


## RESEARCH ARTICLE

# Cesarean overuse and the culture of care

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**Objective:** To assess hospital unit culture and clinician attitudes associated with varying rates of primary cesarean delivery.

**Data Sources/Study Setting:** Intrapartum nurses, midwives, and physicians recruited from 79 hospitals in California participating in efforts to reduce cesarean overuse.

**Study Design:** Labor unit culture and clinician attitudes measured using a survey were linked to the California Maternal Data Center for birth outcomes and hospital covariates.

**Methods:** Association with primary cesarean delivery rates was assessed using multivariate Poisson regression adjusted for hospital covariates.

**Principal Findings:** 1718 respondents from 70 hospitals responded to the Labor Culture Survey. The "Unit Microculture" subscale was strongly associated with primary cesarean rate; the higher a unit scored on 8-items describing a culture supportive of vaginal birth (eg, nurses are encouraged to spend time in rooms with patients, and doulas are welcomed), the cesarean rate decreased by 41 percent (95% CI = -47 to -35 percent,  $P < 0.001$ ). Discordant attitudes between nurses and physicians were associated with increased cesarean rates.

**Conclusions:** Hospital unit culture, clinician attitudes, and consistency between professions are strongly associated with primary cesarean rates. Improvement efforts to reduce cesarean overuse must address culture of care as a key part of the change process.

## KEYWORDS

attitudes, cesarean delivery, culture, overuse

## 1 | BACKGROUND

The cesarean delivery rate in the United States varies widely, with national rates showing a 10-fold variation between hospitals.<sup>1</sup> Prior studies have shown that the wide variation in hospital cesarean delivery rates cannot be accounted for by changes in the health and risk profiles of childbearing women,<sup>2-5</sup> women's preferences,<sup>6,7</sup> or hospital characteristics.<sup>1,3,8</sup> Local hospital culture

is often given as the most likely explanation for this wide, unexplained variation; however, attempts to characterize and measure differences in hospital culture in relation to cesarean delivery overuse are lacking.<sup>2,3,7,8</sup>

In the past several years, the state of California has taken steps to increase pressure on hospitals to reduce cesarean delivery overuse. Payers are examining possible areas of overuse and putting greater pressure on health care organizations to improve maternity

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quality metrics and lower health care costs. Covered California, the state's health insurance marketplace under the Affordable Care Act, has required that all hospitals in any network the Covered California health plans provide must hit the national target for low-risk primary cesarean delivery rate of 23.9 percent by 2019. Hospitals that do not meet this target will undergo increased scrutiny and their participation in the network will be questioned.<sup>9</sup> The California Maternal Quality Care Collaborative (CMQCC) created a Toolkit to Support Vaginal Birth and Reduce Primary Cesareans (Toolkit) and began its quality improvement initiative (Cesarean Collaborative) in May 2016. Since then, 93 hospitals, participating in three successive "waves" of rollout, have joined the Cesarean Collaborative and are encouraged to use the Toolkit as a tool to reduce their low-risk primary cesarean delivery rates. While the Toolkit recommends hospitals start by addressing their hospital's "culture of care and the value of vaginal birth," tools to perform internal assessment of these variables did not yet exist.

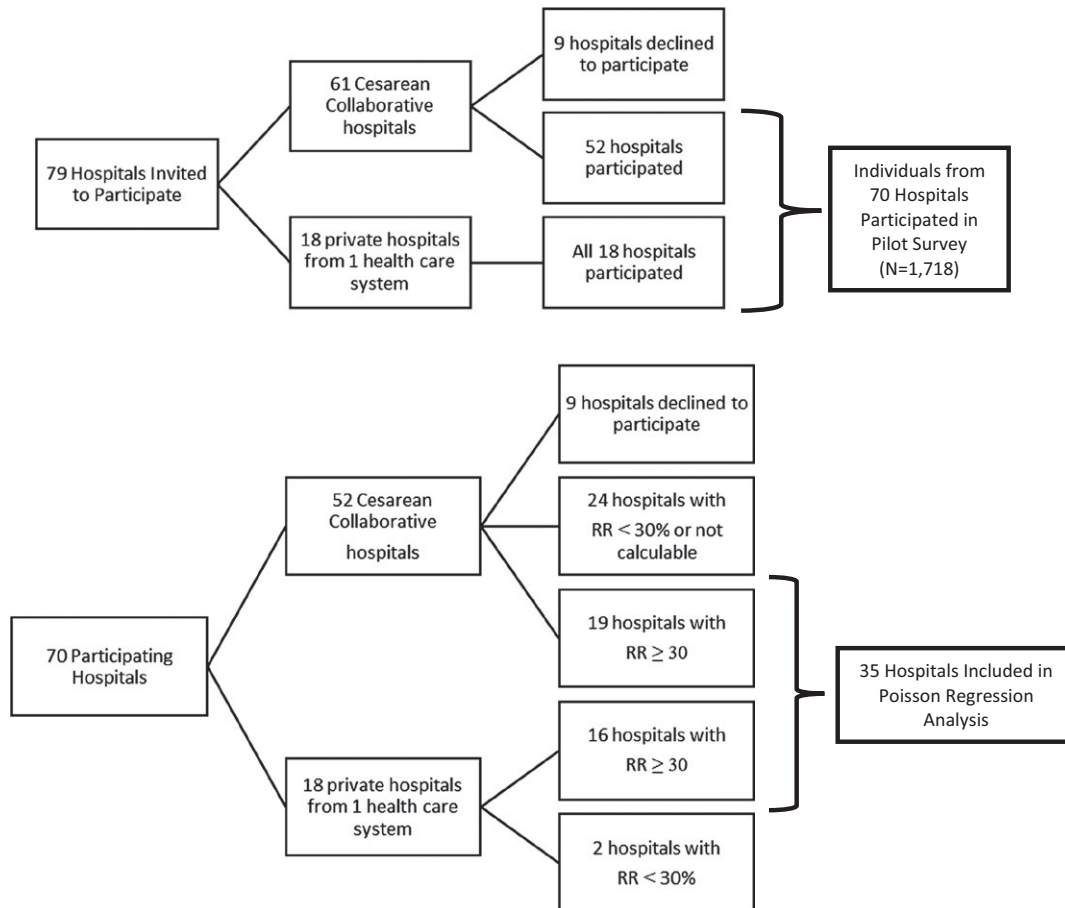
The Institute of Medicine released its report on preventable medical errors in 2000,<sup>10</sup> which prompted increased focus on creating a "culture of safety" in health care organizations.<sup>11</sup> This has led to increased understanding of patterns of hospital variation and delineation of what characterizes hospitals with strong cultures of safety.<sup>12,13</sup> Organizational culture is generally defined as members'

