ORIGINAL ARTICLE

Pain assessment and control by nurses of a neonatal intensive care unit*

Avaliação e controle da dor por enfermeiras de uma unidade de terapia intensiva neonatal

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ABSTRACT

BACKGROUND AND OBJECTIVES: Pain is frequent during hospitalization of premature neonates (PNN) in neonatal intensive care units (NICU) and is caused by routine invasive procedures. This study aimed at identifying and analyzing pain conceptions and management by nurses during nine routine invasive procedures in a NICU of a teaching hospital.

METHOD: This was a descriptive study with nine nurses working from one to nine years in NICUs, who answered an adapted questionnaire with 13 open and closed questions about pain conceptions. Answers went through descriptive and content statistical analysis.

RESULTS: Nurses acknowledged PNNs ability to feel pain and the importance of pain control to minimize children's development risks. Pain was primarily evaluated by behavioral indicators, such as weeping, facial mimics and motor activity. Routine procedures were considered *from moderate to extremely painful*, such as venous/arterial puncture and chest drainage; however they used to be carried out without adequate relief measures.

CONCLUSION: Although acknowledging that PNNs feel pain and that invasive procedures are painful, nurses considered that pain relief measures were still inadequate. Qualification in pain control is critical for professionals to act as a source of resources to protect future children's development.

Keywords: Neonatal intensive care unit, Neonatal nursing, Nursing care, Pain management, Pain measurement.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A dor é uma presença constante durante a internação de recém-nascido prematuro (RNPT) em unidade de terapia intensiva neonatal (UTIN) pela necessidade de realização de procedimentos invasivos de rotina. O objetivo deste estudo foi identificar e analisar as concepções e o manuseio da dor por enfermeiras durante nove procedimentos invasivos de rotina em uma UTIN de um hospital universitário.

MÉTODO: Realizou-se um estudo descritivo com a participação de nove enfermeiras, com um a nove anos de trabalho em UTIN, que responderam um questionário adaptado, contendo 13 questões abertas e fechadas sobre as concepções, avaliação e o manuseio da dor. As respostas passaram por análise estatística descritiva e de conteúdo.

RESULTADOS: As enfermeiras reconheceram a capacidade do RNPT de sentir dor e a importância do controle para amenizar os riscos no desenvolvimento infantil. A dor era avaliada, principalmente pelos indicadores comportamentais, como choro, mímica facial e atividade motora. Os procedimentos de rotina foram considerados como *moderados a extremamente dolorosos*, como a punção venosa/arterial e a drenagem torácica, mas, costumavam ser realizados sem medidas de alívio adequadas.

CONCLUSÃO: Apesar do reconhecimento de que o RNPT sente dor e que os procedimentos invasivos são dolorosos, as enfermeiras consideraram que as medidas de alívio de dor ainda não eram realizadas de maneira adequada. A capacitação na área de controle da dor é fundamental para que o profissional possa atuar como uma fonte de recursos protetores ao desenvolvimento infantil posterior.

Descritores: Cuidados de Enfermagem, Enfermagem neonatal, Manuseio da dor, Medição da dor, Unidade de terapia intensiva neonatal.

INTRODUCTION

Survival and hospitalization in the neonatal period, especially for premature neonates (PTNN), imply going through, in average, 16 potentially painful procedures per day[1], performed during the hospitalization period in the Neonatal Intensive Care Unit (NICU). This situation remains, even with current sophistication of therapeutic resources. In spite of this high frequency of painful procedures, analgesia is not a routine for neonates (NN), being even ignored as even denied[2]. Part of this situation is due to the fact that NN pain is seen as inevitable during neonatal treatment[3].

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In addition, for a long time NN pain has not been a concern for clinicians and researchers because there was the belief that central nervous system immaturity would protect them. Only in the early 1960s it has been observed that incomplete central nervous system myelination would not prevent the transmission of sensory tract impulses. It was then acknowledged that nervous system functional and neurochemical elements needed for the transmission of painful impulses to brain cortex were present in term and premature NN[4].

