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Parental presence during painful or invasive procedures in neonatology: a survey of healthcare professionals

Short title: Parental presence during painful procedures

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Abstract:

Background: Newborns in neonatology are exposed to invasive and painful procedures. The absence of parents during procedures revealed significantly high pain scores.

Objective: The aim of this study was to assess practices regarding the role of parents during painful and invasive procedures.

Methods: This was a prospective, observational, multicenter study in France in which 471 caregivers participated. Professional practices regarding the role of parents during painful procedures on their child were assessed. Univariate and multivariate analyses were performed to identify factors associated with parental presence during painful procedures.

Results: Parental presence was most often allowed during capillary blood sampling, nasogastric tube insertions, and vein punctures, whereas it was mostly restricted during central line insertions, extubations, lumbar punctures, and intubations. However, we found discrepancies depending on the type of facility and caregiver seniority.

Conclusion: An important variability in practices concerning the role of parents during painful and invasive procedures on their child was reported.

Keywords: Infant, Newborn, Intensive Care Unit, Neonatal, pain management, Nursing care, Family traduction

1. Introduction

Approximately 10% of newborns are hospitalized in neonatology and are exposed to repetitive and painful, but necessary, medical interventions. A previous study showed that hospitalized newborns experienced more than a dozen stressful, potentially painful, procedures per day [1]. In recent years, appropriate measures have been taken to change practices regarding pain evaluation, management, and treatment [2]. Nonpharmacological methods have been shown to prevent neonatal pain and include non-nutritive sucking, sweet solutions, skin-to-skin contact, and breastfeeding. The absence of parents during painful procedures is clearly correlated with significantly higher pain scores [3]. The presence of parents, especially with skin-to-skin contact, also seems essential to the infant's pain management [4]. Moreover, it has been shown that breastfeeding or sucking sweet solutions was more effective when the parents were present [5]. The presence of parents can also be beneficial for themselves, leading to reduced stress, depression, and anxiety, or even improvement of attachment [6,7].

In the United States, despite efforts to implement family-centered care and engaging parents in the neonatal intensive care unit (NICU), the mean duration of parental visitation per week is relatively short: only 21 h [8]. In Europe, there is a great variability in parental NICU presence, ranging from 3 to 22 h per day [9]. Barriers to parental involvement persist in the NICU. Units that provided facilities for overnight stays showed a significantly higher parental presence. Several factors are associated with longer parental presence in the NICU, among

others, mothers who are Caucasian, married, with a job, with familial support, with fewer children, or who breastfed [10].

To our knowledge, a quantitative assessment of parental presence during painful or invasive procedures in neonatology or regarding the professional characteristics of caregivers has not been conducted to date. The aims of our study were (1) to describe current practices in neonatology units in a French region concerning parental presence during painful and invasive procedures and (2) to investigate the links between the presence of parents and the professional characteristics of caregivers.

2. Material and methods

2.1 Study design and study population

This prospective and observational study was conducted from June to October 2017 in all 20 neonatology units of Nouvelle-Aquitaine (southwestern region of France, approximately 65,000 births per year). Healthcare professionals were invited to complete an anonymous questionnaire divided into four parts. In the first part, data on professional characteristics were collected, such as type of healthcare facility, ward type, occupation, work shift, seniority, and work place location. In the second part, caregivers were asked about parental presence (always, most of the time, never) during six technical procedures (capillary blood sampling, insertion of nasogastric tube, venipuncture, insertion of central catheter, extubation, lumbar puncture, intubation), including benefits and barriers of this presence. Reports concerning benefits and barriers of this presence were subjective: quantitative pain evaluation or parental evaluation stress was not carried out. Details on parental presence during venipunctures were specifically investigated. The last part related to ways to improve parental presence in neonatology units and NICUs. Before distribution, the questionnaire was proofread and

approved by two pediatricians, two nurse managers, a psychologist, and a representative of the parents association. This survey was approved by the local ethics committee (No. 237-2018-03, university hospital, Limoges, France).

In all 20 neonatology units, all caregivers were questioned with the help of nurse managers and the head of each department (previously contacted by e-mail). Caregivers had two possibilities to reply to the questionnaire: via online or printed questionnaires (previously sent to nurse managers). The participation rate was communicated bimonthly using either newsletters or phone calls to the nurse managers and head of each unit. The composition of staff (number of workers, positions) was collected from the nurse managers and head of each department. These units represented different levels of care, as defined by the American Academy of Pediatrics [11]. Three levels of neonatology units were studied: 15 level-2 units (for stable or moderately ill newborn who are born at ≥ 32 weeks' gestation or who weigh ≥ 1500 g at birth), one level-3 unit (for infants who are born at < 32 weeks' gestation, weigh < 1500 g at birth and require NICU stay), four level-4 units (include the services of level-3 units with additional capabilities in pediatric surgical care).

