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Two practice models in one labor and delivery unit: Association with cesarean delivery rates

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Abstract

Objective—To examine the association between labor and delivery practice model and cesarean delivery rates at a community hospital.

Methods—This was a retrospective cohort study of 9,381 singleton live births at one community hospital, where women were provided labor and delivery care under one of two distinct practice models: a traditional “private” practice model and a midwife-physician “laborist” practice model. Cesarean rates were compared by practice model, adjusting for potential sociodemographic and clinical confounders. Statistical comparisons were performed using the chi square test and multivariable logistical regression.

Results—Compared with women managed under the midwife/laborist model, women in the private model were significantly more likely to have a cesarean delivery (31.6% vs 17.3%, p<0.001; adjusted odds ratio [aOR] 2.11, 95% confidence interval [CI] 1.73-2.58). Women with nulliparous, term, singleton, vertex (NTSV) gestations also were more likely to have a cesarean delivery if they were cared for in the private model (29.8% versus 15.9%, p<0.001; aOR 1.86,

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95% CI 1.33-2.58) as were women who had a prior cesarean delivery (71.3% versus 41.4%, p<0.001; aOR 3.19, 95% CI 1.74-5.88).

Conclusion—In this community hospital setting, a midwife-physician laborist practice model was associated with lower cesarean rates than a private practice model.

INTRODUCTION

Approximately one in three pregnant women in the United States undergoes cesarean delivery each year.[1] Numerous patient-specific factors, including maternal obesity and advanced age, may be contributing to the rapid increase in cesarean delivery rates over the past two decades.[2,3] However, healthcare provider and system factors also likely play important roles. As cesarean is associated with increased maternal morbidity and mortality, identifying modifiable risk factors is critical to addressing growing concerns about the cesarean rate in this country.[4,5]

The significant variation in rates between hospitals across the U.S. supports the concept that institutional policies, hospital staffing structure and the "culture" around birth may impact cesarean rates.[6,7,8] Little is known, however, about specific modifiable hospital-level factors that directly influence cesarean rates. We sought to investigate the extent to which model of care is one such factor, by examining the differences in cesarean rates between two different models of care in the same hospital. We hypothesized that a model involving in-house 24-hour provider coverage is associated with a lower cesarean rate than a traditional private practice model.

MATERIAL AND METHODS

We conducted a retrospective cohort study of singleton live births delivered at Marin General Hospital between January 1, 2005, and December 31, 2010. Approval for this study was obtained from the institutional review boards of Marin General Hospital (no number; 9/12/11) and the University of California, San Francisco (11-07-916). Marin General Hospital is a 235-bed community hospital that houses the only labor and delivery (L&D) unit in the county. During the study period, the L&D unit had two distinct models of care: a midwife-obstetrician laborist model (subsequently referred to as "midwife/laborist"), and a traditional private practice model (subsequently referred to as "private"). Women receiving care from private obstetrical providers with privileges at Marin General Hospital were managed under the private model, while women receiving prenatal care from the County of Marin Health and Human Services obstetrical care program were managed under the midwife/laborist model. All other women presenting for L&D care, including those with a non-Marin prenatal care provider, who had undergone an unsuccessful homebirth attempt, or who had no prenatal care, were managed under the midwife/laborist model. As the hospital's neonatal intensive care unit is level 2, the study cohorts only contain women less than 33 weeks who were considered unstable for transfer to a tertiary care center.

Under the midwife/laborist model, L&D care was provided by a 24-hour, in-hospital team of one certified nurse-midwife and one obstetrician. The care was midwife-led, with the extent of physician involvement determined by standard protocols reflective of the patient's

obstetrical and medical risk factors. Under the private model, women received prenatal care from providers who were either solo-practitioners or part of a group practice. In this model, the private practitioner or one of his/her call partners were responsible for all aspects of L&D care, with no involvement from the midwife/laborist providers except in rare occasions when urgent physician involvement was needed in the context of obstetric or medical emergencies. During the study period, there were 20 private practitioners who provided in-hospital care to women under the private model: 18 obstetricians and two CNMs who worked in physician-owned practices. Under the midwife/laborist model, 20 CNMs and 25 obstetricians provided in-hospital care. All nurses were assigned to patients independent of provider practice type.

