

ANESTHESIOLOGY

Education Program Regarding Labor Epidurals Increases Utilization by Hispanic Medicaid Beneficiaries

A Randomized Controlled Trial

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EDITOR'S PERSPECTIVE

What We Already Know about This Topic

- Hispanic women choose epidural labor analgesia less commonly than non-Hispanic women. The causes of the healthcare disparity are unknown, and effective interventions are to be established.

What This Article Tells Us That Is New

- A language-concordant, educational program regarding labor epidurals during the first stage of labor, in addition to the routine prenatal education, is feasible and does not cause any negative effect.
- Such an intervention increases epidural use among Hispanic but not non-Hispanic women.
- It also reduces misconceptions regarding epidural analgesia in both Hispanic and non-Hispanic women.

Labor is associated with some of the most intense pain on the McGill Pain Index, with an average pain score higher than nonterminal cancer pain, phantom limb pain, and postherpetic neuralgia.^{1,2} Epidural analgesia is the most effective approach to alleviate labor pain.³ The American Society of Anesthesiologists and the American College of Obstetricians and Gynecologists issued a joint statement that “neuraxial analgesia techniques are the most flexible,

ABSTRACT

Background: Hispanic women choose epidural labor analgesia less commonly than non-Hispanic women. This may represent a healthcare disparity related to a language barrier and inadequate opportunities for labor analgesia education. It was hypothesized that a language-concordant, educational program regarding labor epidurals would improve epidural utilization in two independent cohorts of Hispanic and non-Hispanic women.

Methods: A randomized controlled trial, blinded to anesthesia, nursing, and obstetric providers, was completed at an academic hospital (February 2015 to February 2017). Two cohorts of Medicaid beneficiaries of Hispanic (English- and/or Spanish-speaking) and non-Hispanic ethnicity were enrolled concurrently. The patients were randomized to routine care alone or routine care and an additional educational program comprised of three components: a video show, corresponding pamphlet, and in-person counseling. The primary endpoint was use of epidural labor analgesia. The secondary endpoint was change in response before and after delivery on common misconceptions based on a 12-point epidural questionnaire.

Results: Hispanic women randomized to the intervention group were 33% more likely to choose epidural analgesia compared to the routine care group (40 of 50 [80%] vs. 30 of 50 [60%]; risk ratio, 1.33 [95% CI, 1.02 to 1.74]; $P = 0.029$). For the non-Hispanic cohort, no difference was detected in epidural use between the intervention and routine care groups (41 of 50 [82%] vs. 42 of 49 [86%]; risk ratio, 0.96 [95% CI, 0.80 to 1.14]; $P = 0.62$), but the study was underpowered to determine a result of no difference. Patients assigned to the intervention had a greater improvement in epidural understanding compared with routine care, among both Hispanic (2.26 vs. 0.74, respectively; difference in change from baseline, 1.52 [95% CI, 0.77 to 2.27]; $P < 0.001$) and non-Hispanic (1.36 vs. 0.33, respectively; difference in change from baseline, 1.03 [95% CI, 0.23 to 1.75]; $P = 0.005$) cohorts. There were no adverse events during the trial.

Conclusions: The educational program increased epidural use among Hispanic women. The educational program reduced misconceptions regarding epidural analgesia in both Hispanic and non-Hispanic cohorts.

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effective, and least depressing to the central nervous system” and that “pain management should be provided whenever medically indicated.”⁴ In the United States, the use of epidural analgesia to manage labor pain is lower in Hispanic than Caucasian women.^{5–9} This may represent a healthcare disparity. There is a growing body of evidence suggesting that several factors related to the patient, provider, and healthcare system contribute to the disparity.¹⁰ Hispanic women may be more likely to be misinformed about the

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risks and potential benefits associated with labor epidurals^{11,12}; counseling on labor analgesic options provided to Hispanic women may be inadequate¹²; and language barriers may hinder education and foster misconceptions about labor epidurals.^{13,14}

The National Institutes of Health, the Agency for Healthcare Research and Quality, the U.S. Department of Health and Human Services, and the U.S. Congress have all included the elimination of health care disparities in their strategic plans,¹⁵ and there has been a call for the development of “culturally and linguistically appropriate interventions” aimed at reducing disparities in pain management.¹⁵ The National Partnership for Maternal Safety recommends that providers “address language barriers for women with limited English proficiency using shared decision-making” to reduce peripartum disparities.¹⁶ One such strategy is the use of decision aids. Decision aids are educational programs that facilitate patient participation in medical decision-making by making the risks and benefits associated with treatment alternatives more understandable. They have been shown to improve patient knowledge, clarify patient priorities, align medical decisions with patient values, and help eliminate health disparities.^{17,18} To date, there are no published trials that assess the impact of a culturally tailored, linguistically concordant educational program on epidural labor analgesia utilization.¹⁰

We designed a randomized trial assigning Medicaid beneficiaries of Hispanic and non-Hispanic ethnicity to receive routine epidural counseling by an anesthesia resident that includes a description of the epidural procedure, an explanation of risks and benefits, and an opportunity for questions or routine counseling and an additional educational program comprised of an instructional video, a pamphlet, and in-person counseling. We hypothesized that a linguistically concordant educational program that described the epidural procedure, clarified the benefits and risks, and explained alternative analgesic techniques may improve epidural utilization in two independent cohorts of Hispanic and non-Hispanic women. We further hypothesized that the educational program would reduce misinformation on epidural analgesia, compared with routine care. Because Hispanic women represent a minority, we concurrently enrolled two separate cohorts to ensure women of both ethnicities were adequately represented. To address for possible differences in cultural preference, we analyzed each cohort independently.

