Use of Nonmedical Methods of Labor Induction and Pain Management Among U.S. Women

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ABSTRACT: Background: *There exists limited documentation of nonmedical methods of labor induction and pain management during childbirth in the United States. We estimated the prevalence of nonmedical interventions for induction and pain management and examined the association between medical and nonmedical care during labor.* **Methods:** *We used a nationally representative survey of U.S. women who gave birth in 2005 (N = 1,382) to examine use of nonmedical methods of labor induction and pain management. Using logistic regression, we calculated odds of nonmedical and medical interventions to induce labor or mitigate pain, and the odds of medical induction and obstetric analgesia by whether nonmedical methods were reported.* **Results:** *Nearly 30 percent of women used nonmedical methods to start labor, and over 70 percent of women used nonmedical pain management. Doula support was the strongest predictor of nonmedical methods of labor induction (Adjusted Odds Ratio [AOR] = 3.0) and labor pain management (AOR = 5.7). Use of nonmedical pain management was significantly associated with decreased odds of medical pain management (OR = 0.65); this relationship was attenuated with covariate adjustment.* **Conclusions:** *Nonmedical methods to induce labor and manage pain during childbirth are commonly used by U.S. women. Future research should examine effectiveness of these strategies and their influence on medical services use. (BIRTH 40:4 December 2013)*

Key words: *childbirth, complementary and alternative therapies, labor induction, labor pain management, obstetrics*

Childbirth is a common reason for use of medical services by U.S. women (1). Both induction of labor and medical management of labor pain are increasingly common interventions that offer important potential benefits to childbearing women, but they also carry risks. Medical induction of labor has increased dramatically, from 9.5 percent in 1990 to 23.2 percent in 2011, and approximately 75 percent of all women

receive neuraxial analgesia (epidural or intrathecal) during labor to manage pain during childbirth (2–4). Clinicians can induce labor by rupturing the amniotic sac, applying synthetic prostaglandin gel to the cervix, or giving synthetic oxytocin (Pitocin) intravenously (5). Labor induction is an important and sometimes necessary procedure, but when used without medical indication, especially before 39 weeks' gestation, it can have adverse consequences. The rise in nonindicated labor induction is associated with decreasing mean birthweight (6); labor induction is also associated with increased odds of cesarean delivery (7), which, although often performed to avoid potential adverse events, also carries maternal and infant health risks (8,9). Neuraxial analgesia is generally effective in managing labor pain, but may increase the chances of instrumental delivery, prolonged second stage of labor, need for labor augmentation, severe headache, maternal hypotension, maternal fever, and urinary retention (10–13).

Women of childbearing age are also frequent users of alternative health strategies and complementary and alternative medicines (CAM), the use of which have been steadily increasing in the United States, and currently comprises about 3 percent of national health expenditures for ambulatory care (14). CAM use is associated with being female, aged 30–65, higher levels of income and education, private (vs public) insurance, and living in the West census region (15).

Although the use of medical care during labor is well-documented, less is understood about the use of nonmedical means of labor induction and pain management in the U.S. population. There exists a lack of national data on how many women try to start their own labor, yet the results of small studies suggest that women frequently attempt "self-induction." Even so, evidence on the efficacy of these nonmedical techniques for starting labor is sparse, with small sample sizes and limited generalizability (16–18). Studies have had mixed or inconclusive results with respect to the effectiveness of sexual intercourse for labor induction (17,19–21). The evidence for nipple stimulation is tentatively positive (22). A systematic review of the use of castor oil found only one study that was of sufficient quality to include, and results showed it to be ineffective at starting labor (23); and a case report actually suggests potential harms of castor oil ingestion (24). In addition, early labor, iatrogenic birth, and delivery before 39 weeks' gestation entails maternal and neonatal risks, whether labor is self-induced or medically induced without a clear clinical need (8,9).

