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Nurses' perceptions of newborns' procedural pain assessment and alleviation with non-pharmacological methods in Estonia

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Abstract

Purpose: The purpose of this study was to describe newborns' procedural pain assessment and alleviation with non-pharmacological pain alleviation methods based on nurses' perceptions in neonatal and neonatal intensive care units.

Design and methods: A descriptive cross-sectional survey carried out among all nurses (n = 149) who were working in neonatal and infant departments or neonatal intensive care units (NICUs) in Estonian hospitals. Altogether, 128 questionnaires were returned and 111 respondents were eligible (75% response rate). The data was analysed using statistical methods.

Results: More than half of the nurses agreed that the systematic documentation of the measurement of pain is necessary in nursing care and affects newborns' pain alleviation. Half of the respondents (51%) confirmed that pain scales are important in the measurement of neonate pain and 58% of the respondents stated that they could measure pain in a reliable way. Nurses also reported that most of the pain scales were unfamiliar for them and were not routinely used in everyday practice. The most useful non-pharmacological pain alleviation methods were touching (83%) and positioning infants (78%) and the most rarely used were music (17%) and encouraging mothers to breastfeed (34%). The majority of respondents (79%) reported that they don't know or don't have written instructions on pain assessment in their workplace and only a few nurses (10%) reported that they have participated in pain management courses during the last year.

Conclusions: The study results were controversial. There are problems with using pain scale and pain documentation in every day practice. The use of scales in pain assessment was valued by quite few nurses. The biggest problem seems to be the lack of information on such methods. Even though nurses are using non-pharmacological pain alleviation methods and counselling parents to use them, the results show that there is a need to increase awareness and offer pain alleviation training courses to nurses.

Practice implication: Nurses need pain management guidelines for everyday work and in addition to nurses, it's needed to create written guidelines for parents.

Keywords: nurse role, neonate procedural pain, pain alleviation, non-pharmacological methods

Introduction

Newborns' procedural pain

Pain refers to an unpleasant physical or mental sensation and it is a subjective experience (IASP 2010). In care, various treatments and procedures can cause pain (Sundal & Lykkeslet 2019). The neonatal period is the first 28 days of a child's life. Neonates react to acute or long-term pain with changes in physical and behavioural patterns because it causes physiological stress, which affects a child's healing process (Witt et al. 2016, Johnston et al. 2017). Pain intensity evaluation and measurement are vital components of good pain management practice (Association... 2012). Neonates are unable to express or confirm their pain verbally, therefore pain evaluation for neonates is difficult (Pölkki et al. 2018).

During hospitalisation, the most common procedures that cause pain for neonates are heel pricks, injections and vascular punctures (Cruz et al. 2016, Lago et al. 2017). Painful neonate procedures are also described as the most distressing aspects of medical treatment for them and their parents. Uncured pain in neonates may result in extended time spent in hospital, a memory of a painful experience or a low pain threshold (Brummelte et al. 2012, Johnston et al. 2017). Therefore, nurses' knowledge of procedural pain assessment methods as well as alleviation of the pain are crucial.

Neonates' procedural pain assessment

However, based on previous studies, neonates' pain has been under-assessed and poorly documented. In addition, pain assessment scales have not been ~~routinely~~ widely used in practice. Therefore, neonates have been under medicated and their pain poorly managed (Taylor 2008, Pölkki et al. 2010, Birnie 2014, Manworren et al. 2016, Pölkki et al. 2018). The assessment of neonates' pain requires that nurses are able to recognise pain and use context-specific, validated and objective pain evaluation measurements (Hall & Anand 2014, Carter & Brunchost 2017, Oliveira 2017). Typically, a multimodal assessment should be performed where a pain score result is comprised of facial expressions of grimace, physiologic measurements and behavioural components (Beltramini et al. 2017).

Based on previous studies, nurses have been found to have rather good knowledge of neonates' ability to sense and express pain. More experienced nurses tend to use pain assessment scales more than their less experienced colleagues and only a few nurses had participated in an educational programme on infant pain alleviation during the previous two years (Pölkki et al. 2018). It has been shown that proper documentation of pain will contribute to better pain management (Weissman 2009). Nurses also require appropriate guidance on the use of pain assessment scales and their ability use them (Zhou 2008).

