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Influence of the birth attendant on maternal and neonatal outcomes during normal vaginal delivery: A comparison between midwife and physician management

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Summary. *Background:* The purpose of this study was to compare the obstetric outcome of low-risk maternity patients attended by certified midwives with that of low-risk maternity patients attended by obstetricians.

Patients and methods: Obstetric outcome of 1352 midwife patients was compared with that of 1352 age- and parity-matched physician patients with normal spontaneous vaginal delivery at the Department of Obstetrics and Gynecology of the University Hospital Vienna during the period from January 1997 to July 2002. Our analysis was restricted to a sample of low-risk pregnant women. Women with medical or obstetric risk factors were excluded.

Results: A significant decrease in the use of oxytocin ($p = 0.0001$) was observed in women who selected a midwife as their primary birth attendant compared with women in the physician group. In both groups most women gave birth in a supine position; however, significantly more alternative birth positions were used by midwife patients ($p = 0.0001$). Concerning perineal trauma, a significantly lower rate of episiotomies ($p = 0.0001$) and perineal tears of all degrees ($p = 0.006$) were found in midwife patients. When analyzing severe postpartum hemorrhage and postpartum infections, there were no significant differences between the two groups ($p > 0.05$). Concerning neonatal outcome, there were no significant differences in APGAR score < 7 at 5 minutes ($p > 0.05$).

Our data clearly show the ability of certified midwives to successfully provide prenatal care and delivery to low-risk maternity patients, with neonatal outcomes comparable to those of physician patients. The use of certified midwives supervised by obstetricians may provide the optimum model for perinatal care, particularly for those women who are low-risk maternity patients, leaving physicians free to attend to the high-risk elements of care.

Key words: Midwifery-led care, low-risk maternity patients, perineal lacerations.

Introduction

Since maternity care provided by midwives seems to be as safe as that provided by physicians [1], midwifery-led care has been introduced at several centres [2, 3]. A more extensive involvement of midwives in maternal care [2] is supported by the fact that women who selected a midwife as their primary birth attendant reported feeling more knowledgeable about birth attendants, more in control over the birth attendant decision, more satisfied about their delivery decisions, and more autonomous in their pregnancy decision making [4].

However, substantial differences in labor management style between midwives and physicians are described in the literature. Chambliss and colleagues reported that obstetricians perform episiotomies more frequently, use oxytocin augmentation more often, and supervise longer labors with an increased risk of major lacerations compared with midwives [5]. Successful obstetric outcome of low-risk pregnant women cared for by certified midwives has also been documented in previous studies [6–9]. By tradition, midwives have managed only pregnancies that are low risk, transferring care to obstetricians when complications develop [9]. Criticism of successful obstetric management by midwives has focused on the fact that women in these studies were always low-risk, and thus any comparison with patients managed by obstetricians was invalid because of selection bias.

The purpose of this study was to compare the obstetric outcome of low-risk pregnant women attended by certified nurse-midwives with that of low-risk pregnant women attended by physicians.

Patients and methods

Clinical assessments

At the University Hospital Vienna, a midwifery service has been offered to low-risk maternity patients since 1997. All women have the possibility of having their labor and delivery managed either by a certified midwife alone or in conjunction with a physician (obstetrician or resident in gynecology and obstetrics). In Austria the labor management style is quite different from other countries, and physicians are always present at delivery. Women who selected a midwife as their primary birth attendant were

classified as midwife patients, and women who were attended by an obstetrician or resident in gynecology and obstetrics were classified as physician patients.

The midwifery care team consisted of 21 certified midwives. After providing detailed information, only midwives agreeing with the study project participated. Only certified and experienced midwives who felt confident to take on the responsibility themselves were authorized to conduct these births. Midwives discussed participation with every available woman, and informed consent was obtained from all women who selected a midwife as their primary birth attendant. The study samples were taken from women who registered at the Department of Obstetrics and Gynecology of the University Hospital of Vienna (annual birth rate: 3800) for prenatal care between January 1997 and July 2002 and who met the criteria of eligibility for the midwifery service, as described below.

