SEVEN
publicações acadêmicas

BUNDLE FOR PAIN RELIEF IN ARTERIAL PUNCTURE IN NEWBORNS HOSPITALIZED IN INTENSIVE CARE

https://doi.org/10.56238/sevened2024.042-001

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ABSTRACT

Objective: To describe the process of applying a bundle for pain relief during arterial puncture of the newborn. **Method:** cross-sectional study, with a quantitative approach, carried out between June and September 2019, through non-participant observation of arterial blood collections together with the application of the bundle and calculation of the pain score presented by the baby. The data were analyzed descriptively and using the Mann-Whitney test with a significance index of 5%. **Results:** 186 arterial punctures were observed, of which 34 were included. There was an increase in pain scores located at the minimum limit, while the intense score decreased due to the use of the bundle. Statistical significance was also evidenced in the comparison of pre- and post-bundle pain scores. **Conclusion**: it was concluded that the bundle had positive results, however the work routine and inadequate sizing were pointed out as impediments to its application.

Keywords: Pain management. Care set. Neonatal nursing.

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INTRODUCTION

The definition of pain encompasses an unpleasant sensory, emotional, and associated experience associated with real, potential, and described tissue injury, always subjectively[1]. In newborns, this concept does not apply literally, since this population does not verbalize and has not yet had previous painful experiences that would allow the comparison and exact description of the sensation of pain[2].

It is estimated that numerous routine procedures and interventions are performed within a neonatal intensive care unit (NICU), with an average of 51 painful stimuli in just one day, including punctures, aspirations, among others[3]. Thus, the professionals who work in these units are increasingly concerned with measuring the painful sensations related to manipulations, since the newborn, even being premature, has sufficient brain maturity to conduct and perceive the painful stimulus[4]. Since the neonate, including the preterm infant, is understood to have sufficient brain maturity to conduct and perceive the painful stimulus[4].

Although babies do not verbalize, the baby's pain can be identified by means of scales, considering physiological changes, such as heart and respiratory rate, blood pressure, oxygen saturation, vagal contraction, palmar sweating and hormonal changes and, at the same time, it can be analyzed using behavioral criteria, such as facial expression, sleep status, crying and wakefulness, and body movements associated with physiological parameters[5].

Available methods for pain relief include administering medications and non-pharmacological therapies, such as oral glucose delivery, non-nutritive sucking, kangaroo position, swaddling, and even organizing care in a way that groups and reduces manipulation of the baby. In addition, noise and luminosity are reduced, so as to enable the identification and individual treatment of each baby, valuing their uniqueness[6].

One of the challenges in pain management is that care is based on scientific evidence and not only on the subjective level. One strategy to improve care is the application of bundles during care. The term was first described in the Guideline for the Prevention of Intravascular Catheter-Related Infections by the Centers for Disease Control and Prevention (CDC), which states that measures incorporated into health care can be applied through a package, that is, a set of scientific evidence grouped by relatively simple and low-cost interventions, which, when applied together, result in a better outcome than when implemented individually[7,8].

In a study carried out within the NICU with the objective of reducing the rate of infection by multidrug-resistant (MDR) bacteria through the application of a bundle, there

was an increase in the rates of compliance with isolation standards (from 55.8% to 92.8%) and hand hygiene (from 90 to 93%), as well as a reduction in the rates of infection from 1.87 to 1.71% and detection of the MDR bacteria. which went from 2.63% to 1%[9].

Another study carried out with the objective of reducing hypothermia in babies born with low birth weight (less than 2,500 g), considering that this may be a criterion that leads to hospitalization in the NICU, demonstrated that with the use of the bundle the monthly hypothermia rate fell from 29.8% to 13.3% and at the end of the intervention period the rate of 10% was reached[10].

Based on the scientific evidence that points to significant results derived from the use of the care package, and considering that, so far, its use has not been identified for pain management in neonatal units, the hypothesis was defined that the application of a bundle for pain relief during arterial puncture could reduce the discomfort felt by the baby. Thus, the objective of the study was to describe the process of applying a bundle for pain relief during arterial puncture of the newborn.

METHOD

This is a cross-sectional study with a quantitative approach. The research is part of the third phase of the doctoral thesis research entitled: "Construction of a bundle for pain management during arterial puncture in premature newborns" whose objective was to develop and implement a bundle for pain relief in arterial puncture of newborns.

