Revista Brasileira de Enfermagem
REBEn

THEMATIC ISSUE:
HEALTH OF WOMAN AND CHILD

RESEARCH

Clinical application of the Standard Operating Procedure of Positioning with Premature Infants

Aplicação clínica do Procedimento Operacional Padrão de Posicionamento com Prematuros

Aplicación clínica del Procedimiento Operativo estándar de Posicionamiento con Prematuros

Alessandra Madalena Garcia Santos[I], Claudia Silveira Viera[I], Beatriz Rosana Gonçalves de Oliveira Toso[I], Grasiely Masotti Scalabrin Barreto[II], Sarah Nancy Deggau Hegeto de Souza[III]

[I] Universidade Estadual do Oeste do Paraná. Cascavel, Paraná, Brazil.
[II] Hospital Universitário Oeste do Paraná. Cascavel, Paraná, Brazil.
[III] Universidade Estadual de Londrina. Londrina, Paraná, Brazil.

How to cite this article:
Santos AMG, Viera CS, Toso BRGO, Barreto GMS, Souza SNDH. Clinical application of the Standard Operating Procedure of Positioning with Premature Infants. Rev Bras Enferm [Internet]. 2018;71(Suppl 3):1205-11. [Thematic Issue: Health of woman and child] DOI: http://dx.doi.org/10.1590/0034-7167-2016-0674

Submission: 02-14-2017 **Approval:** 06-11-2017

ABSTRACT

Objective: To compare the physiological and behavioral responses of Premature Infant (PREEMIE) positioned by the Unit Routine Decubitus (URD) and the Standard Operating Procedure (SOP). **Method**: A quasi-experimental comparative study performed at a Neonatal Intensive Care Unit in Southern Brazil. We evaluated 30 PREEMIEs with gestational age ≤32 weeks, randomly assigned to Unit Routine Decubitus (URD) and Intervention Group (IG), subdivided into Right Lateral Decubitus (RLD), Dorsal Decubitus (DD), Left Lateral Decubitus (LLD) and Ventral Decubitus (VD). It was evaluated before, during and after the procedure: Heart Rate (HR); Respiratory Frequency (RF); Peripheral Oxygen Saturation (SpO2); behavior by the Neonatal Behavioral Assessment Scale (NBAS); by NIPS. **Results**: During the intervention, RR ($p = 0.023$), indexes in NBAS ($p = 0.01$) and NIPS ($p < 0.0001$) reduced significantly in SOP. HR and SpO2 did not present a significant difference. **Conclusion**: Positioning according to the SOP shows benefit in relation to the behavioral and physiological status of PREEMIE.

Desacriptors: Patient Positioning; Newborn Infant; Premature; Neonatal Intensive Care Unit; Therapy.

RESUMO

Objetivo: Comparar respostas fisiológicas e comportamentais de Recém-Nascidos Prematuros (RNPT) posicionados pelo Decúbito de Rotina da Unidade (DRU) e pelo Procedimento Operacional Padrão (POP) de posicionamento. **Método:** Estudo comparativo quase experimental, realizado em uma Unidade de Terapia Intensiva Neonatal no Sul do Brasil. Avaliados 30 RNPTs com idade gestacional ≤32 semanas alocados, randomizadamente, em Decúbito de Rotina da Unidade (DRU) e Grupo Intervenção (POP), este subdividido em Decúbito Lateral Direito (DLD), Decúbito Dorsal (DD), Decúbito Lateral Esquerdo (DLE) e Decúbito Ventral (DV). Avaliou-se antes, durante e após o procedimento: Frequência Cardíaca (FC); Frequência Respiratória (FR); Saturação Periférica de Oxigênio (SpO_2); comportamento pela Escala de Brazelton Modificada (EBM); dor pela NIPS. **Resultados:** Durante a intervenção, FR ($p=0,023$), índices na EBM ($p=0,01$) e NIPS ($p<0,0001$) reduziram significativamente no POP. FC e SpO_2 não apresentaram uma diferença significativa. **Conclusão:** O posicionamento conforme o POP evidencia benefício em relação ao estado comportamental e fisiológico de RNPT.