basic assumptions, values, and beliefs that are used to acculturate new members into the "correct" way to perceive, think, and feel.<sup>14</sup> According to the Theory of Planned Behavior, attitudes, norms, and perceived behavioral controls are translated into behaviors by creating specific sets of intentions among members of the group.<sup>15</sup> This model has been used to show association between labor nurses' attitudes and intentions to provide more supportive care during labor.<sup>16</sup> From this conceptual model, it is possible to posit that a hospital's birth culture, and its orientation to vaginal vs cesarean delivery, may play a key role in a hospital's tendency to overuse cesarean delivery. We hypothesized that to further reduce primary cesarean delivery rates strategies may require a shift in culture; specifically, shifting hospitals and clinicians to place greater value on supporting vaginal birth.

## 2 | METHODS

### 2.1 | Study population and data

The study population included intrapartum care clinicians (obstetricians, maternal-fetal medicine physicians, family physicians, midwives, and anesthesiologists, labor and delivery nurses, nurse educators, and nurse managers), recruited from 61 hospitals in California



**FIGURE 1** Hospital sampling frame for culture survey

participating in the CMQCC Cesarean Collaborative, as well as 18 additional hospitals from a large northern California health system. Hospitals were eligible to participate in the Cesarean Collaborative if they had a low-risk primary cesarean delivery rate of  $\geq 24$  percent as of May 2016 ( $N = 101$ ), additionally, four private health care systems representing 71 hospitals, elected to participate in the quality improvement initiative despite having variable rates of NTSV cesarean delivery across their hospitals. A hospital had to elect to participate in the Cesarean Collaborative and was then assigned to one of three “waves” of initiative rollout. Our sample was recruited from the first and second waves ( $N = 61$  hospitals). Hospitals were strongly advised, but not required, to participate in the labor culture assessment as part of the Cesarean Collaborative. The 18 additional hospitals were recruited from one large northern California health system with a diverse range of hospital and patient characteristics and a large proportion of hospitals with cesarean delivery rates under the 23.9 percent target. This system was chosen as a means to establish what cultural norms look like in hospitals with low NTSV cesarean rates, as well as its demonstrated interest in taking part in the labor culture assessment, and its proximity to the study team. Hospitals provided total counts of intrapartum care clinicians for use in response rate calculations (Figure 1).

## 2.2 | Labor and delivery unit culture

We measured labor and delivery unit culture using a survey comprised of 29 Likert-style items measuring both individual attitudes and beliefs about birth and birth practices, as well as perceptions of the cultural norms on the individual's labor and delivery unit.<sup>17</sup> All items use a 5-point Likert scale, from strongly disagree to strongly agree. The Labor Culture Survey (LCS) has six subscales that include the following: Best Practices to Reduce Cesarean Delivery (Cronbach alpha [ $\alpha$ ] = 0.84), Cesarean Safety ( $\alpha = 0.53$ ), Fear of Vaginal Birth ( $\alpha = 0.89$ ), Maternal Agency ( $\alpha = 0.67$ ), Physician Oversight ( $\alpha = 0.79$ ), and Unit Microculture ( $\alpha = 0.79$ ).

The first five scales measure individual attitudes and beliefs about different aspects of birth and are adapted from several different previously validated scales, updated based on current practice patterns in the United States, and informed by additional findings from vignette-based physician surveys on thresholds to perform cesarean delivery.<sup>18-22</sup> For instance, the Fear of Vaginal Birth scale asks the participant to rate their level of agreement with items that attempt to get at the participant's underlying discomfort with vaginal vs cesarean birth; for example, “Because of the unpredictability of vaginal birth, I would prefer a scheduled cesarean section birth for myself or my partner.”

