

## Validation of newborn positioning protocol in Intensive Care Unit

*Validação de protocolo de posicionamento de recém-nascido em Unidade de Terapia Intensiva*  
*Validación de protocolo de posicionamiento de recién nacido en la Unidad de Cuidados Intensivos*

**Beatriz Rosana Gonçalves de Oliveira Toso<sup>1</sup>, Cláudia Silveira Viera<sup>1</sup>, Jéssica Martins Valter<sup>II</sup>,  
Silvana Delatore<sup>III</sup>, Grasiely Mazoti Scalabrin Barreto<sup>III</sup>**

<sup>1</sup> Universidade Estadual do Oeste do Paraná, Undergraduate Nursing Course. Cascavel, Paraná, Brazil.

<sup>II</sup> Secretaria Municipal de Saúde. Toledo, Paraná, Brazil.

<sup>III</sup> Universidade Estadual do Oeste do Paraná, West Paraná University Hospital,  
Neonatal Intensive Care Unit. Cascavel, Paraná, Brazil.

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### ABSTRACT

**Objective:** to verify the positioning indications of newborn and build a standard operating procedure protocol for newborn positioning in Neonatal Intensive Care Unit (NICU). **Method:** for protocol validation, the Delphi technique was used, in which expert nurses in the field reviewed the proposed procedure. **Results:** we present the results of this validation in a protocol form, to contribute to the discussion about newborn positioning in NICU and standardization of nursing care related to positioning. We evaluated ten indicators, in which there was agreement of 100.0% in seven, and of 80% in three, above the 60% recommended by the validation technique. **Conclusion:** given the importance of newborn positioning in NICU for its neuromuscular development, this study contributes to the adoption of an evidence-based practice for nursing.

**Key words:** Neonatal Nursing; Newborn; Patient Positioning.

### RESUMO

**Objetivo:** verificar as indicações de posicionamento dos recém-nascidos (RN) e construir um protocolo de procedimento operacional padrão (POP) para posicionamento de RN em Unidade de Terapia Intensiva Neonatal (UTIN). **Método:** para validação do POP utilizou-se a técnica Delphi, em que enfermeiros especialistas na área avaliaram o procedimento proposto. **Resultados:** apresentam-se os resultados dessa validação na forma de protocolo, para contribuir com a discussão sobre o posicionamento do RN na UTIN e padronização da assistência de enfermagem relacionada ao posicionamento. Foram avaliados dez indicadores, em sete dos quais houve concordância de 100,0% e, em três, de 80%, acima dos 60% preconizados pela técnica de validação. **Conclusão:** dada a importância do posicionamento dos recém-nascidos internados em Unidades de Terapia Intensiva Neonatal para seu desenvolvimento neuromuscular, o estudo contribui para adoção de uma prática baseada em evidência para a enfermagem. **Descritores:** Enfermagem Neonatal; Recém-Nascido; Posicionamento do Paciente.

### RESUMEN

**Objetivo:** este estudio encontró las indicaciones de posición del recién-nacido (RN) y construyó un protocolo de procedimiento operativo estándar para el posicionamiento del RN en la Unidad de Cuidados Intensivos Neonatales (NICU). **Método:** para la validación del POP fue utilizada la técnica Delphi, en el que enfermeras expertas en el campo revisaron el procedimiento propuesto. **Resultados:** presentamos los resultados de esta validación en forma de protocolo, para contribuir a la discusión sobre la posición del RN en la NICU y estandarización de cuidados de enfermería relacionados al posicionamiento. Se evaluaron diez indicadores, de los cuales hubo acuerdo de 100,0% en siete y de 80% en tres, más que 60% recomendado por la técnica de validación. **Conclusión:** desde la importancia del posicionamiento del RN en UCIN para su desarrollo neuromuscular, el estudio contribuye a la adopción de una práctica basada en la evidencia para la enfermería.

