Factors Affecting Neonatal Pain Management

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Abstract: Background/Objectives: Managing neonatal pain is an important issue in neonatal cares. This was a prospective survey on perception of pain management among medical professions in neonatal intensive care units (NICUs). Methods/Statistical analysis: The subjects were 14 physicians and 78 nurses working in NICU in two university hospitals in S and Y cities in South Korea. Self-reported questionnaire were surveyed. The perception of pain, the perception about the necessity of medical treatment, and actual use of medicine for 27 mostly common painful procedures in the NICUs were measured on 5-point Likert scales. Additionally pain related characteristics such as existence and reading experience of pain management guideline and education were investigated.

Findings: Among 92 staffs, 83.7% answered that they had a pain management guideline in the NICUs (57.1% of physicians vs. 88.5% of nurses,$\chi 2=9.48$, p=.009). Among those who had pain management guidelines, 68.5% had read them at least once, and there was a difference between professions (35.7% of physicians vs. 74.4% of nurses,$\chi 2=8.21$, p=.004). Also, there was a difference in the participation of pain management education (28.6% vs. 91.0%, respectively, $\chi 2=30.73$, p=<.001). Overall level of pain perception for 27 painful procedures was 1.76±0.47 out of 4 and there was a difference according to professions (1.44±0.57 for physicians vs. 1.81±0.43 for nurses, Z=-2.13, p=. 033).The level of necessity of pain medication was 2.06±0.66 out of 4(1.90±0.59 for physicians vs. 2.09±0.67 for nurses), and actual use of medicine was 0.79±0.43out of 4(0.93±0.38 for physicians vs. 0.76±0.44 for nurses). However, there was no difference in the level of necessity of pain medication or actual use of medicine according to professions. Nurses showed higher level of pain perception and those who had pain management guidelines, had read guidelines, and had received pain management education showed higher level of the necessity of pain medication. However, the actual use of medicine was relatively low and did not show difference according to professions, existence of guideline, reading or education on pain management.

Improvements/Applications: It is necessary to provide appropriate pain management education and pain guidelines for medical personnel working in NICUs. Also an effort to enhance the actual practice of pain management guidelines should be implemented.

Keywords: Neonate, Pain, NICU, Management, Guideline

I. INTRODUCTION

High-risk neonates in the NICU were repeatedly exposed to multiple treatments and these treatments caused a variety of pain or discomfort. Newborns were more sensitive to pain than adults and this sensitivity was more pronounced in premature infants [1]. Repeated and prolonged pain exposure in neonates was known to be associated with brain development disorders or behavioral changes, and long-term cognitive, social, and emotional dysfunction [2, 3]. High-risk neonates in the NICUs had lower thresholds for pain and therefore pain causing treatments had more harmful effects on the health of high-risk neonates [4].

As the negative effects of pain on newborns were known, guidelines for the assessment, prevention, and management of neonatal pain had been proposed by academic and professional groups [5, 6]. These guidelines required all nurseries or NICUs had written guidance or protocols for neonatal pain management. Also, all clinicians were responsible for the assessment, prevention and management of neonatal pain. Unnecessary procedures or procedures that caused pain should be limited, and it was recommended that clinicians choose a method that produced the least amount of pain [6].If painful procedures were unavoidable, appropriate non-drug interventions or use of pain medication were recommended.

However, there was a discrepancy between practice and guidance [7], and the reasons for inadequate pain management were poor time to manage pain due to the urgency of the procedure, a lack of confidence in the benefits/risks of drug administration, a lack of education about pain management, and a difficulty in assessing pain [8]. In particular, although the proper assessment of pain by the medical professions was the first steps in pain management, clinicians commonly evaluated pain based on their subjective and personal knowledge [9]. Also, they did not know how to manage pain properly or underestimated the pain.

Therefore, this study evaluated the perception of neonatal pain level and the need for medication for pain relief and actual use of medication among physicians and nurses working in NICUs in South Korea. Also, the use of pain management guidelines and factors related to the perception of neonatal pain were investigated.

II. MATERIALS AND METHODS

2.1 Design

This study was a prospective survey to evaluate the perception of neonatal pain level and the need for medication for pain relief and actual use of medication among medical professionals in NICUs in Korea.

2.2 Subjects

The subjects of this study included all staffs working in two NICUs located in Y and S city (26 doctors and 86 nurses) during study period. After IRB's approval, researcher contacted hospital nursing department and explained the purpose of the research and data collection procedures. Unit managers of each NICU were in charge of distributing and completing survey questionnaires.

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All fulltime and part-time NICU staffs were included in the survey. The completed questionnaires were recalled by mail. Among 112 staffs, 14 doctors (53.8% response rate) and 78 nurses (90.7% response rate) were answered.

2.3 Measures

The questionnaire was composed of general characteristics of the participants, pain management related characteristics, and the perception of pain, the perception about the necessity of medical treatment, and actual use of pain medicine. General characteristics included gender, age, profession, educational level, duration of working in the hospital, and duration of working in the NICUs. Pain management related characteristics included an existence of a guideline on pain management, reading experience and educational experience on pain management and type of education.