Although nonmedical pain management techniques during labor are commonly discussed in childbirth preparation books, manuals, and courses (25), no nationally representative studies provide information on the prevalence of their use. Effectiveness studies have generally evaluated individual methods separately despite the fact that multiple techniques are likely used together (26). Some evidence supports the effectiveness of immersion in water, acupuncture, acupressure, massage, and relaxation techniques in labor (10,27,28). The use of hypnosis did not affect the probability of using pharmacological pain relief or having a spontaneous vaginal birth (29). A Cochrane review on this topic noted the difficulty in comparing studies as a result of variation in process and outcome measures, which can include outcomes such as length of labor, women's reports of pain relief, and satisfaction with pain relief, use of pharmacological pain management, and spontaneous vaginal birth (10).

Having the support of a trained labor companion may also reduce a woman's need for medical pain management in labor. A doula is a nonmedical professional who "provides continuous physical, emotional and informational support to the mother before, during and just after birth; or who provides emotional and practical support during the postpartum period" (30). Randomized controlled trials have shown the clinical benefits of continuous labor support to include shorter labors, higher reported levels of patient satisfaction, higher rates of spontaneous vaginal birth, lower rates of cesarean delivery and instrument-assisted vaginal delivery, and lower rates of regional (i.e., epidural) analgesia (31).

In this study, we characterized the use of nonmedical care to induce labor and manage pain during childbirth in the United States. We further report the prevalence and types of nonmedical methods of labor induction and pain management, maternal characteristics associated with nonmedical methods, and the relationship between use of medical and nonmedical methods.

Materials and Methods

Data

Data came from the Listening to Mothers II Survey, a survey of English-speaking women, aged 18–45, who gave birth to a singleton infant in a U.S. hospital during 2005 ($N = 1,573$). The survey was conducted by Harris Interactive by means of Internet and telephone, using validated sampling methods (32,33). Full information about the survey questionnaires, methodology, reports, and related materials are publicly available (34). Data from the Listening to Mothers surveys have previously been used in public health and maternal health services research (4,35–37), but have never before been used to examine the use of complementary and alternative medicines or nonmedical forms of

health care related to labor induction and pain management during childbirth.

The Listening to Mothers II survey contains detailed data on medical and nonmedical care used during pregnancy and childbirth and the reasons for use of this care and the self-reported effectiveness. This analysis uses the online component of the survey, in which the use of methods of labor induction and pain management was assessed (N = 1,382). We excluded women with scheduled cesarean deliveries (n = 224) and those who did not experience labor (n = 31). The final analytic sample included 1,127 women who gave birth in a U.S. hospital during 2005 (weighted N = 1,087).

Variable Measurement

Labor induction

We used two measures of labor induction: self-induction and medical induction. Women were asked whether they themselves had done anything to start their labor (self-induction). Women who responded that they had tried to start their labor were asked whether they had used nipple stimulation, sexual intercourse, castor oil, herbal treatments, walking or exercise, or other methods. A second set of questions asked whether a medical practitioner had done something to start labor; if so, each was asked whether the practitioner had ruptured her membranes, swept her membranes, used Pitocin, cervical gel, an oral tablet or pill, or some other method. For both types of induction, respondents could indicate more than one method that was used. We categorized respondents as having used self-induction only, medical induction only, both, or neither.

Pain management during labor

The survey also investigated use of nonmedical and medical techniques for pain management during labor. Respondents indicated whether they had used each of the following nonmedical techniques: tub or pool, shower, position changes, birth ball, hot or cold objects, mental strategies, environmental changes such as music or aroma, hands-on techniques, breathing techniques, or other techniques. Women were categorized as having used a nonmedical pain management technique if they had used at least one of the listed options. Respondents also indicated whether each of the following pain medications had been used: epidural, narcotics, nitrous oxide, local block, general anesthesia, or other. They were categorized as having used a medical pain management technique if one or more pain medications had been used. We also created a variable that categorized women as having used nonmedical pain management only, medical pain management only, both medical and nonmedical pain management, or neither type of pain management.