The sixth scale measures an individual's perceptions about their labor and delivery unit's norms and consists of eight questions created de novo from concepts identified in CMQCC's “Major Factors Influencing the Culture of Care and the Value of Vaginal Birth.”<sup>23</sup> The survey underwent psychometric analysis, including exploratory factor analysis, iterative revisions using focus groups and individual interviews with labor and delivery personnel, and

confirmatory factor analysis.<sup>24</sup> The LCS was administered electronically via Survey Monkey (SurveyMonkey, Inc., San Mateo, CA, USA), and individual invitations to complete the survey were sent out by hospital administrators or labor and delivery unit leaders. Regular reminders via email and telephone contact with labor and delivery unit liaisons were done by CMQCC personnel. Additional targeted recruitment was performed at hospitals with particularly low levels of participation during the two waves of each 4-week survey collection period. Study staff regularly contacted hospitals to check that the survey had been sent out, and troubleshoot any problems that arose. Unfortunately, nine hospitals out of 70 were unable to give us a total number of staff to which they had sent the survey; thus, we chose to use a conservative approach and count them among our “non-responders” (total hospital response rate  $< 30$  percent).

Participants were issued a numeric study identifier to input as their only identifier on the survey. This 6-digit numeric identifier was assigned to associate an individual with their hospital and either their role (nurse, anesthesiologist) or individual identity (obstetrician, family physician, midwife), but not require any personally identifying information to be input by the participant. All analyses were conducted using de-identified datasets, and the researchers did not have access to individual practitioner identities throughout the study. This project was approved by the Stanford University Internal Review Board.

## 2.3 | Nulliparous, term, singleton, vertex cesarean delivery rate

The California Maternal Quality Care Collaborative maintains a comprehensive database to track and share California hospitals' maternity care quality metrics in as close to real time as possible and includes 210 out of the 240 (in 2018) birthing hospitals in California. This database, called the Maternal Data Center (MDC), uses the standard National Quality Forum-endorsed algorithm<sup>25</sup> to calculate total number of primary low-risk cesarean delivery by hospitals and by providers within those hospitals. Births are eligible for inclusion if they are nulliparous, term ( $> 37$  weeks gestation), singleton, and vertex (NTSV) at delivery. The NTSV cesarean delivery rate has been endorsed by the American College of Obstetricians and Gynecologists<sup>26</sup> and The Joint Commission in its Perinatal Care Measures Set,<sup>27</sup> as the most appropriate measure of cesarean delivery overuse. All of the sample's 79 hospitals are included the MDC database. Using the MDC, we obtained hospitals' NTSV cesarean deliveries and total NTSV births for the years 2015 and 2016 and calculated the hospitals' 2-year NTSV cesarean birth rate.

## 2.4 | Hospital and individual covariates

The MDC collects and summarizes hospital demographic and patient population data, including annual birth volume, geographic location (rural/urban-suburban), nursery acuity level, percent maternal population with Medicaid (% Medicaid), percent maternal population with a body mass index over 30 (% BMI  $> 30$ ), and percent maternal population older than 35 years (% Age  $> 35$ ). Individual survey participants

were asked to supply their professional role (obstetrician, family medicine physician, certified nurse midwife, labor and delivery nurse, nurse educator, nurse manager/director, or anesthesiologist), race/ethnicity, gender, usual shift worked, years of practicing maternity care (for physicians only), and years of working maternity care (for nurses only). Though providers in the sample could practice at multiple hospital sites, the site at which they performed the most number of deliveries annually was where they were asked to take the survey.

## 2.5 | Statistical analysis

We used descriptive statistics to compare the aggregate LCS responses of individuals practicing at hospitals with NTSV cesarean delivery rates within the Top Quartile of the state—defined according to California statewide data for 240 hospitals with maternity wards as NTSV cesarean delivery rate <22 percent—vs all other hospitals. For categorical variables, we performed chi-squared tests, and for continuous variables, we performed Student's *t* tests between groups. *P*-values were provided to determine association between groups. For descriptive comparisons, we collapsed Likert responses into either agree (strongly agree or agree) or disagree (neutral, disagree, strongly disagree). For LCS subscales, we compared means for individuals practicing at Top Quartile hospitals vs all other hospitals.

We used multivariate Poisson regression to measure the association between hospital-level means on each subscale and the hospital-level NTSV cesarean delivery rate over 2015-2016. The distribution of our data was a better fit for a Poisson regression, which are used to model counts rather than rates; therefore, we used NTSV birth volume as an offset term. An offset term is used to account for the large range of total NTSV birth volume at participating hospitals. We used robust estimator of standard error to account for model misspecification. SAS version 9.3 (SAS Institute Inc., Cary, NC, USA) was used for all statistical analyses.

## 3 | RESULTS

### 3.1 | Participant characteristics

A total of 1718 respondents from 70 hospitals responded to the Labor Culture Survey. Of these, 35 hospitals achieved an overall labor and delivery unit personnel response rate (RR) of at least 30 percent ("respondent hospitals"). Labor and delivery nurses made up approximately 2/3 of all participants (*n* = 1266), with obstetricians being the next populous group (*n* = 284), and the remainder comprised of certified nurse midwives, family physicians, and anesthesiologists. Differences in professional role were noted between respondent hospitals (RR ≥ 30 percent) and nonrespondent hospitals (RR < 30 percent), with respondent hospitals having more anesthesiologists, more labor and delivery nurses, and fewer obstetricians (*P* = <0.001). More participants from respondent hospitals endorsed working an evening, rotating, or "other" shift (*P* < 0.0001). There were no significant differences in race/ethnicity, gender, or years of practicing or working maternity care between individuals from respondent vs nonrespondent hospitals (Table S1).