Pain alleviation with non-pharmacological methods

Procedural pain in neonates can be controlled by pharmacological and non-pharmacological techniques. Non-pharmacological techniques are any treatments, environmental, psychological/cognitive and behavioural strategies that do not resolve the uses, effects and forms of action of medications and can be used to ease procedural discomfort and aimed at short-term effects. (Pillai Riddell et al. 2015) The most utilised strategies for neonates are non-nutritive sucking (Pillai Riddell et al. 2015), breastfeeding (Weissmann et al. 2009, Shah et al. 2012, Harrison et al. 2016, Friedrichsdorf & Goubert 2020) and use of sucrose solution (Bueno et al. 2013, Stevens et al. 2018, Friedrichsdorf & Goubert 2020).

In addition, skin-to-skin care, facilitated tucking, swaddling or tactile stimulation and heel massage can be used as pain alleviation methods during painful procedures (Hall & Anand 2014, Lago et al. 2009). Non-pharmacological methods have been found to reduce the physiological responses of neonates, reduce facial expressions of pain and also the duration of crying. Composite pain scores have also been improved during skin-breaking procedures. (Pillai Riddell et al. 2015.)

The advantage of non-pharmacological pain alleviation techniques is that they are cost-effective, easily tolerated and with minimal to no adverse reactions. They are effective in reducing severe pain and can be applied by nurses without a doctor's instruction. (Hall & Anand 2014, Katende & Mugabi 2015, Stevens et al. 2016) However, based on previous research, non-pharmacological approaches are not consistently applicable in neonate treatment, and the key challenges have been a lack of knowledge of the child's pain, lack of criteria and instructions, and restricted usage of pain scales (Beckett, 2015). Nurses' cultural values, lack of cooperation and time as well as high workload can influence pain alleviation methods. Often, nurses' have considered that non-pharmacological methods are non-effective, and they do not have experience and knowledge of using them. (Beckett, 2015, Katende & Mugabi 2015)

Parental guidance

The downside in neonate pain management is that nurses do not advise and inspire parents to take part in pain treatment (Beckett 2015, Thrane et al. 2016). Stevens et al. (2011) established the underlying issues that affect optimal pain procedures in the Neonatal Intensive Care Unit (NICU) and one critical topic is communication and support between healthcare professionals and patients' families. Parents need more information on all facts of child pain management, increased pacing of information delivery, and opportunities for participation (Frank et al. 2012). Parental engagement has been encouraged by offering appropriate counseling on the basis of parents' needs and by establishing a hospital atmosphere that promotes parental participation (Palomaa et al. 2016). Parents who have good contact with newborns are more likely to develop effective calming habits that allow newborns to cope with stressful or painful conditions (Thrane et al. 2016). Factors such as parents' emotional state and communication and support from NICU staff have affected parents' ability to reach their desired degree of participation (Frank 2012). In addition, involvement can be supported by instructions on non-pharmacological pain alleviation methods which have been adjusted for parents (Pölkki et al. 2018).

Aim

The aim of the study was to describe newborns' procedural pain assessment and alleviation with non-pharmacological pain alleviation methods based on nurses' perceptions in neonatal and neonatal intensive care units.

The research questions were:

1. How do nurses assess procedural pain in newborns in relation to:
 - (a) importance of pain assessment;
 - (b) parameters observed when assessing pain;
 - (c) pain assessment tools that are well known and used for newborns?

2. What kind of non-pharmacological methods do nurses use and how do they offer guidance to parents when alleviating newborns' procedural pain?
3. Which background factors are related to the provided pain assessment and pain alleviation in newborns?

Methods

Design

We carried out a descriptive cross-sectional survey study in the four Estonian hospitals' neonatal and infant medicine departments and NICUs from May-Jun 2019

Research environment

We carried out our study in six paediatric units in four Estonian state-run hospitals which provide neonatal and infants care. The six units have altogether 96 beds for neonates, where most beds are for the second level of critical care. Altogether 149 nurses work in the units on two shifts (Table 1).

Data collection questionnaire

We collected data using the validated questionnaire *Nurses' Perceptions of Assessing Pain and Using Non-pharmacological Methods in Infants' Procedural Pain Management* (Pölkki & Korhonen 2012). The questionnaire comprised three sections with the first section on background information of nurses (9 items) and their workplace (4 items). The response scales for the first section were dichotomous or multiple-choice. The second section (44 items) focused on nurses' perceptions of neonate pain evaluation as well as the use of pain assessment scales in nursing care and the third section (27 items) on non-pharmacological pain relieving methods and parent guidance on pain management carried out by nurses. The response scale used in the second and third sections was a 5-point Likert scale ranging from not at all or totally disagree to always or totally agree. In addition, the questionnaire included five open-ended questions where nurses were able to elaborate their responses.