Covariates

We included several covariates in our analyses. Sociodemographic measures included were as follows: age category (18–24, 25–29, 30–34, 35 years or older), race and ethnicity (white, black, Hispanic, or other or multiple race), marital status (married or not), education level (high school or less, some college, Bachelor's degree, or graduate education), census region (Northwest, Midwest, South, West), and nativity (foreign born or U.S. born). Pregnancy-related covariates were doula support during the birth, parity (experienced mother or first-time mother), whether the pregnancy was unintended, and whether the woman agreed with the statement that "birth is a process that should not be interfered with unless medically necessary." Other covariates included the type of health insurance that paid for maternity care (private vs Medicaid or uninsured) and self-reported health status (excellent, very good or good, vs fair or poor),

Analysis

First, we examined descriptive statistics for the sample, characterizing the overall prevalence of labor induction and pain management techniques. We then used multivariate logistic regression to identify predictors of having used any nonmedical method of labor induction and any nonmedical method of pain management. Finally, we estimated unadjusted and adjusted odds of any medical method of labor induction and any medical method of labor pain management by use of nonmedical interventions using logistic regression. All analyses were conducted in Stata12 and weighted to be nationally representative.

Results

Sample Characteristics

Characteristics of the study population are reported in Table 1. Approximately 41 percent of women in the sample had a high school education or less; about 29 percent had a Bachelor's or graduate degree. Over 70 percent of women were white, about 9 percent were black, and nearly 15 percent were Hispanic. Women in the sample were fairly evenly distributed across the younger age categories (18–24, 25–29, and 30–34), with 25–30 percent in each category. A smaller number (18.5%) were age 35 or older. Over 70 percent of the

sample was married and about 5 percent was foreign-born. Nearly two-thirds of women were experienced mothers (parity > 1), and over 40 percent reported that the pregnancy resulting in their recent birth was unintended. About 3 percent reported receiving support from a doula during labor. Nearly half (47.1%) agreed with the statement that childbirth is a process that should not be interfered with unless medically necessary. Forty-two percent of women reported public coverage or no insurance coverage for their maternity care, whereas 58 percent of women were privately insured. The vast majority (92.6%) of women in the sample reported being in good health.

Table 1. Characteristics of sample

	% (No.)
Sociodemographic characteristics	
Age category	
18–24	27.9 (304)
25–29	29.4 (320)
30–34	24.2 (263)
35+	18.5 (201)
Race	
White	71.3 (775)
Black	9.3 (101)
Hispanic	14.7 (156)
Other/multiple race	4.7 (52)
Married (vs not married)	71.4 (777)
Education	
High school or less	40.9 (445)
Some college/Associate's degree	29.9 (325)
Bachelor's degree	21.2 (231)
Graduate education/degree	8.0 (87)
Region	
Northeast	18.3 (199)
Midwest	23.0 (250)
South	34.2 (372)
West	24.5 (266)
Foreign born (vs U.S. born)	5.4 (59)
Pregnancy Characteristics	
Doula support	2.9 (31)
Experienced mother (vs first-time mother)	62.9 (684)
Unintended pregnancy (vs intended pregnancy)	41.9 (455)
Belief that childbirth is a process that should only be interfered with if medically necessary	47.1 (512)
Other characteristics	
Public or no insurance (vs private insurance)	41.5 (636)
Good health (vs poor health)	92.6 (1,007)

Table presents weighted Ns and percentages.

Labor Induction

Table 2 reports the prevalence of labor induction strategies among women in the study population. Nearly 30 percent of women had used some nonmedical intervention to start their labor; over 50 percent had a practitioner attempt to induce their labor. Twenty-three percent of women in the sample used walking or exercise to try to start labor; this was the most common self-induction technique. A fifth of the sample had sexual intercourse to try to start labor. Nipple stimulation to induce labor was also fairly common, used by nearly 12 percent of women. The most common medical induction technique was use of Pitocin, used by 41 percent of all women in the study population. Rupturing the membranes or sweeping the membranes was also common, reported by 25 and 17 percent of women, respectively. About a third of women in the sample used medical interventions only to try to start labor; 10 percent used nonmedical interventions only. Nearly a fifth of women used both medical and nonmedical techniques to try to start labor, and about 39 percent did nothing to start labor.