**Palabras clave:** Enfermería Neonatal; Recién Nacido; Posicionamiento del Paciente.

**CORRESPONDING AUTHOR**

**Beatriz Rosana Gonçalves de Oliveira Toso**

E-mail: [lb.toso@certto.com.br](mailto:lb.toso@certto.com.br)

## INTRODUCTION

It is believed that premature newborns may present neuropsychomotor development delay (NPMD) and damage to the central nervous system (CNS) due to the immaturity and fragility of their nervous system<sup>(1)</sup>.

The development of intensive care in recent decades led to the survival of a large number of premature newborns. However, preterm newborns (PTNB's) below 32 weeks of gestational age (extreme premature) are considered high risk for developing neuromotor changes throughout their lives<sup>(2)</sup>.

Currently, Neonatal Intensive Care Units (NICUs) have many technological resources for the care of premature infants, as mechanical ventilators and cardiorespiratory monitors. Due to that, the NBs who need intensive care or invasive maneuvers must adapt to the reality of the NICUs, without the comfort of the womb and exposed the hyper stimulation with lights, alarms and actions of the multidisciplinary team. A team oriented to the proper positioning of the premature NB may contribute to the decrease of physiological and motor stress<sup>(3)</sup>.

The differences between the womb and the NICU are related to pace, intensity, quality and shape of a large class of sensory stimuli, including the tactile, proprioceptive, vestibular, auditory and visual ones. The preterm NB cannot count with the uterus that protected it from external environment, constantly supplied it with nutrients, controlled the temperature and its hormonal regulation systems<sup>(4)</sup>. In addition, the NICU provides a sensory overload, with its routine and excessive handling, noisy environment, frequent placement of the NB in the supine position, neglected cry, prolonged sleep state, lack of suction opportunities and social interactions of the newborns with the professionals, which hinder the adaptation outside the uterus and the internal organization of the preterm NB<sup>(5)</sup>.

A study showed that the prone positioning significantly decreased salivary cortisol levels, the respiratory rate and the Brazelton sleep score, suggesting a correlation between this approach and the reduction of stress in those newborns<sup>(6)</sup>. Another study comparing preterm NBs positions on NICUs concluded that choosing alternative positions rather than keeping them in traditional positions showed less asymmetry of reflexes and motor responses, indicating that the symmetrical motion and motor responses are crucial for early development<sup>(7)</sup>.

The fetus is constantly surrounded by the walls of the uterus, which serve as support and reference to its movements. When placed in the incubator, the NB is deprived of these physical rhythms of its usual space, which creates insecurity, irritability, increased motor activity and greater calorie expenditure. If the NB is kept in an extended position, motor development will be hampered and transitional hypertonia may occur in the lower limbs, scapular retraction and alteration of the messages transmitted to the CNS, causing changes in its development<sup>(1,8)</sup>.

The greater activity of the extensor muscles can be regarded as typical of the fetus of 28 to 30 weeks. It is explained by the fact the NB gets rid of the restriction that was imposed by the

uterine walls. In addition, the literature also discusses that in the PTNB that has relatively weak muscles and is usually held in supine position, the growth of muscles tends to favor the extension position. According to this, it seems possible that the tension generating capacity of flexor and extensor muscles is specifically developed in accordance with the prevailing lengths of these muscles, since any movement performed by the child involves the extensor muscles that are relatively little constricted. If that is the case, the extension that is characteristic of the infant and the child who were born prematurely may be an evidence of the development of a muscle imbalance with adaptive purpose, in such a way that the extensor muscles would develop maximum strength when shorter, while flexors would have only a weak contraction when longer<sup>(9)</sup>.

When a baby is born prematurely, its muscles have not yet acquired the appropriate tone. Concerning that, with the action of gravity to which they are exposed after birth, the NBs acquire a posture in extension, which is totally contrary to the one adopted in the uterus. Still, the extension position deprives the baby of a proper flexion of the upper limbs, making hand-mouth activities and meeting with the middle line harder, which are key factors for a harmonious development<sup>(10)</sup>.

When newborns in the NICU are positioned in different postures and positions, they experience different forces of pressure on joints and muscles that positively influence the development of mechanic receptors in the preparation for the coordinated movement. However, newborns with poor health and that are held in restrictive positions are subjected to prolonged joint compression with minimal refinement of mechanic receptors, which predisposes to deformation of the skeleton, muscle shortening, and restricted joint mobility<sup>(11)</sup>.

