

Vaginal Birth After Cesarean in German Out-of-Hospital Settings: Maternal and Neonatal Outcomes of Women With Their Second Child

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ABSTRACT: Background: To offer vaginal birth after cesarean (VBAC) in a hospital setting is recommended in international guidelines, but offering VBAC in out-of-hospital settings is considered controversial. This study describes neonatal and maternal outcomes in mothers who started labor in German out-of-hospital settings. **Method:** In a retrospective analysis of German out-of-hospital data from 2005 to 2011, included were 24,545 parae II with a singleton pregnancy in a cephalic presentation at term (1,927 with a prior cesarean and 22,618 with a prior vaginal birth). **Result:** The overall VBAC rate was 77.8 percent. The intrapartum transfer rate to hospital was 38.3 percent (prior cesarean) versus 4.6 percent (prior vaginal) ($p < 0.05$), and the 10-minute Apgar < 7 rate was 0.6 versus 0.2 percent ($p < 0.05$), and the nonemergency intrapartum transfer rate was 91.5 versus 85.0 percent ($p < 0.05$). Prolonged first stage of labor was the most common reason for intrapartum transfer in both groups. The leading reason for postpartum transfer was retained placenta. **Discussion:** There was a high rate of successful VBAC in this study. The high nonemergency transfer rate for women with VBAC might mean that midwives are more cautious when attending women with a prior cesarean in out-of-hospital settings. Further studies are necessary to evaluate which women are suitable for VBAC in out-of-hospital settings. (BIRTH 41:4 December 2014)

Key words: maternal and neonatal outcomes, out-of-hospital setting, VBAC

Cesarean rates in Germany, as in many industrial countries, are much higher than the World Health Organization (WHO) recommended rate of 15 percent (1). Moreover, the cesarean rates rose in Germany from 25.3 percent in 2002 (2) to 33 percent in 2012 (3).

Although the WHO and international guidelines, including one from Germany (1,4–6), recommend vaginal birth after cesarean (VBAC) for most women, nonetheless, 67.5 percent of mothers in Germany undergo a repeat cesarean (3).

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Although the recommendation to offer VBAC in a hospital setting has been widely endorsed (4), VBAC in an out-of-hospital setting is much more controversial. Only a few studies have focused on VBAC in out-of-hospital settings. Deline et al. (7) found a high rate of VBAC among women belonging to an American Amish community. The women in this local midwife-led birth center were at moderate risk, as the low-risk Amish women give birth at home. Of the 927 women who gave birth in the birth center from 1993 to 2010, 86 women had one prior cesarean section, and six women had two. There existed no serious maternal morbidities, and the neonatal mortality rate was 0.54 percent, comparable to the 2006 U.S. average of 0.45 percent (7). Lieberman and colleagues (2004) analyzed data of 1,452 women with one or more prior cesareans choosing to give birth in U.S. birth centers. The results showed a high successful VBAC rate of 96.8 percent. The intrapartum transfer rate was 24 percent. In 51 percent of those cases, the reason for transfer was a failure to progress. The maternal postpartum transfer rate was 3.8 percent with laceration repair as the main reason for transfer (8).

Two birth center studies from the United States that have been limited to women with one prior cesarean have demonstrated good outcomes. One in a hospital-based birth center with 298 participants, and one with 57 home births, found a high rate of VBAC (98 and 93%) (9,10). The intrapartum transfer rates in those studies were 8.7 percent (9) and 12 percent (10), with the latter study recording a maternal postpartum transfer rate of 1.7 percent (10). David et al. (11) included maternal and neonatal outcomes of 344 births among women attempting a VBAC in 80 free-standing midwife-led birth centers in Germany. The successful rate of VBAC in this German study was slightly lower (73.5%) than other international studies, possibly because it was limited to women having their second birth. They found an intrapartum hospital transfer rate of 41.2 percent and a maternal postpartum transfer rate of 4.1 percent (11). Reported neonatal transfer rates ranged from 1.4 to 1.9 percent (8,10,11). All studies attempted to assess a uterine rupture rate but only Lieberman and colleagues (8) detected any uterine ruptures. Their calculated rate was 0.4 percent, consistent with other studies of women undergoing a trial of labor after a cesarean in hospitals (12,13). Based on their findings, the authors advised that VBAC should not be offered in any out-of-hospital setting (8). This study's conclusion has been challenged because three of the six mothers with uterine rupture had more than one prior cesarean (14,15).

