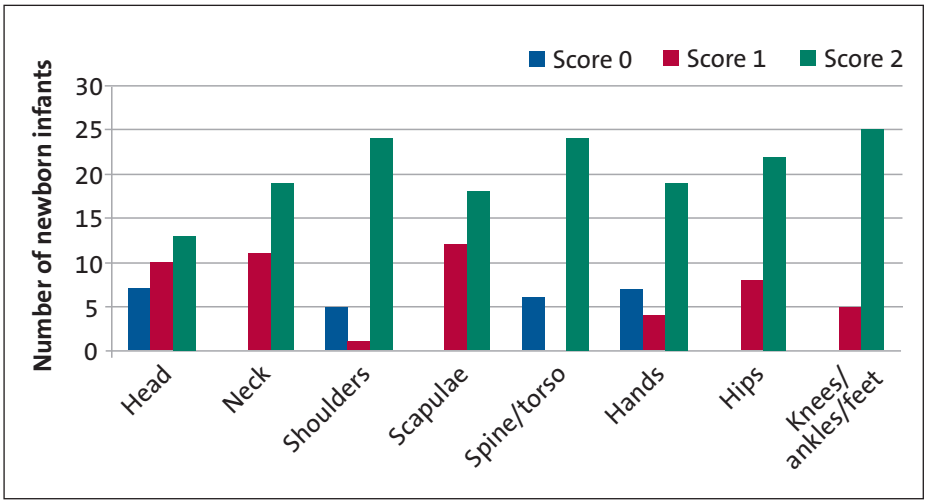

FIGURE 2 The neoPAW item scores for the total group (n=30).

Declaration

The authors are not affiliated to the Caring Essentials Collaborative LLC or the neoPAL app and they did not receive funding for this study.

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