The main objectives during the positioning of the NB are: providing support and posture to the movement; optimizing the development of the skeleton and biomechanical alignment; providing controlled exposure to varied proprioceptive, tactile, and visual stimuli, and promoting calmness and regulating the behavioral state<sup>(11)</sup>.

Many products, both craft work and commercial, are available to assist the positioning of the NB and promote postural stability and motion of flexion and semi-flexion positions. For example, a circular nest, made of fabric roll (cover, duvet) long, stuffed with fiber and used to surround and engage the NB, and also a foot roller can be useful to promote a partial containment of the movements of the extremities and assist in the symmetry of the median posture of the extremities in semiflexion<sup>(11)</sup>.

Thus, this study aimed to develop a Standard Operating Procedure (SOP) regarding the positioning of the premature newborn in incubator and or warmers, to be validated by experts in the area, aiming at its application in neonatal intensive care units.

## METHOD

This study was preceded by the Ethics Committee approval from Universidade Estadual do Oeste do Paraná and the signing of free and informed consent term of the participants.

This is a methodological type of study, which aimed at developing and validating SOP instrument on the positioning of premature newborn in incubators and/or warmers in the NICU. Validation was made as to the content and the construct, using the Delphi Technique for the validation of the nursing intervention proposal.

This technique allows to obtain a consensus from a group about certain phenomena<sup>(12-13)</sup>. The group is composed of judges, i.e., professional experts with practical and scientific proven experience in the area of the study. The participation of experts supports the process of identification and selection of variables and important inter-relationships to analyze the instrument, as well as the collection of information and ideas for the definition of perspectives, offering credibility to the validation of the procedures adopted.

The study was conducted from June 2013 to March 2014, with the participation of five experts in the area, being three nurses specialized in neonatology, a specialist in child and adolescent health and a pediatric nurse. The criteria to join the group of experts were activities in the area for at least five years and/or specific training in neonatology through specialization, master's degree or doctorate, and having had scientific production in the area in the last five years.

The invitation for the participation in the essay was sent via e-mail, containing the guidelines and justification of the study, along with the informed consent, the validation instrument, and the SOP. Upon acceptance of the guests, the process of instrument analysis began. Although it is not a study with human beings, all ethical precepts were followed.

We opted for using a values scale to the responses, like Likert scale, to obtain mean data. We defined that it would be considered a consensus when three of the five possible answers to a question of the evaluation were similar, i.e., 60% consensus. Validation occurred when the minimum consensus established allowed for greater understanding of the scientific evidence. Thus, for this study, we consider valid the final product which includes the SOP for positioning of the premature newborn in the warmer and/or incubator in the NICU, which is recommended by the experts.

#### **Content and construct validation for the SOP**

Literature review was conducted on the subject, both in national and international databases, on the main indications for positioning the NBs in the NICU and their main influences as for the neuromuscular development of the NBs. From the indications of authors we tried to find a suitable model that met their main recommendations.

Then, the SOP was structured and organized in the standard format used by the University Hospital of the University in which the proposal has been developed, including: concept, purpose of the procedure, who were the ones responsible for prescribing and performing the implementation of the procedure and the detailed description of each position. Three ways of positioning and nest templates that could provide the proper positioning were described in the SOP.

The experts were asked to express their judgment in relation to each of the proposed items. In Likert scale the options

were: entirely agree (5), partially agree (4), I do not have an opinion (3), partially disagree (2) and entirely disagree (1). In the validation tool, the semantic concordance, the introduction sequence, the removal, the addition or modifications on each item were questioned. It is noted that the association of open-ended questions is part of the information collection process about the relevance of the instrument and its content. The validation instrument was composed by the eight topics of the SOP model proposed, in addition to the suggestions for modification item.