In the first phase of the study, a situational diagnosis of the unit was performed and the pain scores obtained were calculated from the use of a scale to measure pain during the arterial puncture of the babies. This stage was consolidated through non-participant observation (pre-bundle phase). The second phase included the construction of the bundle, in a participatory manner and in line with the nursing teams, along with the definition of strategies for its application; and in the third phase, the focus of this study, the bundle was applied, with measurement of pain scores, through the use of the same scale, and comparison with the pre-bundle phase, when such a strategy was not employed.

The study was carried out in a neonatal and pediatric ICU of a private hospital in the northwest of Paraná, and based on evidence about the non-pharmacological management of pain in the neonatal period. The unit has been in operation since 2014 and has 12 beds for the hospitalization of babies and children.

To select the population, an intentional sampling was used, since it was observed in the pilot phase of the study that the vast majority of premature babies born at the age of 30 weeks were on mechanical ventilation, a condition that prevents the offer of non-nutritive

sucking. Based on this finding, the inclusion criterion was defined as babies with a gestational age equal to or greater than 30 weeks and who underwent arterial puncture.

Neonates who were on mechanical ventilation, receiving continuous sedation-analgesia, who were in the immediate postoperative period and with a time of admission to the unit of less than 06 hours were excluded.

The punctures were observed by the researcher herself using an instrument created for this purpose, which aggregated the baby's birth data, main diagnoses, which items in the bundle were applied at the time of the puncture and complications during the procedure.

To quantify the pain score presented by the baby at the time of puncture, the Premature Pain Infant Profile (PIPP) scale was used. Each parameter of the scale can receive a score ranging from 0 to 3 and that, when added at the end of the evaluation, provide the final score. The maximum score for preterm infants with gestational age less than 28 weeks is 21, and for infants 36 weeks or older, 18. According to the authors, the non-identification of pain, or pain on a minimum scale, is found when the score is less than or equal to 6. When the values are above 12, moderate or severe pain is delimited. Scores between 7 and 11 also fit into this range of moderate or severe pain[11].

The PIPP scale[11] was used by the researcher herself, during the non-participant observation of arterial puncture concomitant with the application of the bundle, which was previously constructed with the team in the second phase of the study. The entire nursing team that participated in the second moment was aware of the content of the bundle, since it was built together and composed of items listed by the professionals themselves.

Data collection was carried out between June and September 2019, during the punctures for arterial blood collection, in the morning. The application of the bundle also took place during this period, since this is the unit's routine. In rare exceptions, blood collections are carried out in another shift.

The bundle consisted of the following items: facilitated restraint or rolling, oral administration of 25% glucose, non-nutritive suction, and attempted arterial puncture. It was selected to perform "one puncture attempt" as an item in the bundle, considering that excessive manipulation and exposure to multiple procedures contribute to increased pain, negatively impacting the baby's development. In addition, premature and hospitalized babies have a lower pain threshold, a situation that can compromise their basal state completely, indicating that the lower the exposure to manipulation, the lower the stress and pain indexes, and the greater the chances of promoting adequate development[12].

The bundle was schematized in the form of a reminder, which was displayed in the incubator of the baby who would receive the procedure. The materials necessary for its

application, such as gloves for non-nutritive suction, 25% glucose ampoule, and swaddling or compress for restraint or rolling, were requested by the researcher for the nursing team and left with the material for test collection (blood bottles, scalp, syringe, and cotton with 70% alcohol).

Oral glucose, together with non-nutritive sucking, was offered to the baby at least 02 minutes before the beginning of the puncture. When the baby was comfortable, well positioned, and receiving relief measures, the procedure was initiated, as well as the non-participant observation phase. At the end of the procedure, and in order to measure the pain score as recommended by the PIPP scale[11], the baby was permanently observed for 30 seconds.

As soon as the data collection began, the researcher refrained from any interference in the scenario, and those responsible for the collection were responsible for all conducts[13]. At times when more than one puncture was performed at the same time, the pair who were performing the collection was asked to wait. This recommendation was not always met, due to the routine imposed by the unit and in view of the need for results as soon as possible.