Data for this study, including maternal sociodemographic and clinical characteristics, and perinatal outcomes, were obtained from the hospital's perinatal data collection system (Perinatal Data Center by Site of Care Systems ©). Our primary outcomes included any cesarean delivery, cesarean among nulliparous women at term with singleton, vertex gestations (NTSV), and elective repeat cesarean. The secondary outcomes were operative vaginal delivery, delivery mode (cesarean or vaginal) among women with prior cesarean, 5-minute Apgar score <7, umbilical cord arterial pH <7.1, and umbilical cord base deficit <-12. The definitions of these outcomes are included in Table 1. Our primary exposure was practice model, which was based on the prenatal care provider on record and not the delivering provider of record. Intrapartum management of patients was according to the managing provider's interpretation of case presentation and clinical judgment.

We used the chi-square test and multivariable logistic regression analysis to examine the association between model of care and delivery mode. The covariates included in the multivariable logistic regression model included maternal age, race/ethnicity, education, parity, and insurance status; maternal pre-gestational or gestational diabetes, maternal hypertensive disorder, and other maternal medical condition; adequacy of prenatal care visits (greater than 8 visits); use of epidural analgesia, induction of labor, and gestational age at delivery, as well as birth weight. Midwife/laborist group was designated as the reference comparison in the multivariable logistic regression analysis.

To further investigate the difference in NTSV cesarean rates between the midwife/laborist and private groups, we examined indications for operative delivery. In this analysis, we sought to distinguish between cesareans performed for indications that are “not well-defined” and therefore may be affected by model of care, and those performed for “well defined” indications that should not change based on provider setting. Indications that we considered well-defined were “maternal request” and “absolute obstetrical indication” (prior non-cesarean hysterotomy, placenta previa, active herpes, cord prolapse, uterine rupture). Indications that we considered to be “not well-defined” included arrest disorder, fetal heart rate abnormality, and indications other than “absolute obstetrical indication” (Table 1).

RESULTS

There were 9,381 singleton live births at Marin General Hospital during the study period, with 3,987 (42.5%) were managed under the midwife/laborist model and 5,394 (57.5%)

under the private model. Compared to women in the midwife/laborist group, women in the private group were more likely to be white, age > 35, nulliparous, privately insured, and to have attended college (p<0.001 for all, Table 2). They also weighed more on average (median 77.7 kg versus 73.6 kg; p<0.001).

In addition, compared to women cared for under the midwife/laborist model, women managed under the private model were more likely to have had a prior cesarean delivery, to undergo induction of labor in the current pregnancy, and to use an epidural during labor (p<0.001 for all). They were also less likely to carry a diagnosis of pre-existing or gestational diabetes mellitus (3.2% versus 9.3%, p<0.001), but more likely to have a medical condition other than hypertension or diabetes (9.2% versus 4.1%, p<0.001). Finally, the proportion of women who delivered in each gestational age range differed by group (Table 2).

The overall rate of cesarean delivery differed dramatically between the two groups. While 31.6% of women managed under the private model had a cesarean, only 17.3% women in the midwife/laborist group underwent this delivery mode (p<0.001). Even after controlling for covariates, the adjusted odds of cesarean delivery among women in the private group was twice that of women in the midwife/laborist group (adjusted odds ratio (aOR) 2.11, 95% confidence interval (CI) 1.73-2.58; Table 3). Among the NTSV subset, women managed under the private model were also nearly twice as likely as those in the midwife/laborist group to have a cesarean (29.8% versus 15.9%, p<0.001; aOR 1.86, CI 1.33-2.58). And, among women with a prior cesarean delivery, those in the private group were substantially more likely than those in the midwife/laborist group to have an elective scheduled repeat cesarean (71.3% versus 41.4%, p<0.001; aOR 3.19, CI 1.74-5.88). Of note, although over the six-year study period, both groups had changes in the specific clinicians that were providing care and their number of years in practice, the annual rate of cesarean remained constant in each group.