Materials and Methods

Study Population

Patients admitted to the labor and delivery unit at Oregon Health and Science University, Portland, Oregon, between February 10, 2015, and February 24, 2017, were recruited. Eligible patients were English- or Spanish-speaking Medicaid beneficiaries at least 18 yr of age with a singleton

fetus of at least 24 weeks of gestation and were non-midwife parturients presenting in spontaneous labor, having an induction of labor, or receiving augmentation of labor who were free to choose epidural labor analgesia. Furthermore, eligible patients needed to be in the first stage of labor during day shifts and on weekdays. Parturients were ineligible if they were on the midwife service; if they had cardiac disease, a coagulopathy (defined as a platelet count of less than 100,000/ μ l, a nonnormal partial thromboplastin time, or a nonnormal prothrombin time); or if they were on anticoagulation medications. After study initiation, it was realized that patients in severe labor pain could not participate in the educational program. Accordingly, severe labor pain was added as an exclusion criterion.

The study was approved by Oregon Health and Science University’s Institutional Review Board (IRB00010975), and all patients were provided written informed consent. Patients did not receive compensation or inducements for study participation. The trial was registered on ClinicalTrials.gov (NCT02672397).

Randomization, Recruitment, and Blinding

In this parallel design, randomized, controlled, superiority trial two separate cohorts of women of Hispanic (English- and/or Spanish-speaking) and non-Hispanic (English-speaking) ethnicity were concurrently enrolled with a plan to analyze each cohort independently. Within each cohort, patients were equally randomized to receive either the study education or routine care. Women assigned to the intervention group were administered the labor analgesia educational program in addition to routine care. Routine care includes the opportunity to receive free prenatal education taught by Lamaze International or International Childbirth Education Association health educators through a 4-week course, a condensed 1-day course, or an 8-chapter interactive online program. The content and percentage of time allocated to education regarding labor epidurals is the same in all three options. This content includes a video showing an epidural being placed; a video showing childbirth with and without epidural analgesia; and four slides that (1) define epidural analgesia, (2) describe epidural placement, (3) summarize the risks and benefits of epidural analgesia, and (4) reinforce that labor analgesia is a personal decision. With the exception of patients that are managed by midwives, all patients receive a consult with the anesthesia resident on admission during which there is a description of the epidural procedure; a summary of potential benefits, side effects, and complications; and an opportunity for patient questions. For Spanish-speaking patients, an officially certified interpreter is used for this initial anesthesia consultation. Residents receive training and watch an attending complete this consult during the first day of their obstetric anesthesia rotation. Anesthesia consultations last 10 to 15 min, and unless initiated by patient questioning, it does not include a discussion of misconceptions.

Discussion regarding other options for labor analgesia (*e.g.*, opioids, nitrous oxide, laboring in water, partner massage) is nursing-led. There are no differences in routine counseling provided between English- and Spanish-speaking patients. To facilitate care, most Spanish-speaking patients receive care from Spanish-speaking nurses.

Two separate computer-generated randomized block allocation sequences with a 1:1 assignment ratio were generated by a researcher not involved in enrollment or data collection: one for Hispanic and one for non-Hispanic subjects. This stratified randomization guaranteed that the treatment groups would be balanced both within and between the ethnic groups. Allocation was concealed in sequentially numbered opaque envelopes. Anesthesiologists, labor and delivery nurses, obstetricians, and family medicine providers were kept blinded to group assignment. Study personnel were blind to group allocation during recruitment and enrollment procedures.

A customized dashboard was established within the electronic health record to assist recruiters identifying potentially eligible participants. Nurses were consulted before entering labor rooms to determine whether patients were suitable for being approached for the study. Patients in severe pain were not approached because it was felt that they would not be able to participate in the educational program or were not in the appropriate state of mind to provide informed consent. Two investigators (K.M.S. and M.K.W.) were bilingual, and a third investigator (B.M.T.) used a telephone interpreter to assess interest, evaluate eligibility, obtain informed consent, and enroll study participants. Consistent with hospital policy, officially certified interpreters provided in-person or on the phone were required for obtaining written consent from Spanish-speaking women. After verification of eligibility and signing the informed consent, participants completed baseline surveys. After collection of baseline data, one of the investigators opened the next sequentially numbered opaque envelope concealing the randomization assignment and implemented the study procedures accordingly. Providers that recruited and enrolled participants did not provide care for those same subjects. On most days, only one investigator was available to enroll patients and perform the randomization procedures. This led to unblinding of the investigator at the time of collection of postdelivery data.

Development of Education Material for Study Intervention

The labor analgesia educational program consisted of a video and pamphlet (Supplemental Digital Content 1, <http://links.lww.com/ALN/B994>) that were created by obstetric anesthesiologists with input and feedback from stakeholders comprised of four Hispanic Medicaid beneficiaries that were felt to have knowledge of and adequately represent the Hispanic population presenting to our institution in labor. The pamphlet contained the same information as the video. The educational interventions were

created in English and translated into Spanish by a bilingual obstetric anesthesiologist at our institution (L.M.N.). The Hispanic Medicaid stakeholders demonstrated understanding of the pamphlet, video, and study survey questionnaires. The video actress was a bilingual obstetric anesthesiologist (L.M.N.), and the narrator was a bilingual anesthesia resident (K.M.S.). In the video, the narrator asks the obstetric anesthesiologist questions about epidural labor analgesia. The obstetric anesthesiologist, wearing a white coat, answers in a warm and well informed manner. The English version is 6 min 40 s long, and the Spanish version is 7 min 10 s long. The obstetric anesthesiologist explains the options for labor analgesia, what an epidural is, how an epidural is placed, potential side effects from a labor epidural, potential advantages associated with having a labor epidural, and evidence linked to commonly held misconceptions regarding labor epidurals.