During the study period, a final sample of 1352 women with low-risk pregnancy and uncomplicated first and second stages of labor, with a gestational age > 37 weeks, a normal sized fetus (fetal birth weight between 2500 and 4000 g), a reactive admission cardiotocography and a pregnancy with cephalic presentation were attended by midwives alone. 1352 age- and parity-matched low-risk pregnant women with normal spontaneous vaginal delivery attended by a physician served as a control group. Cardiotocography was performed continuously during the first and second stages of labor in both groups. Women were excluded from the study if any of the following characteristics were recorded: multiple gestation, pregnancy with non-cephalic presentation, history of cesarean section, gestational age < 37 weeks, known fetal macrosomia or retardation, maternal risk factors such as diabetes mellitus or hypertension, history of intrauterine fetal death, premature rupture of the membranes or wish for epidural analgesia during delivery. A pathologic cardiotocography, epidural analgesia, a prolonged first stage (more than 720 minutes in primiparous women; more than 540 minutes in multiparous women) or second stage (more than 120 minutes) or the patients´ decision were reasons to interrupt midwife management during delivery. These women were then cared for by the attending physician and thus excluded from the study (Table 1). To avoid selection bias, physician patients undergoing epidural analgesia, cesarean section, operative vaginal delivery or with prolonged first or second stages were not included in the control group. Tables 2 and 3 illustrate the clinical characteristics of the two populations (midwifery group vs. physician group).

Table 1. Midwife patients handed over to physicians during delivery

	n = 113 n	100% %
Reasons		
Pathologic cardiotocography	50	44%
Lengthened first or second stage of labor	25	22%
Unknown reason	15	13%
Hypotony during delivery	1	1%
Wish of the patient	1	1%
Epidural analgesia	10	9%
Manual removal of placenta	11	10%
Mode of delivery of these patients		
Normal vaginal delivery	85	75%
Cesarean section	9	8%
Vacuum extraction	19	17%

Data were collected continuously using a computer-assisted database for the whole observation period. Variables selected to measure the effectiveness of the two services included the following outcomes in the mothers (obtained from the record of delivery): maternal age, parity, gestational age, length of first and second stages of labor, amniotomy, episiotomy, perineal trauma, oxytocin stimulation (to augment labor), the use of medical analgesia (Nubain, Alodan and Tramal), maternal birth position (supine position versus alternative positions: lateral recumbent, upright position and water birth), severe postpartum hemorrhage (maternal blood loss > 500 ml), and postpartum infection. Infant outcomes were determined by APGAR score at 1 and at 5 minutes, using a cut off point of 7 as the minimal acceptable score, and arterial cord pH. Postpartal maternal infection was diagnosed mainly from clinical parameters such as maternal pyrexia, subinvolution of the uterus, ill-smelling discharge and the need for intravenous antibiotics. Additional indicators for maternal infection were leucocytosis and elevated CRP levels.

Perineal traumas were categorized using the traditional definitions of first-, second-, and third-degree perineal tear [10]. All perineal tears were confirmed by an experienced obstetrician-gynecologist and sutured under general, epidural or local anesthesia. Episiotomies were performed midline or mediolateral.

Table 2. Patient characteristics (n = 2704)

	Midwife group	Physician group	p-value
Maternal age*	28 (24–31)	28 (24–32)	n.s.
Gestational age, week*	40 (39–41)	40 (39–41)	n.s.
Parity			
Primiparous	359 27%	359 27%	
Multiparous	993 73%	993 73%	n.s.

*Median (25% and 75% quartile); *n.s.* not significant.

Table 3. Duration and management of labor of the clinical population

	Midwife group		Physician group		p-value
Length of 2nd stage, minutes*	61	(40–89)	66	(45–91)	n.s
Amniotomy					n.s.
Yes	186	13.8%	198	14.6%	
No	903	66.8%	890	65.8%	
Missing data	263	19.4%	264	19.6%	
Oxytocin stimulation					p = 0.0001
Yes	82	6.1%	358	26.5%	
No	1270	93.9%	994	73.5%	
Maternal position at vaginal delivery					p = 0.0001
Supine position	908	67.1%	1185	87.6%	
Lateral recumbent	182	13.5%	77	5.7%	
Upright position	222	16.4%	85	6.3%	
Water birth	40	3.0%	5	0.4%	
Maternal blood loss					n.s.
< 500 ml	1335	98.7%	1329	98.3%	
> 500 ml	15	1.1%	22	1.6%	
Missing data	2	0.2%	1	0.1%	
Postpartum infection					n.s.
Yes	10	0.7%	17	1.2 %	
No	1340	99.1%	1334	98.7%	
Missing data	2	0.2%	1	0.1%	

*Median (25–75% quartile); *n.s.* not significant.

