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Planned Home VBAC in the United States, 2004–2009: Outcomes, Maternity Care Practices, and Implications for Shared Decision Making

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ABSTRACT: Background: *In the United States, the number of planned home vaginal births after cesarean (VBACs) has increased. This study describes the maternal and neonatal outcomes for women who planned a VBAC at home with midwives who were contributing data to the Midwives Alliance of North America Statistics Project 2.0 cohort during the years 2004–2009.* **Method:** *Two subsamples were created from the parent cohort: 12,092 multiparous women without a prior cesarean and 1,052 women with a prior cesarean. Descriptive statistics were calculated for maternal and neonatal outcomes for both groups. Sensitivity analyses comparing women with a prior vaginal birth and those who were at the lowest risk with various subgroups in the parent cohort were also conducted.* **Results:** *Women with a prior cesarean had a VBAC rate of 87 percent, although transfer rates were higher compared with women without a prior cesarean (18% vs 7%,* $p < 0.001$*). The most common indication for transfer was failure to progress. Women with a prior cesarean had higher proportions of blood loss, maternal postpartum infections, uterine rupture, and neonatal intensive care unit admissions than those without a prior cesarean. Five neonatal deaths (4.75/1,000) occurred in the prior cesarean group compared with 1.24/1,000 in multiparas without a history of cesarean (*$p = 0.015$*).* **Conclusion:** *Although there is a high likelihood of a vaginal birth at home, women planning a home VBAC should be counseled regarding maternal transfer rates and potential for increased risk to the newborn, particularly if uterine rupture occurs in the home setting. (BIRTH 2015)*

Key words: *decision making, home birth, trial of labor, vaginal birth after cesarean*

In 2013, nearly one-third (32.7%) of childbearing women in the United States gave birth by cesarean delivery (1). In subsequent pregnancies, these women will have to choose between a repeat cesarean delivery and a trial of labor after cesarean (TOLAC), as well as where and with whom to give birth. Although national guidelines encourage offering a TOLAC to most women with one prior low transverse cesarean (2,3), vaginal birth after cesarean (VBAC) rates decreased nationwide, from 28.3 percent in 1996 to 10.6 percent

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in 2013 (4,5). Access to VBAC is limited in many United States regions because one third of hospitals and one half of obstetricians do not offer TOLAC services (4,6–8). This is partly because of concerns over safety and liability in the event of a uterine rupture (4,8–12).

As the TOLAC rate has fallen in hospitals, the proportion of home births occurring in women with a prior cesarean has increased (13). Out-of-hospital TOLAC is controversial, and few studies have been conducted on birth outcomes in this population. The only prior United States study of home VBAC enrolled 57 women with a previous cesarean (14). Of these, 88 percent delivered vaginally without significant complications; this proportion remained constant, regardless of whether the mother had previously experienced a successful VBAC (14). This study was too small to reliably estimate the rates of transfer to a hospital or uncommon adverse maternal or neonatal outcomes.

In 2014, the largest United States study of home birth reported on the outcomes of 16,924 planned home births using data from the Midwives Alliance of North America Statistics Project (MANA Stats) 2.0 cohort (2004–2009) (15). These data included 1,052 women with a history of cesarean delivery. Of these, 87.0 percent had a successful VBAC, although there was an increased risk of intrapartum fetal death (2.85/1,000 vs 0.66/1,000, $p = 0.05$) in the TOLAC group compared with multiparous women without a history of cesarean (15). In the current study, we further analyzed the TOLAC cohort, with three research aims: 1) to describe the demographics of women choosing VBAC at home; 2) to characterize the prenatal and intrapartum care provided; and 3) to report birth outcomes in planned home VBACs in an effort to inform shared decision making.

Methods

Data were collected between 2004 and 2009 using the MANA Stats 2.0 web-based data collection tool. This tool was developed by the MANA Division of Research for midwives practicing primarily in home and/or birth center settings. Midwives entered the data over the course of care from the initial visit through the 6-week postpartum visit. Participation was voluntary, with an estimated 20–30 percent of active certified professional midwives (CPMs) and a substantially smaller proportion of certified nurse midwives contributing data (16). Written informed consent was obtained at the onset of care from all clients who were willing to participate.