In addition to the educational material, we developed an epidural questionnaire (Supplemental Digital Content 2, <http://links.lww.com/ALN/B995>) that assessed parturients' knowledge of factors known to be associated with the decision to use epidural labor analgesia. The misconceptions associated with epidural labor analgesia that were addressed were selected from in-person interviews and previously published literature that assessed women's beliefs about epidural labor analgesia.^{11,12,19} Community stakeholders including one Hispanic, Medicaid-eligible woman helped create the epidural questionnaire in collaboration with the researchers. The questionnaire assessed agreement with commonly held misconceptions regarding epidural labor analgesia and included 12 false statements about epidural analgesia. Patients were asked to answer whether they agreed or disagreed with the statements.

Experimental Intervention and Comparison Group

After obtaining written informed consent, participants were administered a baseline epidural questionnaire. Patients were permitted family in the labor room while they completed their questionnaires, but family was asked to refrain from participation. Patients were given the choice to complete surveys in English or Spanish.

After completion of the questionnaire, patients randomized to the intervention group were provided the epidural educational program consisting of viewing the video and then reviewing the corresponding pamphlet in their preferred language. After watching the video, the patient's questions were answered, and they were offered the opportunity to review the pamphlet under the guidance of the study personnel. The patients received a copy of the pamphlet. Completion of the educational intervention took from 10 to 30 min.

Patients randomized to the routine care group received no additional education on epidural labor analgesia beyond what is typically provided by anesthesia, nursing, obstetrician, and family medicine providers.

Consistent with the position of the American College of Obstetricians and Gynecologists⁴ and the American Society of Anesthesiologists,²⁰ all laboring women were counseled on their options for analgesia, and epidural analgesia was offered to all women without a medical contraindication.

After delivery, a follow-up visit was conducted on the postpartum unit, to readminister the epidural questionnaire. Patients who were discharged before completing the post-delivery questionnaire in person completed the survey by phone interview. There were no changes in clinical practice during the trial implementation.

Primary and Secondary Endpoints

The primary endpoint was use of epidural labor analgesia. Details regarding delivery, including epidural usage, were extracted from the electronic health record. The secondary endpoint was the change from baseline to after delivery in the responses to the epidural questionnaire, specifically the change in the agreement with labor epidural misconceptions.

Statistical Analyses

Basic statistical summaries are presented as means \pm SD for continuous characteristics and frequencies (%) for categorical characteristic. Where appropriate, bivariate statistical tests of association were performed using unequal variance (Welch's) *t* tests for mean comparisons of quantitative characteristics and chi-square tests of associations for categorical characteristics. We also used chi-square tests to investigate a treatment effect for the primary endpoint, use of epidural labor analgesia, and Welch's *t* tests for the secondary endpoint that investigates the mean change between the 12-item total pre- and postrandomization survey scores regarding misconceptions associated with labor epidural analgesia. The analyses for both endpoints were stratified by Hispanic ethnicity status. We chose Welch's *t* tests to make our statistical inference more robust to possible violations of standard modeling assumptions. A *P* value of less than 0.05 was considered statistically significant for all analysis. For the primary endpoint of epidural analgesia, and secondary endpoint, change in misconception from baseline, we tested for differences between the routine care and educational program, for each of the two cohorts. This provided for a total of four hypothesis tests for the primary and secondary endpoints. *P* values for the tests were not adjusted for an experiment-wide α level. In exploratory analyses, we investigated the effect of each individual response to the epidural questionnaire using a correlated data generalized estimating equation regression.

All hypothesis tests and CI are two-sided. Within each cohort (Hispanic and non-Hispanic), the study was powered to detect a 30% difference in the proportion of women that choose epidural labor analgesia between the intervention and control groups, with a two-tailed α level of 0.05. Our assumptions were based on historical epidural

usage of 45.3% in Hispanic Medicaid patients and 55.8% in non-Hispanic Medicaid patients (Oregon Health and Science University data from June 2013 to May 2014). This gave us a sample size of 46 subjects/group. An additional 4 subjects/group were recruited to account for potential dropouts, requiring a sample of 50 patients per group (total, *n* = 200). All analyses were conducted using the Stata (StataCorp, USA; version 15.1) statistical package.

Results

Participant Flow

During the study period, 105 eligible Hispanic and 105 non-Hispanic Medicaid laboring women carrying a fetus of at least 24-week gestation that were admitted to the obstetric service were approached for consent to participate in the trial. In total, 10 women (5 Hispanic and 5 non-Hispanic) declined to participate, leaving 200 patients available to participate in the study (fig. 1). All patients assigned to the intervention group completed the educational program. One non-Hispanic patient randomized to routine care withdrew. Two non-Hispanic patients randomized to routine care left the hospital before completing the follow-up epidural questionnaire and could not be contacted by phone. Complete data were available for 199 of 200 (99.5%) patients for the primary endpoint and 197 of 200 (98.5%) for the secondary endpoints.