Logistic regression results for use of nonmedical interventions for labor induction are shown in Table 3. Women with doula support had substantially higher odds of using nonmedical techniques for labor induction (AOR = 3.03, 95% CI 1.21–7.61), as did experienced mothers (vs first-time mothers) (AOR = 1.91, 95% CI 1.28–2.86) and women in good health (AOR = 2.34, 95% CI 1.07, 5.11). Women over age 35 had lower odds of using nonmedical labor induction techniques compared with women aged 18–24 (AOR = 0.24, 95% CI 0.12, 0.50). The unadjusted and adjusted odds of use of medical interventions for labor induction are also presented in Table 3. In the unadjusted model, use of nonmedical labor induction methods was positively associated with use of medical labor induction methods (Odds Ratio [OR] = 2.20, 95% CI 1.51, 3.21). After adjusting for covariates, the association between medical and nonmedical methods of labor induction remained positive and statistically significant (AOR = 2.45, 95% CI 1.66, 3.62). Women over age 35 (vs 18–24) had higher odds of using medical labor induction methods (AOR = 1.81, 95% CI 0.99, 3.31), although this finding was only marginally significant. Belief that birth is a process that should not be interfered with was negatively associated with medical labor induction (AOR = 0.67, 95% CI 0.48, 0.95).

Pain Management

The uses of both medical and nonmedical strategies for managing pain during labor were very common (see

Table 2. Prevalence and type of nonmedical and medical interventions for induction of labor and labor pain relief

	% (No.)
Induction of labor	
Any nonmedical interventions (%)	28.6 (311)
Nipple stimulation	11.9 (129)
Sexual intercourse	20.3 (220)
Castor oil	3.8 (41)
Herbal treatment	4.1 (45)
Walk, exercise, movement	23.4 (255)
Other	2.1 (23)
Practitioner Induction (%)	51.3 (557)
Rupture membranes/break water	25.4 (276)
Sweep membranes	17.1 (186)
Pitocin	41.1 (447)
Cervical gel	12.2 (133)
Tablet/pill (oral)	1.7 (19)
Other	1.1 (12)
Medical interventions only	32.7 (355)
Nonmedical interventions only	10.0 (109)
Both medical and nonmedical interventions	18.6 (202)
Neither medical nor nonmedical interventions	38.7 (421)
Labor pain relief	
Any nonmedical interventions (%)	70.5 (766)
Tub/pool	6.2 (67)
Shower	4.4 (48)
Position changes	42.9 (467)
Birth ball	6.9 (75)
Hot or cold objects	6.5 (70)
Mental strategies	25.4 (276)
Environmental changes (music, smells)	3.7 (41)
Hands-on techniques	21.0 (228)
Breathing techniques	51.0 (555)
Other	2.2 (23)
Any medical interventions (%)	84.7 (921)
Epidural	75.3 (819)
Narcotics	25 (272)
Nitrous oxide	1.5 (16)
Local block	0.8 (9)
General anesthesia	2.2 (24)
Other	7.6 (82)
Medical interventions only	26.1 (284)
Nonmedical interventions only	11.9 (129)
Both medical and nonmedical interventions	58.6 (637)
Neither medical nor nonmedical interventions	3.4 (37)
Used more than one nonmedical intervention	50.1 (545)

Table presents weighted Ns and percentages. Women who had a planned cesarean delivery or did not experience labor are excluded. Categories are not mutually exclusive and may sum to more than 100%.

Table 2). Over 70 percent of women used some non-medical pain management technique, and 85 percent used medical pain management during labor. Breathing techniques, position changes, and mental strategies were the most frequently reported nonmedical pain management techniques, with over half of women using breathing techniques. Epidural analgesia was by far the most common medical intervention for management of labor pain, used by three-quarters of women in the sample. Narcotics were used by 25 percent of women. Most women (58.6%) used both medical and nonmedical interventions to manage their labor pain. About a quarter used medical interventions only, 12 percent used nonmedical interventions only, and 3.4 percent reported no medical or nonmedical pain management interventions. Half of women reported using multiple nonmedical pain management strategies during labor.