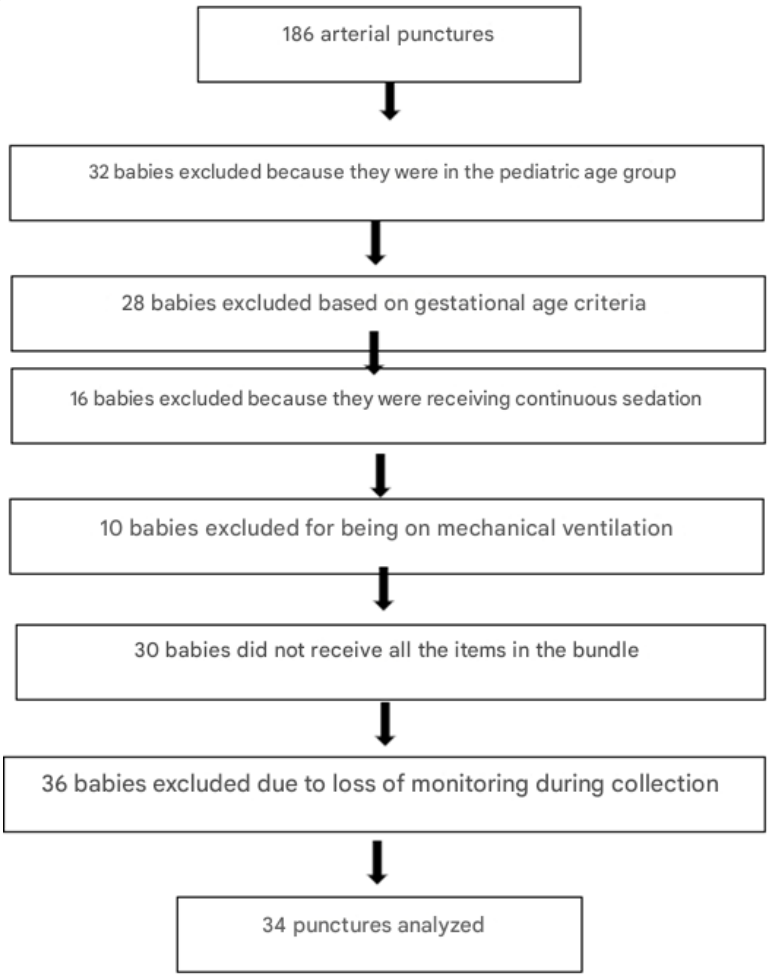
The data from the non-participant observation were tabulated in an Excel spreadsheet and analyzed by means of descriptive statistics, and the pain scores were calculated according to the recommendations of the scale. The Mann-Whitney test with a significance level of 5% was used to compare pain in pre-bundle and post-bundle arterial puncture. The data was stored by the researcher in her own collection.

All participants were given an Informed Consent Form (ICF), which was signed in two copies, observing all the ethical precepts recommended by res. 466/2012-CNS. The confidentiality of the information was observed through the coding of the participating subjects and institutions. The study was approved by the Human Research Ethics Committee under opinion No. 2,680,438/2018 and CAAE 89368518.0.0000.0104.

RESULTS

Arterial punctures were observed in babies born with gestational age between 30 and 41 weeks, totaling 186 collections, but of these only 34 were included according to the previously determined criteria. The results regarding the arterial punctures included in the sample are shown in Figure 1:

Figure 1 - Arterial punctures in a neonatal intensive care unit: Phase III



Source: The author (2019).

The gestational age of the infants ranged from 31 weeks and two days to 39 weeks, and the diagnoses were transient tachypnea of the newborn, early jaundice, early and late sepsis, pneumonia, grade I intracranial hemorrhage, enterocolitis, pneumothorax, and intrauterine growth restriction.

At the time of collection, the babies' weight ranged from 1,875 g to 3,470 g. The predominant type of delivery was cesarean section and 62% of the NB were male, 34% were using positive pressure in the upper area (CPAP), 52% were using oxygen in the incubator and 14% were using room air.

Table 1 details the pain scores at the time of arterial puncture. It is worth mentioning that phase I of the study aimed to make an initial diagnosis of the unit, characterized as a descriptive study, and the results found at that time were also analyzed in this way, dispensing with the use of inferential statistics. In phase I, the same inclusion and exclusion criteria were applied, as well as the use of the PIPP scale to measure the pain score. Those found ranged from 6, indicating mild or minimal pain, to 17 indicating moderate to severe pain.