Given the known higher incidence of cesarean among women of advanced maternal age and the significant difference in age between women in the two groups (mean 33.5 vs. 27.1 years), we performed an age-matched analysis of primary outcomes using a threshold of 35 years (Table 3). Among women aged less than 35 years at time of delivery, we observed that compared to those in the midwife/laborist group, those in the private group had two-fold higher odds of cesarean (aOR 1.99, 95% CI =1.57-2.51), which was more pronounced among the younger NTSV population (aOR 2.43, 95% CI 1.64-3.61). And younger women with a prior cesarean who were managed in the private model were also more likely to undergo elective scheduled repeat cesarean delivery (72.1% versus 39.9%, p=0.001; aOR 3.34, CI 1.63-6.84). Among women aged 35 and older, those managed under the private model also were more likely to have a cesarean (36.3% vs. 25.5%; aOR 2.61, CI 1.78-3.82), but no statistically significant difference in rates or odds of NTSV or scheduled repeat cesareans emerged.

Because NTSV deliveries are considered an ideal target for lowering the overall incidence of cesarean,[1] we further explored the difference in NTSV cesareans between the two practice models by examining indications for cesarean delivery (Table 4). 29.8% of NTSV deliveries

in the private model were by cesarean, versus 15.9% in the midwife/laborist model. In both groups, very few women were delivered by cesarean for "well defined indications," and a significant difference across group did not emerge (0.1% versus 0.5%, p=0.15). For indications that are less well-defined and require providers' clinical judgment (including arrest disorder and fetal heart tracing abnormality), women in the private group were again found to be at higher odds of cesarean compared to those in the midwife/laborist group (28.1% versus 15.6%, aOR 1.69 CI 1.21-2.37).

We also examined neonatal outcome associated with mode of delivery and model of care. We observed that neonates born under the private model were less likely to have a 5-minute Apgar score <7 (0.7%) compared to those in the midwife/laborist group [1.8%, aOR 0.22 (95% CI 0.10-0.48)]. When stratified by delivery mode, neonates delivered by intrapartum cesarean were not at lower risk of 5-minute Apgar <7 by practice model, but those delivered vaginally were less likely to have low Apgar score when cared for by the private group (Table 5). The incidence rate and the adjusted odds of umbilical cord arterial pH <7.1 and umbilical cord base deficit <-12 were not different between the midwife/laborist and private practice groups (Table 5).

DISCUSSION

In this study, we observed a consistent pattern of higher use of cesarean delivery among women cared for under the private model compared to women cared for under a midwife/laborist model. While prior studies have documented variation in cesarean rates between U.S. hospitals,[6,9,10] it is difficult to isolate the effect of model of care from other contributory hospital-level factors such as the type of hospital,[11,12] the availability of anesthesia and NICU services,[11] the option to undergo trial of labor after cesarean,[13,14] and, possibly, hospital staff attitudes around cesarean.[5,15] By examining cesarean rates among two different models of care within the same L&D unit, we were able to control for these hospital-level factors. Our findings suggest that in the community care setting, a hospital's model of L&D care may play an important role in the institution's cesarean delivery rate. Whether this association can be generalized to other hospital settings, such as academic-affiliated hospitals or hospitals under managed care organization, awaits further elucidation.