The difficulty to adopt pain control measures lies in the difficulty to understand NN non verbal communication and in the fact that pain is a subjective phenomenon. These conditions make NN pain evaluation a challenge for health professionals. To qualify and quantify pain during this period, tools or indicators are in general used, which take into consideration behavioral changes, such as weeping, face mimic and body movements, and NN physiological changes in heart and respiratory rates, blood pressure, oxygen saturation and hormonal levels. Currently, with the adoption of validated scales, such as Neonatal Facial Action Coding System (NFCS) and Ecchelle Douler Inconfort Nouveau-né (EDIN)[5] one tries to obtain most information about individual PTNN responses to pain and their interactions with the environment.

These scales are part of the joint management of pain during invasive procedures, being an important indicator of the quality of NN care. Judicious pain evaluation is then one responsibility of nursing professionals dealing with hospitalized NN[6]. They should effectively control pain and its prevention, not only due to ethical issues, but especially due to the consequences that repeated painful exposures may bring to short and long term child development[7,8]. In this context, and due to frequent contact with babies, the nursing team has an important role in recognizing and managing pain, acting as a source of protective resources for NN development[9].

However, in spite of advances in pain physiology knowledge, of the development of pre-verbal infants evaluation tools, and of the existence of therapeutic measures for neonatal pain relief, there is still a gap between knowledge and practice and pain is not adequately managed[10,11]. So, knowledge may not be the single factor to assure pain control, as a Brazilian study with nurses has also shown[12]. Barriers for such care may include insufficient individual or organizational knowledge about evidence factors, which impairs nurses ability to use their knowledge[13,14].

To understand the difficulties of these professionals, factors interfering with NN ability to decode pain should be identified, in addition to understanding the complex interaction between NN pain and the interpretation of the health professional that will interfere with the therapeutic decision[15].

When studying these interactions, it is relevant to know variables related to beliefs and behaviors about pain control during routine NICU invasive procedures, condition still poorly investigated in spite of all scientific knowledge about pain. Considering the need to identify beliefs related to NN pain, this study aimed at capturing pain conception, its evaluation and management by nurses in nine routine invasive procedures during hospitalization in the NICU.

METHOD

Study with convenience sample made up of nurses working in the NICU of a teaching hospital of the Metropolitan Region of Vitória/ES. All nine nurses of this sector participated, aged between 27 and 40 years (SD = 33.3 ± 2.5), working in the neonatal area between 1 and 9 years (SD = 8 ± 2.8). Inclusion criteria were being a nurse acting in the NICU and not being on leave of any nature during the data collection period.

Nurses have filled an adapted questionnaire[11] about pain for nursing professionals, with 13 open and closed questions about pain conceptions and management during the following invasive procedures: venous and/or arterial puncture, tracheal intubation, chest drainage, gastric probe, tracheal aspiration, lumbar puncture, heel puncture, umbilical catheter and muscular injection.

The questionnaire was organized in three parts: I – Socio-demographic data such as age, time working in the NICU; II – Pain evaluation data were respondents classified the nine procedures in a scale from zero to four, corresponding to "painless" to "extremely painful"; and III – Data on pain management during procedures, classified in a scale from zero to four and equivalent to "never" to "always performed". Data were collected between September and November 2010. All participants have signed the Free and Informed Consent Term (FICT).

Questionnaires were filled in the presence of one of the investigators. Open question answers were recorded and transcribed for further content analysis. Open answers were categorized by objective content, after consensus among authors, initially by subjects such as: neonatal pain conceptions, pain evaluation, management and handling and child development. Then, subcategories were created according to participants' answers. Quantitative data were treated with descriptive statistical analysis, with frequency distribution (absolute figures).

This study was approved by the Research Ethics Committee, UFES (Process 099/2010).

RESULTS

Premature neonate pain conception

All nurses have reported that PTNN are able to feel pain, based on the justifications:

(a) Four nurses gave *descriptive answers about how they perceive neonatal pain*, with painful characteristics perceived on the face when NN feels pain, such as: weeping, irritation, agitation and sad glaze visualized by the pain face, by codes and mimics. Example of report: "*Be it by weeping, irritation, movements or expression, this is one way to identify that, yes, they feel pain*" (E5).