Study Population Baseline Characteristics

Table 1 shows baseline characteristics of the study population by treatment assignment and stratified by Hispanic ethnicity. Randomization procedures performed well in generating homogenous groups within both the Hispanic and non-Hispanic cohorts (tables 1 and 2). Overall, baseline characteristics were similar between routine care and the educational intervention groups, within each ethnicity cohort. The only exception was a higher mean age for the educational intervention group compared to the routine care group in the non-Hispanic ethnicity cohort (29.1 ± 6.6 vs. 26.2 ± 4.7 yr; *P* = 0.014). In the non-Hispanic cohort, significantly more patients attended prenatal classes in the intervention group than in the routine care group (18 of 50 [36%] vs. 7 of 50 [14%]; *P* = 0.013).

Primary and Secondary Endpoints

The primary endpoint, *e.g.*, frequency of use of epidural analgesia, is shown in table 3. Among the Hispanic cohort, patients assigned to the educational intervention were 33% more likely (40 of 50 vs. 30 of 50) to receive epidural anesthesia compared with patients assigned to the routine care group (risk ratio, 1.33 [95% CI, 1.02 to 1.74]; *P* = 0.029; fig. 2). For the non-Hispanic cohort, there was no evidence of a difference in epidural use between the intervention and routine care groups (risk ratio, 0.96 [95% CI, 0.80 to 1.14];

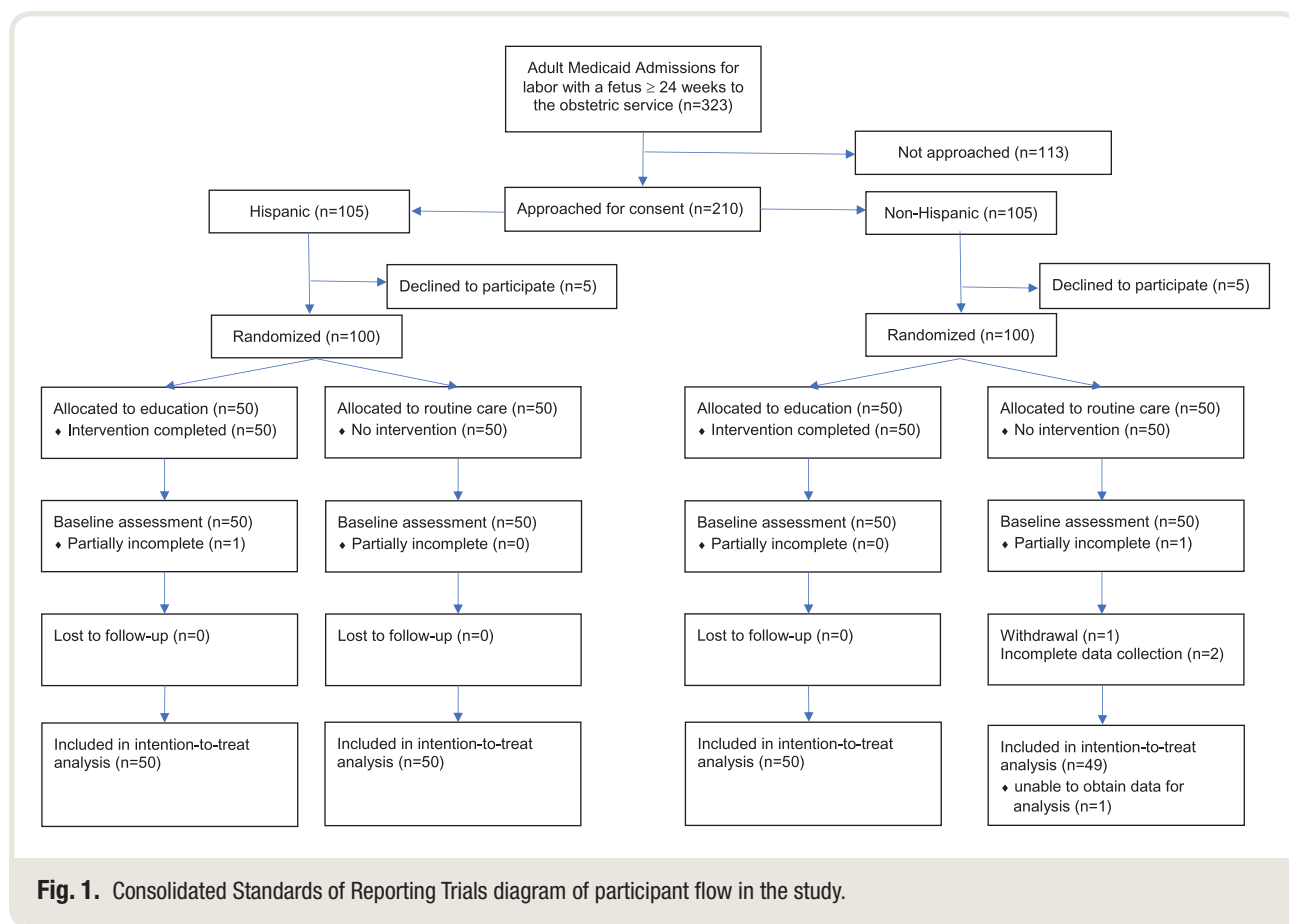


Fig. 1. Consolidated Standards of Reporting Trials diagram of participant flow in the study.

