Pain Intervention for Infant Lumbar Puncture in the Emergency Department: Physician Practice and Beliefs

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Abstract

Objectives: The objectives were to characterize physician beliefs and practice of analgesia and anesthesia use for infant lumbar puncture (LP) in the emergency department (ED) and to determine if provider training type, experience, and beliefs are associated with reported pain intervention use.

Methods: An anonymous survey was distributed to ED faculty and pediatric emergency medicine (PEM) fellows at five Midwestern hospitals. Questions consisted of categorical, yes/no, descriptive, and incremental responses. Data were analyzed using descriptive statistics with confidence intervals (CIs) and odds ratios (ORs).

Results: A total of 156 of 164 surveys (95%) distributed were completed and analyzed. Training background of respondents was 52% emergency medicine (EM), 30% PEM, and 18% pediatrics. Across training types, there was no difference in the belief that pain treatment was worthwhile (overall 78%) or in the likelihood of using at least one pain intervention. Pharmacologic pain interventions (sucrose, injectable lidocaine, and topical anesthetic) were used in the majority of LPs by 20, 29, and 27% of respondents, respectively. Nonpharmacologic pain intervention (pacifier/nonnutritive sucking) was used in the majority of LPs by 67% of respondents. Many respondents indicated that they never used sucrose (53%), lidocaine (41%), or anesthetic cream (49%). Physicians who thought pain treatment was worthwhile were more likely to use both pharmacologic and nonpharmacologic pain interventions than those who did not (93% vs. 53%, OR = 10.98, 95% CI = 4.16 to 29.00). The number of LPs performed or supervised per year was not associated with pain intervention use. Other than pacifiers, injectable lidocaine was the most frequently reported pain intervention.

Conclusions: Provider beliefs regarding infant pain are associated with variation in anesthesia and analgesia use during infant LP in the ED. Although the majority of physicians hold the belief that pain intervention is worthwhile in this patient group, self-reported pharmacologic interventions to reduce pain associated with infant LP are used regularly by less than one-third. Strategies targeting physician beliefs on infant pain should be developed to improve pain intervention use in the ED for infant LPs.

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Lumbar puncture (LP) is a painful procedure frequently performed on neonates in the emergency department (ED). The International Evidence-Based Group for Neonatal Pain,[1] the Joint Commission on Accreditation of Healthcare Organizations,[2] and the American Academy of Pediatrics in conjunction with the

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Canadian Paediatric Society[3] have set forth guidelines for treatment of pain in neonates; however, it is unknown to what degree physicians in the ED have incorporated these guidelines into practice. Prince et al.[4] observed that there is no consistent practice pattern for alleviating pain in infants undergoing painful procedures in neonatal intensive care units.

Current evidence suggests that neonates experience pain from noxious stimuli.[5–9] Young infants may actually experience pain more intensely as evidenced by the lack of descending inhibitory nerve fibers and the need for high doses of narcotics to relieve pain.[8,9] Untreated pain in human neonates has been shown to have an adverse effect on development, resulting in hyperalgesia and increased morbidity.[10,11] Although it has not been established that the pain of a single LP has long-term effects on infants, painful stimuli such as repeated heel blood draws and circumcision have been shown to have long-term effects on infants.[11,12] In a landmark study, Taddio et al.[11] demonstrated that male infants who received no pain treatment for circumcision showed significantly stronger pain responses months later when receiving immunizations versus infants who had received dorsal nerve block. Similarly, untreated procedural pain in older children has been shown to affect future pain responses for the same procedure. Patients whose procedural pain was not treated for the initial procedure required higher doses of narcotics to control pain versus patients who had adequate pain treatment initially. This was true even if the second procedure occurred months to years later.[13] A recent systematic review has shown an increasing number of high-quality studies demonstrating the effectiveness of pain management for various procedures in infants.[14] Given these data, one can infer that the pain from an LP should be anticipated and adequately treated to decrease the negative consequences of untreated pain.