(b) Three nurses have justified based on *explanatory answers about pain physiology and central nervous system development*, with verbalizations involving health professionals' scientific knowledge with regard to physiology and immature central nervous system as shown by the following report: "*Neonates, for being premature, still have developing central nervous system. So, any external stimulation to this premature child will activate the central nervous system through the spinal cord, leading to the brain and the premature child will feel more pain, will be more sensitive to pain than adults*" (E9).

(c) One nurse has justified her *answer relating neonatal pain to clinical presentation and to painful procedures*, which make neonates vulnerable, such as in the following example: "[...] *depending on the pathology, which is already painful, and on the procedures performed with them during hospitalization* [...]" (E2).

Importance of premature neonate pain management

All nine nurses considered important to manage pain, justifying it according to the following categories:
(a) *To minimize general negative consequences of pain* (5 reports) – to improve clinical presentation, helping recovery, treatment and general prognosis, such as in the following example: "[...] *any procedure, the premature becomes unstable and this may even impair the prognosis, induce some hemodynamic instability and impair treatment, in prognosis*" (E3).
(b) *Vulnerability conditions of the neonate* (3 reports) – neonatal pain management was justified by the prematurity condition itself, by being hospitalized and by the exposure to painful procedures, as in this example: "*Because they are premature, everything in them… is… even… they… their skin is more sensitive, everything is more exposed, so I believe that… their threshold, yes, also of pain, I believe it is shorter*" (E6).
(c) *Humanitarian issues to manage pain* (2 reports) – revealed an ethical point of view of pain management related to care, were taking care of the other is an ethical responsibility of human beings. An example is: "*Is… a human being, isn´t it? Regardless of the birth date, whether is term or not. They feel pain as any of us and feeling pain (laughter), isn't good for anyone*" (E2).
(d) *To minimize negative consequences specific to pain* (1 report) – addressed the losses that may occur in nervous system development if pain is not managed, as it can be seen from this report: "*Yes… because pain interferes with vital signs […] and also the neurological development is finishing, isn't it? Since it was not intrauterine, this uncertain environment, with so many stimulations, may impair such development*" (E4).

Interference of pain in future premature neonate development

Eight nurses have acknowledged the influence of painful procedures in child development and only one said that there are no consequences of neonatal pain. Proximal and distal influences of neonatal painful procedures on child development were classified as follows:
(a) *Specific short and medium term pain consequences* (5 reports) – in this category reports on the appearance of diseases, behavioral disorders and changed sensitivity to pain of neonates exposed to painful procedures were included, such as: "*[…] at (sic) long term, having the development impaired by super-stimulation, cortisol release, is… having even hyperactivity, attention deficit, and […] in addition to behavioral disorders*" (E4).
(b) *General consequences of pain* (3 reports) – described the influence of treatment results and recovery, common situation to all those going through painful experiences, such as in this example: "*[…] in this procedure, you may be spared from pain discomfort, I believe that for sure you respond much better, results are better than you being submitted to a treatment where you will have pain every day*" (E1).
(c) *There are no pain consequences on child development* (1 report) – in this case, the nurse has considered that painful procedures do not interfere: "*I don't think so. I guess it does not hurt. […] [that] it should not interfere. I don't think so*" (E6).

Premature neonate pain evaluation

Neonatal pain was recognized by behavioral indicators: (a) weeping (9 nurses); (b) motor activity (8), including "agitation" and "quietness"; and (c) facial mimic (5), with squeezed eyes, stretched mouth, open mouth, protruding forehead, deepened nasolabial groove. Physiological pain indicators, such as heart rate and oxygen saturation, were mentioned by two nurses. Only one nurse was familiar with the Neonatal Infant Pain Scale (NIPS), and 4 were unaware of any type of neonatal pain scale; 2 knew the pain scale for adults.