The original questionnaire is published in Finnish and was translated into Estonian and Russian for this study. As the first step of the translation process, the questionnaire was evaluated in the research group focusing on its cultural relevance to Estonian context. According to this evaluation, two items were revised concerning education structures and working profiles. As the second step, the questionnaire was translated by educated language editors using the translation-back-translation technique (Maneesriwongul & Dixon 2004). After this, the translated questionnaire was evaluated by two educated nurses who speak Finnish, Estonian and Russian. The translated and evaluated questionnaire was then pilot tested in April 2019. The aim of the pilot test was to evaluate the understandability of the items and the time used to complete the questionnaire. We recruited ten voluntary nurses who worked in the NICU and based on their comments, we clarified wording on the two questions concerning newborns' pain relief and parental guidance on non-pharmacological methods. As only minor changes were made to the pilot questionnaire, we used the responses with the main study. Internal consistency in the original questionnaire, Chronbachs α in the original questionnaire (Pölkki & Korhonen 2012), was for the importance of pain assessment ($\alpha = 0.65$), assessing neonates' physiological parameters ($\alpha = 0.78$), behavioural changes ($\alpha = 0.84$) and specific facial expressions ($\alpha = 0.90$), physical methods ($\alpha = 0.62$) and parental counselling ($\alpha = 0.63$), 0.63 sucrose/non-nutritive sucking ($\alpha = 0.63$) and music ($\alpha = 0.45$).

Data collection and recruitment

We used a full sampling method and recruited all nurses who fulfilled the inclusion criteria and were working with neonates during the study period. Our inclusion criteria were that participants were able to communicate Estonian or Russian and voluntarily agreed to be involved in the study. The data was collected in May-Jun 2019. After organisational permissions and ethical approval, the researcher contacted nursing managers in participating hospitals for recruiting the nurses. The researcher delivered an information letter with a questionnaire and informed consent forms to nursing managers, who distributed them to the potential participants. The nurses, who voluntarily agreed to participate, filled in the questionnaires and put them in a sealed envelope in a locked post box in the units. At the end of the data collection period, the researcher collected the envelopes from the hospitals. Altogether, 128 questionnaires were returned and 111 of them were included in the study. Seventeen of the questionnaires were not included in the final analysis because eight were empty and nine filled incompletely. The response rate was 75%.

Data analysis

We analysed data using PASW Statistics for Windows version 26.0. We used descriptive statistics to summarise respondents' background data and to describe nurses' responses about neonates' procedural pain assessment, alleviation in practices and parental counselling. For better generalisation and simplification, the answers on the 5-point Likert scale were divided into three categories – 'not at all/very seldom', 'sometimes' and 'nearly always/always'.

We used the Mann-Whitney U-test to find the differences among demographic groups of respondents because the variables were not normally distributed, and the Kruskal Wallis test to compare the mean ranks in two or more groups. The Spearman rank correlation test was used to examine the correlation between nurses' use of non-pharmacological methods and parental guidance. P values of ≤ 0.05 were considered as statistically significant.

The analysis of open-ended questions followed the principles of inductive content analysis (Elo & Kyngas 2008). First, we read the text in all open-ended questions several times to get an overview of the content. We found that the responses to the open-ended questions concerning the use of non-pharmacological methods and teaching parents to use them as well as questions concerning developmental actions for pain alleviation in their units did not provide any new information in relation to the questionnaire items. Thus, we decided to analyse and report the findings on two open-ended questions concerning pain alleviation practices and parental counselling. After reading the data, we grouped the content based on its similarities and differences and reported it as elaborating the statistical results.

Research ethics

We applied for and received ethical permission from the Research Ethics Committee of the University of Tartu (Protocol number 291/T-13) and organisational permission from all participating hospitals. In addition, we obtained informed consent from the study participants and informed them of the purpose, anonymity and confidentiality of the study. Participants also had the opportunity to ask researchers for additional information if needed. We ensured that the anonymity and confidentiality of the participants were protected throughout all stages of the study. We present results at a group level and the data do not contain identifiable information.