The perception of pain was configured to respond on a 5-point Likert scale regarding 27 painful procedures. Twenty seven painful procedures were selected by the researcher, referring to the literature on the common painful procedures in nurseries and NICUs [9]. The question was asking the participant to answer how painful the neonates would feel when one of the 27 painful procedures such as intravenous catheter insertion, chest tube insertion, intubation or chest physiotherapy was administered. The Cronbach's alpha for the perception of pain was .925, for the perception about the necessity of medical treatment was .960, and actual use of pain medicine was .899.

2.4 Statistical Analysis

Collected data were analyzed by IBM SPSS Statistics 21.0 program to present frequencies, percentage, means, standard deviation, and ranges. To analyze the differences of general characteristics and pain management related characteristics between professions, independent t-test, chi square test, or Fisher's exact test were applied. In order to compare the perception of pain, the need for medication for pain relief and actual use of medication between the professions and pain management related characteristics, Mann-Whitney U test or Kruskal-Wallis test were applied due to small sample size. The probability level for testing statistical significance was estimated lower than .05.

III. RESULTS AND DISCUSSION

The average hospital work experience was 4.5 years for the physicians and 3.0 years for the nurses as shown in Table 1. The average NICU work experience was 2.1 years for doctors and 2.6 years for nurses. There was no significant difference between the occupations in terms of the duration of work. Among the subjects, 83.7% answered that they had a pain management guideline in the NICU and there was a significant difference between 57.1% of physicians and 88.5% of nurses.

Although this rate of having written guidelines was from only two NICUs in Korea, it seems to be relatively high as compared to the rate of 65% in France [10] or 67% in Italy [11]. However, what should be of interest to the study was that 12% of respondents did not even know if they had pain management guidelines, and that percentage was very high with 35.7% of physicians. In addition, only two-thirds of the respondents (68.5%) had read pain management guidelines, and there also was a difference between physicians and nurses (35.7% vs. 74.4%). Among physicians, only one-third of them had read written guidelines on pain management.

A total of 81.5% had been educated about neonatal pain management, 28.6% of physicians and 91.0% of nurses, and there was a significant difference between the occupations. Compared to large percentage of nurses had been trained in neonatal pain management, physicians had significantly lower experience of reading pain management guidelines or receiving training. In explanation, some physicians did not know whether the unit had pain management guideline or had little chance to read or educated because they worked in the NICUs for a short period of time as an intern or a resident.

However, high-risk neonates hospitalized in the NICU were exposed to a variety of painful treatments [9], and repetitive and long-term pain was associated with negative health outcomes such as brain development or behavioral disorders [1-3], physicians and nurses scheduled to work in the NICUs should be able to familiarize themselves with pain management guidelines and provide various interventions to prevent or reduce pain. In particular, physicians should be more aware of neonatal pain management as medical personnel who actually implement painful procedures such as chest tube insertion, arterial puncture, or central line insertion.

Regarding the type of pain education, all physicians participated out-hospital training whereas 97.1% of nurses participated in-hospital training. As shown in the table 1, most nurses received pain management education through in-hospital education, and 23% of nurses received additional out-hospital education. Although, all physicians received out-hospital training for pain management, it means no significant impact since only a total of 4 physicians participated in pain education.

Table 1. Experience of neonatal pain management among healthcare professionals (N=92)

Categories		Physician (n=14)	Nurses (n=78)	t/χ^2	*p*
		M±SD or N(%)			
Working year at hospital		4.5±2.0	3.0±2.7	1.94	.056
Working year at NICUs		2.1±1.6	2.1±1.6	-0.67	.503

Have guideline on neonatal pain management	No Yes Don't know	1(7.1) 8(57.1) 5(35.7)	3(3.8) 69(88.5) 6(7.7)	9.48	**.009**
Have read guideline on neonatal pain management	Never Ever	9(64.3) 5(35.7)	20(25.6) 58(74.4)	8.21	**.004**
Have taken education on neonatal pain management	Never Ever	10(71.4) 4(28.6)	7(9.0) 71(91.0)	30.73	< **.001**
Type of education (multiple responses)	In-hospital education Out-hospital education Reading articles	2(50.0) 4(100.0) 2(50.0)	67(97.1) 16(23.2) 6(8.7)	7.88	**.003***

*Fisher's exact test

The overall level of pain perception was 1.76±0.47 on a scale of 4 as shown in Table 2. This level of pain was found to be lower than that of other studies [9, 12]. Although it was difficult to compare directly with the different types of painful treatments, doctors and nurses in the NICUs in Norway recognized that 8 out of 10 painful treatments caused more than moderate level of pain in neonates [12]. Medical professionals working in 13 U.S. NICUs were perceived to be at least 40 points on a 100 point basis for all painful procedures [9]. Among 27 painful procedures, chest tube insertion and lumbar puncture were selected as the most painful procedures, which was consistent with the previous study [12].