### 3.2 | Hospital characteristics

Respondent hospitals (*n* = 35) showed no significant differences in measured characteristics from nonrespondent hospitals (*n* = 35). Both groups had representation from basic, intermediate, community, and regional nursery levels, with only three hospitals in each group having a regional nursery. The majority of hospitals were located in urban locations and had medium (1000-2499) or large (≥2500) annual birth volumes. Maternal population characteristics at hospitals also did not differ between respondent vs nonrespondent hospitals. Maternal % BMI > 30 and maternal % age ≥ 35 years reflected the California population averages as a whole. Slightly less than half of all births were to women with Medicaid as their primary insurance (40.4 percent at respondent hospitals and 47.4 percent at nonrespondent hospitals) (Table S2).

### 3.3 | Labor and delivery unit culture by hospital performance

Hospitals with NTSV cesarean delivery rates of <22 percent comprised the Top Quartile hospital group, which included 13 hospitals in the sample. Nurses at Top Quartile hospitals were significantly more likely to agree with providing more direct (in room) nursing time with laboring women (77.9 vs 84.0 percent, *P* = 0.03) and providing more doula services (61.5 vs 45 percent, *P* < 0.0001). They were also less likely to agree that there are too many cesarean deliveries performed on their unit (36.4 vs 47.4 percent, *P* < 0.01) and that provider workflow considerations affected medical interventions in labor (53.5 vs 62.3 percent, *P* < 0.01). Physicians at Top Quartile vs other hospitals did not express different levels of agreement on the item, "There are too many cesarean deliveries performed on my unit," (32.3 vs 33.6 percent, respectively, *P* = 0.85). Nurses at Top Quartile hospitals were more likely to agree that their patients had sufficient knowledge about vaginal birth and cesarean delivery to make informed choices (44.6 vs 30.8 percent, *P* < 0.0001), though there was overall lower agreement with this item among all nurses compared with all physicians (34.3 vs 65.1 percent). Physicians at Top Quartile hospitals did not differ on this question compared to other physicians (66.7 vs 64.6 percent, *P* = 0.73). One notable difference among physicians at Top Quartile hospitals compared with others was their agreement with departmental peer review of all cesarean births not meeting ACOG/SMFM guidelines (84.2 vs 72.5 percent, respectively, *P* = 0.03).

Significant differences in subscale scores were seen at Top Quartile hospitals, though this differed between physicians and nurses. Physicians at Top Quartile hospitals showed significantly more agreement of the Best Practices, Unit Microculture, Physician Oversight, and Maternal Agency scales, and significantly less agreement with the Fear of Vaginal Birth and Cesarean Safety scales. Nurses at Top Quartile hospitals answered similarly to nurses at other hospitals with two notable exceptions: Top Quartile nurses were more likely to agree with best practices to reduce cesarean and that their unit norms were supportive of vaginal birth (Table 2).

**TABLE 1** Hospital characteristics among the 61 CMQCC cesarean collaborative hospitals, 18 private health care system hospitals, the 70 participating hospitals, and all California birthing hospitals (2015)

Hospital characteristics	61 Cesarean collaborative hospitals	18 Private hospitals	70 Participating culture survey hospitals	All 248 California hospitals
	N (%)	N (%)	N (%)	N (%)
Teaching hospitals				
Yes	4 (7.7)	0 (0.0)	4 (5.7)	22 (8.9)
No	48 (92.3)	18 (100.0)	66 (94.3)	226 (91.1)
Nursery acuity level				
Basic & intermediate	25 (41.0)	13 (72.2)	34 (48.6)	126 (50.8)
Community & regional	36 (59.0)	5 (27.8)	36 (51.4)	122 (49.2)
Geographic region				
Southern California	41 (67.2)	0 (0.0)	35 (50.0)	101 (40.7)
Northern California	13 (21.3)	13 (72.2)	26 (37.1)	100 (40.3)
Central valley	6 (9.8)	5 (27.8)	9 (12.8)	47 (19.0)
Rural/urban-suburban <sup>a</sup>				
Urban-suburban	44 (88.0)	13 (72.2)	57 (83.8)	220 (88.7)
Rural	6 (12.0)	5 (27.8)	11 (16.2)	28 (11.3)
Average annual delivery volume				
Less than 1000	8 (13.1)	9 (50.0)	17 (24.3)	83 (33.5)
1000 to 2499	31 (50.8)	6 (33.3%)	35 (50.0)	94 (37.9)
2500 or more	22 (36.1)	3 (16.7)	18 (25.7)	71 (28.6)
Hospital ownership				
University/city/county	3 (4.9)	0 (0.0)	3 (4.3)	45 (18.2)
Integrated health system	7 (11.5)	0 (0.0)	7 (10.0)	29 (11.7)
Private nonprofit	49 (80.3)	18 (100.0)	58 (82.9)	131 (52.8)
Private investor	2 (3.3)	0 (0.0)	2 (2.9)	43 (17.3)

CMQCC: California Maternal Quality Care Collaborative; Cesarean Collaborative: CMQCC Promoting Vaginal Birth Quality Improvement Collaborative.