## **RESULTS**

Table 1 presents the results related to the validation of the SOP containing the propositions of the standard operating protocol, with the results of the application of the Delphi technique. It contains the indicators evaluated for the ten items evaluated. In seven items there was an agreement of 100.0%, and in three items it was of 80%, that is, in all items there was agreement over 60%.

Regarding suggestions, just one of the evaluators would not add or change anything in the procedure. The others presented several suggestions. Regarding the concept, it was suggested adding that the Protocol should be applied to all newborns, including those in mechanical ventilation and unstable health condition; as for the goals, there was a suggestion to replace the word calm by another one more objective; about the charge by prescription, it was suggested to also include other professionals beyond the nurse and physical therapist, occupational therapist, speech therapist and doctor; as for materials, adding other relevant materials; in relation to the nest, there were suggestions to also propose handmade nests with diapers and muslin squares, materials available at NICUs, with low cost and easy handling.

#### **Protocol after validation**

1. Concept: Set of actions related to the positioning of newborns admitted to NICUs to be carried out by professionals who provide assistance to babies.
2. Objectives: a) to standardize procedures for the correct positioning of the NB in the NICU; b) to support and encourage proper posture to the movement; c) to optimize the development of the skeleton and the biomechanical alignment; d) to provide exposure to varied controlled proprioceptive, tactile and visual stimuli; e) to promote calmness and regulate the behavioral state; f) to reduce the incidence of motor and bone joint abnormalities during hospitalization; g) to contribute to reducing development and motor changes after hospital discharge.
3. Responsible for the prescription: nurse and/or physical therapist.
4. Responsible for the procedure: multidisciplinary team of the NICU.
5. Materials needed: nests (snuggle up, dandle-roo), rollers, diapers, cloth diapers, bands and other materials available.
6. Description of the procedure: the correct positioning of the premature baby; the headboard should be elevated to 30°.

**Table 1 -** Content and construct validation according to the selected indicators, Cascavel, state of Paraná, Brazil, 2014

Indicator	Entirely Agree f%	Partially Agree f%	I do not have an opinion f%	Entirely Disagree f%	Partially Disagree f%	Consensus %
Concept	3 (60)	2 (40)	--	--	--	100
Objectives	2 (40)	3 (60)	--	--	--	100
Responsible for Prescription	3 (60)	1 (20)	--	--	1 (20)	80
Responsible for Procedure	4 (80)	1 (20)	--	--	--	100
Materials Required	2 (40)	3 (60)	--	--	--	100
Procedure description						
a) Supine position	3 (60)	2 (40)	--	--	--	100
b) Semi-supine position	1 (20)	4 (80)	--	--	--	100
c) Prone position*	2 (20)	2 (20)	--	--	--	80
d) Restraint	2 (40)	3 (60)	--	--	--	100
Nest	3 (60)	1 (20)	1 (20)	--	--	80

Note: \*One item was blank.

### Position 1 - Supine position

#### Maximum flexion (Figure 1)

- Put the head in the midline, preventing craniofacial deformity and minimizing the risk of apnea or intermittent airway obstruction, as well as fluctuations in intracranial pressure (ICP), which may result from the lateralization of the head.
- Position the NB in the nest with the head near the middle line to suitable formation of the skull, thus avoiding enlongating the head.



Figure 1 - Maximum flexion

#### Support of the scapular area (Figure 2)

- Place a support under the shoulder, which can be made of folded cloth diaper to prevent the retraction of the humerus and allow the hands to reach the chest or mouth, thus giving support to the scapular area, avoiding abduction and scapular retraction that limit the ability of the child to do the rotation of the shoulder.
- Add rolls under the legs to encourage flexion and avoid excessive abduction and external rotation, promoting

maximum flexion with the aid of rolls or nests placed near the baby.

- Leave the chest region exposed in order to evaluate the respiratory pattern.



Figure 2 – Support of scapular area

### Position 2 - Semi-prone position (Figure 3)

#### Slight flexion of the trunk and head in the midline

- Use rollers to favor the position, keep the symmetry and perpendicular posture to the surface of the mattress.
- Position the NB in the nest, paying attention to the alignment of the head in relation to the body, keeping it in neutral position.