The MANA Stats 2.0 online form consisted of nearly 200 variables, including demographic characteristics; reproductive, general health, and social histories; antepartum, intrapartum, neonatal, and postpartum outcomes and procedures; maternal and neonatal transfers of care; and intended and actual place of birth. Analysis of the history, methodology, and validity of the MANA Stats 2.0 cohort data set has been published elsewhere (17). All analyses reported here were approved by the institutional review boards at the University of New Mexico and Oregon State University. The MANA Stats 2.0 data set, 2004–2009, (the parent cohort, $N = 24,848$) included records from all women receiving at least some care from 432 midwives contributing data. For this study, a comparison group of multiparous women without a history of cesarean was created using the following exclusion criteria: care transferred to another provider prior to the onset of labor ($n = 3,433$); planned birth location other than home prior to the onset of labor ($n = 4,437$); did not live in the United States ($n = 54$); primiparous women ($n = 3,773$); or previous cesarean status unknown ($n = 7$). This yielded a sample of 13,144 multiparous women and 13,198 babies (54 sets of twins). Of these women, 8 percent ($n = 1,052$) had a history of cesarean. The comparison group included the remaining 12,092 multiparous women without a history of cesarean and 12,141 babies (49 sets of twins).

Descriptive statistics were calculated for demographic, style of care, and outcome variables. We compared the TOLAC group with the comparison groups using chi-square tests for categorical variables and Kruskal–Wallis tests for continuous variables, which were chosen because many of the continuous variables analyzed were likely to have skewed distributions. All analyses were conducted with SPSS Statistics (version 21.0.0; IBM Corp., Armonk, NY, USA).

We conducted a series of sensitivity analyses to compare outcomes for several subgroups of women within the data set. The TOLAC group was divided by history of whether the woman had a prior vaginal birth. In the first analysis, TOLAC women without a prior vaginal birth were compared with primiparous women in the overall MANA 2.0 data set. We then compared TOLAC women with a prior vaginal birth with multiparous women without a history of cesarean. We also assessed perinatal morbidity and mortality in a lower risk sample of women planning a TOLAC; for these analyses, women with multiple gestations, breech presentations, gestational diabetes, preeclampsia, or more than one prior cesarean were removed from the subgroup.

For this study, a "confirmed uterine rupture" was defined as a rupture observed during a cesarean delivery. The definition of a "probable uterine rupture" includes clinical description of a vaginal birth with sudden onset of fetal bradycardia or loss of fetal heart tones occurring prior to arrival at the hospital and resulting in fetal demise or an intrapartum or postpartum diagnosis of uterine dehiscence based on radiologic evidence.

Confirmed uterine ruptures were assessed in women with and without prior cesarean; however, probable uterine ruptures could only be assessed in the women with prior cesarean deliveries.

Results

Demographic and pregnancy characteristics are shown in Table 1, stratified by history of cesarean. The women were predominantly white, well-educated, and married, with few pregnancy-related risk factors, and a significant proportion were Amish or Mennonite. Compared with multiparous women without a history of cesarean, women in the TOLAC group had higher parity and more pregnancy-related comorbidities. A majority of the TOLAC group (89.6%) had only one previous cesarean, and many also had a previous vaginal birth (68.7%). Nearly half (43.3%) of the TOLAC group had a previous VBAC. Although the highest proportion of women from both groups resided in Western states, a higher proportion of women with a previous cesarean lived in the Southeast.

Prenatal and Birth Care Characteristics

Prenatal and birth care characteristics are shown in Table 2. Although women in both groups initiated prenatal care early, the TOLAC group, on average, initiated care 1 week later than the comparison group. Prenatal consultations with obstetric specialists and ultrasound examinations were also more common in the TOLAC group, yet almost 25 percent of women in the TOLAC group had no prenatal ultrasound examination and only 37 percent had gestational diabetes mellitus (GDM) testing. The median duration of the first (280 vs 215 minutes) and second (15 vs 30 minutes) stages of labor was significantly longer in the TOLAC group relative to the comparison group ($p < 0.001$).

