Published in final edited form as:

Anesth Analg. 2014 July ; 119(1): 105–109. doi:10.1213/ANE.0000000000000260.

A Prospective Observational Study of Ethnic and Racial Differences in Neuraxial Labor Analgesia Request and Pain Relief

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Abstract

BACKGROUND: As ethnic and racial diversity increases, it is important that anesthesia providers understand the expectations and concerns of this changing population regarding labor analgesia. Our objective was to evaluate ethnic/racial differences in labor analgesia characteristics with regard to the timing of request for neuraxial analgesia.

METHODS: Three hundred ninety-seven parturients were enrolled in this prospective observational cohort study. Term laboring parturients who planned vaginal delivery and requested neuraxial labor analgesia were eligible for inclusion. Data collected included cervical dilation at the time of neuraxial analgesia request, self-identified ethnicity/race, parity, education, insurance status, pain score before and after the initiation of neuraxial analgesia, and mode of delivery. The primary outcome was cervical dilation at the time of neuraxial analgesia request. Ethnicity/race classification was determined by asking the patient, “How would you define your ethnicity?” Patients were categorized into the ethnic/racial groups of non-Hispanic White, African American, Hispanic, or other. Univariate associations between cervical dilation and categorical variables were

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The authors declare no conflicts of interest.

DISCLOSURES

Name: Sylvia H. Wilson, MD.

Contribution: This author helped design and conduct the study, analyze the data, and write the manuscript.

Attestation: Sylvia H. Wilson has seen the original study data, reviewed the analysis of the data, approved the final manuscript, and is the author responsible for archiving the study files.

Name: Matthew P. Elliott, MD.

Contribution: This author helped conduct the study.

Attestation: Matthew P. Elliott has seen the original study data and approved the final manuscript.

Name: Bethany J. Wolf, PhD.

Contribution: This author helped analyze the data, write the manuscript, and all statistical analysis.

Attestation: Bethany J. Wolf has seen the original study data, reviewed the analysis of the data, and approved the final manuscript.

Name: Latha Hebbar, MD, FRCA.

Contribution: This author helped design and conduct the study, analyze the data, and write the manuscript.

Attestation: Latha Hebbar has seen the original study data, reviewed the analysis of the data, and approved the final manuscript.

This manuscript was handled by: Cynthia A. Wong, MD.

examined. Multivariate analysis was performed for the primary outcome of cervical dilation at the time of initiation of neuraxial analgesia.

RESULTS: At the time of neuraxial analgesia placement, the mean difference in cervical dilation of Hispanic parturients was 0.8 cm compared to non-Hispanic Whites (95% confidence interval [CI], 0.1–1.4; $P = 0.047$). After controlling for education, reason for placement, labor augmentation, and mode of delivery in a multivariate model, Hispanic parturients had 0.5 cm greater cervical dilation compared to non-Hispanic Whites, which was not significant (95% confidence interval, -0.1 to 1.1 ; $P = 0.089$).

CONCLUSIONS: Our data indicate that ethnicity/race plays a small role in acceptance and request for neuraxial labor analgesia.

Neuraxial analgesia (NA) provides parturients with an excellent analgesia option.¹ Despite the low associated risk and notable analgesic benefits, many women choose not to have NA. Studies have examined women's preferences for choosing to avoid or request NA including socioeconomic barriers that decrease NA use^{2–5} and retrospectively documented discrepancies for the use of NA among ethnic/racial subgroups.^{4,6} In parturients with similar socioeconomic backgrounds, NA rates have been found to be lower for African American, Hispanic, and Asian women than White non-Hispanic women.⁴ Similarly, African American and Hispanic women, compared with non-Hispanic White women, are less likely to use NA, even after adjusting for clinical risk factors, socioeconomic status, and provider effects.⁶ The reason for these findings is poorly understood. Among other potential differences, little information is known about ethnic/racial differences in the timing of NA request.

Therefore, the primary aim of our study was to prospectively examine whether the timing of the request for labor NA varied among ethnic/racial groups by examining the degree of cervical dilation and numeric pain scores at the time of NA request. Furthermore, if an NA request was affected by ethnicity/race, parturient socioeconomic status, formal education, labor augmentation, and mode of delivery were examined to evaluate if the observation could be explained. Our hypothesis was that ethnicity/race impacts the timing of NA request.