All out-of-hospital births in Germany are attended by a midwife, with some births having both a midwife and a physician present. There are no official exclusion

criteria for giving birth in an out-of-hospital setting. However, exclusion criteria have been defined in the contract between medical insurance companies and the German midwifery association. Accordingly, women with a history of uterine rupture and more than one prior cesarean not followed by a successful VBAC are excluded (16).

Mothers in Germany have a choice of where to give birth, in hospital or in an out-of-hospital setting. Out-of-hospital settings include at home, in midwifery-led birth centers or ambulatory medical practice offices where women go home within a few hours of birth, or a maternity home where mothers and their infants are cared for by midwives for 2–3 days postpartum. In Germany, the rate of women giving birth in an out-of-hospital setting is relatively stable, around 1.7 percent ($N = 11,000$) (17). In 2011, 5.5 percent of the women who decided to give birth in an out-of-hospital setting had a prior cesarean (17). A recent study from the United States observed that a possible consequence of an increasing lack of access to in-hospital VBAC might be that more women with a history of a prior cesarean would plan a home birth (18).

Because of very small sample sizes of out-of-hospital VBAC studies to date, a more recent large study is warranted. The aim of this study was to compare maternal and neonatal outcomes in mothers giving birth to their second baby with and without a prior cesarean who started labor in a German out-of-hospital setting.

This study had research approval from Witten/Herdecke University, Germany, and human subjects approval from the Ethics Council of the German Society of Nursing Science.

Methods

Setting

This study used perinatal data collected from the Society for Quality in Out-of-Hospital Obstetrics in Germany from 2005 to 2011. This time period was chosen because, beginning in 2005, the mode of delivery for the prior birth was included as a required reporting variable. As part of quality management of pregnancy and birth outcomes, all hospital birth attendants in Germany complete an electronic form after every birth. This form includes prenatal risk factors, labor and birth information, presence of complications, and maternal and infant outcome data. Out-of-hospital births require additional information, such as transfer to a hospital and primary reason for the transfer. Midwives must choose only one primary reason for maternal transfer. The Society for Quality in Out-of-Hospital Obstetrics in Germany performs validity checks on the data for any

inconsistent or implausible values or presence of missing data. If these issues are present, then a query is sent to the midwife to verify or correct the information as part of the quality management process. Although it is optional for midwives who attend home births to provide information to this database, almost 82 percent of all midwives who attend women in out-of-hospital settings participate. Moreover, the midwives who report out-of-hospital births must do most of these births, because the number of actual births and the number of births reported in the database are very similar. In most cases, nonreporting midwives attend very few births (< 5/yr). To be reimbursed by health insurers, midwives in Germany attending births in free-standing birth centers are mandated to follow certain exclusion criteria (see Table 1). Although independent midwives attending home births do not have the same mandate, they mostly use these same exclusion criteria.

Study Population

This retrospective analysis of 70,300 births, documented from 2005 to 2011 in out-of-hospital settings, was restricted to births with the following inclusion criteria: women who planned their second birth in an out-of-hospital setting, with a singleton pregnancy and a cephalic presentation at term (37/0 to 41/6 wk of gestation). Variables of interest chosen to describe the study population were maternal age, and neonatal weight and length. The primary outcome measures were VBAC rate, hospital transfer (characterized as emergent

or nonemergent), intrapartum or postpartum, and the main reason for transfer. Apgar scores and neonatal transfer were used to assess neonatal outcome. Because the German perinatal documentation does not differentiate between an “imminent” uterine rupture and an actual rupture, this outcome measure is not described.

In the sample of this study, 56.2 percent of the women started labor in an independent midwife-led birth center, and 35.2 percent at home. Only a few women chose to give birth at a maternity home or in an ambulatory medical practice setting (8.6%).