The study was performed in accordance with the Declaration of Helsinki, as revised by the World Medical Assembly at Tokyo and Venice, and was approved by the institutional review board.

Statistical analysis

Chi-square tests were used to compare the frequency distributions of binary outcome variables between the group of women with midwifery service and the control group. Continuous variables were compared by T-test. P-values smaller than 0.05 were considered statistically significant. Univariate and multiple logistic regression models were used to evaluate the influence of delivery management and other potential risk factors on perineal injury. Odds ratios and 95% confidence intervals were estimated to describe the prognostic strengths of the factors considered in the regression models. The SPSS system was used for the calculations.

Results

During the study period the data of 2704 women (1352 midwife patients and 1352 physician patients) were available for analysis. In 69 cases the precoded study forms were not completed satisfactorily, and 113 midwife patients were handed over to the attending physician and thus excluded from the study. The reasons for interruption of midwife management and the mode of delivery of these patients are shown in Table 1.

Maternal outcomes

Characteristics of the study participants are shown in Table 2. Table 3 shows the duration and management of labor in the two populations. The use of oxytocin to augment labor was significantly reduced in women who selected a midwife as their primary birth attendant compared with women in the physician group (82/1352 vs. 358/1352; $p = 0.0001$). The length of the first stage (240 vs. 240 minutes; $p > 0.05$) and second stage (61 vs. 66 minutes; $p > 0.05$) did not differ significantly in the two groups. There was no significant difference in the rate of amniotomy (186/1352 vs. 198/1352; $p > 0.05$). Most women in both groups gave birth in supine position; however, significantly more alternative birth positions were used by midwife patients (444/1352 vs. 167/1352; $p = 0.0001$).

Table 4 shows the rates and sites of perineal trauma. A significantly lower rate of episiotomy was found in midwife patients than in physician patients (63/1352 vs. 235/1352; $p = 0.0001$). Furthermore, the frequency of perineal tears was significantly lower in women assigned to the midwifery service compared with women assigned to the physician group (288/1352 vs. 348/1352, $p = 0.006$). A trend towards reduction of severity of perineal trauma was found in midwife patients, but this difference did not reach statistical significance ($p = 0.06$). The occurrence of vaginal trauma (220/1352 vs. 231/1352; $p > 0.05$) and labial trauma (103/1352 vs. 106/1352; $p > 0.05$) was similar in the two groups. When analyzing severe postpartum

Table 4. Frequency distributions and sites of genital tract trauma

	Midwife group		Physician group		p-value
Perineal trauma					p = 0.006
1st degree	221	16.3%	264	19.5%	
2nd degree	63	4.7%	79	5.8%	
3rd degree	4	0.3%	5	0.4%	
Location of other trauma					
Vaginal trauma	220	16.3%	231	17.1%	n.s.
Labial trauma	103	7.6%	106	7.8%	n.s.
Episiotomy					p = 0.0001
None	1289	95.3%	1117	82.6%	
Median	11	0.8%	20	1.5%	
Mediolateral	52	3.8%	215	15.9%	

n.s. Not significant.

hemorrhage (blood loss > 500 ml; 15/1352 vs. 22/1352; p > 0.05) and postpartum infections (10/1352 vs. 17/1352; p > 0.05), there were no significant differences between the two groups.

Neonatal outcomes

Neonatal parameters (birth weight, birth length, head diameter, shoulder) were similar in both groups and are shown in Table 5. Significantly fewer infants of midwife patients had an APGAR score < 7 at 1 minute (5/1352 vs. 21/1352; p = 0.003) and a cord pH < 7.1 (36/1352 vs. 70/1352; p = 0.001). No significant differences in APGAR score < 7 at 5 minutes were observed between the two groups.

Risk factors for perineal injury

A logistic regression model was used to adjust for the effects of other factors shown to influence perineal lacerations. Both univariate and multiple logistic regression models showed that the absence of midwifery-led care (p = 0.006; p = 0.0001), maternal age (p = 0.011; p = 0.005), the absence of episiotomy (p = 0.0001; p = 0.00001) and a large head diameter (p = 0.019; p = 0.002) increased the risk of perineal tears (Table 6). In addition, the multiple logistic regression model revealed primiparity (p = 0.0001) as an independent risk factor for perineal tear.

Discussion

The ability of certified midwives to successfully provide prenatal care and delivery to low-risk pregnant women, with neonatal outcomes comparable to those of women attended by physicians has been demonstrated in this and several studies and contributes to the growing body of evidence in support of midwife care in a collaborative relationship with obstetricians [7–9].