METHODS

After receiving IRB approval, this prospective observational cohort study was conducted on a convenience sample of 397 parturients requesting labor NA over a 6-month period. The requirement for written informed consent for the study was waived by the IRB, but all subjects verbally agreed to participate. All parturients gave informed, written consent for NA because this is our institutional practice.

All term parturients in labor with planned vaginal delivery and requesting NA were eligible for inclusion in the study. Exclusion criteria were patients with a contraindication to NA, emergency situation, or planned cesarean delivery. All study subject data were collected by the anesthesia care team.

The primary outcome was cervical dilation at the time of request for NA. Cervical dilation was assessed by obstetric providers within 1 hour of NA request. If cervical dilation was not

assessed within 1 hour of NA placement, the measurement was not considered valid and was not recorded; however, other patient characteristics were still collected.

Additional data collected included patient self-identified ethnicity/race, numeric pain scores, parity, level of formal education, insurance status, use of labor augmentation medications (yes or no), use of IV pain medication (yes or no), service providing obstetric care (resident, private, midwife, family medicine), analgesia labor plan on admission, prior NA labor analgesia, reason for NA request, and mode of delivery (vaginal or operative). Operative deliveries included cesarean deliveries and forceps or vacuum vaginal deliveries. The patient's numeric pain scale score (0–10; 0: no pain; 10: worst pain imaginable)^a was recorded at the time of NA request and 15 to 20 minutes after the placement of a functioning epidural catheter; intrathecal medications and catheters were not used. Reasons for initiation of NA were recorded at the time of NA placement and included pain not bearable, afraid to wait, starting oxytocin, or other reason. The mode of delivery was recorded after delivery.

All other data were collected at the time of the initial patient evaluation using open-ended questions. Self-identified ethnicity/race classification was determined by asking the patient, "How would you define your ethnicity?" Level of formal education was collected as grade school, high school, college, or graduate degree and simplified as education beyond high school versus education of high school or less. Insurance status was used as a marker of socioeconomic status and recorded as private insurance or others (Medicaid or no insurance). Obstetric providers were reduced to 2 categories: resident services (obstetric and family medicine) and private. Labor analgesia plans included NA, IV medications, breathing exercises, doula, meditation, music, no plan, or other. These data were reduced to 2 categories: labor NA and all other plans. Parturients were also asked to list how they had learned about NA. These data were collected and reduced to previous labor epidural analgesia, family and friends, external information (magazines, books, Internet, or prenatal classes), or medical professionals. Many patients listed >1 information source. Interpreters were used for patients who did not speak English as a first language.

Lumbar epidural analgesia (L_{2–3} or L_{3–4}) was initiated in the sitting position with a 12-mL bolus of 0.125% bupiva-caine with fentanyl (50 µg) in 3 aliquots following a negative epidural test dose (1.5% lidocaine with epinephrine 1:200,000, 3 mL).

Statistics

The primary outcome was cervical dilation at the time of initiation of NA. At the time of the initial study design, we planned to compare the outcome between 2 groups: Hispanic and non-Hispanic mothers. A difference of 2 ± 2 cm cervical dilation at the time of initiation of NA was considered to be clinically significant. Based on a Student *t* test, 12 Hispanic mothers and 36 non-Hispanic mothers, chosen to mimic the 3:1 ratio of Hispanic to non-Hispanic mothers expected at our institution, provide >80% power to detect a difference of 2 cm cervical dilation. The sample size was inflated by a factor of 4 to allow for adjustment of potential confounders in a multivariable model. After data collection was complete and upon

^aNIH Pain Consortium. Available at: http://painconsortium.nih.gov/pain_scales/NumericRatingScale.pdf. Accessed August 1, 2011.

initial review of the article, we elected to compare 3 groups: Hispanic, non-Hispanic White, and African American.

Univariate associations between cervical dilation and categorical variables were examined using the Student *t* test, analysis of variance, Wilcoxon rank sum test, and Kruskal-Wallis tests. Univariate associations between cervical dilation and all continuous predictors were examined using the Pearson correlation. A multiple regression model was constructed using backward selection. Forward selection was also considered. Variables with univariate associations with cervical dilation with $P < 0.20$ were considered candidates in a multiple linear regression model. In addition, interactions between ethnicity/race and all other candidate variables were considered in the model selection process. Model assumptions were checked graphically, and all were found to be met in the final model. The variance inflation factor (VIF) was also used to test for collinearity, and all VIFs in the final multivariable model were found to be < 2 , indicating that there was no significant collinearity. All analyses were conducted in SAS v.9.3 (SAS Institute, Cary, NC).