2.2 Statistical analysis

Descriptive demographic data are presented as mean (standard deviation), median (interquartile ranges), and range. Categorical variables are presented as percentages. Qualitative variables were compared using Fisher's exact test. Values of $p < 0.05$ were considered statistically significant. Univariate and multivariate analyses were performed to investigate the relationship between parental presence and the professional characteristics of caregivers. Variables with a value of $p < 0.2$ in the univariate analyses were included in the

multivariate model. Statistical analyses were performed using R software version 3.5.1 (R foundation for statistical computing; <http://www.rproject.org>).

3. Results

3.1 Caregiver characteristics

Out of the 933 caregivers contacted (145 physicians and 788 paramedics), 471 answered (50.4%): 238 (50.4%) caregivers worked in level-2 centers, 211 (44.9%) in level-4 centers, and 22 (4.7%) in level-3 centers. Response rates by type of profession are presented in Figure 1. Among all respondents, 218 (46.3%) were pediatric nurses, 106 (22.5%) nonspecialized nurses, 66 (14%) pediatricians, 63 (13.4 %) childcare assistants, and 18 (3.8 %) pediatric residents. Most caregivers worked on the day shift (217 caregivers, 46.2%), 65 (13.8%) on the night shift, and the others on rotated shifts. Caregiver experience in neonatology was divided into three groups: 152 (32.3%) belonged to the short-experience group (less than 5 years' practice in neonatology), 145 (30.7%) to the mid-experience group (5–10 years), and 174 (37%) to the long-experience group (more than 10 years).

3.2 Caregiver reports on parental presence during painful or invasive procedures

The results of parental presence according to procedure, as reported by all caregivers, are presented in Figure 2. The reports showed that caregivers mainly approved parental presence for common procedures, i.e., nasogastric tube placement, capillary blood sampling, or venipuncture. However, for more invasive procedures (central venous catheter placement, lumbar puncture, extubation or intubation), caregivers mostly refused parental presence (Figure 2).

3.3 Factors influencing approval of parental presence by caregivers

When investigating the relationship between parental presence and the professional characteristics of caregivers, our survey showed that the hierarchical status had a significant

influence on the approval or disapproval of parental presence during painful procedures (Table 1). As far as seniority was concerned, the younger the caregivers, the less they allowed parental presence for capillary blood sampling ($p=0.037$). By contrast, the younger the caregivers, the more they allowed parental presence for lumbar puncture ($p=0.036$).

To investigate the relationship between parental presence and hospital level, hospitals with NICUs were compared with those that did not have NICUs. Caregivers working in hospitals with NICU more often allowed parental presence during extubation ($p<0.001$, respectively). All results are available in the supplemental files.

3.4 Parental presence during venipuncture

Regular parental presence during venipuncture was reported by 88% of caregivers, with 60.8% declaring that parents were in the same room. More than half of the caregivers had performed this procedure during breastfeeding (52.9%) and some even during skin-to-skin contact (34.4%). The level of the center significantly influenced these results ($p<0.001$): venipuncture was more frequently performed during breastfeeding in level-2 centers than in level-3 or level-4 centers (67.7%, 44.5%, and 57.5%, respectively). The survey results showed significant differences in the type of ward: 60.5% of caregivers working in neonatology units had performed venipuncture during breastfeeding, compared with 26% of those working in the NICU ($p<0.001$). More pediatric nurses were in favor of proposing skin-to-skin during this procedure (61%) compared with nonspecialized nurses (42.3%, $p<0.001$).

3.5 Reported benefits and barriers of parental presence

Caregivers reported that parental presence helped them keep newborns quiet (73.8%), decreased parental anxiety during the procedures (73.1%), and clearly decreased newborns'

pain (67.1%). Moreover, most caregivers thought that parental presence could improve the involvement of parents in their infant's care (71.6%) as well as the relationship between parents and staff (57.2%). A proportion of caregivers believed that parental presence could improve the ties between parents and their infant (46.9%).