Transfer Characteristics

Three quarters of the intrapartum transfers occurred during the first stage of labor and were nonurgent. For women planning a TOLAC, the median time from decision to arrival at the hospital was 35 minutes (interquartile range [IQR], 25–60 minutes) and from decision to transfer until birth was 180 minutes (range, 98–390 minutes).

Women in the TOLAC group were more likely than women in the comparison group (multiparas without a history of cesarean) to require transfer to a hospital (21.7% vs 8.5% ($p < 0.001$) during labor or immediately postpartum. Transfer rates were also significantly higher for the subgroup of TOLAC women with a prior vaginal birth than for the comparison group: 16.6 percent versus 8.5 percent, ($p < 0.001$). Interestingly, when the subgroup of TOLAC women without a prior vaginal birth was compared with primiparas, the transfer rates were higher still: 34.3 percent versus 27.2 percent ($p = 0.009$). Figure 1 shows the place of delivery and number of women and newborns in the TOLAC group who were transferred.

Birth Outcomes

The overall VBAC success rate was 87.0 percent (Table 3). Women with a previous vaginal birth ($n = 721$) had a success rate of 90.2 percent (95% CI, 88.0–92.4), and those with a previous VBAC ($n = 434$) had an even higher rate of 95.6 percent (95% CI, 93.7–97.5). Failure to progress (73.3%) was the most common indication for cesarean. Overall, the TOLAC group had higher proportions of blood loss, maternal postpartum infections, neonatal intensive care unit admissions, and infants who required hospitalization in the first 6 weeks of life. These outcomes remained statistically significant for women in the TOLAC group who had a prior vaginal birth as well (Table 4).

Uterine Rupture

Rates of uterine rupture are shown in Table 3. One case of uterine rupture in a multipara who did not have a history of cesarean occurred in the comparison group. Two cases of uterine rupture were documented during cesarean delivery in the TOLAC group, but neither was associated with a fetal or neonatal death. The first case, a woman with eight previous pregnancies, one previous cesarean, and four previous VBACs, with a pregravid body mass index (BMI) of 31 kg/m^2 and no GDM, was transferred during labor that occurred spontaneously at 39 weeks and 1 day. The first stage was 660 minutes, and the primary reason for transfer was failure to progress. After transfer, the mother gave birth by cesarean to an infant with a 5-minute Apgar of 5 and a birth weight of 3,969 g. The baby was discharged 5 days after birth.

The second case of uterine rupture involved a woman with a previous cesarean in her only prior pregnancy. Her pregravid BMI was 21 kg/mm^2, with no history of GDM and spontaneous onset of labor at 41 weeks and 3 days. The length of the first stage was 972 minutes, with at least one period of no progressive cervical change. She was transferred in labor primarily for pain relief, although "baby's condition" was listed

Table 1. Demographic Characteristics, Obstetric History, and Pregnancy Complications for Multiparous Women from the MANA Stats 2.0 Cohort, 2004–2009