Table 4 presents logistic regression results for use of nonmedical pain management strategies. Similar to labor induction, doula support was the most important predictor of using nonmedical pain management techniques (AOR = 5.74, 95% CI 1.26–26.13). Other predictors of nonmedical pain management included census region (women in the West had twice the odds compared with women in the Northeast) and belief that childbirth is a process that should not be interfered with (AOR = 1.83, 95% CI 1.27–2.64). Table 4 also shows unadjusted and adjusted odds of use of medical pain management techniques. In the bivariate model, use of nonmedical pain management methods was associated with decreased odds of use of medical pain management (OR = 0.65, 95% CI 0.42, 1.00). After controlling for covariates, the negative association remained but was no longer statistically significant (AOR = 0.68, 95% CI 0.42, 1.11). Being in the West census region (vs the Northeast) was associated with higher odds of using medical labor pain management methods. Some college education (vs high school or less), being married, being an experienced mother (vs new mother), and believing that birth is a process not to be interfered with were all negatively associated with use of medical pain management.

Discussion

Nonmedical methods of labor induction and pain management are used nearly as frequently as medical methods among U.S. women who give birth. Almost a third of women used some nonmedical intervention to start their labor, and half had a practitioner attempt to induce their labor. Women who used nonmedical techniques for self-induction of labor also had higher odds of medical induction, perhaps as a result of women's

discomfort or desire to hasten labor at the end of pregnancy or preference to avoid a medical induction by using techniques to encourage labor to begin spontaneously.

Over 70 percent of women used some nonmedical pain management technique, and 85 percent used medical pain management during labor. Breathing techniques, position changes, and mental strategies were the most frequently reported nonmedical pain management techniques, with over half of women using breathing techniques. Many of these techniques are commonly recommended by clinicians and have shown effectiveness in mitigating labor pain (10,38). Epidural analgesia was by far the most common medical intervention for

management of labor pain, used by three-quarters of women in the sample, similar to the rates reported in birth certificates (13).

Given the frequency with which epidural analgesia is used for labor pain management, it is important to consider the potential impact of widespread use on the frequency of known risks associated with the procedure, including instrument-assisted delivery, prolonged second stage of labor, need for labor augmentation, severe headache, maternal hypotension, and maternal fever. Medical management of labor is also associated with added costs: the average professional fee paid by commercial health insurers to anesthesiologists for intrapartum care is $995 per birth (39). Our analysis showed

Table 3. Odds of use of nonmedical and medical interventions for labor induction

	Any nonmedical method of labor induction		Bivariate: Any medical method of labor induction		Multivariate: any medical method of labor induction	
	AOR	95% CI	OR	95% CI	AOR	95% CI
Any nonmedical labor induction method			**2.20**	**1.51, 3.21**	**2.45**	**1.66, 3.62**
Sociodemographic characteristics						
Age category (Ref = 18–24)						
25–29	0.78	0.47, 1.29			1.42	0.88, 2.28
30–34	0.85	0.47, 1.52			1.53	0.91, 2.56
35+	**0.24**	**0.12, 0.50**			1.81	0.99, 3.31
Race (Ref = white)						
Black	0.51	0.25, 1.05			0.99	0.53, 1.83
Hispanic	0.86	0.44, 1.67			0.73	0.40, 1.32
Other/multiple race	1.11	0.51, 2.4			0.99	0.49, 2.00
Married	0.99	0.56, 1.76			0.85	0.54, 1.36
Education (Ref = High school or less)						
Some college/Associate's degree	0.95	0.61, 1.49			0.78	0.52, 1.15
Bachelor's degree	1.13	0.64, 1.97			0.67	0.39, 1.14
Graduate education/degree	1.45	0.74, 2.83			0.86	0.47, 1.59
Region (Ref = Northeast)						
Midwest	0.80	0.46, 1.4			1.25	0.77, 2.22
South	1.07	0.62, 1.84			1.25	0.74, 2.09
West	1.00	0.55, 1.8			0.86	0.47, 1.59
Foreign born	0.76	0.28, 2.08			0.67	0.31, 1.44
Pregnancy characteristics						
Doula support	**3.03**	**1.21, 7.61**			0.60	0.22, 1.68
Experienced mother (Ref = first time mother)	**1.91**	**1.28, 2.86**			0.73	0.50, 1.06
Unintended pregnancy	0.98	0.66, 1.46			0.97	0.67, 1.42
Belief that childbirth is a natural process	0.80	0.55, 1.17			**0.67**	**0.48, 0.95**
Other characteristics						
Public or no insurance (Ref = private insurance)	0.87	0.54, 1.4			0.86	0.56, 1.31
Good health (Ref = poor health)	**2.34**	**1.07, 5.11**			0.65	0.35, 1.21