Several differences between the two models of care in our study could have lead to the difference in cesarean rates we observed. First, in the midwife/laborist model, the clinicians making decisions regarding labor management were in the hospital at all times, without outside responsibilities or commitments. In contrast, clinicians under the private model were usually in their outpatient offices or on-call from home, coming to the hospital on an "as-needed" basis for imminent delivery or situations that warranted a clinicians' presence. As such, the private clinicians may have been more likely to encounter competing demands, and balancing needs and clinical outcomes of women in the inpatient and outpatient settings may have influenced their decision making.[5,7,8] To explore this possibility, we examined the timing of intrapartum cesareans; a statistically significant relationship between time of day cesareans were performed and L&D coverage type did not emerge. However, the most likely phenomenon is one that would not reveal such a relationship: clinicians called in from their offices by a concerned L&D nurse may be more likely to proceed with cesarean than to

watch closely and allow labor to progress, leading to an overall higher cesarean rate. In one large non-academic hospital, the primary cesarean rates of 10 of 17 physicians significantly decreased once their call duty was changed from out-of-hospital (private) to in-hospital (as in the midwife/laborist model).[16] The authors suggest that more direct patient contact, immediacy of case management, and avoidance of external professional or personal duty pressures may have played a role in the observed decrease in cesareans.

A second difference between the groups was practice structure. In the midwife/laborist model, a larger group of providers shared the responsibility for each patient, whereas in the private model, individual providers or small groups of providers (up to of six physicians) had a panel of patients that they ultimately cared for from early pregnancy through the intrapartum and postpartum periods. It has been suggested that group practices are associated with lower cesarean rates than solo provider practices.[17,18] Indeed, in this study, there was a higher odds of cesarean among patients managed by providers in solo private practice compared to those managed by providers in group private practice (aOR =1.43, $p<0.001$). One hypothesis for this observation is that larger group practices are more likely to have operational elements that are associated with lower cesarean rate, such as lower frequency of night calls, the ability to obtain second opinions, the implementation of systematic protocols, and having quality assurance programs.[8,19,20]

Finally, a difference in provider type existed between the two models of care: women in the midwife/laborist group were managed by a midwife-obstetrician team, while women in the private model were primarily managed by obstetricians. Several studies have suggested lower rates of intervention, including operative delivery, with midwifery compared to physician management;[21,22] however, a Cochrane review found no significant difference in cesarean rates comparing midwife led care to “other models” of care, which included obstetrician led care.[23] This finding would suggest that the lower cesarean rates in the midwife/laborist group in our study cannot be solely attributed to the involvement of midwives. Nevertheless, as midwives were a central part of the care model, their involvement must be considered as a factors potentially contributing to the significantly lower cesarean rate in this group.

While some diagnoses, such as placenta previa or cord prolapse, clearly require cesarean delivery, others are based on a provider's judgment that neonatal outcome may be improved by cesarean delivery.[1] We therefore examined neonatal outcomes in addition to mode of delivery in this study. While we note that neonates delivered to women in the midwife/laborist group were more likely to have a 5-minte Apgar <7, particularly those delivered vaginally, there were no differences in other measures of risk of birth asphyxia, such as low umbilical artery pH (<7.1) and base excess <-12. Some studies have shown that neonates born to women who had public insurance had higher rates of low 5 minute Apgar scores compared to privately insured patients, independent of delivery mode.[24,25] In this study, we could not definitively attribute differences in Apgar scores between midwife/laborist and private groups to differences in underlying maternal socioeconomic status, to variation in intrapartum care, or to other factors. Nonetheless, it is important to stress safe prevention of cesarean delivery to optimize both maternal and neonatal outcomes.[26]

Several limitations of our study deserve comment. First, there were clear sociodemographic differences between the patients managed under the two different models of care. When compared to the midwife/laborist group, the private group patients were substantially more likely to have commercial insurance and to have attended college. They were also predominantly (77%) white, while the midwife/laborist group was predominantly (80.1%) Latina. Though the baseline difference in cesarean rates among white women versus Latinas in the U.S. appears to be small, both private insurance and higher education are associated with higher incidence of cesarean.[11,27] In addition, our study is limited by the absence of information on patient preferences and the role they may play in the differing cesarean delivery rates between the groups.