In order to facilitate understanding and present the data in a comparative way, Table 1 was constructed with the inclusion of data from the phase prior to the application of the bundle (phase I, previously described in the method):

Table 1 – Pain scores during arterial puncture, pre- and post-bundle

Dor Scores	Pre-bundle		Post-bundle	
	FA	FR	FA	FR
Minimum (≤ 6)	6	18%	19	56%
Moderate to severe (7 to 11)	11	32%	9	26%
Moderate to severe (> 12)	17	50%	6	18%
Total	34	100%	34	100%

FA: Absolute frequency; FR: Relative frequency.
Source: Data collection (2019).

Although there are still moderate to severe pain scores, it is noted that there was a significant reduction in pain from the pre-bundle phase to the post-bundle phase, from 32% to 26%, while scores above 12 also decreased significantly, from 50 to 18%. It is noteworthy that the minimum scores have increased, from 18 to 56%, a finding that can be attributed to the application of the non-pharmacological relief measures proposed by the bundle.

The Mann-Whitney test showed that pain during the arterial puncture procedure after bundle application was lower than pain when pre-bundle puncture (p= 0.000583).

The private and individual analysis of the items in the bundle showed that each item was applied with a minimum rate of 50%, with non-nutritive sucking with a rate of 88%, the use of oral glucose with 72%, restraint/curling with 68% and the performance of a puncture attempt in 59% of the procedures. Such analysis is performed with the purpose of verifying which strategies need to be optimized, in order to outline interventions or replanning that ensure the accomplishment of all items at an initial rate of 80%, until the consistency in the interventions reaches 95%[14].

DISCUSSION

The fact that the researcher had to remind the team about the material needed for the application of the bundle during the procedure can be considered a limitation of the study, as it demonstrates that the team training process was not fully effective. It is also not possible to affirm that the bundle was applied at times when the researcher was not in the unit. The employees alleged the busy routine as a factor for not performing it.

Other factors that limited the study were the lack of glucose at the time of collection and the resistance to waiting for it to be brought from the pharmacy, keeping the baby in easy restraint. In addition, the fact of puncturing the baby in a state of psychomotor

agitation and with alteration of vital signs should have been avoided, since this would consequently influence his pain score.

Despite the obstacles encountered during the process, at the moments when the bundle was applied, the pain scores presented by the babies were lower. Thus, even if the presence of pain was measurable by the scale, it was of lower intensity.

It is understood that, although the use of the bundle for pain management is still relatively new, this instrument has been applied in other contexts with promising results. Its use began within the scope of patient safety, in order to prevent bloodstream infections, ventilator-associated pneumonia and urinary tract infection, and was later gradually expanded to other realities[15].

Among the various procedures performed in the neonatal environment, it was found that the development of a bundle to reduce the rates of unscheduled extubation in the NICU presented positive results with a reduction in extubation rates[16]. It is understood that extubation is a different event from isolated pain, but the fact that the care package is used to prevent a serious situation that is susceptible to complications such as painful stimulation, shows that bundle has applicability within the neonatal environment.

The use of the tool for the prevention of intracranial hemorrhage has also shown successful results. In this situation, the bundle applied was composed of measures related to the baby's handling, such as keeping the baby's head aligned with the body in the first 72 hours of life. It was evidenced that its use reduced the risk of developing hemorrhage and, consequently, reduced mortality in very premature babies[17]. It is confirmed that the care recommended by this bundle, as in our study, involved relatively simple measures that depended largely on the involvement of the team to be put into practice.

Regarding the scope of more subjective and multifactorial issues, another study tested the effects of the use of the bundle in reducing the number of cases of falls and ensuring safe sleep for babies during the period of hospitalization in rooming-in right after birth, demonstrating positive results[18]. Again, it is possible to observe the applicability of the bundle in a situation that is not as specific as that of a procedure, but equally important.

It is possible to perceive that the use of the bundle depends on the involvement of the entire team, so that the care listed can be applied together. Thus, the need for training of the teams is evidenced, aiming at permanent and continuing education activities. Especially in neonatal units, where the population cared for is even more specific, updating health professionals in the face of the identification of the problems presented and especially on pain management is something that helps to broaden the perception of the theme and stimulate processes of critical reflection on the practice itself[19].

One of the main difficulties pointed out by the professionals in the study and by others who work in the care area was the lack of adequate sizing, a situation that ends up having a direct impact on care practice, considering that the overload of activities leads to the performance of care in a mechanized and unreflective way. To change this scenario, a collective awareness movement is needed, which encompasses both professionals who are on the front line and those in senior management, in order to be able to guarantee, in addition to care based on scientific evidence, a team that can perform its work in a dignified way and involved with care and care technologies that will benefit patients, especially babies[20].