The main barrier to parental presence raised by caregivers was that it increased caregiver stress during the procedures (72.5%). Other obstacles were the fear of increasing newborns' perception of their parents' and caregivers' stress (49.6%), increased parental anxiety regarding any procedures performed on their baby (42.1%), increased risk of infection (41.4%), and fear of prolonged procedure duration due to parental presence (25.3%).

3.6 Improving parental presence in neonatology

A total of 298 responses (63% of all respondents) were received for the last open question about ways to improve parental presence in neonatology and NICUs. The most frequent suggestion was to create a space in the unit dedicated for the family (42.6%) such as a kangaroo room, a common area for all parents, and a breastfeeding room. Another suggestion was to develop videotelephony to maintain contact between parents and their infant despite their physical distance. Improving caregiver training regarding their relationship with the parents was also suggested (6.4%).

4. Discussion

The aim of our study was to investigate current practices concerning the role of parents during painful and invasive procedures on their infants, as well as the link between parental presence and the professional characteristics of caregivers. We sent the questionnaire to all 20 neonatology units of a French region, of all levels, and obtained a response rate higher than 50%. To our knowledge, this is the first study in France investigating the correlation between professional factors and presence or absence of parents during invasive or painful procedures on their child.

The results suggested that the less invasive the procedures were, the more parental presence was allowed, as shown by the presence rate during capillary blood sampling, nasogastric tube insertion, and vein puncture. By contrast, the presence of parents was less allowed during invasive procedures, such as central line insertion, extubation, lumbar puncture, and intubation.

Caregivers have become aware of the importance of parental presence during painful procedures. More than 70% of respondents admitted that parental presence is beneficial and 65% of them knew the impact of parental presence on newborn pain. Recently, the clinical research study EIPPAIN 2 showed that high pain scores were significantly associated with the absence of parents [3].

However, reluctance on the part of caregivers for the presence of parents during the insertion of central line catheters was noticed. One of the reasons reported for not allowing parents to be present was the risk of infection. Nevertheless, the link between the number of persons present and infection risk has not been studied during central line insertion. Moreover, parents could facilitate this procedure by containing their child. Another barrier to parental presence reported in this study included the potentially increased stress for parents and physicians.

Some authors reported that family members wanted to be present during most procedures [12,13]. Thus, it is important to explain to parents the painful nature of the procedure and to obtain their opinion before considering that it would be too stressful for them. Although the impact of parental presence on procedure outcomes has not been extensively studied, Sanders et al. showed no significant association between family presence and tracheal intubation performance [14]. It is thus necessary to highlight the benefits of parental presence and especially its low negative impact.

This study demonstrated that the professional characteristics of caregivers played an important part in parental presence during painful procedures. Other studies also showed differences between healthcare professionals concerning parental presence [15–18]. In fact, in all studies conducted in NICUs, nurses always appeared to be more in favor of involving the parents compared with physicians [15], notably during rounds [16,17]. Despite the reluctance of caregivers to implement developmental care, Solhaug et al. showed that a newborn individualized developmental care and assessment program (NIDCAP) had a positive impact on infants [18]. This study also demonstrated that caregivers' seniority favored parental presence, notably during the most frequent procedures, such as capillary blood sampling. The same differences were also reported in Sweden, where a longer experience in neonatal care units contributed to a more positive attitude toward entrusting parents with their infants' care [12]. Caregivers should show self-confidence before involving parents in care. Conversely, a Brazilian survey showed that older nurses were less supportive and involved the families in pediatric nursing care less [19]. A north-to-south gradient had also been observed in Europe. Barriers to the presence of parents and other family members in European NICUs remain higher in southern European countries [20]. In our study, we found that caregivers working in a hospital with a NICU declared that they more often allowed parental presence during extubation compared with caregivers in hospital without a NICU. This could be explained by

the fact that the more often caregivers perform these procedures, the more comfortable they are and thus do not mind parental presence. Unfortunately, we could not assess whether there was a center-related effect due to lack of statistical power.

To improve parental role in neonatal units, it is necessary to understand caregivers' perception of obstacles and fears. More than 70% of respondents answered that the first obstacle to parental presence during a procedure was that it increased staff anxiety. However, the lack of staff confidence could be improved by training. A neonatal training program for nurses led to an increase in nurses' perceived value of kangaroo mother care, with a significant increase in the use of skin-to-skin care for preterm infants. It also helped improve nurses' education, competency, and comfort [21]. Indeed, it is important to create specific protocols concerning parental presence in each unit, to improve caregivers' communication (notably the communication between physicians and paramedical team) in order to standardize the role of parents in neonatal care.