Results

Background factors

Altogether 111 nurses participated in the survey. The majority of them (98%) were females between 30-50 years of age with an average of 39.5 years (SD = 11.5). Most of the participants (80%) were registered nurses (RN). In addition, forty (37%) of the participants had reported that they have higher education, thirty three (31%) a vocational level education and seven (7%) were nurse specialists in intensive care. All registered midwives (RM) (n = 16, 15%) had a higher education.

The work experience of the participants ranged from two weeks to 48 years (mean 16.5 years, SD 12.8). Half of respondents reported that they had work experience in the neonatal unit or neonatal intensive care from a couple of months up to 10 years.

The majority (79%) of the respondents reported that they don't know or don't have written instructions on pain assessment in their workplace and almost all (92%) answered that they don't know or don't have written instructions on non-pharmacological methods of pain alleviation for parents either. Only a few of nurses (10%) reported that they have participated in pain management courses during the last year (Table 2).

Procedural pain assessment in practice

More than two thirds of the nurses (67%) agreed that the pain assessment of neonates influence the pain control. Over half of respondents (53%) consented that the systematic documentation of pain assessment is needful in neonatal nursing care. Half of respondents (51%) agreed that pain assessment scales are necessary when assessing newborns pain and over half of nurses (58%) reported that they can assess pain without using pain assessment scales (Table 3).

In assessing procedural pain in neonates, more than half (55%) of the nurses reported that they observe newborns breathing, but only one fourth (26%) of respondents observe blood pressure. The majority observed and assessed neonates' behavioural changes routinely, such as crying or moaning (88%) and the state of arousal/alertness (82%). Specific facial expressions were less observed than behavioural changes by the nurses (Table 4).

Nurses reported that most of the pain scales were unfamiliar for them. They knew 'fully' or 'to some extent' the neonatal facial coding system (NFCS) (65%), but the majority (86%) of them were not using the pain scale in practice – 'not at all'. In addition, sixteen (14%) of the nurses mentioned that they 'fully know' pain assessment tool the Face, Legs, Activity, Cry, Consolability scale (FLACC) and fifteen of them reported that they were using it 'nearly daily/daily'.

In the open questions, 63 of the nurses answered; they described and elaborated the practices and reasons for their pain alleviation practices in their units. Altogether 47 of the participants reported that they do not use pain assessment methods because they do not have a certain system or routine for pain assessment (n = 29) or there is no pain scale available (n = 18). No structure for pain documentation answered 19 nurses. In addition, they felt that they do not have awareness of pain assessment. Nurses (n = 24) said that if they assess pain, it is based on children's reactions to treatments, such as crying, moving and physiological parameters. Nurses reported ten times that in some units, pain assessment was routinely used four times in

24 hours and four nurses added that they assess pain after operations. However, the evaluation was often based on their subjective perceptions and documentation as verbal feedback for physicians.

Non-pharmacological pain alleviation methods and parental guidance

The majority of nurses reported that they 'always/nearly always' use non-pharmacological methods such as touching (83%) or positioning infants (78%). The most rarely used non-pharmacological pain relief method was music (17%). The majority of nurses reported that they counsel parents to alleviate an infant's pain using non-pharmacological methods such as touching (89%) and positioning infants (76%). Only a few of them guided 'always/ nearly always' used breastfeeding (23%), swaddling (18%) and kangaroo care (11%) (Table 5).

While examining the correlation between nurses' use of non-pharmacological methods and parental guidance, we found a correlation between all non-pharmacological methods; nurses who used non-pharmacological pain relieve methods 'always/nearly always' also reported guiding parents. The nurses who use non-pharmacological pain alleviation methods 'not at all/ very seldom' did not report guiding the parents (Table 5).

Almost three quarters (70%) of the respondents notified that they 'sometimes' or 'always /nearly always' ask parents to go elsewhere during the painful procedure. In the open-ended questions, 54 of the nurses elaborated that they advise parents to go elsewhere during the procedure due to parents, infants and nurses but also due to the care environment and type of procedure. More frequently mentioned reasons for asking parents to go elsewhere during the procedure were if they do not want to attend ($n = 25$) and were afraid ($n = 12$) or emotionally loaded because of the procedure ($n = 15$). Parents were also guided out if they have some health problems due to which they are not able to attend ($n = 9$) or even if the parents are behaving aggressively ($n = 3$). In addition, nurses asked parents to leave the room if nurses felt that parents would disturb or interfere with the procedure ($n = 8$). The reasons why parents didn't want to attend also included their own discomfort concerning the procedure ($n = 4$). Due to the procedures, parents were asked to go away if the procedure was sterile, surgical or acute for life-saving ($n = 6$). Nurses ($n = 5$) also asked parents leave the room if there was not enough space in the care room. Nurses ($n = 4$) said that they asked parents to leave if infants' have a poor health condition.