Previous studies have shown that pharmacologic measures such as administration of oral sucrose,[15,16] use of anesthetic creams,[17] or injection of local anesthetic[18] are effective at decreasing neonatal pain. Studies have also shown that nonpharmacologic interventions such as nonnutritive sucking through use of a pacifier can be effective at decreasing neonatal pain.[15,19] A recent study from Australia noted significant knowledge gaps regarding neonatal pain and its effects, primarily among junior physicians.[20]

The lack of consistent management for painful diagnostic and therapeutic procedures in young ED patients, particularly in the preverbal age group, creates the potential for oligoanalgesia. Furthermore, as neonatal pain treatment is not a standard quality indicator in EDs, wide variations in practice likely go unnoticed. It has been documented that pain treatment practices in the ED differ between adults and children and that practice setting may have an effect on treatment.[21] Most studies have shown relatively lower rates of analgesia usage in children compared to adults.[22,23]

We sought to document the practices for providing pain intervention to infants undergoing LP among physicians practicing at five different EDs in the Midwest. We also sought to document physician beliefs regarding the pain of LP in neonates.

METHODS

Study Design and Population

This was a survey study. This study was approved by the Spectrum Health and University of Michigan Institutional Review Boards. The survey was distributed in five academic Midwestern ED settings: two freestanding children's hospital EDs, two pediatric EDs housed in departments of emergency medicine (EM) within large hospital systems, and one pediatric ED in a non-children's hospital. The participants came from a variety of different training backgrounds: emergency physicians, subspecialized pediatric emergency medicine (PEM) physicians or fellows, and pediatricians. For the purposes of analysis, individual physicians were separated into three different groups depending on their training: EM only, a combination of EM and pediatrics or PEM subspecialty training, and pediatrics only. A site investigator at each hospital distributed the survey in the spring of 2007 and tracked completion at the site.

Survey Content and Administration

An 11-item survey (see Data Supplement S1, available as supporting information in the online version of this paper) was developed by the authors (JDH and AR) with input from a statistician (DR) and a research survey consultant. The survey was pilot-tested by the authors and modified based on their input and that of the survey consultant and statistician. Questions consisted of categorical, yes/no, descriptive, and incremental responses. The survey included questions on board certification and number of LPs completed and/or supervised per year on infants ≤ 3 months. We also surveyed physicians on use of pharmacologic (sucrose, lidocaine, and anesthetic cream) and nonpharmacologic (nonnutritive sucking/pacifier use) pain interventions for LP. Questions on infant sensitivity to pain, long-term effects from the pain of LP, and the importance of treating infant pain were also included. Each anonymous survey had a site identifier to determine the site response rate.

We collected the background demographics of the survey participants, including training background, number of LPs performed per year, and number supervised per year. We measured use of specific pain interventions for LP: pharmacologic (sucrose, injectable lidocaine, anesthetic cream) and nonpharmacologic (nonnutritive sucking/pacifier). We also measured physicians' beliefs if treating infant pain was worthwhile, if pain from an LP has long-term effects on an infant's pain response in the future, and if an infant's pain sensitivity is greater, lesser, or the same as an adult.

Data Analysis

Responses from individual surveys were entered into Microsoft Excel 2003 (Microsoft Corp., Redmond, WA) and exported into SPSS statistical software (version 14, SPSS Inc., Chicago, IL). Descriptive statistics were performed and are expressed as percentages and odds ratios (ORs) with confidence intervals (CIs). Chi-square testing was used to determine significance between percentages.

RESULTS

A total of 156 of 164 eligible physicians (95%) completed the survey. The range of return rates for sites was 87% to 100%. The training background of respondents was 80 (52%) EM, 46 (30%) PEM, and 28 (18%) pediatrics. PEM fellows represented 12% (18) of respondents. There were three respondents certified in both EM and pediatrics, three certified in both EM and PEM, and two certified in all three specialties of EM, pediatrics, and PEM. These eight physicians were grouped with the PEM respondents for analysis. Two respondents did not give their training background.