Descritores: Posicionamento do Paciente; Recém-Nascido; Prematuro; Unidade de Terapia Intensiva Neonatal; Terapêutica.

RESUMEN

Objetivo: Comparar respuestas fisiológicas y comportamentales de Recién Nacidos Prematuros (RNPT) colocados por el Decúbito de Rutina de la Unidad (DRU) y por el Procedimiento Operativo Estándar (POE) de posicionamiento. **Método:** Estudio comparativo casi experimental, realizado en una Unidad de Terapia Intensiva Neonatal en el Sur de Brasil. Evaluados 30 RNPTS con la edad gestacional ≤32 semanas asignado, aleatoriamente, en Decúbito de Rutina de la Unidad (DRU) y Grupo Intervención (POE), este subdividido en Decúbito Lateral Derecho (DLD), Decúbito Dorsal (DD), Decúbito Lateral Izquierdo

(DLI) y Decúbito Ventral (DV). Fueron evaluados antes, durante y después del procedimiento: La Frecuencia Cardíaca (FC); La Frecuencia Respiratoria (FR); La Saturación Periférica de Oxígeno (SpO_2); el comportamiento por la Escala de Brazelton Modificada (EBM); el dolor por la NIPS. **Resultados:** Durante la intervención, FR (p=0,023), los índices en la EBM (p=0,01) y NIPS (p<0,0001) redujeron significativamente en el POE. FC y SpO_2 no presentaron una diferencia significativa. **Conclusión:** El posicionamiento conforme el POE evidencia beneficio en relación al estado conductual y fisiológico de RNPT.
Descriptores: Posicionamiento del Paciente; Recién Nacido; Prematuro; Unidad de Terapia Intensiva Neonatal; Terapéutica.

CORRESPONDING AUTHOR **Claudia Silveira Viera** E-mail: clausviera@gmail.com

INTRODUCTION

In the last decades, prematurity has emerged as an eminent problem in the world and in Brazil, since preterm birth rates rose from 7.1% to 11.9% of total births, respectively, in the years 2010 and 2013[1-2]. The different regions of the country have different rates of preterm birth, evidencing a regional disparity, since in the northern region 12.9% of the births are premature, whereas in the South, the lowest rate is 11.1%[2]. Prematurity is usually associated with hospitalizations in hospital units to provide the necessary life support resources, as needed for each Premature Infant (PREEMIE).

The immaturity of PREEMIE, which presents greater difficulty in adapting to extrauterine life associated with clinical changes due to prematurity, may have repercussions on its organization and energy expenditure during hospitalization, as well as alterations in its Neuropsychomotor Development (NPMD). After birth, this newborn infant suddenly finds itself outside the environment that provides support and reference represented by the uterine walls and experiences a new space, that of the incubator walls, which causes insecurity, irritability, which generates a increased motor activity and increased energy expenditure[3].

In the extrauterine environment promoted by the hospitalization unit, the PREEMIE is often exposed to the excess of inappropriate stimuli that lead it to seek compensatory forms of organization, leaving it vulnerable to complications during the neonatal period. It is necessary that the health team of the Neonatal Intensive Care Unit (NICU) is prepared and attentive to minimize the effects of the unit's environment, the therapeutic behaviors and the management to reduce the sequelae resulting from that period in the life of the child and among these consequences of inadequate PREEMIE placement[4-5].

If the PREEMIE is not assisted by the health team to remain in a comfortable and protected position in the hospitalization, for example, if the extension position of Upper Extremities (UEs) and Lower Extremities (LEs) is maintained, there will be difficulty in adjusting in your organization for the full functioning of your body, as well as difficulty in the motor development of that child. This situation may lead to increased discomfort during sleep, pain, respiratory pattern, and transient hypotonias of lower extremities, scapular retraction and alteration of messages that are transmitted to the central nervous system, which leads to changes in development[6].