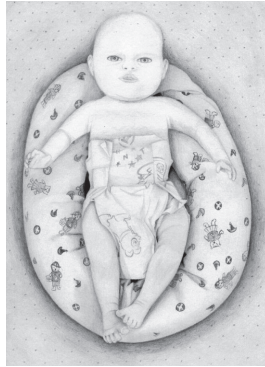
#### Support the lower limbs

- Place a bracket (roll) under the head, the torso and between the legs, with a roll between the members to keep a neutral position of the ends. The use of a diaper across the pelvis helps keeping the position and providing stability and flexion. The semi-prone position is preferable

to supine position if the child cannot be in the prone position.

#### **Flexion of the arms**

- Allow its hands to stay free so they can reach the mouth, to facilitate self-comfort and suction movements, ensuring the neutral position of the shoulder.
- If there is persistent shoulder retraction, use a pad to stabilize it toward the midline.
- Change the position as a routine procedure.



**Figure 3 - Semi-prone position**

#### **Position 3 - Prone position (Figure 4)**

##### **Spinal flexion**

- Put its head slightly bent in the midline simulating the fetal position is essential to the normal development, with the aid of rolls or nests.

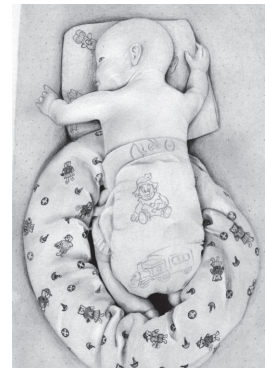
##### **Slight pelvic lift**

- Position the NB in the nest and put a horizontal roller or muslin square under its hips to keep the pelvic tilt and hip flexion, preventing a large abduction of lower limbs with the use of a small roll, so that its knees do not stay flexed in more than 90°.

##### **Correct angle of the feet**

- Put lateral support for the legs and feet in order to avoid foot eversion, excessive hip abduction and external rotation, providing support in order to avoid deformations and provide a contact base that favors the development of the CNS.
- Alternate the direction of the head, in the case of hypotonic children, and use a vertical muslin square (from sternum to pubic bone) to support the baby's chest and minimize shoulder retraction.

This is the preferred position when physiological stability is the most important thing for preterm babies. Even the sickest babies can be placed in prone position to ease the pulmonary expansion and improve oxygenation<sup>(14)</sup>.



**Figure 4 - Prone position**

#### **Restraint Nests**

Promote self-control, conservation of energy and reduction of physiological and behavioral stresses. This form of positioning should be used with caution before 36 weeks gestation, once the choke or gag reflex is not fully developed, increasing the risk of aspiration. It is, however, the position of choice when there is abdominal distension and umbilical catheterization, because it allows to detect early complications<sup>(15-16)</sup>.

The snuggle up or dandle-roo, restraining nest commercial models available only in foreign countries, can be used in order to perform the restraint. Another type of support is the frog or octopus, which can be used both around the head and neck as well as the hips, in order to help maintain proper positioning<sup>(17)</sup>.

#### **DISCUSSION**

A tool like SOP consists of a description of a procedure in a systematic order, allowing the team to perform its step by step execution. It facilitates work routine and provides security for the patient in relation to the compliance with the proposed item in a similar way by all professionals. The validation form using the Delphi technique allows for the evaluator to register the appropriateness or inappropriateness of each item, in order to understand if all aspects of that action have been addressed fully. It emphasizes the essential criteria that should be considered according to what each item proposes in the activity.

When being submitted to the expert evaluators, the SOP was considered approved in its first round of evaluation because all items obtained more than 60% of concordance, which was the cut-off point established in this study. Thus, the use of this SOP can be a tool that promotes patient safety and improves the autonomy of the professionals at the time of performing the positioning procedure of the preterm NBs in the NICUs.

However, for its practical validation - and this is a limitation of the study -, the SOP needs to be applied routinely in the NICUs, and there is the need for adjustments after a certain period of use. This phase still needs to be developed.