$P = 0.616$; fig. 2); however, the use of epidural analgesia was substantial in this population (41 of 50 intervention *vs.* 42 of 49 routine care), and the test for a positive treatment effect would be underpowered and likely inconclusive.

The secondary endpoint, *e.g.*, the change from baseline in misconceptions about labor analgesia on a 12-point scale, comparing the Hispanic and non-Hispanic cohorts is shown in table 3. A higher misconception score represents more misconceptions, and a larger negative change in score represents greater improvement in understanding. Among the Hispanic cohort, the mean change was 1.5 points lower for the educational intervention group (mean change 2.26 ± 2.3) compared with the routine care group (mean change 0.74 ± 1.3), yielding a mean difference between groups of 1.52 (95% CI, 0.77 to 2.27; $P < 0.001$; fig. 2). Among the non-Hispanic cohort, the mean change was approximately 1.0 point lower for the educational intervention group (mean change, 1.36 ± 1.6) compared with the routine care group (mean change, 0.33 ± 1.9), yielding a mean difference between groups of 1.03 (95% CI, 0.23 to 1.75; $P = 0.005$; fig. 2).

Exploratory Endpoints

The results of the *post hoc* analysis investigating the changes from baseline in the individual responses to the epidural questionnaire are shown in figure 3. In an additional exploratory

analysis to address the role of prenatal classes on epidural analgesia utilization, we found that taking prenatal classes was marginally associated with increased usage of epidural analgesia in the non-Hispanic cohort (96% epidural use for those taking and 79% for those not taking classes, $P = 0.053$), without differences among the Hispanic cohort. There were no adverse events (*i.e.*, seizures, respiratory depression, cardiac arrest, new postdelivery neurologic deficits, or central nervous system infections) reported during the trial.

Discussion

The most important finding from this study was that Hispanic patients were more likely to choose epidural labor analgesia after receiving an educational program. Using the survey instrument, although modest, we documented a decrease in misconceptions regarding epidural analgesia in both Hispanic and non-Hispanic women receiving the study intervention. Although it is possible that the survey did not capture the full extent of knowledge that was gained, it is notable that decision-making was different in the Hispanic cohort. These results support our hypothesis that Hispanic women lack access to accurate information regarding labor analgesia, have a knowledge gap, and can be impacted by an educational program. The importance of increasing access to labor epidural is particularly relevant because the Hispanic population is projected to

Table 1. Participants' Baseline Characteristics Stratified by Ethnicity and Randomization Assignment

Characteristic	Hispanic			Non-Hispanic		
	Routine Care (n = 50)	Education (n = 50)	P Value*	Routine Care (n = 50)	Education (n = 50)	P Value*
Age, yr, mean ± SD	27.5 ± 6.3	27.9 ± 7.3	0.781	26.2 ± 4.7	29.1 ± 6.6	0.014
White race, N (%)	50 (100)	50 (100)		41 (85)	39 (78)	0.343
Gravida, mean ± SD	2.8 ± 1.7	2.7 ± 1.5	0.798	2.7 ± 1.9	2.9 ± 1.9	0.603
Parity, mean ± SD	1.3 ± 1.3	1.4 ± 1.2	0.745	1.0 ± 1.1	1.2 ± 1.6	0.468
Multipare, N (%)	32 (64)	38 (76)	0.194	29 (58)	26 (52)	0.551
Gestational age, week, mean ± SD	38.0 ± 2.2	38.1 ± 2.3	0.744	37.6 ± 3.9	38.0 ± 3.3	0.538
Height, m, mean ± SD	1.56 ± 0.07	1.58 ± 0.06	0.054	1.65 ± 0.08	1.66 ± 0.07	0.414
Weight, kg, mean ± SD	79.8 ± 19.3	88.1 ± 21.0	0.054	90.6 ± 28.6	88.7 ± 23.1	0.713
Body mass index, kg/m ² , mean ± SD	32.9 ± 6.8	34.7 ± 7.6	0.260	32.6 ± 8.9	32.5 ± 7.7	0.954
First stage, min, mean ± SD	748 ± 669	636 ± 510	0.395	630 ± 515	700 ± 764	0.626
Second stage, min, mean ± SD	65 ± 79	59 ± 82	0.740	62 ± 60	74 ± 82	0.448
Infant birth weight, kg, mean ± SD	3.2 ± 0.6	3.2 ± 0.6	0.981	3.3 ± 0.7	3.2 ± 0.7	0.547
1-min Apgar score, mean ± SD	8.0 ± 1.5	8.0 ± 1.3	1.000	7.8 ± 1.4	7.4 ± 1.9	0.246
5-min Apgar score, mean ± SD	8.9 ± 0.4	8.7 ± 0.8	0.054	8.7 ± 0.8	8.6 ± 0.9	0.577
Labour type, N (%) [†]			0.630			0.782
Induced	33 (66)	38 (76)		39 (78)	40 (80)	
Spontaneous	9 (18)	7 (14)		9 (18)	7 (14)	
Augmented	7 (14)	5 (10)		2 (4)	3 (6)	
Unknown	1 (2)	0 (0)		0 (0)	0 (0)	
Delivery type, N (%) [‡]			0.837			0.847
Spontaneous	40 (80)	40 (80)		40 (82)	41 (82)	
Cesarean	10 (20)	9 (18)		7 (14)	8 (16)	
Instrumental vaginal	0 (0)	1 (2)		2 (4)	1 (2)	