Nurses' age and work experience related to pain assessment factors

Younger nurses rated the importance of pain assessment higher than older nurses ($\rho = -275$, $p < 0.009$). Older nurses pay less attention to physiological parameters ($\rho = -368$, $p < 0.00$), behavioural changes ($\rho = -453$, $p < 0.00$) and specific facial expressions ($\rho = -320$, $p < 0.00$). Nurses who were older than 40 years of age assessed neonates' pain without using pain assessment scales ($\rho = -260$, $p < 0.16$) and reported that systematic documentation of pain assessment in newborns is not essential ($\rho = -348$, $p < 0.001$). The knowledge and daily use of pain scales was statistically significantly related to nurses' age: younger nurses are more familiar with pain scales such as VAS ($\rho = -455$, $p < 0.00$) and NIPS ($\rho = -237$, $p < 0.02$), in addition often using the FLACC ($\rho = -437$, $p < 0.00$) pain scale.

Nurses with longer work experience assessed pain parameters in neonates less often than nurses with shorter work experience. It appeared that nurses with more work experience reported assessing both neonates' physiological parameters ($\rho = -337$, $p < 0.00$) and specific facial

expressions ($\rho = -317$, $p < 0.00$) less often. Nurses with longer work experience in the NICU often reported that they assess neonates' pain without using pain assessment scales ($\rho = -212$, $p < 0.05$) and do not use systematic pain documentation ($\rho = -292$, $p < 0.01$). Nurses' work experience was related to their knowledge and use of pain scales. Nurses with shorter work experience most often used FLACC ($\rho = -385$, $p < 0.01$), and in addition they knew NIPS ($\rho = -274$, $p < 0.01$), VAS ($\rho = -460$, $p < 0.00$) and mimical scale ($\rho = -249$, $p < 0.02$) better.

Nurses' work experience related to non-pharmacological pain alleviation and parental counselling

Nurses with longer work experience reported encouraging mothers to breastfeed more ($\rho = 293$, $p < 0.01$) whereas NICU nurses provide guidance on the use of glucose ($\rho = 322$, $p < 0.00$). The longer the nurses have been working, the less they tend to use non-pharmacological methods such as swaddling ($\rho = -419$, $p < 0.00$) and non-nutritive sucking ($\rho = -291$, $p < 0.00$).

Nurses' education related to pain assessment factors and pain alleviation

Nurses with a lower level of education take into account infants' behavioural changes parameters less ($p < 0.00$), whereas nurses' who have higher or nurse specialists' education are more aware of the NIPS ($p < 0.04$) and VAS ($p < 0.03$) pain assessment scales than those with vocational education. The FLACC scale is only used by nurses with higher education ($p < 0.00$). In the units where written pain alleviation instructions for the nurse are available, the nurses report using more non-nutritive sucking ($p < 0.01$) and non-nutritive sucking and glucose ($p < 0.00$).

The nurses' educational level was statistically significantly related to the use of non-pharmacological pain alleviation methods. It was found that nurses with a lower level of education encourage mothers to breastfeed more ($p < 0.00$) and hold infants ($p < 0.01$). Nurses with higher education use more non-pharmacological pain relief methods such as swaddling ($p < 0.00$) and sucrose plus non-nutritive sucking (test statistic 7191, $df = 2$, $p < 0.03$).

Discussion

Neonates' procedural pain and pain assessment

The study indicates that nurses' perception of neonates' procedural pain assessment and alleviation in everyday practice is controversial. Our research results showed that nurses agreed that neonatal pain assessment influences pain alleviation and nurses consider it important to assess and document procedural pain in neonates. On the other hand, nurses confirm that pain is not routinely assessed or documented in their departments. It should be noted that the assessment and documentation of pain is a problem in everyday practice, not only in Estonia but elsewhere. It should be noted that the assessment and documentation of pain is a big challenge in everyday practice because similar findings have been reached by (Manworren et al. 2016, Cruz et al. 2016, Carter & Brunchost 2017, Pölkki et al. 2018). Based on our research, nurses reported that most of the pain scales were unfamiliar for them and they do not-use them in their daily work. Therefore, nurses need training on the use of pain assessment scales (Zhou 2008).