Characteristic	*TOLAC group (n = 1,052), median [IQR] or No. (%)*	*Comparison group (n = 12,092), median [IQR] or No. (%)*
Median maternal age at first prenatal visit, years	32 [28–36]***	31 [27–34]
Median maternal pregravid BMI, kg/m^2	24.0 [21.3–28.0]***	22.7 [20.6–25.8]
Race/ethnicity		
White	970 (92.2)	11,172 (92.4)
Black	21 (2.0)	253 (2.1)
Latina	42 (4.0)	474 (3.9)
Asian	46 (4.4)	487 (4.0)
Native American	7 (0.7)	120 (1.0)
Other	11 (1.0)*	237 (2.0)
Amish/Mennonite	54 (5.1)**	875 (7.2)
Education		
High school graduate	966 (91.8)*	10,843 (89.7)
4 or more years of college	531 (50.5)	5,694 (47.1)
Partner status		
Married	986 (93.7)***	10,923 (90.3)
Partnered	49 (4.7)***	942 (7.8)
Separated/divorced, single, or other	17 (1.6)***	227 (1.9)
MANA region of residence		
New England	54 (5.2)	614 (5.1)
North Atlantic	131 (12.5)	1,384 (11.5)
Southeast	187 (17.9)***	1,456 (12.1)
Midwest	182 (17.4)	1,940 (16.1)
West	214 (20.4)**	2,935 (24.3)
Pacific	279 (26.6)**	3,738 (31.0)
Previous pregnancies		
1	275 (26.1)***	3,971 (32.8)
2	247 (23.5)***	3,002 (24.8)
3 or 4	287 (27.3)***	3,146 (26.0)
5 or more	218 (20.7)***	1,926 (15.9)
Previous cesareans (previous cesarean group only)		
1	943 (89.6)***	
2	91 (8.7)***	
3 or more	18 (1.7)***	
Previous vaginal births (previous cesarean group only)	721 (68.7)***	
Previous VBAC (previous cesarean group only)	454 (43.3)***	
Comorbid conditions		
Gestational diabetes mellitus	17 (1.6)**	93 (0.8)
Pregnancy-induced hypertension	20 (1.9)*	140 (1.2)
Chronic hypertension	8 (0.8)*	40 (0.3)
Twin pregnancy	5 (0.5)*	49 (0.4)

*$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq 0.001$. *Categorical variables: chi-square tests; continuous variables: Kruskal–Wallis tests. MANA = Midwives Alliance of North America; TOLAC = trial of labor after cesarean; IQR = interquartile range; BMI = body mass index; VBAC = vaginal birth after cesarean.*

as a secondary indication. The infant was delivered by cesarean, weighed 3,827 g at birth, and was discharged 4 days after birth.

Based on information obtained during the fetal/infant mortality review (FIMR) (16), two additional vaginal births that resulted in intrapartum or neonatal deaths, described in the next section, included suspected uterine rupture, although these were not confirmed by means of visual inspection because no cesarean was performed.

Fetal and Neonatal Mortality

Five deaths (3 intrapartum, 1 early neonatal, and 1 late neonatal) occurred in the TOLAC group, yielding death rates of 2.85/1,000, 0.95/1,000, and 0.95/1,000, respectively, for a combined intrapartum and neonatal mortality rate of 4.75/1,000. For comparison purposes, the combined mortality rate among multiparas without a history of cesarean was 1.24/1,000 ($p = 0.015$), with 0.66/1,000 intrapartum, 0.41/1,000 early neonatal, and 0.17/1,000 late neonatal. Based on the FIMR, Patients 1 and 3 were likely uterine ruptures. Patient 1 had one prior cesarean and a normal prenatal course. Labor was uncomplicated before an episode of severe bradycardia, during which the mother was transported to the hospital where she delivered a stillborn infant by vacuum extraction 35 minutes later. Patient 3 also had one prior cesarean. She had an uncomplicated labor until 30 minutes before the birth, when abnormal fetal heart tones

Table 2. Antenatal and Birth Care Characteristics for Multiparous Women from the MANA Stats 2.0 Cohort, 2004–2009

Characteristic	*TOLAC group (n = 1,052), median [IQR] or No. (%)*	*Comparison group (n = 12,092), median [IQR] or No. (%)*
Prenatal testing		
Ultrasound	784 (75.3)***	7,831 (65.4)
Gestational diabetes mellitus	387 (36.8)**	5,018 (41.5)
Prenatal care		
Week initiated	11 [9–14]	11 [9–14]
Week initiated with this midwife, median	14 [10–22]***	13 [10–19]
No. midwife visits, median	10 [8–12]	10 [8–12]
Any physician visits	406 (42.6)***	3,153 (29.6)
Physician visits (care started with this midwife only)	159/654 (24.3)***	1,262/8,031 (15.7)
Length of pregnancy in days	282 [276–287]**	281 [275–287]
No. vaginal exams during labor		
1st stage	2 [0–3]***	1 [0–2]
2nd stage	0 [0–1]***	0 [0–1]
Labor duration in minutes		
Active 1st stage	280 [157.5–501]***	215 [125–360]
2nd stage	30 [10–80]***	15 [8–35]
Water immersion for pain relief		
Any, early labor	473 (56.9)***	3,839 (45.1)
Any, active 1st stage	742 (89.4)**	7,370 (86.4)
Any, 2nd stage	425 (52.0)***	4,939 (58.1)
Auscultation frequency in 1st stage		
Every 15 minutes	229 (22.2)***	2,100 (17.7)
More often	52 (5.0)***	512 (4.3)
Less often	750 (72.7)***	9,255 (78.0)
Auscultation frequency in 2nd stage		
After every contraction	195 (19.2)	2,121 (17.7)
After every 2nd contraction	369 (36.2)	4,221 (35.3)
Every 5 minutes	142 (13.9)	1,898 (15.9)
Other	312 (30.6)	3,726 (31.1)

