

# Postoperative Pain Management in Children, Parental English Proficiency, and Access to Interpretation

## AUTHORS

Nathalia Jimenez, MD, MPH,<sup>1</sup> Douglass L. Jackson, DMD, MS, PhD,<sup>2,3</sup> Chuan Zhou, PhD,<sup>2,4</sup> Nelly C. Ayala, RN, MSN,<sup>5</sup> and Beth E. Ebel, MD, MSc, MPH<sup>2,3,4</sup>

<sup>1</sup>*Departments of Anesthesiology and*

<sup>2</sup>*Pediatrics, School of Medicine, and*

<sup>3</sup>*School of Public Health, University of Washington, Seattle, Washington; and*

<sup>3</sup>*Centers for Diversity and Health Equity and*

<sup>4</sup>*Child Health, Behavior and Development, Seattle Children's Research Institute, Seattle, Washington*

## KEY WORDS

interpreters, language barriers, pain management

## ABBREVIATIONS

ASA: American Society of Anesthesiologists

EP: English-proficient

FLACC: Face, Legs, Activity, Cry, and Consolability

LEP: limited English proficiency

MIPS: modified infant pain scale

NRS: numerical rating scale

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Address correspondence to Nathalia Jimenez, MD, MPH, Box 9824, 4800 Sand Point Way NE, Seattle, WA 98105. E-mail: njimen@uw.edu

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## abstract

**BACKGROUND AND OBJECTIVE:** Patients with limited English proficiency (LEP) are at risk for undertreated pain. The goal of this study was to examine the association between parental language proficiency, interpreted care, and postsurgical pediatric pain management.

**METHODS:** This was a retrospective matched cohort study among children <18 years of age. Children of LEP and English-proficient (EP) parents were matched according to age group, surgical procedure, and admission date. Mean number of daily pain assessments and mean daily pain scores were compared between language groups. We also compared the association between pain scores and type of medication given (opioid versus nonopioid). Within the LEP group, similar analyses compared pain assessment and treatment of children whose families received  $\geq 2$  professional interpretations per day versus those who received lower rates of interpretation.

**RESULTS:** A total of 474 children (237 LEP and 237 EP) were included in the study. Children of LEP parents had fewer pain assessments (mean: 7 [95% confidence interval: 2–13] vs 9 [95% confidence interval: 4–15];  $P = .012$ ), and higher levels of pain recorded before receiving opioid analgesics, compared with children of EP parents ( $P = .003$ ). Within the LEP group, children with  $\geq 2$  interpretations per day had lower pain scores after medication administration ( $P < .05$ ) and were more likely to receive opioids at pain levels similar to those of EP families.

**CONCLUSIONS:** Children of LEP parents received fewer pain assessments and were less likely to receive opioid analgesics for similar levels of pain compared with children of EP parents. More frequent use of professional interpreters when assessing pain may aid in reducing the gap in pain management between LEP and EP pediatric patients.

Pain is frequently experienced by hospitalized children and adolescents<sup>1</sup> and is a leading concern for parents and caregivers.<sup>2,3</sup> Nonetheless, many children experience significant pain during hospitalization. Earlier studies have reported that 64% of surgical pediatric patients experienced moderate to severe pain<sup>4</sup> and 29% experienced severe or unbearable pain<sup>5</sup> at least once over a 24-hour period during hospitalization. A more recent study found that pediatric surgical patients still experience a higher prevalence of moderate to severe pain compared with patients in medical wards (44% vs 13%).<sup>6</sup> Because pain treatment is based primarily on patient or parent report, good communication between care providers, patients, and families is essential for pain control.<sup>7</sup> Patients with limited English

proficiency (LEP) are at risk for undertreatment of pain due to difficulties communicating with care providers.<sup>8,9</sup> LEP families may hesitate to initiate communication about pain needs, resulting in fewer pain assessments and lower rates of medication administration.<sup>10,11</sup> Professional interpreters improve communication between care providers, patients, and families,<sup>12,13</sup> and their consistent use during inpatient care is associated with better patient-reported outcomes for pain treatment in adult patients.<sup>14</sup> To the best of our knowledge, there are no studies evaluating the impact of LEP of parents and professional interpretation on pain management for children.