Table 1 lists specific interventions and their frequency of use by survey respondents. Nonpharmacologic pain intervention (pacifier/nonnutritive sucking) was used in the majority of LPs by 67% of respondents. Injectable lidocaine was the most frequently used pharmacologic intervention.

A total of 121 of the respondents (78%) agreed that taking the time in the ED to treat the pain of a brief procedure, such as an LP, is worthwhile. When asked if the pain from an LP had any long-term effects on an infant's pain response in the future, 30 respondents (19%) answered ''yes.'' For the question ''Do you think that an infant's sensitivity to pain is the same, greater or less than an adult?'' 112 respondents (72%) answered ''same,'' 32 (20%) answered ''greater,'' 10 (6%) answered ''less,'' and one respondent (1%) wrote in that he or she ''did not know.''

Across training types, there was no difference in the belief that pain treatment was worthwhile (78% for all groups; EM 75%, PEM 79%, and pediatrics 82%; p = 0.84) or in the likelihood of using at least one of the pain interventions at some time (84% for all groups; EM 89%, PEM 78%, pediatrics 79%; p = 0.255). Sixteen percent of respondents never used a pain intervention for LP. There were no differences between provider types in reporting that pain has long-term effects on infants (31% for all groups EM 23%, PEM 44%, pediatrics 32%; p = 0.053). There were also no differences in the belief that an infant's pain sensitivity is greater than an adult's (21% for all groups; EM 16%, PEM 23%, pediatrics 29%; p = 0.327).

Physicians who thought pain treatment was worthwhile, when considering all pain interventions as a group (sucrose, injectable lidocaine, anesthetic cream, and pacifiers), were significantly more likely to use one of these agents for at least some LPs versus those who did not believe pain treatment was worthwhile (93% vs. 53%, OR = 10.88, 95% CI = 4.12 to 28.75). Analysis of the influence of the number of LPs performed and supervised per year on the likelihood of a respondent using at least one of the pain interventions is shown in Table 2. Although the ORs were higher for those supervising more than 20 LPs per year, the CIs were wide.

DISCUSSION

Our study demonstrated that self-reported pain intervention use by emergency physicians for infants undergoing LPs in the ED was low regardless of physician training background or experience with LPs. Use of specific pain interventions for infants undergoing LP in the ED varied widely, with less than one-third of physicians reporting specific pharmacologic intervention use. Nonpharmacologic intervention (pacifier/nonnutritive sucking) was the most frequently used intervention. Use of other analgesic techniques such as local anesthetic and/or sucrose was low despite prior studies suggesting their effectiveness for other painful procedures.[18,24,25]

There are few published reports of pain management for infants undergoing painful procedures in the ED or hospital setting.[18,26,27] These prior reports have been limited to residents and medical students or a small sample of attending physicians. One recent study has shown that only 12.6% of infants in an ED received pain management. Pain management outside of the ED in this study was only 0.9%.[28] It has been well documented that pain is undertreated in the ED setting.[29] Pain treatment has been shown to vary with the age of patient, provider type, and insurance status.[30,31] Younger children are less likely to receive pain medication than older children or adults.[32,33]

In response to this, various organizations including the American Pain Society and the Institute of Medicine have tried to focus on the adequate treatment of pain.[34,35] In 2001, the Joint Commission on the

Table 1
Frequency of Specific Pain Intervention Use by Respondents

Frequency of Use (%)	Pharmacologic Interventions			Nonpharmacologic Intervention
	Sucrose*	Injectable Lidocaine†	Anesthetic Cream†	Pacifier‡
0	83 (53)	64 (41)	77 (49)	17 (11)
0–10	19 (12)	22 (14)	17 (11)	14 (9)
10–30	10 (6)	16 (10)	11 (7)	9 (6)
30–50	12 (8)	7 (5)	8 (5)	8 (5)
50–70	12 (8)	5 (3)	3 (2)	13 (8)
>70	18 (12)	41 (26)	39 (25)	92 (59)
Total	154 (99)	155 (99)	155 (99)	153 (98)

Values are *n* (%).
*Two respondents did not answer question.
†One respondent did not answer question.
‡Three respondents did not answer question.

