



## Research brief

Nurses' practices regarding procedural pain management of preterm infants<sup>☆</sup>

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## ABSTRACT

**Background:** It is well known that preterm neonates can feel pain which can be expressed through specific behaviors and signs. Repeated and untreated pain has consequences for the preterm neonates such as hypersensitivity to pain, as well as important repercussions on their motor and intellectual development. The use of non-pharmacological interventions for pain management by nurses is imperative to prevent these consequences in the NICU. The aim of this study is to survey neonatal nurses' interventions for pain management of preterm neonates.

**Methods:** Twenty (20) nurses were recruited for this pilot observational survey study. Standard pain management interventions used by nurses during heel prick were evaluated by means of a questionnaire. In addition, 11 out of the 20 nurses were observed during heel prick to evaluate what and how interventions were done.

**Results:** All infants (n = 11) received at least one pain management intervention during heel prick. Heterogeneity in pain management practices used by nurses is considerable. For 95% (19/20) of nurses, sucrose is a standard intervention reported in the survey but observations showed that it not always applied (64%). Positioning is more used (64%) by nurses than reported in the survey (45%). Swaddling also was also reported as a standard intervention by 45% of nurses, but it does not appear to be adequately performed (36%).

**Conclusion:** According to the results, it would be essential to review nurses' knowledge and skills regarding standard pain management interventions, during painful procedures, as the quality of these practices is questionable. Homogeneity of the standard of care is particularly important in research to allow an appropriate comparison between study groups and prevention study bias.

## 1. Introduction

It is well known that preterm infants can feel pain and express it through specific signs and behaviors. Even if the number of heel pricks done to preterm infants has decreased over the last decade in neonatal units, it still remains as high as almost once a day (Johnston, Barrington, Taddio, Carbajal, & Filion, 2011). Repeated and untreated pain leads to consequences for preterm infants' neurodevelopment since neurological maturation occurs in the last trimester of pregnancy (Kenner & McGrath, 2011). Among these consequences, major repercussions on motor and intellectual developments are reported at 8 and 18 months of age (Grunau et al., 2009) and hypersensitivity to pain may be observed until 7 years old in infants born preterm (Crozier et al., 2016). The use of non-pharmacological interventions by nurses for pain

management is imperative to prevent these consequences in the neonatal intensive care unit (NICU) (Pillai Riddell et al., 2015). For instance, sucrose, non-nutritive sucking (NNS), skin-to-skin contact, swaddling, breastfeeding, rocking, positioning, music, hand containment can easily be performed by nurses. Sucrose associated with NNS and breastfeeding is considered a gold standard for procedural pain management in preterm infants (American Academy of Pediatrics, 2016). The current study was nested within a pilot study assessing feasibility, acceptability and the effects of an olfactory pain management intervention (De Clifford-Faugère, Aita, Héon, & Le May, n.d.). Furthermore, nursing practices on pain management interventions during preterm infants' heel prick were assessed to provide essential information on methods for the planification for an ulterior full-scale RCT.

<sup>☆</sup> Conflicts of interest: all authors have nothing to declare.

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## 2. Methods

### 2.1. Design

Pilot observational survey study with a single group.

### 2.2. Participants and setting

A convenient sampling of 20 nurses was recruited. The study was conducted from March to April 2017 in a level-III NICU in Canada with a capacity of 65 infants. The nursing staff consists of approximately 200 nurses. Inclusion criteria: nurses had to: a) have at least 6 months of experience in the NICU, b) speak French or English. This NICU offers an informative document to guide nurses in using non-pharmacological pain management interventions during preterm infants' painful procedures. The administration of sucrose is a standard intervention in this NICU, performed systematically during painful procedures.

### 2.3. Procedure

Recruitment began after ethics approval from the ERB of the tertiary pediatric university health center where the study was conducted. Nurses ( $n = 20$ ) who participated signed a consent form. Nine (9) worked evenings and 11 worked nights. Night nurses ( $n = 11$ ) did a heel prick at 6 AM on preterm infants ( $n = 11$ ) and were observed during the procedure by the PI. After heel prick, nurses completed a self-administered questionnaire about the pain management intervention(s) they had carried out in the morning (see Table 1).

### 2.4. Questionnaires and observations

Standard pain management interventions used by nurses during heel prick were evaluated by self-administered questionnaire. Nurses were required to respond to a multiple-choice questionnaire developed by the PI assessing routine pain management interventions they used during heel prick: NNS, skin-to-skin contact, breastfeeding, rocking, positioning, music, swaddling, sucrose, hand containment, others. In addition, the 11 nurses were observed during preterm infants' heel prick to evaluate which and how pain management interventions were done. These 11 nurses completed the same questionnaire with an additional question: What pain relief interventions did you use during the heel prick that you performed this morning?

### 2.5. Statistical analysis

Descriptive statistical analyses (frequencies, percentages and means) were used to analyze nurses' standard pain management interventions during heel prick for questionnaires and observations.

**Table 1**  
Pain management interventions chosen by evening and night nurses ( $n = 20$ ).<sup>a</sup>

Pain management interventions	Evening nurses ( $n = 9$ )	Night nurses ( $n = 11$ )
Sucrose	8	11
Swaddling	7	5
Positioning	1	5
Hand containment	4	1
Music	1	2
Non-nutritive sucking	1	2
Breastfeeding	0	0
Skin-to-skin	0	0
Rocking	0	0

<sup>a</sup> The same nurse could choose more than one intervention.

## 3. Results

### 3.1. Standard interventions according to nurses

Interventions considered as standard by nurses (20) are shown in Table 1. Results show that 95% of the nurses considered sucrose as a systematic pain management intervention, but sucrose would not be combined with NNS (15%). As reported by nurses, pain management interventions involving parents such as breastfeeding and skin-to-skin contact are infrequently done in their NICU. In this study, no parent was present.