The data were analyzed using SPSS 20.0 (IBM Corporation, Armonk, New York, USA) and Excel (Microsoft, Redmond, Washington, USA). Vaginal birth, VBAC, and maternal and neonatal transfer rates were computed per 100 women in the specified group, whereas vaginal birth after transfer and indication for transfer (intrapartum, emergency, and postpartum) were computed per 100 women who were transferred. For the statistical comparisons between the two groups, a chi-square test was conducted and where appropriate, relative risks with 95 percent confidence intervals, were calculated. A $p < 0.05$ was chosen as being significant.

Results

Demographics

The study population of 24,545 consisted of 1,927 (7.9%) women with a prior cesarean and 22,618 (92.1%) women with a prior vaginal birth. More than 90 percent of all births were planned as home births or in a birth center. Less than 10 percent of the mothers chose other out-of-hospital birth places such as maternity homes and ambulatory medical practice offices. The birth center was the planned birthplace for 63 percent of the women with a prior cesarean, and for 55 percent of the women with a prior vaginal birth. The women with a prior cesarean section were, on average, 1 year older than the mothers with a vaginal birth (median age 33 vs 32 years). There existed no differences in the median birthweights of 3,600 grams and lengths of 52 centimeters of the newborn between the two groups.

The overall rate of successful VBAC in the prior cesarean group was 77.8 percent. The repeat vaginal birth rate in the prior vaginal birth group was 99 percent ($p < 0.05$).

Transfer Rates

Among women who were transferred, 42.2 percent of women with a prior cesarean gave birth vaginally, com-

Table 1. Exclusion Criteria for Delivering in a Germany Free-Standing Midwife-Led Unit

Category	Exclusion criteria
Maternal disease	Severe systemic disease HIV positive Drug abuse Diabetes
Previous pregnancy or delivery complications	Previous uterine rupture More than one cesarean without a subsequent vaginal birth Previous septic abortion
Complications in current pregnancy	Blood group incompatibility Birth or membrane rupture before 37 weeks of gestation Placenta previa Third trimester vaginal bleeding Placental insufficiency HELLP syndrome Malpresentation Suspected amniotic fluid infection Vaginal bleeding after admission to the birth center

pared with 77.5 percent of those with a prior vaginal birth ($p < 0.05$) (see Table 2). The intrapartum transfer rate to the hospital was significantly higher in women with a prior cesarean (38.3%) compared with women with a prior vaginal birth (4.6%). However, the emergency transfer rate in the prior vaginal birth group was nearly twice as high (14.7%) as the prior cesarean group's rate (8.1%) (RR = 1.8, 95% CI 1.4–2.4). On the other hand, the nonemergent transfer rate for women with a prior cesarean was significantly higher (91.6 vs 85%).

The postpartum maternal transfer to the hospital in women with a prior cesarean was 60 percent higher than for women with a prior vaginal birth (RR = 1.6, 95% CI 1.3–2.0). The need for newborns to be transferred was more than twice as high (3.1%) in the prior cesarean group compared with the group of mothers with a prior vaginal birth (1.4%, $p < 0.05$). Although few newborns had low Apgar scores, Apgar scores < 7 were slightly more common among newborns of women with a prior cesarean at both 5 (2.0 vs 0.8%) and 10 (0.6 vs 0.2%) minutes postpartum (see Table 2).

Reasons for Transfer to the Hospital

For both groups of women, prolonged first stage of labor was the most common reason for intrapartum

Table 2. Vaginal Birth and Transfer Rates*

	Prior cesarean N = 1,927		Prior vaginal birth N = 22,618	
	Percent	n	Percent	n
Total vaginal birth	77.8	1,500	99.0	22,385
Missing		3		0
Vaginal birth after transport[†]	42.2	312	77.5	802
Intrapartum transfer	38.3	739	4.6	1,035
Emergent [†]	8.1	60	14.7	152
Nonemergent [†]	91.5	676	85.0	880
Missing		3		3
Maternal postpartum transfer	4.15	80	2.55	579
Missing		0		2
Neonatal transfer	3.1	59	1.4	315
Apgar score 5 min postpartum ≤ 7	2.0	38	0.8	175
Apgar score 10 min postpartum ≤ 7	0.6	12	0.2	51