This study has several limitations. Firstly, it was a self-report study, which may deliver different results compared with a descriptive study. Nevertheless, this impact was limited by having anonymous responses. Caregivers who responded may be more sensitive to parental presence than those who did not answer. Thirdly, this study focused only on caregivers' opinions about parental presence. It would also have been interesting to obtain the opinion of the parents. Finally, the results on some procedures need to be interpreted with caution, since the respondents were not always the decision-makers. For instance, intubation or lumbar puncture is only performed by physicians, while other procedures are performed by physicians and/or nurses.

5. Conclusion

Our results show that there was reluctance to allow the presence of parents while performing the most invasive procedures. The role of parents in the NICU was significantly influenced by the level of the center and the seniority of the caregivers. Ways to increase parental presence would be to better inform caregivers on the benefits provided by these practices, to implement specific training/education programs, in order to decrease obstacles perceived by caregivers, and also to improve communication between healthcare professionals and parents.

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Conflict of interest: None

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Figures:

Figure 1: Participation rates of caregivers interviewed. Respondents are shown in dark gray and non-respondents in light gray. Results are given in percent for each profession.

Figure 2: Caregiver responses concerning acceptance of parental presence according to procedure. Caregivers answered whether they allowed parents to be present: yes (dark gray) or no (light gray). Results are given in percent for each procedure.

Supplementary data:

Parental presence during nasogastric tube placement, capillary blood sample, venipuncture, central venous access, lumbar puncture, extubation, and intubation (qualitative variables were compared using Fisher's exact test or chi-square test)

<http://www.sciencedirect.com,doi...>

Figure 1:

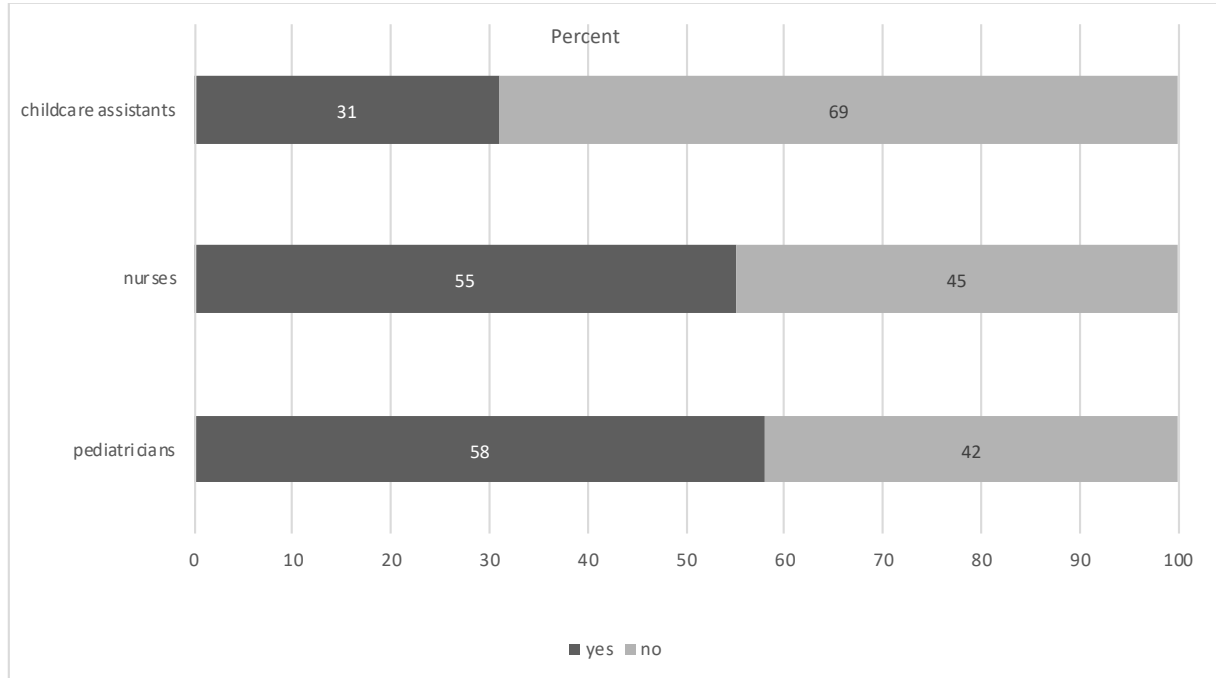


Figure 2:

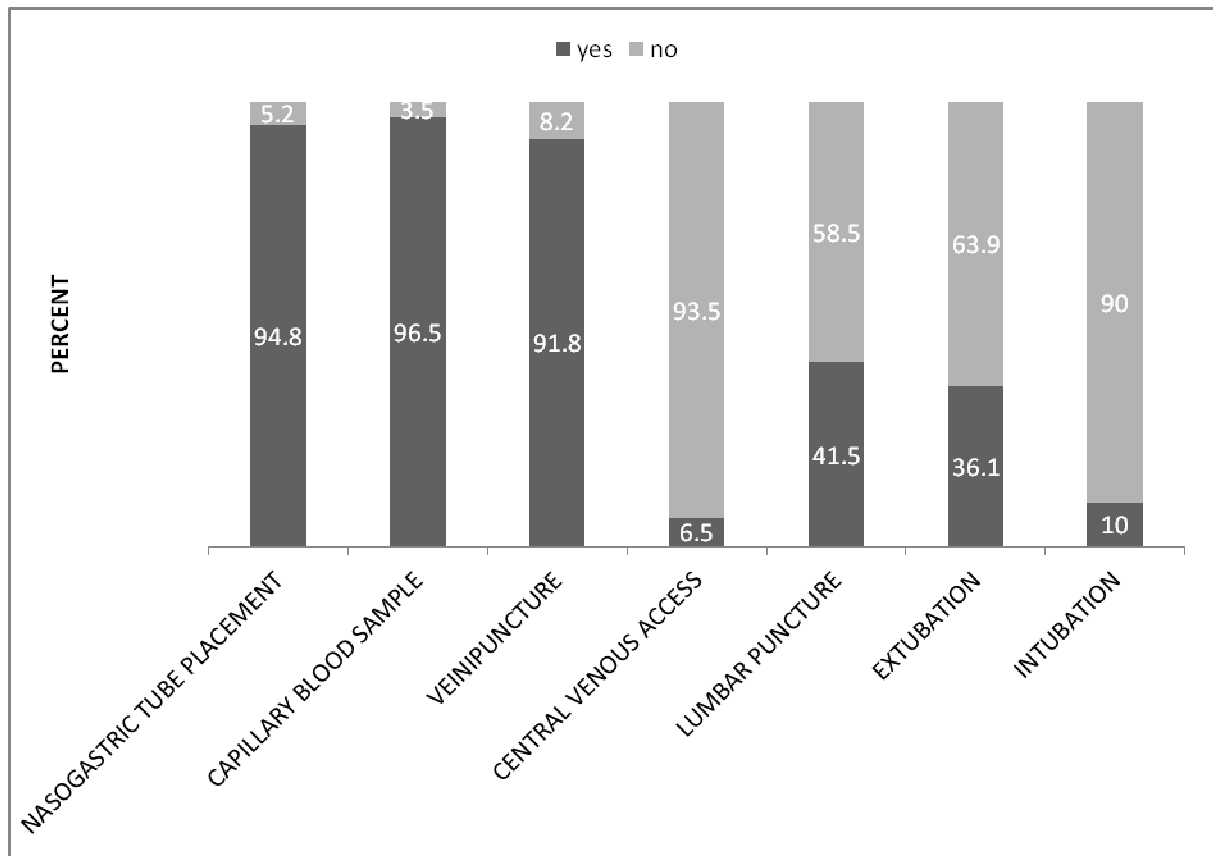


Table 1: Parental presence regarding the six procedures studied: results of univariate and multivariate analysis.