Due to the difficulties that exist both within care and in the scope of management, it is perceived that there is still a gap between the scientifically produced knowledge and its application in practice, so the implementation of new measures, such as the use of bundles to be used in care, should be created through knowledge of the cause that is intended to be treated and together with the care team. Regarding pain in the neonatal period, the use of relief measures in the form of a care package should be put into practice, focusing on minimizing discomfort and remembering the long-term consequences that both hospitalization and painful stimuli can cause, especially emotional, behavioral, learning and growth changes[21].

Within nursing, the use of the bundle should be encouraged, as it is observed that most professionals have intrinsic knowledge related to pain management, but the behavior visualized in practice is not congruent with it. It is understood that the data cannot be generalized because they portray a local reality, but the study becomes innovative by bringing such discussions to light and fosters the need for additional investigations on behavioral determinants and what are the influential factors for not performing a certain practice when its benefits are aware[22].

CONCLUSION

It was possible to describe the process of application of the bundle within the unit and its repercussions. Thus, although the pain scores were not reduced to zero, it was possible to evidence a significant decrease in the scores that indicated moderate or severe pain and, at the same time, there was statistical significance in the comparison of the pre- and post-bundle pain scores. These findings allow us to infer that the bundle had positive results.

It is suggested that the tool be more broadly applied, anchored in the support of managers and led by nursing professionals working in neonatal care, in order to incessantly

seek the increasing qualification of care and the reduction of damage caused by pain and suffering in hospitalized babies.

REFERENCES

1. INTERNATIONAL ASSOCIATION FOR THE STUDY OF PAIN (IASP). IASP terminology. 2018. Disponível em: https://www.iasppain.org/Education/Content.aspx?ItemNumber=1698. Acesso em: 2 jan. 2021.

2. CARTER, B. S.; BRUNKHORST, J. Neonatal pain management. Semin Perinatol. 2017, v. 41, n. 2, p. 111-116. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4254489/. Acesso em: 2 jan. 2021.

3. FIELD, T. Preterm newborn pain research review. Infant Behav. 2017, v. 49, p. 141-150. Disponível em: https://www.sciencedirect.com/science/article/abs/pii/S0163638317301868. Acesso em: 28 dez. 2020.

4. LIM, Y.; GODAMBE, S. Prevention and management of procedural pain in the neonate: an update. Pediatrics. 2016, v. 137, n. 2, e20154271. Disponível em: https://pediatrics.aappublications.org/content/137/2/e20154271. Acesso em: 28 dez. 2020.

5. ANDREAZZA, M. G.; MOTTER, A. A.; CAT, M. L.; SILVA, R. P. G. V. C. Perception of pain in newborns by nursing team in a neonatal intensive care unit. BJHR. 2017, v. 19, n. 4, p. 133-139. Disponível em: https://periodicos.ufes.br/rbps/article/view/19813. Acesso em: 2 jan. 2021.

6. CAMPOS, A. P. S. Neonatal pain: knowledge, attitude and practice of the nursing team. Br J Pain. 2018, v. 1, n. 4, p. 354-358. Disponível em: https://www.scielo.br/pdf/brjp/v1n4/1806-0013-brjp-01-04-0354.pdf. Acesso em: 27 dez. 2020.

7. RESAR, R.; GRIFFIN, F. A.; H ARADEN, C.; NOLAN, T. W. Using care bundles to improve health care quality: Institute for Healthcare Improvement. 2012. Disponível em: https://emergencylaparotomy.org.uk/wp-content/uploads/2015/11/IHIUsingCareBundlesWhitePaper2012-1.pdf. Acesso em: 7 jan. 2021.

8. KAIER, K. et al. Implementing strategic bundles for infection prevention and management. Infection. 2012, v. 40, n. 2, p. 225-228. Disponível em: https://pubmed.ncbi.nlm.nih.gov/21877178/. Acesso em: 7 jan. 2021.

9. HUANG, H.; RAN, J.; YANG, J.; LI, P.; ZHUANG, G. Impact of MRSA Transmission and Infection in a Neonatal Intensive Care Unit in China: A Bundle Intervention Study during 2014-2017. Biomed Res Int. 2019, v. 21, p. 5490413. Disponível em: https://www.hindawi.com/journals/bmri/2019/5490413/. Acesso em: 23 jun. 2021.