Another limitation of our study is that we do not have information regarding pre-pregnancy body mass index (BMI), which is known to increase the risk of cesarean. Interestingly, population-based data from the Center for Disease Control and Prevention (CDC) shows a higher prevalence of obesity (BMI greater than 30 kg/m^2) among adult Latinas compared to white women in the U.S. (33.1% versus 25.2%).[28] If obesity was similarly more prevalent among the Latinas in our study population, we would expect the odds of cesarean to be higher in the predominantly Latina midwife/laborist group compared to the predominantly white private group. However, our study observed the opposite effect estimates.

Finally, we did not have access to information about short- or long-term maternal complications, so cannot compare these outcomes. However, given the extensive literature demonstrating that cesarean delivery is associated with higher rates of complications such as postoperative infection, venous thromboembolism, and higher risk in subsequent pregnancy, we believe that the same would hold true for the women in our study.

In summary, our study examines mode of delivery within one hospital, comparing a private practice model, the predominant obstetric care model in the U.S., to a laborist model that incorporated midwifery care. Previous studies have demonstrated that perinatal outcomes may be influenced by non-medical factors such as date and time of delivery, type of clinician call schedule, and attitudes towards cesarean.[13,15,29] Our findings suggest that specific models of L&D care may directly or indirectly play a role in the prevalence of cesarean delivery. In recent years, both hospitalist and midwifery models of care have gained attention as potential solutions to pressing issues in obstetrical care including obstetrician burnout, safety concerns with prolonged work-hours, productivity implications of clinicians leaving their offices to attend to laboring patients and the overall cost of delivering care.[30,31] Based on our findings, the implementation of obstetrician-midwife laborist programs may also have a positive impact on reducing the rate of cesarean deliveries in the United States.

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CONDENSATION

In one hospital with two practice models for labor and delivery (midwife/laborist and private practice), the cesarean delivery rate across model type differed substantially.

Table 1

Definitions of outcomes

	Numerator	Denominator
PRIMARY OUTCOMES		
Overall cesarean rate	Cesarean births	Live births
NTSV cesarean rate	Cesarean births	Live births among nulliparous women with pregnancies that are vertex at time of presentation, singleton, and at least 37 0/7 weeks gestation
Elective repeat cesarean rate	Cesarean births with primary indication = “prior cesarean”, “elective”, or “maternal request”	Live births among women with prior cesarean
SECONDARY OUTCOMES		
Overall repeat cesarean rate	Cesarean births	Live births among women with prior cesarean
VBAC rate	Vaginal births	Live births among women with prior cesarean
Forceps assisted vaginal delivery	Forceps assisted vaginal births	Live births
Vacuum assisted vaginal delivery	Vacuum assisted vaginal births	Live births
Five minute Apgar <7	Five minute Apgar <7	Live births
Cord artery pH <7.1	Cord artery pH <7.1	Live births
Umbilical cord base deficit <-12	Umbilical cord base deficit <-12	Live births
PRIMARY INDICATION FOR NTSV CESAREAN		
Well defined		
Maternal request	Cesarean births with primary indication = “maternal request” or “elective”	NTSV live births
Absolute obstetrical indications	Cesarean births with primary indication = prior non-cesarean hysterotomy, placenta previa, active genital herpes, cord prolapse, uterine rupture.	NTSV live births
Not well defined		
Arrest disorder	Cesarean births with primary indication = arrest disorder (Arrest of dilation, arrest of descent, failed induction of labor)	NTSV live births
Fetal heart rate abnormality	Cesarean births with primary indication= fetal heart tracing abnormality	NTSV live births
No absolute obstetrical indication	Cesarean births with primary indication = indication other than arrest disorder, fetal heart rate abnormality, or “absolute indication”	NTSV live births

NTSV, Nulliparous term sing eton vertex; VBAC, vaginal birth after cesarean.

