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RESEARCH ARTICLE

Pain Management and Assessment in Polish Neonatal Units in the Opinion of Nurses and Midwives

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Abstract

Objective: The aim of the study was to describe nurses' and midwives' basic knowledge about pain and practice regarding procedural pain assessment and management in Polish neonatal care units.

Design: Descriptive, cross-sectional survey.

Setting: This was a national study. 76 neonatal units from 52 cities in Poland took part.

Participants: 355 participants from level III NICU, 204 from level II NICU and 58 respondents from level I NICU.

Methods: A researcher-developed questionnaire sent to randomly selected hospitals throughout Poland.

Results: Data was available from 617 nurses and midwives. The median of correct answers given by nurses and midwives was 4. Among nurses, none of the factors affected the level of knowledge. Pain treatment before selected procedures seems to be insufficient. Before chest tube insertion, 23.4% of nurses reported lack of use of pain medicines. The study also revealed the frequent use of paracetamol before painful procedures. About 40% of participants were asked to use paracetamol before chest tube insertion.

More than half of respondents (60% of nurses from I level NICU, 87% from II level NICU and 71% from III level NICU) did not use pain scales. Almost 24% of respondents indicated that pain treatment was prescribed according to the guidelines

Conclusion: There is a deficiency in the knowledge and practice of neonatal pain management. There is a need for the education of health professionals on neonatal pain management. This study also suggested that failure in the treatment and assessment of pain in neonates is more widespread than suspected. To sum up, Polish neonatal units need national guidelines for pain management as well as the curriculum for nurses and midwives should put more emphasis on the evaluation and treatment of pain in newborns.

Keywords: Midwives, Neonatal pain management, NICU, Likert scale, Nurses

Introduction

Preventing pain before and during medical procedures is a basic human right, regardless of age. In antiquity, it was believed that pain was caused by demons or that the participation of supernatural forces was seen. Newborns who could not defend themselves against the demons were definitely more susceptible to their attacks, and thus were more likely to experience pain. In ancient times, it was also believed that newborns do not have pain memory [1, 2]. It was believed that throughout life, a person acquires experience related to pain, and therefore he becomes resistant to this phenomenon. Newborns and children suffered more than adults due to their lower pain experience. Over time, the approach to pain memory began to change. In 1957, a theory emerged that small children who do not have experience with pain are not able to feel it, so they do not need pain to be relieved. It has been claimed that pain is always a

subjective feeling, and every person learns to use this word through experiences associated with injuries that could have occurred in the early stages of life. This approach meant that newborns were seen as group of people who do not feel pain [3, 4].

Nowadays, it has been evident that newborns born before the physiological date of delivery may show even greater sensitivity to pain than those born at term. The first pain receptors appear as early as the seventh week of pregnancy, and their peripheral ends are around the mouth. In the eleventh

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week of pregnancy, the sensory receptors are found on the face, hands and feet of the fetus. However, in the twentieth week, the sensory receptors are already covered with the entire skin and fetal mucous membranes [5, 6].

An important problem in the treatment of neonatal pain is that there is no ideal treatment that can be used with all children with the same effect. There are many factors involved in the treatment of pain in this group of patients. These include: a large number of painful procedures, the consequences of untreated pain, the risk of both early and distant complications associated with the use of analgesics. Although the approach to neonatal pain management has changed in the last forty years, pain treatment in this group is still insufficient.

The aim of this paper is to describe practices for pain management and assessment in Polish neonatal units according to the opinion of nurses and midwives.

Methods

Settings and Sample

An anonymous questionnaire was developed by the author. To ensure construct and face validity, the questionnaire was used among a pilot study group. The survey was sent to randomly select neonatal departments throughout Poland. The questionnaire was made up of three parts; in total it contained forty questions. The first section asked about demographic information and basic knowledge regarding pain management. The second part asked about current practices for pain treatment before particular procedures. The third section asked about the existence of rules for pain relief and the frequency of use of pain assessment tools. The Likert scale was used to assess the frequency of use of each

drug. Respondents could choose from all the answers and indicate the frequency of use of each of the mentioned drugs. The research began in October 2014, after obtaining a positive opinion of the Bioethics Committee of the Jagiellonian University. A total of 1,302 surveys were sent to 100 hospitals. All voivodeships took part in the survey, including 52 cities (Figure 1). In this paper we presented only data regarding nurses' and midwives' view on pain treatment and assessment.