**p ≤ *0.01*, ***p ≤ *0.001*. *Categorical variables: chi-squared tests; continuous variables: Kruskal–Wallis tests. MANA = Midwives Alliance of North America; TOLAC = trial of labor after cesarean; IQR = interquartile range.*

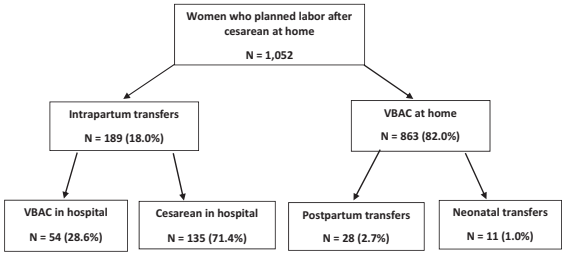

Fig. 1. Place of delivery and hospital transfers for women in the Midwives Alliance of North America (MANA) Stats 2.0 cohort with a previous cesarean who planned labor after cesarean at home.

were detected. She delivered vaginally at home. Emergency medical services were summoned to assist with resuscitation efforts and transfer, but the baby died. The mother was later admitted to the hospital with a diagnosis of uterine dehiscence, hematoma, and a postpartum infection.

Patients 2, 4, and 5 involved twins, an undiagnosed breech with an entrapped head, and a cord prolapse, respectively. All three of these women had one prior cesarean delivery. If women with twins, breeches, gestational diabetes, and preeclampsia are removed from the analysis, however, the mortality rate (intrapartum/neonatal) in the TOLAC group is 3.02/1,000. Women attempting TOLAC without a prior vaginal birth appeared to have a higher combined intrapartum and neonatal mortality rate (9.7/1,000) than did women attempting TOLAC with a prior vaginal birth (2.76/1,000; $p = 0.16$); however, the difference was not statistically significant. Selected maternal and neonatal outcomes stratified by history of previous cesarean and prior vaginal birth are shown in Table 4.

Discussion

The overall VBAC success rate (87%) in our study is consistent with previous research in out-of-hospital settings (15,18,19) and higher than the 74 percent success rate reported in United States hospital births (20). Although we are unable to determine the reason for the higher success rates in our study, this finding may be partially attributable to the high proportion of women with previous vaginal births (21). VBAC success rates may also have been influenced by the high motivation for a vaginal birth that accompanies the choice of a home TOLAC and the individualized style of care that midwives provide in the home setting.

Much of the controversy about place of birth for women with a prior cesarean centers on concern for outcomes following uterine rupture. Given the high proportion of women in our study with a prior vaginal birth and/or a prior VBAC, we expected the rate of uterine rupture to be low. The recent Agency for Healthcare Research and Quality VBAC systematic review described pooled relative risks of uterine rupture

Table 3. Maternal and Neonatal Outcomes, Stratified by History of Previous Cesarean, for Multiparous Women from the MANA Stats 2.0 Cohort, 2004–2009