<sup>a</sup>Rural/Urban-Suburban as defined by List of Rural Counties And Designated Eligible Census Tracts in Metropolitan Counties. Available at: (<https://www.hrsa.gov/sites/default/files/ruralhealth/resources/forhpeligibleareas.pdf>).

**TABLE 2** Mean subscale scores by individuals at top quartile hospitals<sup>a</sup> vs other hospitals for labor and delivery nurses and physicians

Subscale	RN mean (95% CI)			MD mean (95% CI)		
	Other hospitals (n = 979)	Top quartile (n = 271)	P-value	Other hospitals (n = 292)	Top quartile (n = 91)	P-value
Best practices <sup>b</sup>	4.07 (4.0, 4.1)	4.17 (4.1, 4.2)	<b>0.01</b>	3.63 (3.6, 3.7)	4.05 (3.9, 4.2)	<b>&lt;0.001</b>
Fear <sup>c</sup>	1.54 (1.5, 1.6)	1.48 (1.4, 1.6)	0.22	1.8 (1.7, 1.9)	1.44 (1.3, 1.6)	<b>0.001</b>
Unit microculture <sup>b</sup>	3.24 (3.2, 3.3)	3.68 (3.6, 3.8)	<b>&lt;0.001</b>	3.58 (3.5, 3.7)	3.78 (3.6, 3.9)	<b>0.01</b>
Physician oversight <sup>b</sup>	4.01 (4.0, 4.1)	3.96 (3.9, 4.0)	0.28	3.50 (3.4, 3.6)	3.77 (3.6, 3.9)	<b>0.01</b>
Maternal agency <sup>b</sup>	3.12 (3.1, 3.2)	3.12 (3.0, 3.2)	0.99	2.96 (2.9, 3.1)	3.35 (3.2, 3.5)	<b>0.001</b>
Cesarean safety <sup>c</sup>	2.08 (2.0, 2.1)	1.98 (1.9, 2.1)	0.06	2.10 (2.0, 2.2)	1.84 (1.7, 2.0)	<b>0.01</b>

Note: Bolded text signifies statistically significant P-values (P < 0.05).

RN: Labor and delivery nurse; MD: physicians, including obstetricians, family physicians, and certified nurse midwives.

<sup>a</sup>Hospitals with nulliparous, term, singleton, vertex cesarean delivery rates within the Top Quartile of the state (<22%).

<sup>b</sup>Higher scores on these scales indicate greater agreement with attitudes and norms hypothesized to be more supportive of vaginal birth.

<sup>c</sup>Higher scores on these scales indicate greater agreement with attitudes and norms hypothesized to be less supportive of vaginal birth.

### 3.4 | Culture and attitudes' associations with cesarean delivery rate

The analyses of association included only respondent hospitals ( $n = 35$ ). Four of the six LCS subscales were significantly associated with hospital NTSV cesarean delivery rate: Best Practices to Reduce Cesarean Deliveries (Best Practices), Fear of Vaginal Birth, Cesarean Safety, and Unit Microculture. Adjusted point estimates for each subscale from the Poisson multivariate regression are shown in Table 3. Our model adjusted for hospital annual birth volume, geographic location, nursery acuity level, maternal % BMI > 30, maternal % age > 35 years, and maternal % Medicaid as primary insurance. The Unit Microculture and Fear scales showed the strongest associations with cesarean section rate, with point estimates of  $-0.41$  [95% confidence interval (CI)  $-0.47$  to  $-0.35$ ] and  $0.56$  (95% CI  $0.46$  to  $0.67$ ), respectively, indicating that for every one point of average increased agreement that a unit's norms supported vaginal birth, NTSV cesarean delivery rate decreased by a relative 41 percent. Similarly, increased agreement with Best Practices was associated with a 27 percent decrease in NTSV cesarean delivery rate (95% CI  $-0.35$  to  $-0.19$ ). Increased agreement with the Fear of Vaginal Birth scale was associated with a 26 percent increase in NTSV cesarean delivery rate (95 percent CI  $0.17$  to  $0.34$ ). The Physician Oversight and Maternal Agency scales did not show a significant association with a hospital's NTSV cesarean delivery rate; however, individual items within each scale did. Specifically, the item that asked agreement with, "An important determinant of a successful vaginal birth is the woman's own confidence in her ability to give birth," was associated with a 7 percent decrease in NTSV cesarean delivery rate (95% CI  $-0.16$  to  $-0.03$ ,  $P < 0.01$ ).

### 3.5 | Discordance in a unit associated with cesarean delivery rate

Differences between how nurses and physicians responded to items on the LCS was a consistent finding across the majority of items on

**TABLE 3** Adjusted<sup>a</sup> associations between hospital mean score on each Labor Culture Survey subscale and hospital NTSV cesarean delivery rate

Subscale	Estimate	95% CI	P-value
Best practices	-0.27	-0.35, -0.19	<b>&lt;0.001</b>
Fear	0.26	0.17, 0.34	<b>&lt;0.001</b>
Unit microculture	-0.41	-0.47, -0.35	<b>&lt;0.001</b>
Physician oversight	0.05	-0.05, 0.15	0.34
Maternal agency	-0.03	-0.13, 0.07	0.55
Cesarean safety	0.56	0.46, 0.67	<b>&lt;0.001</b>

Note: Bolded text signifies statistically significant  $P$ -values ( $P < 0.05$ ).