		Univariate analysis Crude OR (95% CI, <i>p</i>)	Multivariate analysis Adj. OR (95% CI, <i>p</i>)
<u>CAPILLARY BLOOD SAMPLE</u>			
<i>Experience</i>			
	<5 years	1	1
	5–10 years	5.28 (1.36–34.81, <i>p</i> =0.034)	5.20 (1.32–34.55, <i>p</i> =0.037)
	> 10 years	4.19 (1.25–19.00, <i>p</i> =0.032)	3.72 (1.09–17.05, <i>p</i> =0.052)
<i>Work shift</i>			
	Day	1	1
	Both	3.30 (1.01–14.75, <i>p</i> =0.071)	3.88 (1.12–18.04, <i>p</i> =0.048)
	Night	3.28 (0.62–60.54, <i>p</i> =0.261)	2.98 (0.53–55.78, <i>p</i> =0.308)
<i>Unit</i>			
	Neonatology	1	1
	NICU	1.80 (0.64–5.46, <i>p</i> =0.272)	2.51 (0.85–7.95, <i>p</i> =0.101)
<u>NASOGASTRIC TUBE PLACEMENT</u>			
<i>Experience</i>			
	<5 years	1	1
	5–10 years	2.48 (0.89–7.98, <i>p</i> =0.097)	2.53 (0.90–8.24, <i>p</i> =0.093)
	> 10 years	3.03 (1.09–9.73, <i>p</i> =0.042)	2.79 (0.99–9.08, <i>p</i> =0.063)
<i>Work shift</i>			
	Day	1	1
	Both	1.47 (0.60–3.78, <i>p</i> =0.408)	1.75 (0.68–4.74, <i>p</i> =0.250)
	Night	3.98 (0.77–73.06, <i>p</i> =0.188)	3.53 (0.66–65.47, <i>p</i> =0.234)
<i>Unit</i>			
	Neonatology	1	1
	NICU	2.17 (0.91–5.53, <i>p</i> =0.089)	2.47 (0.98–6.58, <i>p</i> =0.059)

VEIN PUNCTURE

<i>Experience</i>	<5 years	1	1
	5–10 years	2.23 (0.91–6.03, $p=0.091$)	2.29 (0.92–6.20, $p=0.084$)
	> 10 years	1.41 (0.64–3.11, $p=0.393$)	1.36 (0.62–3.04, $p=0.444$)
<i>Work shift</i>	Day	1	1
	Both	1.00 (0.48–2.09, $p=0.999$)	1.13 (0.52–2.45, $p=0.758$)
	Night	1.68 (0.54–7.38, $p=0.423$)	1.70 (0.53–7.56, $p=0.417$)
<i>Unit</i>	Neonatology	1	1
	NICU	1.70 (0.85–3.47, $p=0.138$)	1.73 (0.83–3.65, $p=0.146$)

INTUBATION

<i>Experience</i>	<5 years	1	1
	5–10 years	0.94 (0.39–2.28, $p=0.892$)	0.90 (0.37–2.20, $p=0.820$)
	> 10 years	0.62 (0.24–1.55, $p=0.305$)	0.65 (0.25–1.66, $p=0.370$)
<i>Work shift</i>	Day	1	1
	Both	0.97 (0.45–2.05, $p=0.932$)	0.96 (0.43–2.12, $p=0.915$)
	Night	0.21 (0.01–1.08, $p=0.135$)	0.23 (0.01–1.19, $p=0.159$)
<i>Unit</i>	Neonatology	1	1
	NICU	0.81 (0.39–1.69, $p=0.576$)	0.89 (0.40–1.94, $p=0.762$)

EXTUBATION

<i>Experience</i>	<5 years	1	1
	5–10 years	1.36 (0.76–2.46, $p=0.307$)	1.70 (0.91–3.24, $p=0.099$)
	> 10 years	1.22 (0.69–2.20, $p=0.498$)	1.38 (0.74–2.59, $p=0.314$)

<i>Work shift</i>	Day		1	1
	Both	1.09 (0.67–1.80, $p=0.723$)		1.85 (1.05–3.31, $p=0.036$)
	Night	1.45 (0.71–2.93, $p=0.298$)		1.22 (0.57–2.57, $p=0.607$)
<i>Unit</i>	Neonatology		1	1
	NICU	4.26 (2.58–7.22, $p<0.001$)		5.51 (3.15–9.98, $p<0.001$)

LUMBAR PUNCTURE

<i>Experience</i>	<5 years		1	1
	5–10 years	0.53 (0.31–0.89, $p=0.017$)		0.49 (0.28–0.83, $p=0.009$)
	> 10 years	0.62 (0.37–1.02, $p=0.061$)		0.57 (0.34–0.96, $p=0.036$)
<i>Work shift</i>	Day		1	1
	Both	1.92 (1.23–3.01, $p=0.004$)		1.90 (1.18–3.08, $p=0.008$)
	Night	1.06 (0.53–2.05, $p=0.870$)		1.11 (0.55–2.20, $p=0.758$)
<i>Unit</i>	Neonatology		1	1
	NICU	0.66 (0.43–1.00, $p=0.052$)		0.75 (0.48–1.18, $p=0.215$)

OR: odds ratio; CI : confidence Interval; NICU: neonatal intensive care unit