10. ANDREWS, C. et al. Quality-Improvement Effort to Reduce Hypothermia Among High-Risk Infants on a Mother-Infant Unit. Pediatrics. 2018, v. 141, n. 3, e20171214. Disponível em: https://pubmed.ncbi.nlm.nih.gov/29444816/. Acesso em: 23 jun. 2021.

11. BUENO, M. et al. Tradução e adaptação do premature infant pain profile para a língua portuguesa. Texto Contexto Enferm, Florianópolis, 2013, v. 22, n. 1, p. 29-35.

12. MACHADO, M. C. H. et al. Health care in the first year of life of a prospective cohort of late-preterm and full-term infants, in Botucatu, state of São Paulo, Brazil, 2015-2017. Epidemiol. Serv. Saúde. 2021, v. 30, n. 2. Disponível em: https://www.scielo.br/j/ress/a/5B9WSQw9WrXcqbyxDTRbdLF/abstract/?lang=en. Acesso em: 23 jun. 2021.

13. YIN, R. K. Estudo de caso: planejamento e métodos. 4. ed. Porto Alegre: Bookman, 2015.

14. MCCARRON, K. Understanding care bundle. Nursing Made Incredibly Easy. 2011, v. 9, n. 2, p. 30-33. Disponível em: https://journals.lww.com/nursingmadeincrediblyeasy/fulltext/2011/03000/understanding_care_bundles.9.aspx. Acesso em: 23 jun. 2021.

15. ARAÚJO, F. L. et al. Adherence to central venous catheter insertion bundle in neonatal and pediatric units. Rev Esc Enferm USP. 2017, v. 51, e03269. Disponível em: https://pubmed.ncbi.nlm.nih.gov/29185601/. Acesso em: 23 jun. 2021.

16. KLUGMAN, D. et al. Assessment of an Unplanned Extubation Bundle to Reduce Unplanned Extubations in Critically Ill Neonates, Infants, and Children. JAMA Pediatr. 2020, v. 174, n. 6, e200268. Disponível em: https://pubmed.ncbi.nlm.nih.gov/32282029/. Acesso em: 23 jun. 2021.

17. BIJL-MARCUS, K. et al. Neonatal care bundles are associated with a reduction in the incidence of intraventricular haemorrhage in preterm infants: a multicentre cohort study. Arch Dis Child Fetal Neonatal Ed. 2020, v. 105, n. 4, p. 419-424. Disponível em: https://pubmed.ncbi.nlm.nih.gov/31732682/. Acesso em: 26 jun. 2021.

18. LIPKE, B. et al. Newborn Safety Bundle to Prevent Falls and Promote Safe Sleep. MCN Am J Matern Child Nurs. 2018, v. 43, n. 1, p. 32-37. Disponível em: https://pubmed.ncbi.nlm.nih.gov/29045245/. Acesso em: 23 jun. 2021.

19. MARQUES, A. C. G. et al. Evaluation of pain perception in newborns by neonatal health professionals. Cad. saúde colet. 2019, v. 27, n. 4, p. 432-436. Disponível em: https://www.scielo.br/pdf/cadsc/v27n4/1414-462X-cadsc-1414-462X201900040156.pdf. Acesso em: 7 jan. 2021.

20. REIS, G. A. X. et al. Difficulties to implement patient safety strategies: perspectives of management nurses. Rev Gaúcha Enferm. 2019, v. 40, esp, e20180366. Disponível em: https://www.scielo.br/j/rgenf/a/687N6SXJTd7cqhqNBXyMc4J/?format=pdf&lang=pt. Acesso em: 23 jun. 2021.

21. RELLAND, L. M.; GEHRED, A.; MAITRE, N. L. Behavioral and physiological signs for pain assessment in preterm and term neonates during a nociception-specific response: a systematic review. Pediatr Neurol. 2019, v. 90, p. 13-23. Disponível em: https://pubmed.ncbi.nlm.nih.gov/30449602/. Acesso em: 7 jan. 2021.

22. COSTA, C. A. B. et al. Central Venous Catheter bundle: professional knowledge and behavior in adult Intensive Care Units. Rev Esc Enferm USP. 2020, v. 54, e03629. Disponível em: https://www.scielo.br/pdf/reeusp/v54/en_1980-220X-reeusp-54-e03629.pdf. Acesso em: 7 jan. 2021.