Data Analysis

The distributions of the analyzed variables have been presented by providing absolute and relative numbers in the case of qualitative variables. Quantitative variables, on the other hand, have been presented by providing the mean and standard deviation, or the median and interquartile range depending on the compatibility of their distribution with normal distribution. Three or more groups of variables were compared using the Kruskal-Wallis test. We used Spearman's rank correlation analysis in order to investigate the relationship between the frequency of scale use and work experience. We tested the association between the frequency of use of pain scales and education using the Umann-Whitney test. Statistical analyses were performed in the SPSS statistical program. The significance level was set at $p < 0.5$.

Results

Socio-demographic data

Most respondents worked in level III NICU (355/617) and in level II NICU (204/617). Only 58 respondents worked in level I NICU 511 of the respondents didn't have specialization in neonatology. 62 respondents (10.05%) graduated from

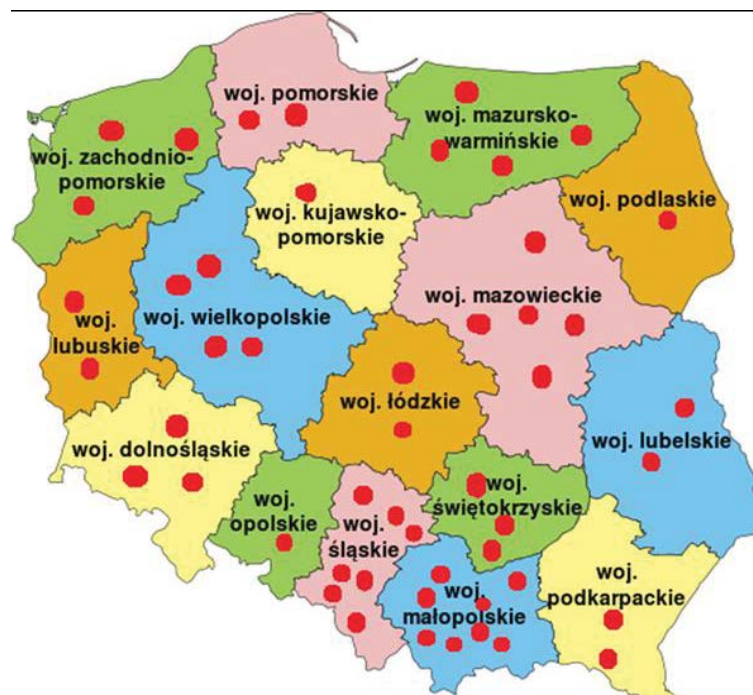


Figure 1: Graphical distribution of cities participating in the study.

specialization in neonatology, 39 respondents (6.4%) were in the process of specialization. 436 of the respondents (70.66%) had more than 16 years of experience in neonatology, 101 (16.37%) worked 6-15 years, 69 respondents (12%) worked from 13 months to 5 years, and only 9 respondents had work experience (1.46%) up to 12 months.

Pain treatment according to the guidelines

140 respondents indicated that pain medicines are prescribed according to the guidelines. A great group of nurses (248) claimed that pain medicines are prescribed according to the doctors' knowledge and experience. Additionally, 229 admitted that they are mainly responsible for choosing the right pain treatment method (Table 1).

Moreover, the study also revealed that pain treatment before selected painful diagnostic-therapeutic procedures did not follow the guidelines. The obtained answers were related to the pattern adopted by the authors, i.e. the guidelines for analgesic treatment of the American and Canadian Pediatric Societies published in 2006. Among nurses and midwives, the median of correct answers was $Me = 36\%$ ($Q1 = 10\%$, $Q3 = 54\%$). Further investigation of the effect of different factors showed that there was a statistically significant relationship between education and pain treatment according to the guidelines ($p = 0.02$). Midwives more often followed the rules than nurses

Pain treatment before specific procedures

The reported use of analgesia varied with the procedure undertaken and with the units' level. For example, before chest tube insertion, the frequency of using opioid analgesics amounted to 45.2% from the third unit level. According to nurses, the frequency of administration of paracetamol, midazolam or opioids was comparable for this procedure. Level II units were more likely to administer midazolam before the tube was inserted into the peritoneal cavity, as indicated by more than half of the participants (56.7%) (Table 2).