Thus, one of the strategies that can minimize these difficulties refers to the standardized positioning within the NICU. Although the benefits of adequate body positioning during hospitalization are known and there are some positioning protocols proposed in some studies, there is still no standard practice implemented and sustained around the world. The maintenance of adequate positioning, especially if it stimulates flexion, is able to collaborate for the motor and neuromuscular development of the premature newborn infant, in addition to reducing stress and stimulating the neuromotor system[6-7].

Therefore, the positioning, which consists of one of the basic care of the patient, is performed as a routine technique in hospitalization, however, in Brazil no study has been conducted to evaluate the effectiveness of a Standard Operating Protocol of Positioning, as opposed to the Routine Positioning Procedure of the units, specifically presenting the behavioral and physiological evidences of the PREEMIE in each positioning.

Thus, any positioning adopted should provide and support comfort for the Infant (INF), through flexor posture and with midline orientation, which will facilitate other later functions such as sucking, sitting, crawling and wandering. In all the placements, attention should be paid to respiratory function using the raised head and the neck semi-extension posture in order to rectify the airways and decrease the resistance at the air inlet. The head should be kept in midline to reduce the risk of increased intracranial pressure and the possibility of obstructive apnea (when under excessive neck flexion); hands should be kept free and close to the face; feet supported and ventral inhibition, because the INF likes to "grab" or possess something to snuggle. It is recommended to change the recumbency every three to four hours, providing the appropriate supports[8-9].

Therefore, the standardization of positioning, taking into account the benefits of each posture, should be considered, since the therapeutic positioning procedure is capable of directly interfering with the physiological response of prematurity, associated with improvement of respiratory function, reduction reflux episodes and time of gastric emptying, also acting on the cerebral circulatory pattern and the behavioral development[6].

Recently, a Standard Operating Procedure (SOP) for PREEMIE was presented[10], which requires application in clinical practice to contribute to its validation for use in NICUs. In this sense, this study proposes to compare physiological and behavioral responses of preterm infants (PREEMIE), positioned by the Unit Routine Decubitus (URD) and the Standard Operating Procedure (SOP) of positioning.

OBJECTIVE

Show the positioning that the Standard Operating Procedure (SOP) benefits in relation to the routine positioning of a NICU.

METHOD

Ethical aspects

The study was approved by the Human Research Ethics Committee (HREC) of the institution and respected the ethical and legal precepts of studies with human beings.

Design, place of study and period

A study with a comparative, univariate, prospective study conducted between July 2015 and April 2016 in a NICU of a hospital in southern Brazil (Figure 1)[11]. The NICU in the study is composed of 10 beds, with total care by the Unified Health System (SUS), around 70-80% of the beds are occupied by PREEMIE, with an average stay of 68 days.