A study developed in China showed that the nursing team training with use of a protocol, associated with educational video and material available for the positioning has risen from

58.3% to 92.3% the knowledge of the nursing staff about the best position for the preterm NB. Still, the use of the correct positioning technique has increased from 63.3% to 91.4%. The authors recommend disclosing this form of knowledge to the teams, and its adoption in order to improve preterm NB care<sup>(3)</sup>.

On the importance of positioning the NB in the NICU, a study evaluated the effects during 24 hours of care and the positioning of the PTNB in the NICU and the factors associated with behavioral state change. Thirty babies were observed for three days in six states: sleeping quietly; sleeping in activity; transition when awake and active; awake and quiet; annoyed, or crying. NBs sleeping quietly has increased while the babies were not getting any care, social interaction, non-nutritious suction, and were positioned on their sides. The authors suggest that non-intrusive care, non-nutritious suction and positioning should be adopted as a routine in NICUs<sup>(18)</sup>. These findings reinforce our intention to validate the SOP for positioning of preterm NBs to apply in our reality of care in the NICUs.

In a study conducted to evaluate the knowledge of nurses of a NICU in New York about the best positioning of the baby to sleep, both in the unit and at the moment of discharge in order to guide parents, the authors found that 65% of the nurses considered the prone position as the best position for the sleep of the preterm NBs, followed by the side position at 12%. The most mentioned reasons to put the babies in the prone position during sleep were: reflux (45%), upper airways anomaly (40%), breathing impairment (29%), inconsolability (29%) and to promote development (17%). The study concluded that the nurses of the NICU do not follow a positioning standardization during hospitalization, as well as for discharge guidelines<sup>(19)</sup>. These results support our intention to develop a validated indication for the positioning, because national studies were not found on the subject during literature review in order to assure us for the proposition of the SOP. This refers to a possible lack of knowledge of NICU nurses on the best positioning option for the PTNB.

Another study was conducted to determine the perception about the positioning of PTNBs in the NICU with nurses, neonatologists, and occupational therapists. Ninety-nine percent of respondents agreed that the positioning is important for the welfare of the NBs. In the survey, 68% of the nurses and 86% of the occupational therapists identified dandle-roo as the ideal method for positioning of the NB<sup>(15)</sup>. It is an elaborate

nest in three-dimensional system of placement of the RN in prone, supine and side position to support the neurological development of preterm NBs. This type of artifact, despite non-existent in Brazil, can assist the nursing staff of the NICU in obtaining the best possible positioning for premature NBs. For this reason it was included in the SOP elaborated, being validated by the experts.

Another kind of nest described in a study is the snuggle up, also included in the SOP. According to the author, it can be used to ensure the flexion, restraint, alignment, and comfort of the NB<sup>(14)</sup>. Next to the moment of discharge, the NB should be placed in the supine position to sleep, wrapped only in a blanket. The family must receive indication about the best way of positioning for the NB to sleep at home. This indication is found in international literature, just as in this article, for the prevention of sudden death syndrome in NBs.

Another important point to highlight was found when reviewing literature in order to investigate the relationship between the positioning of preterm infants in the NICU and motor development. The study mentioned has analyzed 10 essays from 1985 to 2009. The results showed beneficial effects and potentially iatrogenic effects of the three types of positioning. They have influenced the development of motor components that are critical to the acquisition of functional skills by the PTNB. Thus, it is agreed with the authors that the regular variation of posture and the correct functional positioning as care strategies can mitigate the abnormalities and postural asymmetries associated with prematurity and permanence in intensive care. In addition, it favors the development of spontaneous motor and functional activity of the PTNB<sup>(20)</sup>.

Another literature review study concluded that the positioning of the preterm NB is an extremely important nursing care because it interferes in its physiology. However, the scientific literature in this area is still incipient<sup>(21)</sup>.

## FINAL CONSIDERATION

In countries like the United States, England and Canada, there are studies about the positioning of the preterm NBs in the NICU for at least two decades. In Brazilian literature, little was found about this subject. For this reason, the SOP created from this literature review is presented hoping to contribute to the debate and reflection about this practice among nursing professionals who work in NICUs in Brazil.

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