Differences between neonate and adult pain

Considering the above-mentioned invasive procedures, most nurses (8) have evaluated that NN feel more pain as compared to adults, including PTNN (3). Only one considered that PTNN feel less pain than adults.

Pain intensity during invasive procedures

Nurses have classified neonatal pain as "very severe" or "extreme" in four out of nine procedures: *venous or arterial puncture (8 nurses), chest drainage (8), lumbar puncture (6), heel puncture (5) and muscular injection (5).* However, *tracheal aspiration (7), gastric probe (7) and tracheal intubation* (5) were considered as "mild pain" or "not so painful". *Umbilical catheter* (5) and *gastric probe* (1) were considered "painless" (Table 1).

Pain management during invasive procedures

Five nurses have stated that NN received some type of analgesia during invasive procedures in the NICU; but four considered that this was only sometimes.

Daily pain management practice during invasive procedures

Pharmacological and non pharmacological measures for pain relief were seldom used by the sample, even during procedures considered as painful. Pain was seldom managed for the 9 procedures, according to at least one nurse, especially *heel puncture* (4), *chest drainage* (3) and *muscular injection* (3). *Tracheal aspiration and gastric probe were* performed without any pain relief measure, according to 7 nurses; followed by *muscular injection* (6) and *lumbar puncture* (5). On the other hand, chest drainage was the procedure more commonly performed with some pain relief measure (6) (Table 2).

Table 1 – Pain intensity during invasive procedures, according to NICU nurses (n = 9).

Procedures/Pain Intensity	Painless	Mild	Moderate	Severe	Extreme
Venous or arterial puncture	0	0	1	3	5
Chest drainage	0	0	1	4	4
Lumbar puncture	0	1	2	2	4
Heel puncture	0	0	4	2	3
Muscular injection	0	2	2	3	2
Tracheal intubation	0	3	2	2	2
Tracheal aspiration	0	3	4	1	1
Gastric tube	1	4	3	1	0
Umbilical catheter	5	2	2	0	0

Table 2 – Use of analgesia or anesthesia during invasive procedures, according to NICU nurses (n = 9).

Procedures/Frequency of use of pain measures	Never	Seldom	Frequently	Generally	Always
Chest drainage	0	3	3	1	2
Venous or arterial puncture	4	1	3	0	1
Heel puncture	4	4	0	0	1
Muscular injection	6	3	0	0	0
Tracheal intubation	4	2	1	1	1
Lumbar puncture	5	2	0	1	1
Umbilical catheter	4	2	0	2	1
Tracheal aspiration	7	2	0	0	0
Gastric tube	7	2	0	0	0

Table 3 – Expected frequency of use of analgesia or anesthesia during invasive procedures, according to NICU nurses (n = 9).

Procedures/Frequency of use of pain measures	Never	Seldom	Frequently	Generally	Always
Chest drainage	0	0	2	0	7
Venous or arterial puncture	1	0	1	0	7
Heel puncture	1	0	1	0	7
Muscular injection	1	2	1	0	5
Tracheal intubation	1	0	2	1	5
Lumbar puncture	1	0	2	3	3
Umbilical catheter	0	1	2	3	3
Tracheal aspiration	2	2	3	0	2
Gastric tube	1	2	4	1	1

Expected pain management practice during invasive procedures

Nurses believed that pharmacological and non pharmacological measures for pain relief during invasive procedures should be more often used. *Chest drainage, venous and/or arterial puncture and lumbar puncture* were the procedures with more indications (7), followed by heel puncture (6) and *muscular injection* (5). However, *gastric probe was* indicated by just one nurse as the procedure to be "always" performed with analgesia (Table 3).

DISCUSSION

Our results confirm international literature data about neonatal pain identification, evaluation and management[1-3]. This study has identified and analyzed conditions which may favor professional practices in controlling PTNN pain, leading to action proposals. Nurses admit that PTNN feel pain and with higher intensity than adults. This pain notion is evaluated as from PTNN behaviors, especially by weeping, facial mimic hints and motor activity; however

physiological pain indicators were seldom mentioned by respondents.