NTSV: nulliparous, term, singleton, vertex; CI: confidence interval.

<sup>a</sup>Model adjusted for hospital annual birth volume, geographic location, nursery acuity level, maternal % BMI > 30, maternal % age > 35 y, and maternal % Medicaid as primary insurance.

the survey, as seen in descriptive analyses (Table 2). Additionally, the absolute value of the difference in means between nurses and physicians practicing at the same hospital was almost universally associated with an increased hospital NTSV cesarean delivery rate (Table 4). Specifically, for every one point of increased distance between nursing and physician responses on the Physician Oversight subscale, there was an associated increase of 17 percent in the NTSV cesarean delivery rate (95% CI  $0.11$  to  $0.23$ ). This same relationship was seen for nurse-physician discordance on the Best Practices, Fear of Vaginal Birth, and Cesarean Safety subscales. These analyses were adjusted for all hospital-level covariates.

## 4 | DISCUSSION

This study used a measure of birth culture, namely a survey assessing basic assumptions, values, beliefs, and norms, of labor and delivery unit personnel to predict hospital-level variation in NTSV cesarean delivery rates. We found a strong association between a labor and delivery unit's culture and their NTSV cesarean delivery rate; namely, the more a hospital's personnel endorsed norms that reflected a culture supportive of vaginal birth, the lower the hospital's NTSV cesarean delivery rate. Hospital cultures characterized by heightened fear of vaginal birth, lower agreement with best practices to reduce cesarean delivery, and greater agreement with the safety of cesarean delivery had significantly higher NTSV cesarean delivery rates.

Nurses and physicians were often at odds when it came to their attitudes, beliefs, and perceptions of cultural norms on their units, and larger discordance in a hospital unit was associated with increased NTSV cesarean delivery rates. This presents a key, actionable target to reduce cesarean rates by facilitating dialogue and shared learning surrounding these discrepancies at individual hospitals. Discrepancies in endorsement of evidence-based practices highlights the need to ensure all new education, protocols, and initiatives are delivered in the same manner to the entire patient care team of physicians, midwives, nurses, and anesthesiologists. Finally, physicians and nurses greatly differ in their estimation of patients' preparedness to make informed decisions in labor. This suggests that, while physicians may feel they are preparing their patients during prenatal visits, this is not translating well into the intrapartum period, where nurses have greater face-to-face time with patients. These findings are supported by prior work done in Canada that found nulliparous women approaching birth for the first time were not prepared to have evidence-based discussions with their physicians.<sup>28</sup> Reinvestment in prenatal education outside of routine office visits and increased training of physicians in shared decision making may decrease this discrepancy and help patients make informed decisions.

We found that, compared to Top Quartile hospitals, physicians at other hospitals had significantly different attitudes on all of the subscales; however, nurses tended to have similar attitudes across all hospitals. The exception to this rule was the Unit Microculture scale, which was significantly different among nurses at Top Quartile hospitals. This suggests that nurse and physician attitudes and

**TABLE 4** Adjusted<sup>a</sup> associations between absolute difference between a hospital unit's nurses' and physicians' mean scores on each Labor Culture Survey subscale and hospital NTSV cesarean delivery rate

	Estimate	95% CI	P-value
Best practices	0.19	0.13, 0.24	<b>&lt;0.001</b>
Fear	0.30	0.24, 0.36	<b>&lt;0.001</b>
Unit microculture	-0.01	-0.12, 0.11	0.89
Physician oversight	0.17	0.11, 0.23	<b>&lt;0.001</b>
Maternal agency	0.16	0.09, 0.23	<b>&lt;0.001</b>
Cesarean safety	0.30	0.23, 0.37	<b>&lt;0.001</b>

Note: Bolded text signifies statistically significant P-values ( $P < 0.05$ ).

NTSV: nulliparous, term, singleton, vertex; CI: confidence interval.

<sup>a</sup>Model adjusted for hospital annual birth volume, geographic location, nursery acuity level, maternal % BMI > 30, maternal % age > 35 y, and maternal % Medicaid as primary insurance.

behaviors function differently to create an overall culture that affects mode of delivery. Specifically, *physician* (a) attitudes toward evidence-based medicine, (b) underlying fears about vaginal delivery, (c) belief in the importance of maternal empowerment, and (d) not overestimating the safety of cesarean, combined with *nursing* perceptions and interpretations of cultural norms appear critical to a low cesarean section rate.

This study is consistent with prior work finding that attitudes and beliefs of individual providers are associated with variation in cesarean delivery rates,<sup>24</sup> individual providers have different thresholds to perform cesarean delivery,<sup>22</sup> and cesarean delivery rate variation is not attributable to patient differences.<sup>2-5,29</sup> However, physicians and midwives do not practice in an isolated environment and are subject to the cultural norms, expectations, values, and beliefs existent in their hospital, which need to be accounted for to further explain the wide variation in hospital-level cesarean delivery rates.