RESULTS

All laboring parturients who approached for study participation were eligible and no parturients declined to participate. Data collection involved 397 parturients who self-identified into 4 ethnicity/race categories: 51 Hispanic, 161 African American, 168 non-Hispanic White, and 17 others (Asian, Native American, Indian, Portuguese, and Phillipino). The “other” category was dismissed from further analysis due to the small sample.

Patient characteristics were analyzed by ethnicity/race (Table 1). The majority of all subjects were multiparous (59.4%). Mean maternal age was 26 years (range 12–43 years) and mean gestational age was 38.5 weeks (range 21.9–42.4 weeks). Nalbuphine was the only IV pain medication used. Cervical dilation at the time of request of NA did not vary by ethnicity/race ($P = 0.052$). Maternal age, gestational age, education, insurance status, labor plan, and numeric pain scale score after NA placement differed by ethnicity/race. The mean difference in numeric pain scale scores after NA placement in Hispanic parturients was 0.6 (95% confidence interval [CI], 0.0–1.2; $P = 0.046$) compared to non-Hispanic White subjects and 0.6 (95% CI, 0.0–1.2; $P = 0.061$) compared to African American subjects.

Univariate relationships between cervical dilation at the time of request for NA and other factors are presented in Table 2. Cervical dilation in Hispanic parturients was significantly greater than non-Hispanic White parturients (mean difference of 0.8 cm, 95% CI, 0.1–1.4; $P = 0.047$).

The multivariable regression model is presented in Table 3. The results were the same using both forward and backward variable selection. The model included 326 parturients without any missing data points (49 Hispanics, 142 African Americans, 135 non-Hispanic Whites). Variables examined included ethnicity/race, education, reason for initiation of NA, use of oxytocin, mode of delivery (vaginal or operative), parity, and insurance provider (private compared with Medicaid or uninsured). Education, use of oxytocin, reason for placement, and delivery method were significant in the final model. No significant interactions between

ethnicity/race and other factors in the model were found. A sensitivity analysis was also conducted to examine the impact of removing the mode of delivery from the multivariate model (Table 4). The parameter estimates in the model did not change significantly when delivery method was removed from the model, although parity became significant in the model excluding delivery method ($P = 0.011$).

DISCUSSION

In this prospective, observational study, a correlation between a parturient's ethnicity/race and cervical dilation at the time of NA request was examined. Although Hispanic women were noted to request NA with slightly greater cervical dilations than non-Hispanic Whites in the univariate analysis, this finding did not persist in the multivariate model that accounted for other factors known to impact NA request.

Numeric pain scale scores were also examined with regard to cervical dilation and different ethnic/racial groups. Pain scores at the time of NA request did not differ by ethnicity/race. Although Hispanic parturients reported statistically higher pain scores after NA was initiated, the mean difference was small and unlikely to be clinically significant.

Our parturients receiving oxytocin or requiring an operative delivery requested NA at earlier cervical dilations in both univariate and multivariate models. Other studies have also found early request for labor analgesia to be linked with more painful labor and associated with dystocia or pharmacologic labor augmentation. Early labor analgesia request has been suggested to be a marker for increased pain during labor and indicate an increased risk of cesarean delivery.^{7,8} Similarly, both labor dystocia⁹ and fetal macrosomia¹⁰ have been associated with increased pain in labor. Pharmacologic labor augmentation has also been found to increase labor pain.¹¹ Our data were consistent with these observations. Furthermore, these variables did not differ significantly by ethnicity/race.

We noted in our data that parturients with an education of high school or less requested NA at greater cervical dilations compared with parturients with education more than high school. Other studies have found increased NA use associated with increased formal education levels.^{12,13} Similarly, decreased NA use has been associated with decreased economic and education levels.² In contrast, our data did not show variation in NA request when insurance type was used as a marker for socioeconomic status. In addition, many of our patients learned about NA from their friends and family. This indicates that community education regarding labor analgesia options may be as important as individualized patient education and especially significant in populations with decreased formal education.

In conclusion, our data showed a small difference in cervical dilations at the time of NA request in relation to ethnicity/race. However, this difference was explained by other factors known to impact the time of request for NA in laboring parturients.