The current study had 2 objectives. First, we assessed if children with LEP parents experienced more acute postsurgical pain or disparities in pain management compared with children of English-proficient (EP) parents. In addition, we examined whether professional interpretation was associated with fewer disparities in pain management, presumably by improving communication between the child, family, and care team. We studied a cohort of pediatric surgical patients to compare frequency of pain assessments, intensity of pain (measured by using pain scores), and type of analgesic treatment (opioid versus nonopioid) received between children of parents with and without LEP and among patients of LEP parents with various degrees of interpreted care.

## METHODS

### Study Design

This retrospective matched cohort study evaluated the association between parental English proficiency, use of interpreter services, pain

assessment, and analgesic treatment among pediatric surgical patients. The study was approved by the institutional review board at Seattle Children's Hospital.

### Study Population and Setting

The study was conducted in a tertiary care referral pediatric hospital. Inpatient children 0 to 18 years of age admitted for a surgical procedure between January 1, 2008, and August 31, 2009, were eligible for the study. We excluded patients who required postoperative admission to the ICU (to avoid potential confounding from opioid analgesics given for sedation or airway management). Children with LEP parents were matched 1-to-1 with children with EP parents, randomly chosen from a set of eligible subjects based on age category (<1, 1-3, 4-7, 8-12, and ≥13 years of age), type of surgery (based on *International Classification of Diseases, Ninth Revision* and *Current Procedural Terminology* codes), and admission date (within 1 month of index child admission date).

Our institution is a tertiary care center with 323 beds, including 66 beds exclusively for surgical patients. Approximately 15 000 surgeries are performed every year, and roughly one-third require inpatient admission. The majority of inpatient surgeries are performed by pediatric surgery, followed by orthopedic surgery. The distribution of surgical specialties in our study reflects the hospital population admitted to our surgical units. Typically, patient pain is managed by the primary surgical service; the attending surgeon, surgical residents, nurse practitioners, and surgical hospitalists share this responsibility. A small proportion of patients (<5%) are managed by the acute pain service, staffed by

anesthesiologists, and nurse practitioners. Patients on medical floors who require surgical procedures (ie, line placements) are managed by the primary medical service and medical hospitalists.

### Study Variables

Pain assessment and medication variables were as follows: (1) mean number of daily pain assessments; (2) mean daily pain scores before and after analgesic administration; and (3) type of analgesic given. We secondarily collected the choice of pain scale used by nursing staff because we hypothesized that there might be more use of nonverbal scales for children from LEP families. Information on the number of daily pain assessments and daily pain scores was obtained from the electronic medical record. Administration of pain medication triggered a mandatory documentation of pain assessment at the time of medication administration and 30 to 60 minutes after medication administration. Nurses documented administration time, pain scale used, and pain scores at each assessment. Pain scales included 2 behavioral pain scales (the modified infant pain scale [MIPS] and the Face, Legs, Activity, Cry, and Consolability [FLACC] behavior scale) and 2 self-reported pain scales (the Faces pain scale, which asks the child to point to a face representing how he or she feels, and the numerical rating scale [NRS], which asks the child to verbally report a pain number). The Faces and NRS pain scales have been validated in other languages.<sup>15,16</sup> The FLACC and MIPS scales have been commonly used with Hispanic as well as non-Hispanic children.<sup>17,18</sup> However, there were no validation studies in this population.

Each pain scale scores the intensity of pain from 0 (no pain) to 10 (highest possible pain).<sup>7</sup> Our institution promoted the use of behavioral pain scales (MIPS and FLACC) in preverbal patients and self-report scales (the Faces pain scale and NRS) for verbal patients. Parents were encouraged to provide input in the assessment of their child's pain; however, parental pain scales were not used to guide treatment because of their poor correlation with children's reports.<sup>19,20</sup> Analgesics were grouped into 2 main categories: nonopioids (acetaminophen, ketorolac, and ibuprofen) and opioids (oxycodone, hydrocodone, fentanyl, morphine, meperidine, and hydromorphone). Nalbuphine is not routinely used in our institution for postoperative pain management and was not given to any patient in our study.