### 3.2. Observations done during heel prick

Observations were made at 6 AM during heel-prick, 5 min before and after the heel prick. The observer was beside the preterm infant incubator (less than a meter). Overall, seven pain management interventions were performed by the 11 nurses during the heel pricks: sucrose, positioning, swaddling, NNS, music, speaking with a reassuring voice and hand containment. Sucrose was given to 63% (7/11) of the preterm infants. Paradoxically, only 30% of nurses mentioned that positioning was a standard pain management intervention that they systematically performed, whereas it was done in only 64% of preterm infants during heel pricks (lateral positioning).

### 3.3. Discrepancies between nurses' responses and real pain practices

We observed important discrepancies between nurses' responses to the survey on pain management and their real pain practices during infants' heel prick. For instance, eight nurses reported that they administered sucrose before heel prick when only seven actually did (see Table 2). In addition, there was a difference between the interventions that nurses claimed to perform systematically for pain management and those actually observed in practice. Main differences were observed when nurses used positioning, swaddling and sucrose. Positioning appeared to not be a standard care performed in the NICU for pain according to the nurses' survey. However, observations showed that positioning was as often as sucrose corresponding to seven of the 11 preterm infants having a heel prick.

Two nurses (18%) answered that they swaddled preterm infants systematically whereas it was observed that they only placed a blanket over their thorax. All nurses who did the heel prick considered sucrose as a systematic pain management intervention but 37% did not administer sucrose before preterm infants' heel prick. In addition, 91% of nurses answered that they administered sucrose with a pacifier for NNS, whereas it was only done in 27% of the cases.

## 4. Discussion

In this study, standard pain management interventions performed by the nurses in the NICU were evaluated by questionnaire and observations, highlighting important differences between interventions considered as standard practice and those really done in clinical practice. It is important to note that all infants received at least one pain management intervention during their heel prick: one ( $n = 2$ ) or several pain relief interventions ( $n = 9$ ). Sucrose was considered as a standard pain management intervention by 95% ( $n = 20$ ) of nurses but was not observed as systematically used in practice (64%). Moreover, in this study, sucrose was never combined with NNS, while Stevens, Yamada, Ohlsson, Haliburton, and Shorkey (2016) recommended this combination to increase its efficacy. In practice, positioning was used (64%) more than what was reported by nurses in their questionnaire (45%). Swaddling was also reported as a systematic intervention by 45% of nurses but it was not adequately performed (36%) to be considered as an effective intervention. These results confirm that the application of non-pharmacological pain management interventions is not

**Table 2**  
Pain management interventions classified by night nurses (n = 11).

Pain management interventions	Interventions generally considered as systematic by nurses	Interventions nurses reported doing during heel pricks	Interventions nurses have really done during heel pricks (confirmed by observation)
Sucrose	11	8	7
Swaddling	5	6	4
Positioning	5	6	7
Hand containment	1	2	1
Music	2	1	1
Non-nutritive sucking	2	3	3
Breastfeeding	0	0	0
Skin-to-skin	0	0	0
Rocking	0	0	0

always optimal in NICUs (Pillai Riddell et al., 2015).

Other effective pain management interventions requiring the presence of parents, such as skin-to-skin contact (Johnston et al., 2017), were not performed by nurses. This can be explained by the fact that blood samples are schedule at six o'clock AM, and that it may not be possible for parents to be present so early in the NICU. It appears essential to improve nursing practices by encouraging the administration of sucrose combined with NNS and skin-to-skin contact during painful procedures in order to prevent the consequences of repeated and untreated pain. Research could focus on interventions to promote involving parents in care, inform them of the times of painful procedures, and evaluate their presence. Breastfeeding has been less investigated in premature infants, although it is an effective pain management intervention for term newborns (Shah, Herbozo, Aliwalas, & Shah, 2012). Other interventions such as mother's presence and voice, odors, music and massage should be further investigated in premature infants to support their use to the NICU and promote parental involvement (Pillai Riddell et al., 2015). Moreover, qualitative research could investigate barriers to the use of sucrose by nurses. Considering the current limitations in the application of effective interventions, the development of innovative interventions which are easily achievable in practice should be a priority for researchers.

Differences in performing standard pain management interventions could induce bias in neonatal research when pain management interventions are not homogeneous for all preterm infants, thus altering their response to pain. Considering the application of pain management interventions in nurses' practice, it would be essential to revise the standard interventions applied in painful procedures, particularly within a research protocol. This step would ensure that the conditions are similar between the experimental and control groups, allowing for an appropriate comparison between study groups. Discrepancies between interventions reported and those observed could indicate a social desirability by nurses, when responding to the questionnaire, i.e. to provide expected answers or wishes compared to what is really achieved in practice (Polit and Beck, 2012).

The results of this study raise questions about the assessment of procedural pain by health care professionals. Polkki et al. (2010) explored nurses' perceptions of pain assessment and pain relief in the NICU and found that nurses believed they could assess pain without using a reliable tool. Future research could focus on the use or implementation of standardized pain measurement tools to assess the effects of interventions performed. In addition, the development and evaluation of training programs on preterm infants' pain management could be investigated as training of professionals may improve nursing practices related to the pain relief of pain in preterm infants.

#### 4.1. Limitations

Three main study's limits can be identified. First, we recruited

nurses with a convenience sampling, which means that only available nurses were included in the study. Second, we did not collect socio-demographic data to explain the results obtained as the number of participants was too small to perform statistical analyses. Third, this study took place in one center, limiting the generalization of these results to other neonatal units.

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