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Characteristics of the Patient Population

Table 1.

Characteristic (reference)	Non-Hispanic White (n = 168)	African American (n = 161)	Hispanic (n = 51)	P
Spanish speaking	0	1 (1)	42 (82)	<0.001
Parity (nulliparous)	71 (43)	62 (38)	21 (41)	0.76
Maternal age (y)	28 ± 6	24 ± 5	26 ± 6	<0.001
Gestational age (wk)	38.6 ± 2.2	38.0 ± 3.2	39.4 ± 1.5	0.016
Education ^a (high school or less)	66 (44)	125 (79)	45 (88)	<0.001
Insurance ^b (private)	87 (52)	28 (17)	7 (14)	<0.001
Obstetric provider ^c (resident services)	154 (92)	154 (96)	48 (94)	0.27
Labor augmentation	79 (48)	67 (42)	23 (45)	0.55
Mode of delivery (vaginal)	139 (84)	129 (81)	40 (78)	0.62
Instrumental vaginal delivery	5 (3)	2 (1)	2 (4)	0.43
Labor plan ^d (neuraxial analgesia)	148 (88)	134 (83)	35 (69)	0.005
Neuraxial analgesia information sources ^e				
Family and friends	80 (48)	71 (45)	23 (47)	0.89
External information ^f	54 (32)	23 (15)	6 (12)	<0.001
Prior epidural	56 (33)	61 (39)	17 (35)	0.60
Medical professional ^g	29 (17)	26 (16)	12 (24)	0.42
IV nalbuphine ^h	21 (12)	18 (11)	8 (16)	0.69
Reason neuraxial analgesia requested ⁱ (pain not bearable)	131 (80)	129 (82)	45 (90)	0.27
Cervical dilation (cm) ^j	3.2 ± 1.9	3.4 ± 1.9	4.0 ± 2	0.052
Numeric pain score ^k				
Neuraxial analgesia request	7.3 ± 2.4	7.7 ± 2.3	8.3 ± 1.5	0.071
After neuraxial analgesia placed	1.5 ± 1.9	1.5 ± 1.9	2.1 ± 2.1	0.020

Categorical data are presented as *n* (%) and continuous data are presented as mean ± SD. Data have been rounded to nearest tenth decimal place.

^aEducation compared as high school or less versus education after high school.

^bInsurance compared as private insurance versus Medicaid or uninsured.

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^cResident services (obstetric or family medicine) compared with private provider.

^dLabor analgesia plan examined as plan for neuraxial analgesia versus all other plans.

^eParturients listed any sources from which they learned about epidurals and were not limited to 1 source.

^fExternal information sources included magazines, books, Internet, and prenatal classes.

^gMedical professional sources included anesthesia provider, nurses, and obstetric provider.

^hNalbuphine was the only intravenous medication administered for the treatment of labor pain.

ⁱReason neuraxial analgesia requested was examined as pain not bearable versus all other reported reasons.

^jCervical dilation (cm) at the time of neuraxial analgesia request.

^kNumeric pain scale scores (0–10).

Table 2.

Univariate Associations with Cervical Dilation

Variable	Category	N	Mean $\pm$ SD (cm)	P
Patient variables				
Ethnicity/race	Hispanic (H)	49	4.0 $\pm$ 2.0	H vs NHW 0.047
	Non-Hispanic White (NHW)	142	3.3 $\pm$ 1.9	NHW vs AA 1.00
	African American (AA)	145	3.4 $\pm$ 1.9	AA vs H 0.16
Spanish speaking	Yes	42	4.0 $\pm$ 2.0	0.05
	No	280	3.4 $\pm$ 1.9	
Labor plan	Yes	282	3.4 $\pm$ 1.9	0.26
	No	56	3.1 $\pm$ 1.9	
Insurance status	Private	101	3.3 $\pm$ 1.9	0.37
	Other	237	3.5 $\pm$ 1.9	
Education	Less than high school	217	3.6 $\pm$ 1.9	0.003
	More than high school	116	3.0 $\pm$ 2.0	
Obstetric variables				
Obstetric provider	Resident services ^a	321	3.4 $\pm$ 1.9	0.24
	Private	18	2.9 $\pm$ 2.1	
Parity	Nulliparous	138	3.1 $\pm$ 1.8	0.012
	Parous	200	3.6 $\pm$ 1.0	
Labor augmentation ^b	Yes	154	3.1 $\pm$ 1.8	0.004
	No	183	3.7 $\pm$ 2.0	
Anesthetic variables				
IV nalbuphine	Yes	45	3.2 $\pm$ 2.1	0.492
	No	294	3.4 $\pm$ 1.9	
Reason for placement	Pain not bearable	275	3.5 $\pm$ 1.9	0.009
	Other ^c	64	2.8 $\pm$ 1.8	
Operative delivery ^d	Yes	69	2.5 $\pm$ 1.9	<0.001
	No	270	3.6 $\pm$ 1.8	
NA information sources ^e				
Family or friends	Yes	152	3.5 $\pm$ 1.9	0.65