Language and interpretation variables were: (1) self-identified English proficiency of parents at the time of registration to the hospital; and (2) number of professional interpreted communications per day. All families were asked mandatory questions about language use and preference during registration ("Would you prefer communication about your child's health in English or in another language?" If the answer was another language, parents were asked "which language"?). Families who stated that they spoke a language different from English and who requested health communication in that language were considered to be LEP. The number of professional interpretations per day was measured by using electronic record orders generated by requests for in-person interpretation. In addition, our hospital keeps a separate billing record of all the interpretations (in-person or by telephone) provided for families. Each

order was linked to individual patient encounters with a time/date stamp. During the study period, hospital staff was required to pass the interpreter test if they wished to use a second language for medical communication. This request was rare; therefore, nearly every interpreted communication used in-person or telephonic interpretation. For example, only 6% of pediatric residents were fluent in Spanish. We do not have this information for the nursing staff because testing was underway at the time of the study; nonetheless, we believe the percentage of Spanish-fluent nursing staff is similar to that described for pediatric residents. Frequency of interpretation was assessed by the mean number of interpretations per day during hospitalization. For the purpose of this study, we created a binary variable for patient interpretation; "<2" versus "≥2" mean interpretations per day, consistent with our institutional goal for interpreted care (at least 2 interpretations per patient-day).

Additional variables measured were: age in years, gender, hospital length of stay measured in days, and severity of illness as measured according to the American Society of Anesthesiologists (ASA) physical classification. The ASA physical classification ranges from ASA Physical Status 1 (normal healthy patient) to ASA Physical Status 5 (moribund patient).<sup>21</sup> ASA status ratings 3 through 5 are associated with morbidity after surgery and are a common measure of illness severity among surgical patients.<sup>22,23</sup>

### Analysis

Demographic variables and selected clinical outcomes were summarized by using descriptive statistics and

compared between LEP and EP groups by using the paired Wilcoxon signed rank test. This nonparametric test was used because many of the variables demonstrated deviation from normality. To evaluate the associations between English proficiency and pain treatment, we compared mean number of daily pain assessments and mean daily pain scores before and after analgesic administration, between LEP and EP patients, by using paired Wilcoxon tests. Subsequently, we evaluated the association between language and pain scores stratified according to pain medication; for each type of medication (nonopioid and opioid), we compared frequencies of the associated pain scores (mild, 0–3; moderate, 4–6; and severe, 7–10) across LEP and EP groups. Because each individual patient received pain treatment on several occasions during hospitalization, for this analysis we used each medication administration as the unit of measure and adjusted for repeated measure clustering by each individual patient. We applied generalized estimating equations with binomial family and logit link, and controlled for gender and age (to account for residual confounding within the age groups).

Additional subgroup analyses were conducted within the LEP group to compare mean number of daily pain assessments, mean daily pain scores before and after medication administration, and type of analgesic between patients with a mean of <2 vs ≥2 professional interpretations per day. Mean number of daily pain assessments and mean daily pain scores were compared between groups by using Wilcoxon signed rank tests. Relationship between interpretation service and pain scores was assessed

by using generalized estimating equations to account for clustering of individual patient measurements, and regression models controlled for age and gender. We tested the association between frequency of interpretations per day and type of analgesic given. All analyses were conducted by using R version 2.10.1 (R Foundation for Statistical Computing, Vienna, Austria).<sup>24</sup>

## RESULTS

### Patient Characteristics

We identified an initial cohort of 346 children of LEP parents who had inpatient surgery over the study period. Of those, 109 patients were excluded due to admission to the ICU (*n* = 86) or inability to find an adequate match by using the 3 matching variables of age group, admission date ( $\pm 1$  month), and surgical diagnosis (*n* = 23).