Before central line insertion, about 20% of the participants did not use any pain medicines. Among the nurses working in the Level I NICU, the drug most often used was midazolam (33.3%). Such a situation was also seen in the Level II NICU (22% of answers were 'very often' or 'often' among the respondents). In addition, the respondents indicated oral glucose administration (33.6%). However, in the Level III NICU, the most frequently recommended drugs were: acetaminophen (38.3%), phenobarbital (30.5%) and midazolam (22.6%) (Table 3).

Before endotracheal tube suction an average of 70% of nurses and midwives were not asked to give any type of painkiller before the procedure (Table 4).

How Often Pain Medicines are Prescribed	Level I NICU		Level II NICU		Level III NICU		p*
	n	%	n	%	n	%	
At your request	22	38.20%	56	27.30%	151	42.50%	p<0.001
Doctors knowledge and experience	23	40%	86	41.90%	139	39.10%	p=0.402
According to guidelines	13	21.80%	62	30.80%	65	18.40%	p=0.18

*Kruskal-Wallis test

Table 1: An assessment of the manner of prescribing pain killers from the perspective of nurses and midwives.

Before Chest Tube Insertion, Nurses Were Asked to Administer	Level I NICU N=10		Level II NICU N=80		Level III NICU N=287		p*
	% very often, often	% never & rarely	% very often, often	% never & rarely	% very often, often	% never & rarely	
Nothing	50%	50%	35%	65%	23.40%	76.7%	p=0.2445
Opioids	20%	80%	25%	75%	43.20%	43.2%	p<0.001
Paracetamol	10%	90%	12.50%	87.5%	39.70%	60.3%	p<0.001
Midazolam	30%	70%	33.70%	66.3%	41.40%	58.6%	p=0.476
Ketamine	0%	100%	3%	97%	13.80%	86.2%	p<0.001

*Kruskal-Wallis test

Table 2: Frequency of use of medicines before chest tube insertion.

Before Central Line Insertion, Nurses Were Asked to Administer	Level I NICU N=9		Level II NICU N=95		Level III NICU N=340		p*
	% very often, often	% never & rarely	% very often, often	% never & rarely	% very often, often	% never & rarely	
Nothing	66.70%	33.30%	22.10%	77.90%	19.40%	80.60%	p=0.16
Opioids	11.10%	88.90%	8.40%	91.60%	17.30%	82.70%	p=0.003
Midazolam	33.30%	66.70%	23.10%	76.90%	22.60%	77.40%	p=0.32
Fenobarbital	11.10%	88.90%	21%	79%	30.50%	69.50%	p=0.23
Paracetamol	0%	100%	7.30%	92.70%	38.30%	61.70%	p<0.001
Ketamine	0%	100%	3.10%	96.90%	21.80%	78.20%	p=0.001
Glucose/sucrose	11.10%	88.90%	33.60%	66.40%	18.80%	81.20%	p=0.06

*Kruskal-Wallis test

Table 3: Frequency of use of selected drugs before central line insertion.

Drugs used

Fenobarbital intravenous/per os/per rectum and paracetamol were the most frequently used drugs (fenobarbital iv, 14.7% from Level I, 43.7% from Level II and 70% from Level III; paracetamol 76% from Level III). The percentage of administration of individual medicines varied depending on the degree of reference. A higher degree of neonatal care level was associated with the more frequent use of all these drugs (Table 5).

Non-pharmacological pain treatment before heel lancing

The obtained data showed that before heel lancing, the higher the level of neonatal care, the more often nothing was ordered. Respondents also used Emla cream (6.9%), and skin contact was used very often or often only among 28.5% of nurses from a Level III hospital. The most frequently used procedure was heel warming prior to lancing (Table 6).

Pain assessment

The use of pain scales was reported by an insufficient number of nurses. More than 60% of respondents did not use any of the pain scales (Figure 2).

In order to investigate the relationship between the frequency of scale use and work experience, Spearman’s rank correlation analysis was performed. The results of the analysis showed a statistically significant negative relationship: the longer nurses and midwives worked, the lower the frequency of use of pain assessment tools ($p=0.0048$, $R=-0.113$).

An additionally significant correlation was found between the use of scales and basic knowledge ($p=0.000$). A higher level of knowledge was associated with the more frequent use of scales. Additionally, education (nursing or midwifery) was related to the frequency of scales. A significantly higher percentage of midwives used scales to assess pain in neonates ($p<0.005$).