Table 2
ORs Comparing Percentages of Physicians That Used One Pharmacologic Pain Intervention* for at Least Some LPs Versus Number of LPs Performed and Supervised

	Number of LPs		
	≤10 vs. 11–20	≤10 vs. >20	11–20 vs. >20
LPs performed			
Percentages	83.1% vs. 86.0%	83.1% vs. 85.7%	86.0% vs. 85.7%
OR (95% CI)	0.8 (0.3–2.2)	0.8 (0.2–3.2)	1.0 (0.2–4.4)
LPs supervised			
Percentages	82.1% vs. 82.2%	82.1% vs. 88.7%	82.2% vs. 88.7%
OR (95% CI)	1.0 (0.4–2.8)	1.7 (0.2–1.7)	1.7 (0.2–1.9)

LP = lumbar puncture.
*Sucrose, injectable lidocaine, or anesthetic cream.

Accreditation of Healthcare Organizations made the assessment and treatment of pain part of the accreditation process.[2] Since then, the ED assessment and treatment of long bone fracture pain has improved.[30] However, pain treatment remains suboptimal, and the assessment and treatment of pain in young infants presents a unique challenge.

We chose to separate pharmacologic pain interventions from nonpharmacologic pain intervention because use of a pharmacologic pain intervention generally requires a physician's order or some action on the part of the physician and therefore could be considered an active intervention. Use of nonnutritive sucking does not require a physician order and may be a more passive form of pain intervention on the part of the physician, with the parent, caregiver, or nurse giving the pacifier to the infant.

In our study, EM-trained respondents outnumbered PEM-trained respondents, which is reflective of the fact that 90% of children seeking emergency care in the United States are treated in community-based EDs by non-PEM physicians.[36] However, despite their fellowship training, PEM-trained physicians were no more likely to use pain interventions for infant LP than EM or pediatrics only–trained physicians.

Despite the belief by the majority of respondents that pain intervention was worthwhile for LP, pharmacologic pain intervention use was low. The majority of respondents to our survey did not indicate a belief that the pain from an LP has long-term effects on infants or that neonates demonstrate increased pain sensitivity. Our data show that the individual physician belief that pain treatment is worthwhile strongly correlates with analgesia/anesthesia use for LP, while training type and number of LPs done or supervised per year had no effect. Therefore, targeted education of physicians who do not believe pain treatment is worthwhile for neonates may improve use of anesthesia/analgesia in infants.

LIMITATIONS

This study is limited by the typical issues surrounding survey research including bias due to misinterpretation and inaccurate reporting. To reduce ambiguity issues related to these biases, we pilot-tested the survey and had an expert in survey methodology edit the final product. Respondents were given adequate time to fill out the survey. We did not ask respondents how long they had been out of residency, which may correlate with some of the beliefs we were measuring. This was done to help preserve anonymity because such information could serve as an identifier. This survey was done at five hospitals in a specific geographic region (Michigan and Chicago, IL), which limits generalizability to other physicians in non-Midwest states; however, physicians from different training backgrounds and different ED settings participated. Our survey response rate was higher than that typically seen for surveys. We attribute this to each site having an established site investigator to facilitate physicians receiving the survey and ensuring surveys were completed in a timely fashion versus a postal mail or electronic survey.

CONCLUSIONS

Physician self-reported use of pharmacologic pain interventions during infant lumbar puncture in the ED was strongly correlated with the belief that treating infant pain was worthwhile. Use of pharmacologic pain interventions for infant lumbar puncture was low in our cohort of physicians. Strategies targeting physician beliefs on infant pain should be developed to improve pain intervention use in the ED for infant lumbar punctures.

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Supporting Information

The following supporting information is available in the online version of this paper:

Data Supplement S1. Infant LP survey.

The document is in DOC format.

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