Other areas of health care have found culture—often characterized as organizational culture<sup>14</sup> or safety culture<sup>11</sup>—to be associated with variation in care quality,<sup>12,13,30</sup> yet these models do not fully reflect the unique environment on labor and delivery. Birth is a unique aspect of health care, where clinicians have to simultaneously perceive birth as a normal process, while acknowledging its inherent high-stakes risk. In this context, safety is often created by facilitating a normal process rather than proactively intervening.<sup>31</sup> Based on our findings, we conclude that a culture that supports vaginal birth is one characterized by belief in the value of vaginal birth—both for its short- and long-term outcomes for mothers and babies—and in the value of evidence-based practices. Cultures supportive of vaginal birth promote an environment that actively supports and empowers women as they labor, involves women in the decision making process, enables nurses and doulas to be key members of the intrapartum care team, and actively seeks to improve with ongoing transparency and internal oversight to align all members of the patient care team behind a shared understanding of quality goals.

This study had limitations, particularly in our inability to fully quantify the total number of individuals that received the survey at

nine hospitals. We chose to be conservative in our use of these hospitals and classify them as “non-responders.” As an observational study, we cannot infer directionality of the studied associations. We hypothesize that culture influences cesarean delivery rates, but it is possible that differing rates of cesarean delivery performed at different hospitals creates the local birth culture, rather than vice versa. It remains to be seen whether interventions directed at changing attitudes and beliefs in turn reduce NTSV cesarean delivery rates. Additionally, this study, while accounting for patient medical and demographic differences, did not collect data directly from patients about their own attitudes, beliefs, and preferences. Prior work has shown that <1 percent of women in the United States actually believe they elected to have their cesarean delivery;<sup>6</sup> however, it is possible that these women cluster in hospitals and contribute to local cultures. Future work should incorporate patient voices and contributions to local variation in cesarean delivery use.

Many authors have asserted the importance of the role of a hospital's culture in contributing to its cesarean delivery rate,<sup>1,3,29,32,33</sup> and this is the first study we are aware of that characterizes and measures hospital birth culture in the context of its orientation toward mode of delivery. The Labor Culture Survey has shown a unique ability to measure hospital culture associated with NTSV cesarean rate that can help quality improvement efforts to reduce cesarean delivery overuse by providing specific attitudinal targets tailored to an individual hospital. These efforts should include interprofessional education to address current attitudes and align unit personnel, and prioritizing structural changes that have maximal impact on culture, such as increasing hospital-based midwifery, partnering with doulas and birth educators, and empowering current staff identified as thought-leaders to enact unit change. Interprofessional education has been shown to be an important approach to changing behavior through the acquisition of knowledge and skills that change perceptions and attitudes toward another related health profession's group.<sup>34</sup> In 2011, a joint statement by the American College of Obstetricians and Gynecologists and the Association of Certified Nurse-Midwives called for increased interprofessional education to improve health care for women and their newborns,<sup>35</sup> yet few teaching programs have embraced an interprofessional model. Large, unexplained variation among hospitals is not unique to cesarean delivery overuse and increased understanding of the role of culture and attitudes in explaining variation may be highly relevant to other areas of medicine.