Based on our results, nurses find pain assessment subjective and it is based on their individual observation without using pain scales. These results are similar with previous studies (Pölkki

et al. 2010; 2018). In order to ensure pain care experience for infants, nurses need to be familiar with and use validated and objective pain evaluation measurements (Carter & Brunchost 2017, Oliveira 2017). However, it seems that nurses are not familiar with pain scales or they cannot use them at all because of their lack of knowledge. On the other hand, they might be too confident and too reliant on their work experience.

Nurses in this study reported that the most known pain scales were the Neonatal Face Coding System (NFCS) and the Visual Analog Scale (VAS). The Neonatal Face Coding System (NFCS) is a scale for evaluating neonatal facial expressions (Beltramini et al. 2017). In addition, it is noteworthy that VAS is not suitable for measuring infants' procedural pain because it has been developed for self-assessment of pain (Beltramini et al. 2017). The scale nurses mentioned in the open-ended questions was FLACC - face, legs, activity crying and consolability. Witt et al. (2016) and Crellin et al. (2018) pointed out that the FLACC scale is only eligible for pain assessment in infants and non-verbal young children. In future, it is important to cooperate with units and find valid and reliable pain measurement instruments for them, which they can use in everyday practice.

Based on the results of this study, nurses recognised physical and behavioural parameters when evaluating neonate pain, but not systematically. When comparing Estonian results with Finnish nurses (Pölkki et al. 2018), the results are quite similar. Nurses mostly assessed pain by monitoring behavioural patterns such as crying, movement and breathing. This may also be due to the fact that behavioural changes can be recognised quickly and do not require any assisting tools. However, facial expressions are the least used by nurses in their daily assessment of pain, although they can also be used to assess the incidence and severity of neonatal and infant pain. Previous studies have indicated that multimodal pain scales, which simultaneously assess parameters such as behavioural, physiological and facial changes, are best suited for assessing pain in neonates (Carter & Brunchost 2017).

We found that nurses' age, education and work experience were significantly related to pain assessment practices in neonate care. Younger, less experienced nurses and those with higher education consider the systematic assessment and documentation of pain to be more important than older and more experienced nurses. With increasing age and work experience, nurses assessed neonates' pain without using pain assessment scales. This also explains the fact that younger and nurses with higher education are more familiar with pain scales such as VAS and NIPS, in addition often using the FLACC pain scale in everyday practice. The findings are different compared to the previous research by Pölkki et al. (2018), which found that more experienced nurses used more pain assessment scales than less experienced nurses to assess pain. Apparently, nurses have not realised that pain assessment and documentation have a direct impact on neonatal pain alleviation. Training courses regarding pain can be done to raise awareness, but more importantly, we believe that the role of nursing managers who are competent to systematically assess and document pain with reliable pain scales in the unit is necessary because as leaders they can support the use of reliable pain scales.

Non-pharmacological methods

Our results showed that nurses mostly used non-pharmacological methods such as touching, positioning infants and giving sucrose along with non-nutritive sucking. The results are in line with the previous study (Pölkki et al 2018). Breastfeeding (Friedrichsdorf & Goubert 2020) and so called kangaroo care are also considered effective non-pharmacological analgesics (Hall &

Anand 2014, Lago et al 2009), but in our study, nurses reported that they were the most rarely used methods. Neonates in need of intensive care at intensive care levels II and III are too weak or ill for kangaroo care or breastfeeding as a non-pharmacological method. If nurses lack experience and knowledge of the positive and reassuring effects of music, they may seldom apply this method. In addition, they may avoid the use of music in order to not disturb the other families. Based on earlier studies, non-pharmacological methods are not adequately applied because often nurses consider that non-pharmacological methods are not effective and there is lack of experience and knowledge on the use of these methods (Beckett, 2015, Katende and Mugabi 2015). Non-pharmacological pain alleviation techniques suppress facial expressions of pain, reduce physiological responses, and crying time, and decrease the pain score at the time of painful procedure. (Pillai Riddell et al. 2015). Based on the above, nurses should regularly use non-pharmacological pain alleviation methods.