The level of pain perception of nurses was 1.81±0.43 and the level of pain perception of physicians was 1.44±0.57for painful procedures, showing nurses recognized pain level higher than doctors. This result was consistent with existing findings [12, 13]. This finding is thought to be related to differences in roles or experience in neonatal care. In this study, painful procedures that significantly differed in perception of pain levels by profession included nasal suction, central line insertion, and muscular injection. Nurses usually performed nasal suction and muscular injection in the NICUs and showed relatively high levels of pain recognition, but physicians might have a difficulty in recognizing the levels of pain for procedures that they did not perform. Furthermore, nurses usually assist with painful procedures performed by physicians such as chest tube insertion or central line insertion. In that situation, nurses monitor the condition of the neonates after the procedures, which could be considered to be higher level of pain experienced by the patients. However, there were no differences in the level of pain perception according to experience with neonatal pain management guidelines, experience with neonatal pain management education.

The level of perception about the necessity of medical treatment was 2.06±0.66 on a scale of 4 and there was no difference between professions. Rather, having a pain management guideline showed highest score of 2.17±0.59 as compared to 1.54±0.40 on 'no' and 1.47±0.84 on 'don't know'(Z=9.98, p=.007). The international agreement on neonatal pain prevention and care recommended that each unit had written pain management guidelines for effective neonatal pain management [6]. A study of 90 NICUs in Italy [8] reported if more guidance on pain management were given, the use of pain treatment was 12.4 times more likely to be applied before endotracheal intubation, compared to those that did not.

The respondents who had read the instructions for neonatal pain management perceived about the necessity of medical treatment as 2.21±0.56, and those who did not read perceived it as 1.74±0.76(Z=-2.54, p=.004).In other words, reading pain management guidelines increased the rate at which caregivers used pain relief intervention. Finally, the respondents who had education on pain management showed 2.15±0.63 compared to those who had no education showed 1.64±0.64 (Z=-2.82, p=.005). These results suggest that having a caregiver read or trained pain management guidelines can increase awareness of the need for pain management. However, it is necessary to ensure that awareness of pain management is implemented through practical interventions.

In fact, the level of medication use for pain relief was 0.79±0.43 on a scale of 4 and there was no difference between professions. Furthermore, there was no significant difference between experience with neonatal pain guidelines, reading, or education regarding to actual use of medicine. These findings mean the increased recognition of pain was not always associated with actual pain management performance. According to previous research, educational interventions that improve the caregivers' knowledge of pain management had not greatly contributed to the change in pain management practices [14]. Rather, a multi-dimensional approach in terms of personal, social and organizational aspects had resulted in a successful change in practice [15]. Therefore, for caregivers taking care of high-risk newborns to understand and comply with pain management guidelines, it would be necessary to institutionalize the retention and training of pain management guidelines at an organizational level rather than relying solely on individual efforts.

Table 2. Comparison of pain level perception, perception about the necessity of medical treatment, and actual use of medicine (N=92)

Categories		Pain level perception	Perception about the necessity of medical treatment	Actual use of medicine

Overall		1.76±0.47	2.06±0.66	0.79±0.43
Profession	Physician Nurse Z(*p*)**	1.44±0.57 1.81±0.43 -2.13(**.033**)	1.90±0.59 2.09±0.67 -1.16(.247)	0.93±0.38 0.76±0.44 -1.63(.103)
Have guideline on neonatal pain management	No Yes Don't know Z(*p*)***	1.54±0.72 1.80±0.44 1.57±0.56 1.57(.457)	1.54±0.40 2.17±0.59 1.47±0.84 9.98(**.007**)	0.61±0.47 0.78±0.44 0.93±0.41 2.60(.273)
Have read guideline on neonatal pain management	Never Ever Z(*p*)**	1.63±0.54 1.81±0.42 -1.30(.195)	1.74±0.76 2.21±0.56 -2.54(**.004**)	0.78±0.40 0.80±0.45 -0.04(.997)
Have taken education on neonatal pain management	Never Ever Z(*p*)**	1.54±0.51 1.81±0.45 -1.90(.058)	1.64±0.64 2.15±0.63 -2.82(**.005**)	0.94±0.46 0.75±0.42 -1.54(.124)

**Mann-Whitney U test, ***Kruskal-Wallis test

I. CONCLUSION

In this study, physicians and nurses in two NICUs in Korea evaluated awareness of the pain levelsduring the procedures, awareness of the need for pain medication, and utilization levels. These recognition levels were different according to professions, existence of guidelines, reading or education on pain management. Overall, the recognition of pain sensitivity for painful procedures, recognition of the need for pain relief intervention, and the use of pain relief intervention were lower than in previous overseas studies.By profession, physicians were less aware of pain and need for medication than nurses.These findings seem to be related to the differences in roles and experiences in neonatal care as well as to the number of pain management education.

The use of pain medication was also very rare for procedures that would be perceived to have more than moderate level of pain. Considering that the perception of the need for pain relief interventions was related to the level of knowledge on pain, it would be necessary to provide sufficient pain management education for all NICU staffs. Furthermore,various interventions should be developed and applied to enhance actual implementation of pain management including medication.

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