A total of 474 patients (237 with LEP parents and 237 with EP parents) were included in the study. The most common surgeries were appendectomy and other abdominal procedures (31.2%), followed by dental/craniofacial/otolaryngology procedures (18.1%), orthopedic procedures (16.4%), and other procedures (36%), which included neurosurgical (eg, ventriculoperitoneal shunt) and urologic (eg, inguinal herniorrhaphy, renal or urinary tract repair) procedures.

Among the LEP group, two-thirds of parents spoke Spanish. Of the remaining one-third, 26 other languages were spoken, reflecting the diversity of the patient population (eg, Vietnamese, Somali, Ukrainian, Russian, Arabic, Japanese, Mandarin). One-third of patients from LEP families (*n* = 86) had  $\geq 2$  mean interpretations per day. Demographic and clinical characteristics were similar between the EP group and the 2 LEP groups, except for age. Children from LEP families with  $\geq 2$  interpretations per day were somewhat younger, on average, compared with LEP children with  $< 2$  daily interpretations (Table 1).

### Association of Pain Management and English Proficiency

We compared pain assessment and pain treatment between patients from EP and LEP families without stratifying according to intensity of interpretation services. The overall frequency of pain assessments (preanalgesic and postanalgesic administration) per day was lower for patients from LEP families compared with patients from EP families (7.3 [95% confidence interval: 2.4–12.5] vs 9.3 [95% confidence interval: 3.8–14.5], *P* = .01) (Table 2). The 2 groups did not differ significantly in preanalgesic mean daily pain scores. Postanalgesic score differences were statistically significant,

but this difference was not clinically significant.

The use of the nonverbal Faces pain scale was higher among children from LEP families compared with children from EP families (14% vs 10%; *P* < .001) with a similar reduction in the use of the NRS scale. There were no differences in the use of behavioral pain scales (Table 2).

Analysis of medication administered for pain treatment showed a significant difference in the distribution of pain scores for opioid administration. Patients of LEP families had significantly higher levels of pain recorded before receiving opioid analgesics, compared with those of EP families (Table 2). No differences were detected in the distribution of pain scores for the nonopioid analgesic category (Table 3).

### Pain Management and Frequency of Interpretation

We explored the association between the frequency of professional interpretation ( $< 2$  professional interpretations per day versus  $\geq 2$  professional interpretations per day) and pain management within the LEP group. There was no statistically significant difference in the frequency of pain assessment for children of families with  $< 2$  interpreted visits per day, relative to children of

**TABLE 1** Demographic and Clinical Characteristics of EP and LEP Participants

Characteristic	EP ( <i>n</i> = 237)	LEP ( <i>n</i> = 237)	LEP	
			$< 2$ Daily Interpretations ( <i>n</i> = 151)	$\geq 2$ Daily Interpretations ( <i>n</i> = 86)
Age, mean $\pm$ SD, y <sup>a</sup>	7.7 $\pm$ 5.7	7.4 $\pm$ 5.5	8.4 $\pm$ 5.7 <sup>b</sup>	5.8 $\pm$ 4.7
Female gender, <i>n</i> (%)	106 (45)	115 (49)	76 (50)	39 (45)
ASA status, <i>n</i> (%)				
I–II	181 (75)	189 (79)	119 (79)	67 (81)
III	56 (24)	48 (21)	32 (31)	19 (19)
Length of stay, mean $\pm$ SD, d	4 $\pm$ 8.4	4 $\pm$ 5.8	4.5 $\pm$ 6.6	3.1 $\pm$ 3.6

<sup>a</sup> EP and LEP groups were matched according to patient age group.

<sup>b</sup> Significantly different between LEP patients with  $< 2$  vs  $\geq 2$  interpretations per hospital day (*P* < .05).