Most of the nurses reported that they do not know or don't have written non-pharmacological pain all instructions for nurses in their units. In the units where written instructions for nurses were available, nurses reported that they were using more "non-nutritive sucking" and "non-nutritive sucking with glucose". Previous studies have also shown that one of the main obstacles for inadequate use of non-pharmacological methods is the lack of standards and guidelines (Beckett, 2015). According to Pölkki (2018), it is suggested that national guidelines for pain management be developed. However, the mere existence of guidelines does not guarantee the use of them, instead the focus must be on nurses' attitudes and habits in assessing pain and engaging parents in non-pharmacological pain alleviation.

Parental guidance

Our findings showed that nurses guide parents to use the same non-pharmacological pain-relieving methods that they use themselves in daily care. This may increase parental involvement but may be based on nurses' needs not the needs of the infant and parents. It should be noted that many nurses reported that they used to ask parents to leave care rooms during the painful procedures. Previous studies have also recognised lack of involvement with the family in the management of pain as well as lack of encouraging and teaching families (Beckett, 2015, Katende and Mugabi 2015). It is noteworthy that parental participation requires their attendance and this can be promoted by adequate counselling and support facilities (Palomaa et al. 2016). Nurses are responsible for ensuring collaboration between the family and the staff through encouragement and guidance. Therefore it is important to involve parents in care and decision-making as partners.

The nurses' age and work experience was significantly related to the counselling of parents. It appeared that nurses who had longer work experience reportedly provided more guidance to mothers on the use of breastfeeding and those who worked only in the NICU guided mothers to use glucose. Supposedly, the results regarding NICU nurses are caused by the condition of neonates' health, which doesn't always allow them to be lifted to the mother's breast.

Conclusions and implications for practice

The nurses agreed that pain evaluation in practice is important and affects pain alleviation, but the results also show that nurses are not using pain assessment scales because they are subjective and based on nurses' experience. There are problems with pain documentation in everyday practice – it's not systematic. In the future, we should raise nurses' awareness of

neonates' pain assessment and alleviation offer nurses training in this topic. It is important to cooperate with units and find valid and reliable pain measurement instruments which can be used in everyday practice.

Nurses need evidence-based pain assessment and alleviation guidelines in their everyday work. Currently, guidelines are missing in the majority of the departments. In addition to guidelines for nurses, it is necessary to create written guidelines for parents as well.

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Competing Interests

The authors declare no conflict of interests for this study

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Table 1. Research environments and target group.

Hospital	Department (Critical care level)*	Nurses (n)	Beds (n)
Tallinn Children´s Hospital	Department of Neonatal and Infant Medicine (Critical care level: Level II and I, neonatal beds)*	35	26
	Department of Anesthesiology and Intensive Care (Critical care level: Level III)*	31	12
Tartu University Hospital	Childrens Clinic: Department of Neonatal and Infant Medicine (Critical care level: Level II and I and neonatal beds)*	31	24
	Anesthesiology and Intensive Care Clinic: Department of Childrens Intensive Care. (Critical care level: Level III)	20	9
East Tallinn Central Hospital	Maternal Hospital: Department of Neonatology (Critical care level: Level III; II; I and neonatal beds)*	20	14
West Tallinn Central Hospital	Maternal Hospital in the Department of Neonatology. (Critical care level: Level II and I; neonatal beds)*	12	11
TOTAL (N)		149	96

Table 2. Study participants' background and workload factors.

Background factors	n (%)	Range	Mean	SD
Sex				
Female	106 (95)			
Male	2 (2)			
No answer	3 (3)			
Age (Years)				
		21-71	39,4	11,5
<=30	24 (25)			
31-40	27 (28)			
41-50	27 (28)			
> 51	19 (19)			
Education				
Registered Nurse (Vocational education)	33 (31)			
Registered Nurse (Bachelor's degree)	40 (37)			
Clinical Nurse Specialist*	7 (7)			
Registered midwife	16 (15)			
Student	11 (10)			
Work experience as a nurse (n=99)				
		,0-48	16,5	12,8
<=10	43 (44)			
10,1-20	19 (19)			
20,1- 30	22 (22)			
> 30,1	15 (15)			
Work experience as a Neonatal/ NICU nurse (n=90)				
		,0-48	13,2	11,3
<=10	45 (50)			
10,1-20	23 (25)			
20,1-30	15 (17)			
>30,1	7 (8)			
Written pain management instructions in unit (n=104)				
No/don't know	82 (79)			
Yes	22 (21)			
Written instructions on non-pharmacological methods for parents (n=100)				
No/don't know	92 (92)			
Yes	8 (8)			
Participation in education on infant pain during previous year (n=100)				
No	90 (90)			
Yes	10 (10)			

* Clinical nurse specialist is a nurse with particular competence in certain areas such as intensive care, cardiology, oncology, obstetrics, or psychiatry.