Self-evaluation of pain management

56% of respondents (346) claimed that their manner of pain treatment was sufficient, while 228 respondents (36.95%) admitted that it was insufficient, and 21 respondents (3.40%) considered their own analgesia to be perfect (Figure 3).

Before Endotracheal Tube Suction, Nurses Were Asked to Administer	Level I NICU N=23		Level II NICU N=183		Level III NICU N=343		p*
	% very often, often	% never & rarely	% very often, often	% never & rarely	% very often, often	% never & rarely	
Nothing	91.20%	8.85%	80.30%	19.70%	78.10%	21.90%	p=0.55
Midazolam	0%	100%	7.10%	92.90%	10.80%	89.20%	p=0.03
Paracetamol	4.30%	95.70%	1.60%	98.40%	6.70%	93.30%	p=0.001
Opioids	0%	100%	2.70%	97.30%	8.20%	91.80%	p=0.005

*Kruskal-Wallis test

Table 4: Frequency of use of drugs before endotracheal tube suction.

Drugs	Level I NICU N=41		Level II NICU N=199		Level III NICU N=341		p*
	% very often, often	% never & rarely	% very often, often	% never & rarely	% very often, often	% never & rarely	
Fenobarbital iv	14.70%	85.30%	43.70%	56.30%	70.20%	29.80%	p<0.001
Fenobarbital po/pr	12.20%	87.80%	45.20%	54.80%	72.80%	27.20%	p<0.001
Midazolam	7.30%	92.70%	34.20%	65.80%	49.60%	50.40%	p<0.001
Paracetamol	12.20%	87.70%	10%	90%	76.50%	23.50%	p<0.001
Opioids	4.80%	95.20%	4.50%	95.50%	34.90%	65.10%	p<0.001
Thiopental	2.40%	97.60%	1.50%	98.50%	12.30%	87.70%	p<0.001
Ketamine	2.40%	97.60%	0%	100%	16.10%	83.90%	p<0.001
Muscle relaxant	2.40%	97.60%	2%	98%	21%	78%	p<0.001

*Kruskal-Wallis test

Table 5: Frequency of use of selected drugs in Polish NICUs in the opinion of nurses and midwives.

Before Heel Lancing	Level I NICU N=55		Level II NICU N=198		Level III NICU N=350		p*
	% very often, often	% never & rarely	% very often, often	% never & rarely	% very often, often	% never & rarely	
Do nothing	16.30%	83.70%	24.80%	75.20%	37.70%	62.30%	p<0.001
EMLA cream	0%	100%	4.50%	95.50%	6.90%	93.10%	p=0.01
Sucrose/glucose prior to procedure	43.60%	56.40%	50%	50%	41.20%	58.80%	p=0.219
Warm the heel prior to lancing	56.30%	43.70%	72.80%	27.20%	64.60%	35.40%	p<0.001
Sucrose/glucose during procedure	9.10%	90.90%	18.20%	81.80%	28.20%	71.80%	p<0.001
Skin-to-skin contact	37%	63%	31.60%	68.40%	28.50%	71.50%	p<0.001
Non-nutritive sucking	9%	91%	41.90%	58.10%	58.20%	41.80%	p<0.001

*Kruskal-Wallis test

Table 6: Pain management before heel lancing in the opinion of nurses and midwives.

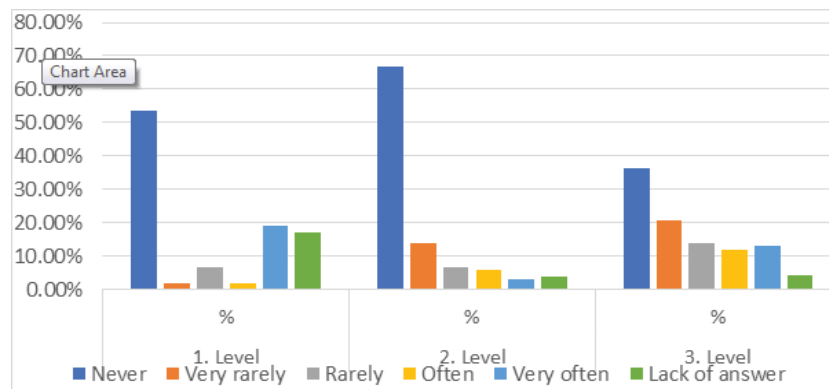


Figure 2: Frequency of use of pain scales.