Table 2

Sociodemographic and clinical characteristics of women delivered by the hospitalist group versus the private practice group

	Hospitalist (n=3987)	Private practice (n=5394)	P-value
Sociodemographic characteristics			
Age >35 years	499 (12.5%)	2452 (45.5%)	<.001
Race/ethnicity			<.001
White	502 (12.6%)	4241 (78.6%)	
Black/African American	102 (2.6%)	109 (2.0%)	
Latino	3138 (78.7%)	520 (9.6%)	
Asian/Pacific Islander	96 (2.4%)	316 (5.9%)	
Other*	149 (3.7%)	208 (3.9%)	
High school graduate or less	3260 (83.2%)	811 (15.3%)	
Private insurance	360 (9.0%)	5044 (93.5%)	<.001
Clinical characteristics			
Median maternal weight at admission (kg (interquartile range))	73.6 (66.4, 82.7)	77.7 (70.5, 86.4)	<.001
Nulliparous	1617 (40.6%)	2403 (44.5%)	<.001
Prior cesarean delivery	486 (12.2%)	901 (16.7%)	<.001
Maternal medical problems			
Gestational diabetes/diabetes mellitus	369 (9.3%)	172 (3.2%)	<.001
Hypertensive disorders	133 (3.3%)	200 (3.7%)	.34
Other medical problems†	163 (4.1%)	498 (9.2%)	<.001
Obstetric interventions			
Epidural binary	1180 (29.6%)	3217 (59.6%)	<.001
Induction of labor	445 (11.2%)	754 (14.0%)	<.001
Medically indicated (maternal, fetal condition or rupture of membrane)	413 (10.4%)	543 (10.1%)	0.64
Elective	13 (0.3%)	168 (3.1%)	<.001
Infant characteristics			
Birth weight >/= 4000 grams	384 (9.6%)	650 (12.1%)	
Gestational age at delivery (weeks)			<.001
24 - 33+6	30 (0.8%)	18 (0.3%)	
34 - 36+7	197 (4.9%)	224 (4.2%)	
37 - 38+9	895 (22.5%)	1117 (20.8%)	
39+	2858 (71.8%)	4023 (74.7%)	

*Includes Native American and multiethnic.

†Includes hepatitis, human immunodeficiency virus, cardiac disease, thyroid problems, and asthma.

Table 3

Operative delivery rates by the model of care stratified by patient subgroup

	Hospitalist	Private Practice	aOR (95% CI) *	*P*-value
All ages	n=3987	n=5394		
Cesarean delivery among all women	689 (17.3%)	1704 (31.6%)	2.11 (1.73-2.58)	<.001
Cesarean delivery among women with NTSV	236 (15.9%)	627 (29.8%)	1.86 (1.33-2.58)	<.001
ERCD (among all women with prior cesarean)	201 (41.4%)	642 (71.3%)	3.19 (1.74-5.88)	<.001
VBAC (among all women with prior cesarean)	187 (38.5%)	162 (18.0%)	0.42 (0.22-0.80)	.008
Forceps assisted delivery among all women	49 (1.2%)	89 (1.6%)	0.72 (0.36-1.41)	.34
Vacuum assisted delivery among all women	146 (3.7%)	267 (4.9%)	0.68 (0.45-1.01)	.05
Maternal age <35	(n=3488)	(n=2941)		
Cesarean delivery among all women	562 (16.1%)	814 (27.7)	1.99 (1.57-2.51)	<0.001
Cesarean delivery among NTSV	196 (14.3%)	349 (25.1%)	2.43 (1.64-3.61)	<0.001
ERCD (among all women with prior cesarean)	159 (39.9%)	271 (72.1%)	3.34 (1.63-6.84)	.001
VBAC (among all women with prior cesarean)	158 (39.7%)	64 (17.0%)	0.43 (0.21 – 0.9)	.03
Forceps assisted delivery among all women	44 (1.3%)	49 (1.7%)	0.58 (0.26-1.29)	.18
Vacuum assisted delivery among all women	120 (3.4%)	158 (5.4%)	0.76 (0.47-1.23)	.27
Maternal age ≥35	n=499	n=2452		
Cesarean delivery among all women	127(25.5%)	889 (36.3%)	2.61 (1.78-3.82)	<0.001
Cesarean delivery among NTSV	40 (36.4%)	278 (38.8%)	1.07 (0.60-1.90)	.82
ERCD (among all women with prior cesarean)	42 (47.7%)	371 (70.7%)	2.99 (0.93-9.69)	.07
VBAC (among all women with prior cesarean)	29 (33.0%)	98 (18.7%)	0.26 (0.07 – 0.95)	.04
Forceps assisted delivery among all women	5 (1.0%)	40 (1.6%)	1.62 (0.40-6.55)	.50
Vacuum assisted delivery among all women	26 (5.2%)	109 (4.4%)	0.54 (0.27-1.09)	.09