*Treatment comparisons by Hispanic strata. [†]Unknown category omitted. [‡]Instrumental vaginal category omitted.

increase by 240% by the year 2060, at which time it is expected that one in three U.S. residents will be Hispanic.²¹

Although we found an increase in epidural usage among Hispanic women given the educational program while on the labor floor, Hansen *et al.*²² found no increase in epidural usage when an educational pamphlet was passively delivered during a prenatal visit. It is possible that active education during the labor process, increased in-person time, and the process of shared decision-making is required to change attitudes toward epidural analgesia for labor. Furthermore, although our study guaranteed that women in the intervention group received the educational program, the percentage of women that read the pamphlet in their study is unknown.²² Our results are congruent with the findings from the abstract presented by Kanter *et al.*²³ Their intervention differed from ours in that it included a video without counseling during a prenatal visit as opposed to our multipronged approach including the pamphlet, the video, and in-person counseling provided to women on the labor ward. It is significant that the decision to use an epidural for labor analgesia can be affected by an intervention that is provided in the labor and delivery room. At our institution, most Medicaid beneficiaries receive their prenatal care at community clinics and only present to the hospital when delivery is imminent. Accordingly, a prenatal educational intervention is more challenging to implement than an intervention that occurs

after presentation to the labor and delivery suite. Because our results were unchanged based on the exposure to prenatal classes, it is unlikely that attending prenatal classes played an independent role on the epidural education program.

At our institution, most Hispanic patients have Medicaid insurance and most non-Hispanic patients have commercial insurance. Although including only Medicaid beneficiaries limits the study's generalizability, we intended to ensure adequate representation of both the Hispanic and non-Hispanic cohorts in the study. Despite restricting enrollment to Medicaid beneficiaries and obtaining cohorts with similar education level or generational status, it is likely the Hispanic patients were from lower-income households than the non-Hispanic patients. Although we do not believe that our primary finding can be explained by educational or economic status, it has been shown that epidural labor analgesia utilization is less common in neighborhoods with lower educational level and lower-income households.²⁴

Our study was conducted at a single institution where the majority of Hispanic patients are from Mexico, the Hispanic subgroup known to be the least likely to choose epidural labor analgesia.⁶ The educational program was created targeting this population and may be less efficacious in other Hispanic subgroups, potentially limiting the study's generalizability.

The inability to recruit patients with severe labor pain caused the majority (83.5%) of patients enrolled in the study

Table 2. Participants' Reported Characteristics, Stratified by Ethnicity and Randomization Assignment

Characteristic, N (%)	Hispanic			Non-Hispanic		
	Routine Care (n = 50)	Education (n = 50)	P Value*	Routine Care (n = 50)	Education (n = 50)	P Value*
Language spoken at home [†]			0.635			0.059
English	10 (20)	13 (26)		49 (98)	43 (86)	
Spanish	36 (72)	35 (70)		0 (0)	1 (2)	
Both English and Spanish	3 (6)	2 (4)		0 (0)	0 (0)	
Other	1 (2)	0 (0)		1 (2)	6 (12)	
Highest education level [‡]			0.713			0.547
Some high school	14 (28)	13 (26)		5 (10)	7 (14)	
High school diploma	21 (42)	26 (52)		11 (22)	13 (27)	
Some college	12 (24)	8 (16)		24 (49)	17 (35)	
Associate's degree	2 (4)	1 (2)		4 (8)	4 (8)	
Bachelor's degree	1 (2)	1 (2)		4 (8)	5 (10)	
Graduate degree	0 (0)	1 (2)		1 (2)	3 (6)	
Generation U.S. citizen			0.552			0.268
First generation	35 (73)	30 (63)		4 (8)	8 (16)	
Second generation	10 (21)	11 (23)		0 (0)	2 (4)	
Third generation	2 (4)	4 (8)		5 (10)	3 (6)	
Fourth generation or higher	1 (2)	3 (6)		41 (82)	37 (74)	
Pain tolerance			0.954			0.439
Low	8 (16)	9 (18)		10 (20)	10 (20)	
Average	27 (54)	27 (54)		26 (53)	21 (42)	
High	15 (30)	14 (28)		13 (27)	19 (38)	
Fear of needles [§]			0.673			0.888
No	34 (68)	32 (64)		32 (65)	34 (68)	
Yes	16 (32)	18 (36)		16 (33)	16 (32)	
Unsure	0 (0)	0 (0)		1 (2)	0 (0)	
Before hospital arrival, did you have a plan regarding epidural analgesia?			0.091			0.616
No	21 (42)	13 (26)		7 (14)	9 (18)	
Yes	29 (58)	37 (74)		43 (86)	41 (82)	
Before hospital arrival, did you think you wanted an epidural? [§]			0.763			0.074
No	26 (52)	24 (48)		12 (24)	21 (42)	
Yes	23 (46)	24 (48)		35 (71)	28 (56)	
Unsure	1 (2)	2 (4)		2 (4)	1 (2)	
Have had epidural before?			0.191			0.909
No	32 (64)	25 (51)		28 (57)	28 (56)	
Yes	18 (36)	24 (49)		21 (43)	22 (44)	
Anyone in family had prior epidural? [§]			0.322			0.297
No	18 (36)	22 (45)		10 (21)	15 (31)	
Yes	32 (64)	26 (53)		37 (77)	34 (69)	
Unsure	0 (0)	1 (2)		1 (2)	0 (0)	
Advised not to have epidural?			0.391			0.284
No	32 (64)	36 (72)		45 (90)	41 (82)	
Yes	18 (36)	14 (28)		5 (10)	9 (18)	
Any prenatal classes?			0.509			0.013
No	37 (74)	34 (68)		43 (86)	32 (64)	
Yes	13 (26)	16 (32)		7 (14)	18 (36)	
Epidurals discussed in prenatal classes?			0.378			0.513
No	2 (17)	5 (31)		3 (43)	4 (29)	
Yes	10 (83)	11 (69)		4 (57)	10 (71)	
Is pain a natural part of childbirth? [§]			0.775			0.706
No	14 (28)	15 (30)		19 (39)	18 (36)	
Yes	36 (72)	34 (68)		27 (55)	30 (60)	
Unsure	0 (0)	1 (2)		3 (6)	2 (4)	