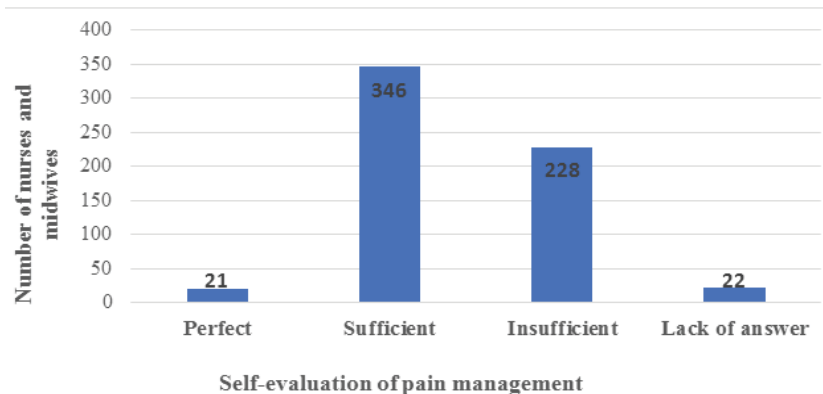


Figure 3: Self-evaluation of pain management.

Discussion

The study aimed to determine the practices for the treatment of pain in Polish neonatal wards. Answers were received from 76 units. Out of 1,302 questionnaires sent, 852 (65%) of correctly completed questionnaires were included in the study, which allowed us to assess the return level as good. This percentage of response is characteristic of surveys carried out by healthcare professionals. A similar result was obtained by other researchers (Germany, Austria and Switzerland - 61%) [7, 8].

Guidelines, pain treatment

The present study showed that a large proportion of respondents did not use analgesics. One of the first studies on the treatment of pain in newborns showed that the number of anesthesiologists who used analgesics during major surgery increased from 6 (10%) in 1988 to 97 (91%) in 1995. In previous years, only 11 anesthesiologists used opioid analgesics when compared to 98 in 1995. In studies from 2006 regarding post-operative pain management in newborns, it was pointed out that opioid analgesics were used in 84% of major surgical procedures. Based on the analysis of the collected data, a very frequent use of paracetamol was also observed to prevent procedural acute pain. According to recommendation, the most common indication for intravenous use of this drug is short-term treatment of moderate pain, especially in the postoperative period. Paracetamol is not effective when alleviating acute procedural pain [9, 10].

The study revealed that the most commonly administered drugs were: phenobarbital, midazolam or paracetamol. As Table 5 shows, in a Level II NICU, sedation drugs were more often used than analgesics. Rawicz paid attention to the use of sedation in pediatric departments. In his work on the principles of using painkillers and sedation medications in newborns, he distinguished two aspects of the use of sedation [11]. While the first, related to humanitarian and medical proceedings, is justified, the latter, aimed at reducing the difficulties of medical staff by ensuring the immobility of the child, requires reflection. The ideal solution according to the author would be to provide the child with individual care with the extensive inclusion of parents involved [12].

In this study, it was observed that about 70-80% of nurses thought that the pain was not treated according to the guidelines. The lack of written guidelines in neonatal wards has been demonstrated in many studies. In Japan, a document that would discuss analgesia was available in 14.5% of centers (in the opinion of departmental nurses) and in 20.4% of centers (in the opinion of head neonatologists) [13]. In Australia, only 76 out of 215 centers had written guidelines for the treatment of pain, while in Spain, there were 13 branches out of 30 [14, 15]. The research shows that the presence of written guidelines does not affect the success associated with their use. Latimer et al. [16] show that nurse-physician collaboration, effective communication exchange with physicians or organizational factors, such as time necessary to do the work and adequate

staff, were more predictive for evidence-based procedural pain care than factors related to knowledge, education or experience [16].