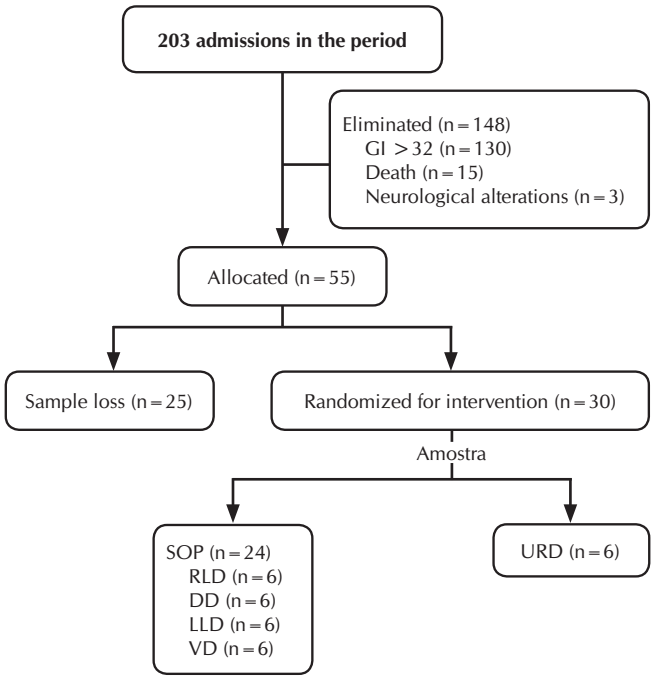
Population and sample

Preterm infants were included in the study using simple probabilistic sampling, in which they were randomized with fixed allocation; the researcher who developed the randomization process was not involved in the recruitment of participants. From the randomization, the PREEMIEs were distributed in the position of the SOP (Dorsal Decubitus - DD, Right Lateral Decubitus - RLD, Ventral Decubitus - VD, Left Lateral Decubitus - LLD) or in the control group, which was submitted to the Unit Routine (URD). Thus, two groups were formed, the Intervention Group (IG), composed of the PREEMIEs who were submitted to the positioning SOP, which was applied by the responsible researcher and the Control Group (CG), which received a positioning by a nursing team according to the routine of the unit. To that end, each week the PREEMIE admitted to the NICU became part of the five groups in the referred decubitus; this procedure was repeated over five days for six weeks. The sample for the study was then composed of six PREEMIEs for each position (24 PREEMIEs in the SOP and six in the URD), totaling 30 PREEMIEs (Figure 1). The previous sample calculation was performed using the GPower 3.1 program, obeying a test power of 0.94, effect size of 0.25 and level of significance of 0.05.

Inclusion and exclusion criteria

The study had as inclusion criteria: PREEMIE with GA ≤ 32 weeks; without congenital or neurological abnormalities, since they could influence the behavioral response evaluated. Exclusion criteria included PREEMIE with some clinical cause that prevented the change of decubitus or PREEMIE without legal accompanying person.

As a result of the long stay of the PREEMIE in the NICU and the total number of beds in the unit, obtaining large sample sizes was not possible. Thus, 55 hospitalizations occurred during the period in which the collection occurred, in addition to the exclusions after the application of the criteria for inclusion of the PREEMIEs, 55 PREEMIEs were eligible for the study. However, during each week of evaluation of the groups there were sample losses due to discharge from the NICU (death or referral to another unit) and clinical instability that prevented SOP placement. Then there was the loss of 25 participants, composing the final sample 30 PREEMIEs, randomized between SOP and URD.



Note: GA: Gestational Age; URD: Unit Routine Decubitus; SOP: Standard Operating Procedure; RLD: Right Lateral Decubitus; DD: Dorsal Decubitus; LLD: Left Lateral Decubitus; VD: Ventral Decubitus.

Figure 1 – Sample distribution flowchart (CONSORT, 2010)[11]

Study Protocol

The procedure was performed during five consecutive days of intervention and started 30 minutes before the second morning decubitus with the baseline data collection: Heart Rate (HR), Respiratory Rate (RR), Peripheral Oxygen Saturation (SpO2); evaluation of pain by the Neonatal Infant Pain Scale - NIPS[9] and behavioral evaluation by the Neonatal Behavioral Assessment Scale (NBAS)[12]. These variables were verified for the URD and GA - SOP, as follows: 30 minutes before positioning the PREEMIE; 30 minutes after placement; in the three hours following the positioning and 30 minutes after the positioning change.

Positioning according to SOP[10] relies on nests, rollers or other supports, in order to ensure the proper body position of the infant and comprises the following guidelines:

Dorsal decubitus: position the head in midline, flexion and adduction of UEs and LEs, avoiding excessive abduction and external rotation. Also, keep the chest exposed to allow evaluation of the respiratory pattern.

Lateral decubitus (right or left): provide slight trunk flexion, keep the head in midline; put a support between the legs to maintain a neutral position of the extremities and keep the UE free so that they can explore the mouth and facilitate the movements.

Ventral decubitus (pronation): Position a roller horizontally to maintain proper hip and pelvic tilt and keep the knee properly flexed. Also maintain a lateral support for the legs and feet in order to avoid deformities and excessive abduction of the hip.

Positioning in the URD group was according to the technique of the nursing professional responsible for the PREEMIE in that period and could vary among the four possible decubitus.