Models are weighted to be nationally representative. Women with planned cesarean deliveries and women who did not experience labor are excluded. Bold text indicates a statistically significant association at p < 0.05.

that—in unadjusted comparisons across the study population—use of nonmedical pain management methods was associated with decreased odds of use of medical pain management, of which epidurals comprise the vast majority. For women with a preference for nonmedical methods of pain management, there may be potential cost savings and improved clinical outcomes when clinicians, health insurers or employers help enhance access to these methods. However, this relationship between medical and nonmedical methods of pain relief may vary across subgroups of women or regions of the United States.

Although doula support was a relatively low-prevalence characteristic in this study population, it was the strongest predictor of using nonmedical methods of labor induction and labor pain management. Women with doula support had triple the odds of reporting nonmedical techniques for labor induction, compared with women without such support. In addition, doula support was the most important predictor of use of nonmedical pain management techniques, (AOR = 5.74, 95% CI 1.26–26.13). Our finding is consistent with results reported in a Cochrane review of continuous labor support, showing lower rates of epidural use for women with support from a trained childbirth professional (31). Use of doula services has increased in recent years, but is limited by financial and cultural barriers to access (40,41). In addition to facilitating use

Table 4. Odds of use of nonmedical and medical interventions for labor pain relief

	Any nonmedical method of labor pain management		Bivariate: any medical method of labor pain management		Multivariate: any medical method of labor pain management	
	AOR	95% CI	OR	95% CI	AOR	95% CI
Any nonmedical pain management method			**0.65**	**0.42, 1.00**	0.68	0.42, 1.11
Sociodemographic characteristics						
Age category (Ref = 18–24)						
25–29	1.02	0.62, 1.67			0.76	0.40, 1.40
30–34	1.00	0.57, 1.74			0.91	0.48, 1.72
35+	1.24	0.67, 2.31			0.89	0.41, 1.93
Race (Ref = white)						
Black	1.07	0.56, 2.01			1.75	0.80, 3.81
Hispanic	1.14	0.6, 2.14			0.93	0.43, 2.04
Other/multiple race	1.18	0.48, 2.88			0.58	0.18, 1.87
Married	0.95	0.59, 1.53			**0.37**	**0.20, 0.69**
Education (Ref = High school or less)						
Some college/Associate's degree	1.38	0.92, 2.09			**0.47**	**0.27, 0.81**
Bachelor's degree	1.05	0.60, 1.86			0.53	0.26, 1.09
Graduate education/degree	1.47	0.72, 2.99			0.61	0.26, 1.44
Region (Ref = Northeast)						
Midwest	1.41	0.81, 2.44			1.23	0.66, 2.26
South	0.97	0.57, 1.66			1.79	0.97, 3.29
West	**1.96**	1.06, 3.66			**2.36**	**1.20, 4.65**
Foreign born	0.47	0.19, 1.14			0.78	0.30, 2.05
Pregnancy characteristics						
Doula support	**5.74**	1.26, 26.13			0.69	0.27, 1.78
Experienced mother (Ref = first time mother)	0.85	0.57, 1.28			**0.30**	**0.18, 0.50**
Unintended pregnancy	0.76	0.52, 1.12			0.92	0.59, 1.44
Belief in birth as a natural process	**1.83**	1.27, 2.64			**0.37**	**0.23, 0.57**
Other characteristics						
Public or no insurance (Ref = private insurance)	0.80	0.51, 1.25			0.63	0.39, 1.01
Good health (Ref = poor health)	1.22	0.64, 2.34			0.59	0.24, 1.48

Models are weighted to be nationally representative. Women with planned cesarean deliveries and women who did not experience labor are excluded. Bold text indicates a statistically significant association at p < 0.05.

of nonmedical methods of labor induction and pain management, continuous labor support is associated with many other positive birth outcomes, so policies to increase access to doula care should be considered (31,41). It may be useful for payers to consider benefits design strategies that allow for a range of choices for labor pain management.