NTSV, Nulliparous term singleton vertex; ERCD, elective repeat cesarean delivery; VBAC, vaginal birth after cesarean; aOR, adjusted odds ratio; CI, confidence interval.

* aOR (95% CI) for private practice model compared to hospitalist practice model. Adjusted for maternal age, race/ethnicity, education, parity, adequacy of prenatal care visit (greater than 8 visits), insurance status, gestational age, birth weight, epidural, induction, maternal pre-gestational or gestational diabetes, maternal hypertensive disorder, and other maternal medical condition.

Table 4

Cesarean delivery rates by indication among nulliparous women with term, singleton, vertex gestations by model of care

	Hospitalist n=1485	Private Practice n=2104	aOR(95% CI)*	*P*-value
Any cesarean delivery	236 (15.9%)	627 (29.8%)	1.86 (1.33-2.58)	<.001
Cesarean with well-defined indication	4 (0.3%)	36 (1.7%)	8.99 (1.88-42.89)	.006
Absolute objective indication†	2 (0.1%)	11 (0.5%)	5.5 (0.5-57.38)	.15
On maternal request	2 (0.1%)	25 (1.2%)	11.5 (1.4-94.38)	.02
Cesarean without well-defined indication‡	232 (15.6%)	591 (28.1%)	1.69 (1.21-2.37)	0.002

*aOR (95% CI) for private practice model compared to hospitalist practice model. Adjusted for maternal age, race/ethnicity, education, adequacy of prenatal care visit (greater than 8 visits), insurance status, gestational age, birth weight, epidural, induction, maternal pre-gestational or gestational diabetes, maternal hypertensive disorder, and other maternal medical condition.

†Prior non-cesarean hysterotomy, placenta previa, active herpes, cord prolapse, uterine rupture.

‡Includes arrest disorder, fetal heart rate abnormality, and indications other than “absolute obstetrical indication.”

Table 5

Neonatal outcomes by model of care

	Hospitalist	Private practice	*P*-value	aOR (95% CI)*
5-minute Apgar <7 (all)	1.8%	0.7%	<0.001	0.22 (0.10-0.48)
5-minute Apgar <7 (vaginal delivery)	1.9%	0.9%	<0.001	0.18 (0.08-0.41)
5-minute Apgar <7 (cesarean delivery)	1.3 %	0.9 %	0.41	0.54 (0.12-2.37)
Umbilical cord arterial pH <7.1	3.9%	2.7%	0.85	1.06 (0.60-1.86)
Umbilical cord base deficit <-12	1.1%	0.9%	0.81	0.88 (0.32-2.46)

*aOR (95% CI) for private practice model compared to hospitalist practice model. Adjusted for maternal age, race/ethnicity, education, adequacy of prenatal care visit (greater than 8 visits), insurance status, gestational age, birth weight, epidural, induction, maternal pre-gestational or gestational diabetes, maternal hypertensive disorder, and other maternal medical condition.