Results analysis and statistics

As a measure of primary outcomes, the proportion of PREEMIEs who had an improvement in their physiological (HR, RR, SPO2) and behavioral (Brazelton scale, NBAS) compared to the baseline data was considered. As measures of secondary outcomes, the difference in the NIPS score was considered. The results were submitted to ANOVA (unidirectional and Friedman), Unpaired T-test and Mann-Whitney tests for the numerical and categorical variables, respectively. The tests were performed using the significance level of 5%. The BioStat 5.0 program was used.

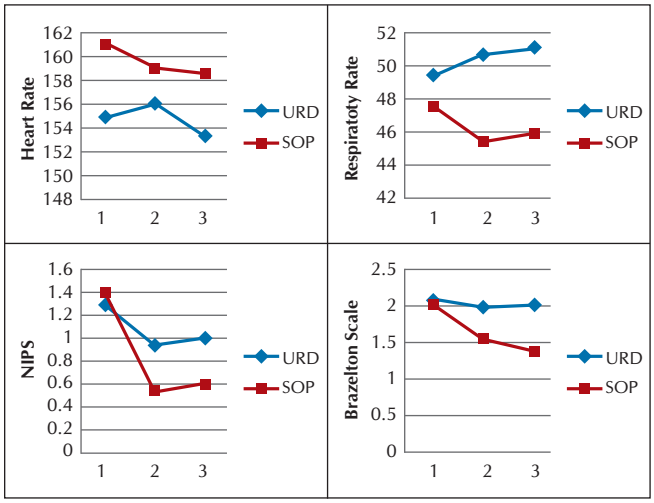
RESULTS

Of the total participants in the study (n = 30), GA was concentrated between 28 and 32 weeks and birth weight between 1001 and 1499 grams, characterizing the sample as very premature and very low birth weight. Prevalence in the URD was female (n = 04) and male (n = 16) in the SOP population. Still, URD participants did not undergo any type of sedation and conversely, 42% of SOPs were sedated at some point in the study. Most, in both groups, made use of O2. The URD and SOP did not show significant statistical differences in relation to the clinical characteristics verified (p value ≥0.05).

Analyzing the physiological responses between SOP and URD, it was observed that HR and SpO2 did not present a significant statistical difference between the groups. RR tended to reduce (p=0.058) the SOP group at the end of the procedure, when compared to the URD (Figure 2). Regarding the behavioral evaluation, this showed a significant reduction during the positioning by the SOP (p=0.04), as well as the analysis of pain (p=0.03) when compared to the URD (Figure 2).

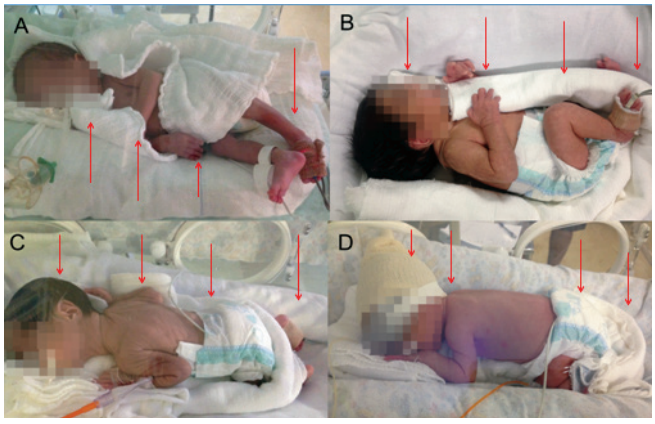
When performing the qualitative analysis of the images by the comparison between the URD and the SOP during the positioning, it is observed during the lateral decubitus in Figure 3 (A and B) that the SOP patient (B) is positioned in a position favor their comfort and relaxation when compared to the URD (A) patient. In the SOP group, the head is in the midline, the positioning of UEs and LEs are in flexion, relaxed and with distal support in the lower extremities, as well as trunk and hip are aligned, which may favor the correct motor stimulation necessary for the development and contribution to higher or lower energy expenditure due to the greater relaxation and comfort of the PREEMIE.