*All comparisons between groups are significant at $p < 0.05$.
[†]Denominator is women who were transferred.

transfer. Women with a prior cesarean were significantly more likely to be transferred for a prolonged first stage or suspicion of pelvic disproportion. Women with a prior vaginal birth were significantly more likely to be transferred for an abnormal fetal heart rate, premature rupture of membranes, meconium fluid or cephalic malpresentation. Rates of transfer because of prolonged second stage of labor, failure of descent, and mothers' request were not statistically different.

Reasons for postpartum transfer can be divided into medical reasons and maternal choice reasons. The leading medical reason for postpartum transfer for both groups was retained placenta (31.3% of the women with a prior cesarean, 44.9% with a prior vaginal birth) ($p < 0.05$). Transfer rates because of postpartum hemorrhage were not significantly different between the two groups. However, since midwives could only choose one primary reason for transfer, it is not clear if a proportion of women with a retained placenta also experienced a large blood loss. When the two categories (bleeding and retained placenta) were combined, transfer rates were similar between the two groups: 47.5 percent ($n = 38$) of women with a prior cesarean, and 58.4 percent ($n = 338$) of women with a prior vaginal birth ($p = 0.06$). In addition midwives can choose between complicated perineal trauma and need for perineal suturing as a reason for transfer, but these may represent similar situations. When we combine these two categories, we see no significant differences between the two groups ($p > 0.05$).

The nearly 5 percent of women with a prior vaginal birth who chose an elective transfer were about equally likely to transfer to accompany their newborn or to obtain normal postpartum care in the hospital. In contrast, all 9 percent of women with a prior cesarean who transferred electively, transferred for normal postpartum care (see Table 3).

Discussion

This analysis revealed a high rate of successful VBAC (78 percent). International studies have described VBAC rates in an out-of-hospital setting ranging from 74 percent in a German study among only second parae (11) to 98 percent in an American study in which 84 percent of the participants had a vaginal birth before their cesarean (9). In this study, among mothers who had an intrapartum transfer, 42 percent of mothers with prior cesarean had a vaginal birth in hospital. In other published reports this rate was between 37 and 87 percent (8–11).

The rate for nonemergency transfers in the course of trial of labor was significantly higher in women

with a prior cesarean. There are two possible explanations for this finding. One is that as “functionally nulliparous” women, they have a greater need for transfer because of nonurgent issues such as slow pro-

Table 3. Reasons for Transfer to the Hospital

	Prior cesarean N = 1,927		Prior vaginal birth N = 22,618		p
	Percent	n	Percent	n	
Intrapartum transfers	38.2	739	4.6	1,035	< 0.05
Prolonged first stage of labor	41.9	310	27.9	289	< 0.05
Prolonged second stage of labor	13.7	101	12.8	132	0.41
Abnormal fetal heart rate	12.6	93	23.6	244	< 0.05
Premature rupture of membrane	5.0	37	8.6	89	< 0.05
Meconium-stained fluid	2.0	15	3.8	39	< 0.05
Absolute or relative pelvic disproportion	3.1	23	0.9	9	< 0.05
Failure of descent	2.6	19	3.1	32	0.39
Cephalic malpresentation	1.8	13	3.3	34	< 0.05
Prior cesarean section	3.8	28		0	
Maternal request	5.5	41	7.0	72	0.21
Other	8.0	59	8.9	92	< 0.05
Missing		0		3	
Maternal postpartum transfer	4.2	80	2.6	579	< 0.05
<i>Medical reasons</i>					
Retained placenta	31.2	25	44.9	260	< 0.05
Hemorrhage > 1,000 ml	16.3	13	13.5	78	0.38
Complicated perineal trauma	13.8	11	9.7	56	0.23
Need for perineal suturing	17.5	14	11.9	69	0.15
Other	12.5	10	10.4	60	0.20
<i>Maternal choice</i>					
To attend the transferred newborn		0	4.8	28	
For normal postpartum care	8.7	7	4.5	26	0.10
Missing		0		2	