Outcomes	*TOLAC group* (n = *1,052)*	*Comparison group* (n = *12,092)*
Maternal outcomes		
VBAC success, *n* (%)	915 (87.0)	N/A
Median blood loss, mL [IQR]	355 [250–500]***	300 [237–473]
Postpartum infection, *n* (%)	80 (7.7)***	514 (4.3)
Hospitalization, first 6 weeks, *n* (%)	174 (16.6)***	795 (6.6)
Uterine rupture, confirmed, *n* (rate per 1,000)	2 (1.90/1,000)	1 (0.08/1,000)
Neonatal outcomes		
5-minute Apgar < 4, *n* (%)	10 (1.0)*	48 (0.4)
NICU admission, *n* (%)	44 (4.2)***	243 (2.0)
Infant hospitalization in first 6 weeks, *n* (%)	179 (17.0)***	945 (7.8)
Combined intrapartum and perinatal death (rate per 1,000)	4.74/1,000*	1.24/1,000
Intrapartum death, *n* (rate per 1,000)	3 (2.85/1,000)	8 (0.66/1,000)
Early neonatal death, *n* (rate per 1,000)	1 (0.95/1,000)	5 (0.41/1,000)
Late neonatal death, *n* (rate per 1,000)	1 (0.95/1,000)	2 (0.17/1,000)

*p ≤ *0.05,* **p ≤ *0.01,* ***p ≤ *0.001. Categorical variables: chi-square tests; continuous variables: Kruskal–Wallis tests. MANA = Midwives Alliance of North America; TOLAC = trial of labor after cesarean; VBAC = vaginal birth after cesarean; NA = not available; IQR = interquartile range; NICU = neonatal intensive care unit.*

Table 4. Selected Maternal and Neonatal Outcomes Stratified by History of Previous Cesarean and Prior Vaginal Birth from the MANA Stats 2.0 Cohort, 2004–2009

Outcomes	*TOLACs with no history of vaginal birth (n = 306; 1 twin set)*	*Primiparas (n = 3,773; 6 twin sets)*	*TOLACs with history of vaginal birth (n = 721; 4 twin sets)*	*Multiparas without history of cesarean (n = 12,092; 49 twin sets)*
Maternal outcomes				
Intrapartum transfer	87/306 = 28.4%*	864/3,770 = 22.9%	98/720 = 13.6%***	796/12,086 = 6.6%
Postpartum maternal transfer	14/304 = 4.6%*	88/3,733 = 2.4%	14/716 = 2.0%	135/12,048 = 1.1%
Cesarean rate	63/307 = 20.5%***	400/3,777 = 10.6%	72/725 = 9.8%***	349/12,138 = 2.9%
Confirmed uterine rupture	1/306 = 0.34%[a]	0/3,765 = 0%	1/718 = 0.14%**	1/12,080 = 0.008%
Probable uterine rupture	0/306 = 0%	Unknown[d]	2/718 = 0.28%	Unknown[d]
Maternal hospitalization (any, first 6 weeks includes transfers)	78/306 = 25.5%*	770/3,768 = 20.4%	92/718 = 12.8%***	795/12,063 = 6.6%
Median blood loss, mL [IQR]	400 [250–593]***	355 [250–500]	350 [237–500]***	300 [237–450]
Median blood loss among vaginal births only, mL [IQR]	400 [250–500]*	355 [250–500]	330/719 = 45.9%	5,091/12,057 = 42.2%
Maternal birth canal trauma (any)	189/305 = 62.0%	2,521/3,753 = 67.2%	5/699 = 0.7%	48/11,930 = 0.4%
Maternal postpartum reproductive tract infection	30/303 = 9.9%	281/3,755 = 7.5%	49/717 = 6.8%**	514/12,039 = 4.3%
Neonatal outcomes				
Combined intrapartum & neonatal deaths, total	9.7/1,000	3.97/1,000	2.76/1,000	1.24/1,000
Intrapartum deaths	2/307 = 6.51/1,000	11/3,779 = 2.91/1,000	1/725 = 1.38/1,000	8/12,137 = 0.66/1,000
Early neonatal deaths[b]	1/305 = 3.28/1,000	1/3,763 = 0.27/1,000	0/724 = 0/1,000	5/12,126 = 0.41/1,000
Late neonatal deaths[b]	0/304 = 0/1,000	3/3,761 = 0.80/1,000	1/724 = 1.38/1,000	2/12,121 = 0.17/1,000
Very low 5-minute Apgar score (< 4)	5/291 = 1.7%	39/3,629 = 1.1%	5/699 = 0.7%[c]	48/11,930 = 0.4%
Neonatal transfer	5/304 = 1.6%	55/3,740 = 1.5%	6/718 = 0.8%	83/12,062 = 0.7%
NICU admission (any, first 6 weeks)	15/302 = 5.0%	194/3,734 = 5.2%	29/719 = 4.0%***	243/12,062 = 2.0%
Infant hospitalization (any, first 6 weeks; includes all transfers and NICUs)	73/306 = 23.8%	805/3,771 = 21.3%	102/722 = 14.1%***	945/12,108 = 7.8%