The problem is that, although pain being partially identified by nurses, there is no guarantee of adequate pain control, as confirmed by a different study[13]. Children's pain relief needs a complex and challenging change in behavior of health professionals directly involved with children's care. So, the notion that neonates feel pain and knowing how to identify it are mandatory aspects of a joint approach using behavioral and physiological indicators for a better evaluation of pain and subsequent use of effective pain relief measures.

In this sense, our results contribute to the development of a discussion of efficient pain evaluation and therapy in the NICU, suggesting the combination of subjective pain aspects, already identified by respondents, and objective aspects, such as physiological indicators, still not recognized by respondents. The emphasis on the identification of such indicators would enable such professionals to more adequately evaluate pain, even in the absence of PTNN pain scales, unknown by most respondents.

However, to adequately manage pain, in addition to its identification it is necessary to know its consequences for further children's development. To improve this knowledge, educative interventions could be based on results of experimental studies with animals[4] which show the influence triggered by persistent and repetitive painful stimulation leading to changes in PTNN brain cytoarchitecture. This is only clear for some nurses, having them stressed the importance of managing NICU pain to minimize early negative consequences and to decrease adverse effects, such as behavioral disorders and changes in pain sensitivity. Participants considered that it is possible to improve clinical presentation and to help PTNN management and prognosis.

However, and paradoxically, even with the predominant conception that PTNN feel pain and stressing the importance of its management, not all nine invasive procedures were considered painful by nurses. In this sense, our data differ from a study[11] where all procedures were considered moderately or extremely painful. In our study, umbilical catheter and gastric probe were considered painless, while venous or arterial puncture, chest drainage, lumbar puncture and heel puncture were considered "extremely" painful. In general, one may consider that these nurses who daily deal with PTNN care, have evaluated that neonates are routinely submitted to painful procedures.

It is interesting to stress that although admitting that some procedures are very painful, nurses have reported that in their daily professional practice such procedures have been performed without any type of pain relief measures. Chest drainage was the procedure more often indicated for the use of pain relief measures, probably due to the fact that it is performed by the pediatric surgeon, according to medical protocol. Tracheal aspiration and gastric probe, on the other hand, were mentioned as never performed with pain relief measures in the studied NICU. These results are similar to other studies[1,11,12] which concluded that most invasive procedures were performed without adequate pain relief measures. In a Canadian study[13], for example, the understanding of pain during invasive procedures is broad and universal; however it is still necessary a dialog between health professionals and researchers aiming at discussing changes in behavior and in professional practice with regard to children's pain.

So, there is inconsistency between conception and action of these health professionals with regard to neonatal pain – it exists and is identified by NN behavioral indicators, even without understanding neonatal pain scales; most invasive procedures are considered very painful and should be followed by pain relief measures, especially chest drainage, venous or arterial puncture and lumbar puncture, with exception of gastric probe – however, pain is not routinely controlled.

NICU pain management should be improved to match the standards proposed by the American Academy of Pediatrics (AAP)[7]. In this sense, the qualification of such professionals and the development of studies on compliance with pain management are justified. A strategy in this direction would include discussions with the whole professional team, not only with nurses, about variables helping and making difficult the effective adoption of adequate pain relief measures during invasive procedures in the NICU, trying to identify socio-cultural and organizational factors of this process[15].

The coexistence of these factors with the adoption of a pain management protocol seems to be more adequate, as shown by the chest drainage case. This invasive procedure is routinely performed by a physician, which assures the adoption of pain control measures. So, the type of professional qualification and the existence of a protocol seem to be variables controlling NICU pain management.

CONCLUSION

Results have shown that, although admitting that PTNN feel pain and that invasive procedures are painful, nurses of this NICU considered that pain relief measures were inadequate.

It is recommended that, for a better NICU pain management, it is important to qualify professionals of this service, including a broad and ongoing discussion with the whole team about the importance of adopting adequate measures during invasive procedures due to the medium and long term consequences to PTNN development, and of using a pain control protocol. This way, these professionals would fulfill their role in protecting children's development.

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