**TABLE 2** Pain Assessment and Mean Pain Scores According to English Proficiency and Interpretation Intensity

Assessment	EP (n = 237)	LEP (n = 237)	LEP	
			<2 Daily Interpretations (n = 151)	≥2 Daily Interpretations (n = 86)
No. of daily pain assessments, median (IQR 25–75)	9.3 (3.8–14.5) <sup>a</sup>	7.3 (2.4–12.5)	8.1 (1.7–12.2)	7.1 (3.3–11.8)
Daily mean ± pain score before medication administration	3.7 ± 1.7	3.7 ± 1.7	4.0 ± 1.7	3.2 ± 1.7
Daily mean ± SD pain score, after medication administration	0.9 ± 1.1 <sup>a</sup>	1.3 ± 1.4	1.6 ± 1.4 <sup>b</sup>	0.7 ± 1.2
Pain scale used, %				
Faces pain scale	10 <sup>a</sup>	14	12 <sup>b</sup>	15
NRS	36	32	36	13
Behavioral	47	49	33	55
No scale used	9	11	19	17

Regression analyses adjusted for clustering by individual patient, age, and gender. IQR, interquartile range.

<sup>a</sup> Significantly different between EP and LEP patients (*P* < .05).

<sup>b</sup> Significantly different between LEP patients with <2 vs ≥2 interpretations per hospital day (*P* < .05).

families with ≥2 interpreted visits per day. Nonetheless, children of families who received <2 interpreted visits per day had higher mean postanalgesic pain scores (1.6 ± 1.4 vs 0.7 ± 1.2; *P* = .004) relative to children with more frequent interpretation (Table 2). In terms of the type of scales used, we found a significant difference between the 2 LEP groups. Children who received >2 interpretations per day were more likely to be assessed by using behavioral pain scales rather than self-reported scales.

Children whose families received more frequent interpretation were also more likely to be given opioid analgesics at any level of recorded pain, relative to

children with fewer interpretations; however, these differences did not reach statistical significance (Table 2).

### DISCUSSION

In this retrospective matched cohort study of children admitted for surgical care, children of LEP families had fewer daily pain assessments compared with children of EP families. This result is consistent with the hypothesis that inadequate communication with LEP families may make it difficult for parents to seek treatment of their child’s pain or may result in fewer interactions with medical staff. We also found that children of LEP families received opioid analgesics at

significantly higher pain scores compared with children of EP families. In addition, mean postmedication pain scores were higher for children of LEP parents compared with children of EP parents, despite the finding that mean preanalgesic pain scores were similar. One explanation for this finding may have been differences in the type of analgesic administered. For similar pain scores, children of LEP parents received less-potent analgesics, and children may therefore have had residual pain after analgesic administration. Unique to this study, we were able to explore whether improved communication, measured through higher rates of interpreter use, might be associated

**TABLE 3** Total Analgesic Doses Administered to EP and LEP Patients According to Type of Analgesic Medication and Pain Severity

Variable	EP (n = 237)	LEP (n = 237)	LEP (n = 237)	
			<2 Daily Interpretations (n = 151)	≥2 Daily Interpretations (n = 86)
Nonopioid doses <sup>a</sup>	1086 (100)	947 (100)	701 (100)	246 (100)
Mild pain (pain scores 0–3)	776 (71)	660 (70)	465 (66) <sup>b</sup>	195 (79)
Moderate pain (pain scores 4–7)	262 (24)	241 (25)	197 (28) <sup>b</sup>	44 (18)
Severe pain (pain scores 8–10)	48 (4)	46 (5)	39 (6) <sup>b</sup>	7 (3)
Opioid doses <sup>a</sup>	975 (100)	968 (100)	726 (100)	242 (100)
Mild pain (pain scores 0–3)	296 (30) <sup>c</sup>	214 (22)	153 (21)	61 (25)
Moderate pain (pain scores 4–7)	481 (49) <sup>c</sup>	473 (49)	343 (47)	130 (54)
Severe pain (pain scores 8–10)	198 (20) <sup>c</sup>	281 (29)	230 (32)	51 (21)

Data are presented as n (%).

<sup>a</sup> Number of analgesic doses; presented percentages correspond to column percentages. Regression analyses adjusted for clustering according to individual patient, age, and gender.

<sup>b</sup> Significantly different (*P* < .05) between LEP patients with <2 vs ≥2 mean interpretations per day.