[a]p *value could not be calculated because of insufficient number of events in at least one category.* [b]*Excludes infants with lethal congenital anomalies.* [c]*Fisher's exact test bc small cells.* [d]*By definition, probable uterine ruptures could only be assessed in women with prior cesarean deliveries.* *p ≤ *0.05,* **p ≤ *0.01,* ***p ≤ *0.001. Kruskal–Wallis test if continuous data; chi-square test if categorical. MANA = Midwives Alliance of North America; TOLAC = trial of labor after cesarean; IQR = interquartile range; NA = not applicable due to small cell size; NICU = neonatal intensive care unit.*

of 0.26–0.62 for women with prior vaginal delivery and 0.52 for women with a prior VBAC (20). Despite the increased relative risk of rupture during a TOLAC, however, the absolute risk remains low (22). In our study, the rate of confirmed uterine rupture in the TOLAC group was 1.9/1,000. However, if we include the two probable ruptures discussed previously, the rate of uterine rupture increases to 3.8/1,000. This finding is similar to Landon et al analysis of women with one previous cesarean in a hospital setting without a need for labor augmentation (4/1,000–5/1,000) and to the Lieberman et al study (4/1,000) of VBAC outcomes in United States birth centers (19,23).

Overall, our combined intrapartum and neonatal mortality rate of 4.75/1,000 in the TOLAC group are comparable to the mortality rate of 5.0/1,000 in the Lieberman et al study in birth centers (19). Compared with the overall rate of combined intrapartum stillbirth at term and neonatal death (1.1/1,000) in Landon et al multicenter study of women who attempted an in-hospital TOLAC, there is some evidence that TOLAC in out-of-hospital settings demonstrates increased fetal/neonatal risk (23). This is expected in a setting where decision-to-cesarean delivery time in the event of a uterine rupture is presumably greater than the 18- to 30-minute interval at which evidence suggests neonatal risk increases (2,24–26). In women with both a prior cesarean and prior vaginal birth, however, the neonatal mortality rate is lower than the rate for primiparous women in our overall data set. These findings are consistent with the higher rate of neonatal mortality and overall adverse outcomes for primiparous (vs multiparous) women having a home birth in the Birthplace in England study (27).

Interpretation of these findings is limited, however, because the MANA Stats 2.0 data set did not capture the entire population of United States home births from 2004 to 2009. Whereas we estimate that approximately one-third of home VBACs during the study years are represented (13), we are unable to determine whether there are differences in the practices of midwives who enter their data into MANA Stats versus those who do not. Although it is impossible to confirm that all midwives who participated in data collection entered all of the clients they cared for during the study years, selection bias was minimized by requiring midwives to log in clients early in prenatal care before outcomes were known (16). We are also limited in our ability to assess the relative safety of home VBAC because of the lack of population-level data, infrequency of rare events such as uterine rupture or fetal/neonatal death, and lack of a hospital-based comparison group.