Non-pharmacological methods

Heel prick blood sampling is a commonly performed and painful procedure in newborn infants. This data indicates that before heel lancing, the most common method was to heat the heel (401 of respondents). The research carried out in a group of 57 newborns Barker et al. [17] and 100 newborns Janes et al. [18] showed that such an operation does not affect the effectiveness of the procedure [17, 18]. In addition, research has shown that 34 respondents used EMLA cream before this procedure. In a randomized, controlled trial involving 112 infants, the efficacy of the preparation was compared to a placebo. The response to nociceptive stimulation was assessed based on the crying of the newborn. The authors proved that EMLA did not show an analgesic effect [19]. The lack or poor analgesic effect of EMLA, when used before a heel puncture in newborns is explained by the difference in skin thickness and blood perfusion. Larsson et al. [19] have attempted to clarify whether there is a difference in the degree of blood supply in three areas: on the forehead, on the back of the hand and on the heel. The measurement was performed in a group of 27 healthy, full-term newborns, using Doppler ultrasound. The heel area showed three times greater blood flow in comparison with other assessed parts of the body. On the basis of the received data, the authors concluded that due to the high blood flow that occurs in the heel area, there may be rapid movement of the preparation outside the area on which it is applied [20].

Pain assessment

There are reports from many countries that there is no routine use of pain scales. These tools were used by 30% of centers in France (35 out of 143 centers), 11% in Australia (21 out of 196 centers), 19% in Italy and 43.35% in Spain (13 out of 30) [14, 15, 21, 22]. Reyes showed that although nurses shared the opinion that the appropriate treatment of pain is associated with his earlier assessment, after analyzing the medical records of patients, he did not find evidence that the pain was assessed with the use of tools or any card related to pain management based on his previous assessment [23]. This work has shown that 60% of nurses from a first degree center, 87% of second degree nurses and 71% of third degree reference center nurses did not use scales to assess pain. In Sweden, studies were carried out to assess the frequency of scales in a fifteen-year period. Data obtained in 2008 was compared to the results obtained in 1993. Activities related to pain assessment increased from 64% in 1993 to 83% in 2009. However, the use of pain assessment tools increased from 3% to 44% [24].

In our study, it can be seen that along with the increase of work experience, the frequency of use of pain scale decreased. The reason for this may be a problem related to motivation [25]. Increased motivation in people with longer work experience could significantly contribute to greater knowledge, and

thus to more frequent use of scales for pain assessment and pain management in accordance with the guidelines. Simons & Macdonald [26] showed that lack of knowledge and, consequently, inadequate education is the most important factor affecting the use of scales [26]. On the other hand, Halimma et al. [27] in their research regarding the level of knowledge in pain and assessment possibilities in newborns showed a different relationship. Nurses participating in the study showed extensive knowledge of the pain experienced by newborn, the methods of its assessment and for pain relief. Despite this, after analyzing the open questions, it turned out that the level of knowledge did not affect the frequency of use of scales [27].

In our work, however, there was a positive correlation between the frequency of scale use and the level of knowledge and pain treatment according to guidelines. Of particular interest are also the results indicating a statistically significant relationship between the frequency of scale use and the profession. Midwives significantly more often used scales to assess pain. This can be justified by the fact that the midwifery polish education program contains separate elements of neonatology, which is lacking in the programs implemented in the field of nursing.

Limitations

The limitation of this study may be the fact that a non-standardized questionnaire was used. An incomplete assessment may result from the fact that the study was conducted before Polish recommendations' appearance. A weakness of the research may additionally be the disproportion in the selection of the reference level of centers (too few centers of the first degree). The study was conducted before the recommendations of the Polish Neonatal Society related to pain treatment in this group of patients appeared. This may affect the incomplete assessment of the situation.

Implications for Practice

As a result of a very reliable statistical analysis, we have been able to obtain enough information about the practice of pain management and assessment in Polish neonatal units. Our study highlights the need for more research. It is necessary to conduct further research using the same questionnaire to compare whether pain treatment and assessment in neonatal units has changed after the appearance of Polish recommendations for pain treatment. This data could show whether their implementation is sufficient or whether additional solutions should be implemented to improve the situation associated with pain management in newborns. Additionally, further analysis of factors that have the greatest impact on pain treatment and assessment seems to be important. These factors seem to play a key role in changing our behavior.

Conclusion

This study showed that pain treatment and assessment in Polish neonatal units was insufficient. The confirmation of such treatment is provided by nurses and midwives. In addition, it

has been shown that most neonatal centers have no guidelines for the treatment of pain in newborns. Knowledge about the factors that influence the effective use of guidelines can help improve pain management in newborns.

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