<sup>c</sup> Significantly different between EP and LEP patients (*P* < .05).

with a reduction in disparities. As hypothesized, children from LEP families with <2 interpreted visits per day had moderately higher postanalgesic administration pain scores. In addition, lower levels of interpretation were associated with a reduced likelihood of being given opioid medication at a given pain score, although this difference did not reach statistical significance. Pain management for patients with LEP parents with higher levels of interpretation was similar to that for patients from EP families, supporting the hypothesis that higher rates of interpretation might help mitigate health disparities.

One point that deserves additional discussion is the difference we found in the use of pain scales between children of EP and LEP parents. Although our finding of higher use of behavioral pain scales for the whole group of LEP children makes clinical sense, it seems paradoxical that within the LEP group, patients who received more interpretations per day were the ones who were assessed more frequently by using behavioral pain scales. We believe that the reason for this apparent discrepancy relies on the fact that the 2 LEP groups are significantly different in age (which largely determines the type of pain scale used) rather than differences in the use of interpreter services. However, given the characteristics of our study, we can only hypothesize about the reasons for this difference.

This is the first study to document an association between parental language proficiency and treatment of pain in hospitalized children. Previous studies have found disparity in pain management for LEP adults<sup>25-28</sup> and children receiving emergency care,<sup>29</sup>

as well as greater risk of adverse events.<sup>30</sup> Our study also suggests a positive effect of use of interpreter services in the pain treatment of children of LEP families. This finding is in agreement with previous studies in adults in which LEP patients who had access to interpreter services reported better pain management.<sup>14</sup> In our study, interpreters were not used exclusively for pain assessments, and it is likely that not all pain assessments were conducted with the use of interpreters. Nonetheless, we feel it is likely that consistent use of interpreters enhanced the overall communication of patients, families, and health care providers and improved the evaluation and treatment of each child's pain.

As part of a commitment to excellent care for every child regardless of language group, our pediatric hospital has participated in a 7-year process to improve access to interpretation services for LEP families. Systems improvements have included adoption and audit of universal language needs screening, hospital performance targets for twice-daily interpreted care, promotion of telephonic interpretation for point-of-care interpretation without delay, implementation of language proficiency testing for bilingual providers,<sup>31</sup> and, more recently, an innovative patient navigation program for LEP children and families with chronic medical conditions.<sup>32</sup>

Previous studies have found that interpretation is associated with improved health outcomes for LEP patients. In adults, access to interpreter services is linked to improved communication with providers,<sup>33</sup> pharmacy,<sup>34</sup> and staff. In children, use of interpreters is associated with timeliness for routine visits and urgent care.<sup>35,36</sup> Nonetheless, despite

the documented advantages and the existing regulatory requirements for providing interpretation during hospitalization,<sup>37,38</sup> the use of interpreters when taking care of patients with LEP remains unacceptably low.<sup>39-41</sup>

Our study has a number of limitations. We included only pain assessments that were recorded at the time when analgesic medications were administered, as well as follow-up pain assessments. If a nurse assessed a patient, and he or she elected not to give analgesic medication, we were not able to record this assessment. Therefore, our study is not able to determine if there were differences in the initiation of medication administration. Also, our measure of LEP was based on parent report of language preference and need for interpreted care. Children of LEP parents are often proficient in English and often communicate with care providers directly about pain needs. In our study, children from families who received fewer interpretations per day were older and may have been more likely to be proficient in English, although we did control for age effects in the analysis. We did not have data on care provider fluency in languages other than English; however, inadequately accounting for the use of bilingual staff would likely have biased results toward the null hypothesis. Few providers and staff members in our hospital were bilingual in the languages spoken by patients, and hospital policy required the use of professional interpretation for providers who had not passed a language proficiency test.

## CONCLUSIONS

Our study found that children from LEP families experience disparities in postsurgical pain management. Children from families with LEP had

less frequent pain assessment and received opioid analgesics at higher levels of pain compared with those of children from EP families.

Health disparities research must now transition from describing disparate health outcomes to seeking solutions. In this spirit, we were encouraged to report that LEP children and families who received more frequent interpretation had pain scores and treatments similar to those of EP children. This beneficial effect of interpretation on pediatric post-surgical pain was found with twice-daily interpretation, an attainable target that has already been surpassed in our institution since this study was conducted.

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