Other significant predictors of nonmedical pain management techniques included parity, U.S. Census region, and belief that childbirth is a process that does not require intervention. Regional patterns uncovered in our analysis are consistent with broad patterns of CAM use across the United States (15), and may reflect geographic differences in practice patterns and clinical norms and variation in the practice of midwifery, which is a care model that focuses on physiological childbirth and may place greater emphasis on nonmedical methods and CAM techniques (42). The role of beliefs about childbirth is also important in our analysis, with women who believe that childbirth does not require intervention having nearly double the odds of reporting nonmedical means of pain management. This finding highlights the need to account for differences in preferences and attitudes toward pain relief during labor and delivery to better understand and address women's needs (11,13). Prior work has not explicitly addressed the relationship between women's beliefs about childbirth and use of alternative health strategies during labor and delivery, and this analysis lays the groundwork for future research which could explore predictors of a belief in childbirth as a process that should not be interfered with and the relationship between these beliefs and quality of maternity care and health outcomes.

Childbearing women and their health care practitioners require more information about the benefits (and in some cases, potential risks) of nonmedical methods of labor induction and pain management. In addition, more data are needed about the clinical and practical interactions between medical care and alternative health strategies used during labor and delivery. Whether clinicians are aware of women's use of CAM techniques or nonmedical strategies may affect the course of care during pregnancy and childbirth, and evidence is needed to guide this shared decision-making process (43). Although birth certificates and hospital discharge records include information on medical procedures during childbirth, there exists no routinely collected information about nonmedical methods of pain relief or about efforts women make to induce labor on their own (44).

Findings should be considered in light of potential limitations. First, our primary outcomes of interest are all based on self-report. When collecting data by means of surveys, there exists potential for recall bias, social desirability bias, and other context effects that may influence the accuracy of self-reports (45). However, previous research comparing recall to medical record documentation suggests that women have relatively high accuracy of recall with respect to events that take place during pregnancy and childbirth (46). Second, we classified all nonmedical methods in one category for each outcome related to labor induction or labor pain management. These are heterogeneous groups of nonmedical methods, each of which may have more or less effectiveness for the desired outcome. Grouping them together may have resulted in an attenuation of the relation between nonmedical methods and decreased odds of medical management. In addition, there exists no detail about frequency, duration, or intensity of the nonmedical interventions. To the extent that there may be a dose–response relation, this lack of detail may obscure any findings. Third, our examination of the association between nonmedical and medical methods is limited by the all-or-nothing nature of the measures of medical intervention (i.e., either had it or not). Even if nonmedical methods did not prevent the use of medical interventions, it is possible that nonmedical interventions might have delayed the use or decreased the amount of some of the medical methods used (e.g., narcotics, Pitocin). However, the available data do not include procedure codes, dosages, or timing of interventions and thus do not allow this more detailed analysis. Fourth, the survey is based on an online survey panel, which is a nonprobability sample of those who have volunteered to participate in surveys and who have access to the Internet. Thus, it may not be fully representative of all women giving birth in the United States. However, evaluation of this online sample suggests that even though it may be a biased sample, it may produce more accurate estimates than other methods of national survey data collection (47). Finally, sample size was moderately small, especially with respect to some variables of interest (e.g., doula support). A larger overall sample, even with a relatively low-prevalence exposure, like doula support, would allow more comprehensive analysis of this important facilitator of nonmedical methods of labor induction and pain management.

Conclusions

Use of nonmedical means of labor induction and labor pain management is very common, and it is important to understand the scope and effectiveness of use and to ensure that medical and nonmedical means of care are well-integrated and mutually supportive. Clinicians should be aware of the needs and preferences of patients with respect to medical and nonmedical methods of labor induction and pain management, and

should encourage the use of trained labor support from a birth doula for those who prefer nonmedical methods. Future research should examine effectiveness of alternative and nonmedical strategies for induction and pain management and consider how they may influence the use of traditional medical care during labor for the benefit of mothers and infants.

Acknowledgments

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