Given the increased neonatal risk, why do women attempt an out-of-hospital VBAC? In the United States access to VBAC in hospitals is limited, particularly in rural areas and community hospitals without 24/7 in-house anesthesia and surgical coverage (6–8,28). Some women have no option in their communities other than to undergo a repeat cesarean. Other reasons may include restrictive hospital policies for TOLAC, such as inability to ambulate, denial of food and fluids in labor, and lack of care providers who are supportive of VBAC. In this study, a higher proportion of women lived in the Southeast, a region with low VBAC and high cesarean rates, which together suggest lower availability (28). Thus, current obstetrical practice in some locales forces women into choosing care that is not optimal to avoid the risks of unwanted surgery. A concerted effort should be made to increase access to VBAC in hospitals so that women are not choosing home VBAC simply because hospitals in their community do not offer it or that restrictive policies prevent the opportunity for a physiologic birth.

Our findings also indicate that there is room for improvement in the practices of home birth midwives who care for women with a previous cesarean. Similar to Lieberman et al (19), our data show that adverse outcomes are more common when additional complicating conditions, such as multiple gestations and nonvertex presentations, are present. It is also concerning that nearly 25 percent of women in the TOLAC group did not receive an ultrasound for placental location and diagnosis of accreta. Given that the rate of abnormal placentation is rising, particularly for women with multiple cesareans (8), an obstetrical ultrasound should be considered the standard of care for any woman with a prior cesarean. During labor, more frequent auscultation through and for at least 30 seconds following contractions may allow for earlier detection of uterine rupture and timely hospital transfer. In many states that currently license CPMs, regulations require specified evaluation and care practices for women with a prior cesarean (29). Adherence to these regulations and to the recently published planned home birth transfer guidelines from the Home Birth Summit (30) may help to improve outcomes.

Even if VBAC access and care practices in hospitals are improved, some women will continue to opt for a home setting despite professional recommendations to the contrary. Although most international guidelines recommend delivery in a hospital setting for women with a previous cesarean, Germany does not have official exclusion criteria for out-of-hospital VBAC (31). Two recent studies of birth outcomes in German out-of-hospital settings indicate that good outcomes are possible with stringent client selection criteria and a low threshold for transfer (31,32). In a recent commentary from the United Kingdom, Dexter et al proposed that safe and acceptable compromises are possible

when a woman with a previous cesarean requests an "unconventional" birth plan, such as a home VBAC (33). In this model, the consultant obstetrician works with the woman, her family, and the midwives to negotiate a safe, acceptable plan for the birth (33). This involves a process of shared decision making that utilizes effective risk communication techniques to provide full disclosure of the risks and benefits of the situation while respecting autonomy (33,34). In the event the birth does not proceed as planned, open communication and documentation of decision making have been shown to reduce provider liability (33,35). This may serve to alleviate reluctance of practitioners that are currently wary of offering TOLAC. In addition, such a model may help to bridge the divide between consultant physicians and home birth midwives in the United States (35).

Conclusion

This research fills an important gap in the literature as the largest United States study of planned, midwife-attended, home VBAC outcomes to date. Our results are comparable to previous research on VBAC in out-of-hospital settings. Rates of successful VBAC were high, and the rate of uterine rupture was similar to both in- and out-of-hospital studies. However, the intrapartum/neonatal mortality rate of 4.75/1,000 when higher risk births were included suggests that home VBACs are associated with an increased risk to the fetus/newborn, particularly in women without a history of a prior vaginal birth.

In light of our findings and those of Lieberman et al, we recommend that women planning a VBAC at home be counseled with respect to the possibility of an increased risk of mortality, particularly if uterine rupture occurs (19). Given that planned out-of-hospital VBAC is likely to continue, we also recommend that home and birth center midwives follow best practices for client selection, prenatal testing, and judicious, timely transport. Limiting TOLAC clients to women with a history of a previous vaginal birth and a term, singleton, vertex, uncomplicated pregnancy is likely to mitigate risk. A more collaborative relationship between home birth midwives and obstetricians in all communities may help to increase timely transfers, provide options other than cesarean delivery following early intrapartum transfer, and improve access to ultrasound and laboratories for prenatal testing. We also recommend that access to VBAC be increased nationwide in hospital settings and that a woman's autonomy be respected, regardless of where and with whom she chooses to give birth.

Conflict of Interest

We declare that we have no conflicts of interest.

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