Treatment comparisons by Hispanic strata. [†]English (yes/no), Fisher's exact. [‡]College degrees combined. [§]Unsure category omitted.

to be those undergoing induction or augmentation of labor. The results may not be generalizable to patients in spontaneous labor.²⁵⁻²⁷ The study selection process or secular trends possibly explain the higher epidural analgesia usage

observed in the routine care non-Hispanic group (86%) than our historical data for non-Hispanic Medicaid patients (56%). Therefore, the study might not have been adequately powered to detect differences in epidural analgesia use

Table 3. Trial Primary and Secondary Endpoints, Stratified by Ethnicity and Randomization Assignment

Characteristic	Hispanic			Non-Hispanic		
	Routine Care (n = 50)	Education (n = 50)	P Value*	Routine Care (n = 50)	Education (n = 50)	P Value*
Primary endpoint: Use of labor epidural, N (%)†			0.029			0.616
No	20 (40)	10 (20)		7 (14)	9 (18)	
Yes	30 (60)	40 (80)		42 (86)	41 (82)	
Secondary endpoint: Misconception score associated with labor analgesia on a 12-point scale, mean ± SD ‡						
Baseline scores	4.16 ± 2.0	3.74 ± 2.4	0.340	2.63 ± 1.7	2.66 ± 1.8	0.922
Follow-up scores	3.42 ± 2.2	1.48 ± 1.5	< 0.001	2.29 ± 2.1	1.30 ± 1.6	0.011
Change scores	-0.74 ± 1.3	-2.26 ± 2.3	< 0.001	-0.33 ± 1.9	-1.36 ± 1.6	0.005

†Treatment comparisons by Hispanic strata. ‡Chi square test. §Unequal variance t test.

between the intervention and routine care groups for the non-Hispanic cohort.

The results of our study should be interpreted in the context of several limitations. Although the nurses, anesthesia providers, and obstetric providers were blinded, the patient was not. Patients in the intervention group may have been influenced by the desire to please anesthesia researchers by choosing an anesthesia procedure. At times, a single researcher both enrolled and collected postdelivery data on the same patient, possibly introducing some unintended bias.

However, we believe this potential is low as the study primary endpoint was objective and identified from the electronic health record. The potential for bias was minimal also for the epidural questionnaire, which was administered on paper in the patient’s preferred language, limiting the potential for researcher influence. The topic areas covered by the epidural questionnaire were specifically addressed in the educational program. It is not possible to discern whether the change in the responses to the epidural questionnaire resulted from change in knowledge or beliefs; however, the