Also in Figure 3 (C and D), during the ventral decubitus, it can be verified that the patient of the URD (C) presents/displays rotation and inadequate extension of head, contraction of UPs, rotation of hip and lack of support in LEs. This positioning can result in torticollis, postural asymmetries and deficits in the adequacy of tonus and muscle strength and contribute to greater discomfort of the PREEMIE, requiring greater effort and energy expenditure to promote the adjustments in its organization in order to the proper functioning of its organism. On the other hand, the PREEMIE positioned in accordance with the SOP (D) has the head positioned in the right position for the VD, flexed and relaxed UEs and with support in the hip and the lower extremity, factors that may help adequate motor, respiratory and behavioral stimulation.



Note: DRU: Unit Routine Decubitation; POP: Operational Procedure Pattern; NIPS: Neonatal Infant Pain Scale

Figure 2 – Cardiopulmonary, behavioral and pain response of the Unit Routine Decubitus and Standard Operating Procedure groups (intervention), Cascavel, Paraná, Brazil, 2016



Note: A and B: Lateral decubitus - URD and SOP PREEMIE (intervention), C and D: Ventral decubitus - PREEMIE of URD and SOP (intervention).

Figure 3 – Comparison of the PREEMIEs positioned according to the Unit Routine Decubitus and Standard Operating Procedure groups, Cascavel, Paraná, Brazil, 2016

DISCUSSION

When the HR was analyzed, the URD had lower HR at the beginning of the intervention, whereas during the procedure the SOP group reduced HR, however, this difference was not statistically significant. Corroborating with these findings, a study[13] showed that during the adequate positions with the raised head and the inclined body there was no association with the changes in the HR or blood pressure. This stability also occurred in the SpO2 evaluation, in which both groups started with the same saturation value, and only the URD reduced SpO2 during the intervention, but without significant statistical difference between the groups, showing the maintenance of SpO2. A similar study was observed in a study[14] that evaluated 12 PREEMIEs with GA between 24 and 32 weeks.

In the RR analysis, the SOP had a significant reduction tendency when compared to the URD. The standardized and adequate positioning is capable of improving the respiratory capacity of the patients submitted to it, besides optimizing the physiological stability that consequently favors the improvement of the respiratory pattern capable of reducing RR[15]. In the development of a study[16], which compared the INFs in normal conditions (dorsal and lateral decubitus) and VD, it was found a significant reduction in RR when INFs were positioned in VD, suggesting a reduction in stress levels with the positioning in appropriate VD.

During the evaluation of EBM and NIPS, the SOP group presented a significant reduction of the scores during the procedure of the two scales. The reduction in the EBM scores can be related to the greater comfort in the positioning, which generates a decrease of the stress, and with that, lower energy expenditure. Consequently, it contributes to the child's development and clinical evolution during hospitalization[17]. Reinforcing the importance of adequate positioning through well-established routines and care protocols, which is a gap in the scientific production of the areas of nursing and physiotherapy. Therefore, it is not enough only to perform a change of decubitus in the NICU, it should have a patterned method.

Regarding the behavioral state, in a study[18], that evaluated the care and positioning effects of 30 PREEMIEs in a NICU during three 24-hour periods and the factors associated with behavioral changes, the results showed that during the evaluation, the INFs in the state of quiet sleep increased while infants were not receiving care, social interaction and non-nutritive sucking, being positioned laterally. Also, the number of crying and agitated newborn infants increased when they received uncomfortable or even routine care.

Another study[19] observed that PREEMIE submitted to the proposed positioning, represented by the involvement of the PREEMIE in a tissue maintaining flexed UEs and LEs presented better responses in relation to the motor and reflex response in relation to those receiving usual positioning methods.