Variable	Category	N	Mean $\pm$ SD (cm)	P
External sources ^f	No	179	3.4 $\pm$ 1.9	0.015
	Yes	73	2.9 $\pm$ 1.8	
	No	261	3.5 $\pm$ 1.9	
Medical professional ^g	Yes	63	3.2 $\pm$ 1.8	0.20
	No	271	3.5 $\pm$ 2.0	
Previous labor epidural	Yes	119	3.7 $\pm$ 2.0	0.08
	No	215	3.3 $\pm$ 1.9	

Data are presented as mean $\pm$ SD. The number of subjects (N) differs from Table 1 because cervical dilation was not considered valid and not recorded if not assessed within 1 hour of neuraxial analgesia placement; however, other patient characteristics were still collected.

^aResident services included both obstetric and family practice resident services and excluded private obstetric faculty patients.

^bLabor augmentation was considered yes if any pharmacologic augmentation was used prior to epidural placement.

^cOther reasons for epidural request included scared to wait, starting pitocin, or other.

^dOperative delivery included cesarean delivery or vaginal delivery requiring the use of vacuum or forceps by the delivering physician.

^ePatients were asked to report any sources from which they had learned about labor epidurals.

^fExternal sources included television, Intranet, books, magazines, and prenatal classes.

^gMedical professional included obstetricians, family practice physicians, anesthesiologists, or nurses.

Table 3.**Final Multivariable Model**

Variable	Reference value	Beta^a (cm) (95% CI)	P
Intercept		3.5 (2.6 to 4.4)	<0.001
Hispanic ethnicity	Non-Hispanic White	0.5 (−0.1 to 1.2)	0.089
African American race	Non-Hispanic White	0.0 (−0.5 to 0.5)	0.96
Education	Greater than high school	0.7 (0.2 to 1.2)	0.010
Reason for placement	Pain not bearable	0.7 (0.6 to 0.8)	0.009
Oxytocin	Yes	0.7 (0.3 to 1.1)	<0.001
Delivery	Operative delivery	1.2 (0.7 to 1.7)	<0.001
Parity	Nulliparous	0.4 (0.0 to 0.8)	0.081
Insurance	Private	0.1 (−0.4 to 0.7)	0.58

Neuraxial analgesia request was earlier in parturients with education beyond high school, pain not bearable, use of oxytocin, and operative delivery (cesarean delivery or vaginal delivery with forceps or vacuum extraction). The adjusted R^2 value for the model was 0.143.

^aBeta values represent the centimeter increase in cervical dilation attributed to the given variable when controlling for other variables.

Table 4.**Final Multivariable Model Excluding Mode of Delivery**

Variable	Reference value	Beta^a (cm) (95% CI)	P
Intercept		3.3 (2.5 to 4.1)	<0.001
Hispanic ethnicity	Non-Hispanic White	0.4 (−0.2 to 1.1)	0.19
African American race	Non-Hispanic White	−0.1 (−0.6 to 0.4)	0.69
Education	Greater than high school	0.8 (0.3 to 1.3)	0.003
Reason for placement	Pain not bearable	0.7 (0.2 to 1.2)	0.010
Oxytocin	Yes	0.7 (0.3 to 1.1)	0.001
Parity	Nulliparous	0.5 (0.1 to 0.9)	0.011
Insurance	Private	0.3 (−0.3 to 0.8)	0.33

Neuraxial analgesia request was earlier in parturients with education beyond high school, pain not bearable, use of oxytocin, and primiparity. The adjusted R^2 value for the model was 0.143.

^aBeta values represent the centimeter increase in cervical dilation attributed to the given variable when controlling for other variables.