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## REFERENCES

1. Kozhimannil KB, Law MR, Virnig BA. Cesarean delivery rates vary tenfold among US hospitals; reducing variation may address quality and cost issues. *Health Aff.* 2013;32(3):527-535.
2. Barber EL, Lundsberg LS, Belanger K, Pettker CM, Funai EF, Illuzzi JL. Indications contributing to the increasing cesarean delivery rate. *Obstet Gynecol.* 2011;118(1):29-38.
3. Caceres IA, Arcaya M, Declercq E, et al. Hospital differences in cesarean deliveries in Massachusetts (US) 2004-2006: the case against case-mix artifact. *PLoS ONE.* 2013;8(3):e57817.
4. Declercq E, Menacker F, Macdorman M. Maternal risk profiles and the primary cesarean rate in the United States, 1991-2002. *Am J Public Health.* 2006;96(5):867-872.
5. Rhodes JC, Schoendorf KC, Parker JD. Contribution of excess weight gain during pregnancy and macrosomia to the cesarean delivery rate, 1990-2000. *Pediatrics.* 2003;111(5 Pt 2):1181-1185.
6. Declercq E, Sakala C, Corry M, Applebaum S, Herrlich A. Listening to Mothers III Pregnant and Birth: Report of the Third National U.S. Survey of Women's Childbearing Experiences. 2013.
7. McCourt C, Weaver J, Statham H, Beake S, Gamble J, Creedy DK. Elective cesarean section and decision making: a critical review of the literature. *Birth.* 2007;34(1):65-79.
8. Baicker K, Buckles KS, Chandra A. Geographic variation in the appropriate use of cesarean delivery. *Health Aff.* 2006;25(5):w355-w367.
9. Covered California Board. Attachment 7 to Covered California Individual Contract: Quality, Network Management, Delivery System Standards and Improvement Strategy. <https://hbex.coveredca.com/insurance-companies/PDFs/Att-7-QHP-Update-for-2018.pdf>. Accessed February 13, 2019.
10. Kohn LT, Corrigan JM, Donaldson MS. *To Err is Human: Building a Safer Health System.* Washington, DC: National Academies Press; 2000:12-14, 155-166.
11. Agency for Healthcare Research and Quality. Patient Safety Primer: Culture of Safety. 2017. Available at: <https://psnet.ahrq.gov/primer/primer/5/safety-culture>. Accessed June 14, 2018.
12. Berry JC, Davis JT, Bartman T, et al. Improved safety culture and teamwork climate are associated with decreases in patient harm and hospital mortality across a hospital system. *J Patient Saf.* <https://doi.org/10.1097/PTS.0000000000000251> [Epub ahead of print]
13. Singer SJ, Falwell A, Gaba DM, et al. Identifying organizational cultures that promote patient safety. *Health Care Manage Rev.* 2009;34:300-311.
14. Brownson RC, Colditz GA, Proctor EK. *Dissemination and implementation research in health: translating science to practice.* Oxford; New York, NY: Oxford University Press; 2012.
15. Seyal AH, Abd Rahman MN. *Theory of Planned Behavior: New Research.* New York, NY: Nova Science Publishers; 2017.
16. Sauls DJ. Nurses' attitudes toward provision of care and related health outcomes. *Nurs Res.* 2007;56(2):117-123.
17. White VanGompel E, Perez S, Wang C-H, Datta A, Cape V, Main E. Measuring labor and delivery unit culture and clinicians' attitudes towards birth: revision and validation of the labor culture survey. *Birth.* <https://doi.org/10.1111/birt.12406> [Epub ahead of print]
18. Levine M. *Measuring Nurse Attitudes towards Childbirth: A Psychometric Test of the Nurse Attitudes and Beliefs Questionnaire-Revised on a National Sample of Labor/Delivery Nurses [dissertation].* Aurora: University of Colorado; 2015.
19. Klein MC, Kaczorowski J, Hall WA, et al. The attitudes of Canadian maternity care practitioners towards labour and birth: many differences but important similarities. *J Obstet Gynaecol Canada.* 2009;31(9):827-840.
20. Adams E. *The Psychometric Properties of an Instrument Measuring Intrapartum Nurses' Beliefs Related to Birth Practice [dissertation].* Texas Woman's University, Denton; 2012.
21. Adams ED, Sauls DJ. Reliability and validity of an instrument to measure the beliefs of intrapartum nurses. *J Perinat Neonatal Nurs.* 2014;28(2):127-134.
22. Cheng YW, Snowden JM, Handler S, Tager IB, Hubbard A, Caughey AB. Clinicians' practice environment is associated with a higher likelihood of recommending cesarean deliveries. *J Matern Fetal Neonatal Med.* 2014;27(12):1220-1227.
23. Smith H, Peterson N, Lagrew D, Main E. Toolkit to Support Vaginal Birth and Reduce Primary Cesareans. California Maternal Quality Care Collaborative website. <https://www.cmqcc.org/VBirthToolkitResource>. Updated September 20, 2017. Accessed February 13, 2019.
24. White VanGompel E, Main EK, Tancredi D, Melnikow J. Do provider birth attitudes influence cesarean delivery rate: a cross-sectional study. *BMC Pregnancy Childbirth.* 2018;18(1):184.
25. National Quality Forum (NQF). *National Voluntary Consensus Standards for Perinatal Care 2008: A Consensus Report.* Washington, DC: NQF; 2009.
26. Caughey AB, Cahill AG, Guise JM, Rouse DJ. Safe prevention of the primary cesarean delivery. *Am J Obstet Gynecol.* 2014;210(3):179-193.
27. Joint Commission. Perinatal Care (PC). Specifications Manual for Joint Commission National Quality Measures. 2018;3Q18 through 4Q18.
28. Klein MC, Kaczorowski J, Hearps SJC, et al. Birth technology and maternal roles in birth: knowledge and attitudes of Canadian women approaching childbirth for the first time. *J Obstet Gynaecol Canada.* 2011;33(6):598-608.
29. Metz TD, Allshouse AA, Gilbert SA, Doyle R, Tong A, Carey JC. Variation in primary cesarean delivery rates by individual physician within a single-hospital laborist model. *Am J Obstet Gynecol.* 2016;214(4):531.e1-531.e6.
30. Glisson C, Williams NJ. Assessing and changing organizational social contexts for effective mental health services. *Annu Rev Public Health.* 2015;36:507-523.
31. American College of Obstetricians and Gynecologists Committee on Obstetric Practice. Committee Opinion No. 687: Approaches to Limit Intervention During Labor and Birth. *Obstet Gynecol.* 2017;129(2):e20.
32. Main EKMC, Hopkins D, Giuliani G, Melsop K, Gould JB. Cesarean Deliveries, Outcomes, and Opportunities for Change in California: Toward a Public Agenda for Maternity Care Safety and Quality. CMQCC White Paper. 2011.
33. Yang YT, Mello MM, Subramanian SV, Studdert DM. Relationship between malpractice litigation pressure and rates of cesarean section and vaginal birth after cesarean section. *Med Care.* 2009;47(2):234-242.
34. Hammick M, Freeth D, Koppel I, Reeves S, Barr H. A best evidence systematic review of interprofessional education: BEME Guide no. 9. *Med Teach.* 2007;29(8):735-751.
35. Avery MD, Montgomery O, Brandl-Salutz E. Essential components of successful collaborative maternity care models: the ACOG-ACNM project. *Obstet Gynecol Clin North Am.* 2012;39(3):423-434.

## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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