Recognizing that PREEMIE does not present adequate muscle tone, they are therefore at risk for the development of abnormal movement patterns as well as skeletal deformities. In the observation of figure 3, it can be suggested that PREEMIE submitted to URD is subject to possible skeletal and motor deformities, since their posture does not promote adequate support and restraint for their body mechanics. On the other hand, observing the SOP birth infants, it is noted that this procedure facilitates the comfort of the PREEMIE when compared to the figures representing the URD group, contributing to the better adjustment of the PREEMIE organization in the NICU environment. Proper head positioning, for example, prevents head and neck deformities such as torticollis and plagiocephaly, changes that may influence the acquisition of motor markers along the NPMD such as rolling, sitting and crawling[6]. However, we suggest the development of follow-up studies with PREEMIE egress from NICU in order to evaluate the damage resulting from the positioning, since they are long-term consequences and in this study model, which cannot be verified.

It is found in the literature[17-18] that the maintenance of calmer states requires less energy expenditure, which contributes to the recovery of the PREEMIE in the NICU. Furthermore, the study concluded that the use of a positioning protocol for PREEMIE leads to variability in movement velocity and the newborn infants brought their hands to the midline more than those who did not receive a positioning protocol[20].

Therefore, as observed in this study and corroborated by the evidence, it is suggested that adequately positioning the PREEMIE during hospitalization using clinically tested and validated protocols may contribute both during the hospitalization period and after discharge from the NICU.

Study limitations

The sample size, the intervention period, which was five days for each PREEMIE, and the absence of follow-up of these PREEMIEs were considered as study limitations, in order to assess, in the long term, the appearance of motor and developmental sequelae, which were not possible in a cross-sectional study like this. It is suggested that a follow-up throughout the length of stay in the NICU be performed in order to reinforce the benefits of this standardized and adequate procedure during the entire period of PREEMIE stay in the NICU. Also, follow-up studies of premature newborn infants by nurses in childcare and by physiotherapists to determine the effects of standardized positioning on the outcome of neurological development in childhood.

Study contributions

It is hoped that the results will stimulate health professionals to implement the protocol analyzed in the study in their daily practice, based on the understanding that the positioning goals with the PREEMIE include not only the promotion of flexion, but also the including the prevention of head flattening and external rotation of the hips and promotion of midline orientation to avoid asymmetrical posture and movement. In the long term, it is expected that standardization of positioning will contribute to the reduction of postural asymmetries within the NICU and after hospital discharge.

CONCLUSION

The findings showed that the primary outcomes expected for the intervention were obtained, since there was a reduction in the RR, HR and the Brazelton scale scores in comparison to the baseline parameters for the SOP group. The secondary endpoint that referred to the pain scale scores (NIPS) was also reached, since after the intervention, the scores showed reduction when compared to the period.

For this, the data observed in the NIPS and EBM scales, as well as the reduction in the RR, may be related to the fact that the PREEMIE is calmer, relaxed and comfortable when positioned according to a SOP, since, despite starting from the same average parameter of pain, for example, PREEMIE who were positioned according to a SOP significantly reduced pain scores. Still, they presented lower scores in EBM, which demonstrate a deeper, calmer and more comfortable sleep. This quieter state may have a relationship in maintaining SpO2 and reducing RR.

The positioning SOP showed benefits in relation to the routine positioning of a NICU. Thus, it is suggested that a

positioning SOP may interfere directly with the physiological and behavioral response of PREEMIE, and may, in the long term, reduce the occurrence of musculoskeletal disorders such as plagiocephaly, brachycephaly and torticollis. Thus, contributing to the clinical recovery during hospitalization and promoting better alignment and body position to avoid damages in the acquisition of motor milestones throughout the development.

Employ, therefore, routine placements of preterm infants in NICU hospitalization should follow SOP positioning to avoid future sequelae of these children. The health team must be prepared to implement it in the daily care.

FUNDING

This research was a project clipping entitled "Repercussions of prematurity: maternal stress and metabolic programming after hospital discharge", approved by the National Council for Scientific and Technological Development (CNPq) under the process: 457109 / 2014-9.

ACKNOWLEDGMENT

CAPES (Coordination for the Improvement of Higher Level Personnel), by the grant award.

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