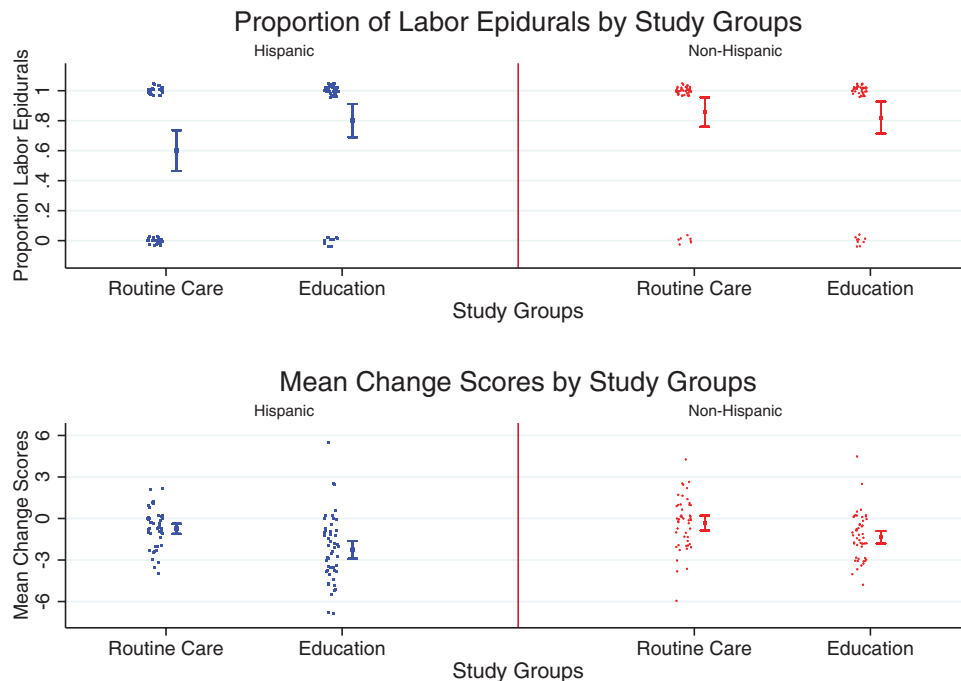
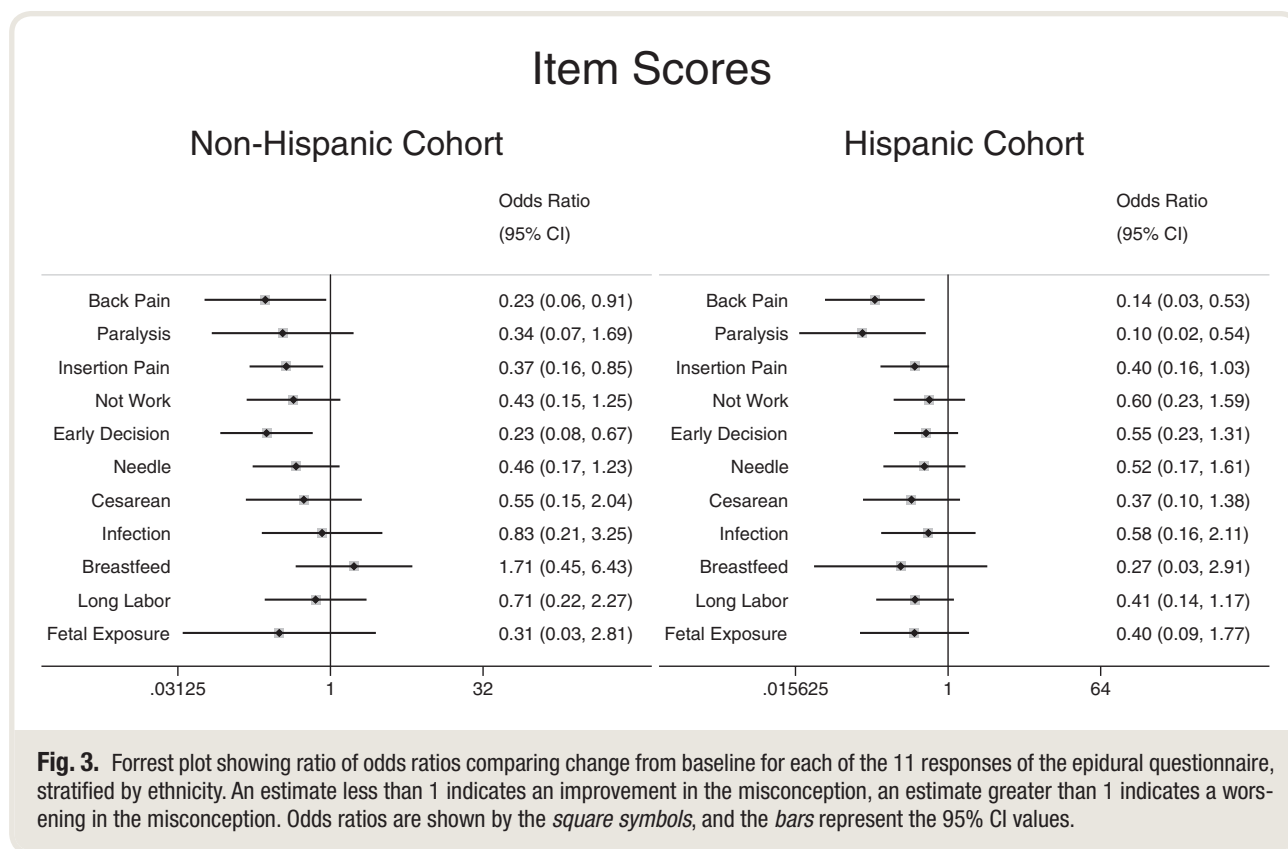


Fig. 2. Proportion of labor epidurals and mean change scores for misconceptions about labor analgesia, stratified by ethnicity and randomization assignment. Proportions and mean change scores are shown by the squares and circles, and the 95% CI values are shown by the whisker bars. The Hispanic cohort is in blue, and the non-Hispanic cohort is in red.



education program led to an increase in the use of epidural analgesia in the Hispanic cohort. This finding would support the concept that patient beliefs were changed by the educational program. Last, patients were asked to complete this questionnaire in the immediate postpartum period. Patient knowledge and beliefs regarding epidural analgesia at this time point may not reflect patient views at a later time.

In conclusion, our educational program helped dispel several misconceptions about epidural labor analgesia and increased the percentage of Hispanic women that choose epidural labor analgesia. Both Hispanic and non-Hispanic women were found to have baseline misconceptions that improved with the educational program. Misinformation appears to be contributing to the decision by Hispanic women not to choose epidural analgesia. To this extent, the low rate of labor epidural utilization in Hispanic women cannot be entirely attributed to cultural preference. Our findings support the recommendation for healthcare organizations to evaluate their systems for providing labor analgesia education targeting Hispanic women and to consider providing additional education in the patient's preferred spoken language. The majority of patients arriving to labor and delivery in spontaneous labor were unable to receive the educational program. From the perspective of educating and facilitating evidence-based decision-making among more patients, it may be preferable to begin a labor analgesia educational program during a prenatal visit. The impact of an earlier education program on epidural analgesia usage

is unknown. Further study is suggested to determine the optimal time for administering an epidural education program and the key components that should be included in such a program.

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Competing Interests

The authors declare no competing interests.

Reproducible Science

Full protocol available at: togioka@ohsu.edu. Raw data available at: togioka@ohsu.edu.

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