Table 3. Nurses' perceptions' of the importance of pain assessment in infants.

Items of the importance of pain assessment	Totally agree/agree some extent f (%)	Don't know f (%)	Disagree to some extent/totally disagree f (%)
Pain assessment in infants affects the implementation of pain management (n=105)	71 (68)	23 (22)	11 (10)
Pain assessment scales are important when assessing pain in infants (n=105)	53 (51)	41 (39)	11 (10)
I can assess the infant's pain in a reliable way without using pain assessment scales (n=105)	61 (58)	21 (20)	23 (22)
Nurses assess the pain in infants consistently without pain assessment scales (n=103)	62 (60)	24 (23)	17 (17)
Systematic documentation of pain assessment in infants is not necessary in nursing (n=106)	22 (20)	28 (27)	56 (53)

Table 4. Pain assessment parameters in infants.

Items of the pain assessment parameters	Always/nearly always f (%)	Sometimes f (%)	Not at all/ Very seldom f (%)
Physiological parameters			
Heart rate (n=108)	52 (48)	35 (32)	21 (20)
Breathing (n=108)	59 (55)	29 (27)	20 (18)
Blood pressure (n=106)	27 (26)	31 (29)	48 (45)
Oxygen saturation (n=107)	42 (39)	41 (38)	24 (23)
Behavioral changes			
Crying/ moaning (n=108)	95 (88)	10 (9)	3 (3)
State of arousal/alertness (n=105)	86 (82)	14 (13)	5 (5)
Arm movements (n=108)	75 (70)	26 (24)	7 (6)
Leg movements (n=107)	73 (69)	25 (23)	9 (8)
Facial expressions in general (n=108)	83 (77)	18 (17)	7 (6)
Specific facial expression			
Brow bulge (n=106)	35 (33)	48 (45)	23 (22)
Eye squeeze (n=106)	43 (41)	35 (33)	28 (26)
Naso-labial furrow (n=104)	13 (12)	37(36)	54 (52)
Mouth stretch (n=106)	29 (27)	40 (38)	37 (35)
Lip pursing (n=105)	21 (20)	38 (36)	46 (44)
Taut tongue (n=103)	7 (6)	25 (24)	71 (70)
Chin quiver (n=106)	46 (43)	41 (39)	19 (18)

Table 5. Nurses' use of non-pharmacological methods and parental guidance.

Item	Nurses use of non-pharmacological methods			Parental guidance			Spearman's ρ
	Not at all/ very seldom f (%)	Sometime s f (%)	Always/ nearly always f (%)	Not at all/ very seldom f (%)	Sometime s f (%)	Always/ nearly always f (%)	
Swaddling	30 (29)	42 (40)	33 (31)	43 (43)	39 (39)	18 (18)	0,597
Sucrose	7 (66)	33 (31)	67 (63)	25 (25)	40 (40)	36 (35)	0,396
Non-nutritive sucking	12 (11)	39 (37)	55 (52)	15 (15)	24 (24)	60 (61)	0,694
Sucrose + non- nutritive sucking	14 (13)	32 (31)	59 (56)	29 (29)	28 (28)	43 (43)	0,626
Touching	2 (2)	16 (15)	88 (83)	5 (5)	6 (6)	89 (89)	0,452
Facilitated tucking	40 (37)	37 (35)	30 (28)	27 (27)	26 (26)	48 (47)	0,581
Holding	18 (17)	39 (37)	49 (46)	11 (11)	26 (26)	62 (63)	0,393
Positioning	1 (1)	22 (21)	83 (78)	9 (9)	15 (15)	77 (76)	0,594
Kangaroo care	58 (56)	34 (32)	13 (12)	68 (69)	20 (20)	11 (11)	0,478
Breast feeding	71 (66)	20 (19)	16 (15)	48 (47)	30 (30)	23 (23)	0,701
Multisensorial stimulations	25 (23)	34 (32)	48 (45)	61 (60)	20 (20)	20 (20)	0,695