gress in labor. Alternatively, it may be that midwives are very cautious when managing women with a prior cesarean in an out-of-hospital setting. With these women, when the first signs of deviations from normal occur, midwives may appropriately have a lower threshold to transfer, compared with women without this history. Midwives seem to transfer women earlier if they suspect dystocia in women with a prior cesarean, as seen by the higher proportion transferred for prolonged first stage. An alternative explanation for the higher first stage transfer rate in the prior cesarean women is that women who have had a prior vaginal birth may have a shorter first stage of labor (19). The fact that transfers for an abnormal heart rate pattern were more common in women with a prior vaginal birth (23.6–12.6%) also suggests that midwives are not waiting until problems develop to transfer women with a prior cesarean. Harrington and colleagues (1997) (9) documented a transport rate for abnormal heart rate of 27 percent and found no significant difference in transport rate with the control group of women without a prior cesarean section. Lieberman and colleagues (2004) (8) found an intrapartum transfer rate of 56 percent because of fetal conditions of women with a prior cesarean section.

Maternal postpartum transfer rates to the hospital were significantly higher among women with a prior cesarean. However, there were no significant higher risks for placental complications and postpartum hemorrhage in the group of women with a prior cesarean. Although studies demonstrate an association between placental problems and increasing cesareans, this sample was at low risk for these problems. Because of risk screening, no women had a placenta previa which greatly increases the risk of placenta accreta (20) and these women had only one prior cesarean giving a very low expected total number of placenta accreta for the entire sample of < 1 (20,21).

By both neonatal outcome measures, newborns of mothers with prior cesarean were more often transferred to a hospital and had increased rates of low Apgar scores ≤ 7 at both 5 and 10 minutes after birth. Therefore, newborns of mothers with a prior vaginal birth experienced less fetal distress than newborns of mothers with a prior cesarean. This finding is similar to the other German study by David et al. (11).

Limitations

This study has some limitations. First, although it captures all of the German birth center’s births, and most of the German home births, not all home births are included. There are no data to indicate whether the home births that are entered into the database are

similar or different from the ones that are not. Second, midwives can only report one reason for transfer, but there may be multiple reasons they decide to transfer women. Because the German perinatal documentation does not differentiate between an “imminent” uterine rupture and an actual uterine rupture, this outcome measure could not be examined. Therefore, this study can glean only a crude understanding of how midwifery management may be altered for women with a prior history of a cesarean.

As with any administrative database where data are entered at the time of birth, there can be data entry errors. There are data cleaning procedures to detect gross errors but undoubtedly some errors are missed. However, there is no evidence that this misclassification is greater for one group of women than the other. This nondifferential misclassification poses a problem only in that it may make it harder to detect significant differences between the two groups of women.

A further limitation is the comparison between women with a prior cesarean and women with a prior vaginal birth. Rozen and colleagues suggested that comparing women with VBAC to other nulliparous women may be more valid in terms of risk outcomes (22). This study used the same design as two prior studies to have comparable outcome data (9,11). However, a comparison to nulliparous women might be considered for future studies.

Conclusions

The results of this study demonstrate that VBAC in an out-of-hospital setting, as practiced by midwives in Germany, can be a safe way to give birth. In order for women with a prior cesarean to make an informed choice about the place of birth, midwives should inform women and their partners that there is at least a one in three chance that a transfer to the hospital may become necessary. On the other hand, women and their partners should also be informed that a successful VBAC is more than twice as likely in the out-of-hospital setting (77.8%) than in an in-hospital setting (32%) (3).

The current guidelines governing midwifery practice in Germany allow women to choose their place of birth and facilitate transfers when needed. In contrast, many hospitals in the United States do not allow even hospital VBAC, and home VBAC is even more discouraged (23). Hopefully this study, along with others, can persuade policy makers that in systems with clear risk screening criteria and well-trained midwives and other obstetric providers, women can safely choose their place of birth.

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