The data of our study showed that women who selected a midwife as their primary birth attendant had a significant reduction of both oxytocin use and invasive interventions such as episiotomy. A significant decrease in perineal lacerations and a significantly higher rate of alternative birth positions were also observed in these women compared with those attended by physicians. No difference in the 5-minute APGAR score, using a cut-off point of 7 as the minimal acceptable score, was observed.

The relationship between midwives and obstetricians has traditionally been antagonistic [11]. On the one hand the midwife is likely to be the first person to detect abnormalities in labor and it is up to her to decide when to call for the obstetrician; on the other hand the obstetrician is responsible for the parturient woman [2]. According to the literature, it seems that prenatal and intrapartal care provided by certified nurse-midwives achieves obstetric outcomes equivalent to those of the traditional physician

Table 5. Neonatal outcomes (n = 2704)

	Midwife group		Physician group		p-value
Infant birth weight (g)*	3430	(3150–3720)	3410	(3100–3730)	n.s.
Infant birth length (cm)*	51	(50–53)	51	(50–53)	n.s.
Infant head diameter (cm)*	34	(34–35)	34	(33–35)	n.s.
Infant shoulder (cm)*	38	(36–39)	38	(36–39)	n.s.
APGAR score					
At 1 minute < 7	5	0.4%	21	1.6%	p = 0.003
At 5 minutes < 7	4	0.3%	1	0.1%	n.s.
Cord pH < 7.1	36	2.7%	70	5.2%	p = 0.001

*Median (25–75% quartile); *n.s.* not significant.

Table 6. Risk factors for perineal injury: results of univariate and multivariate logistic regression analyses

Risk factor	Univariate			Multivariate		
	OR	95% CI	p	OR	95% CI	p
Midwife care (physician care vs. midwife care)	1.282	1.072–1.532	0.006	1.629	1.340–1.979	0.0001
Parity (1 vs. 2 or more)	1.172	0.962–1.427	0.115	1.736	1.396–2.158	0.0001
Oxytocin (no vs. yes)	0.949	0.748–1.205	0.670	1.023	0.788–1.328	0.866
Episiotomy (no vs. yes)	11.324	5.797–22.121	0.0001	15.980	8.090–31.563	0.00001
Maternal age (yrs)	1.022	1.005–1.039	0.011	1.026	1.008–1.044	0.005
Head diameter (cm)	1.077	1.012–1.147	0.019	1.108	1.037–1.183	0.002

OR Odds ratio; *95% CI* 95% confidence interval; *p* p-value; *vs.* versus.

service [12], but some differences exist and were also found in our study:

A significant decrease in the use of oxytocin was observed in women who decided on a midwife birth attendant compared with women who chose physicians. This finding is in accordance with the data of Hueston and colleagues, who observed that multiparous women attended by physicians were twice as likely to receive oxytocin augmentation during labor [6]. In accordance with previous studies, there was no difference in the length of labor, in either the first or second stage, between midwife and physician patients [6, 9, 12]. Contrary to the findings of Hueston and colleagues, who observed that primiparous women attended by midwives were more likely to have an amniotomy, the amniotomy rates were similar in our two study populations [6].

In both groups most women gave birth in supine position; however, significantly more alternative birth positions were used by midwife patients. Recent studies have shown that women who decide on an alternative birth position feel more comfortable during labor and delivery and have less labor pain than women delivering in supine position [13–17]. However, in our opinion the best recommendation is to give the mothers the option of bearing in the position that is most comfortable for them.

As expected, midwives were less likely to use episiotomy for the delivery and were less likely to encounter perineal lacerations. These results are in accordance with previous studies [6, 9, 18, 19]. One may hypothesize that the lower episiotomy rate is due to the lower tendency of midwives to perform invasive interventions. Because the episiotomy rate and the rate of spontaneous perineal lacerations were significantly lower in midwife patients, midwife management is superior to physician management in overall trauma rates. Minimizing perineal trauma, which is often responsible for both short- and long-term morbidity, including perineal pain, painful intercourse, urinary and fecal incontinence, has enormous benefit for the new mothers.

Apart from the kind of labor management, we found that absence of midwifery-led care, primiparity, maternal age, absence of episiotomy and a large head diameter were independent risk factors for perineal injury, as described previously [20, 21].

There were no differences in severe postpartum hemorrhage or postpartum complications between the two services. These findings are consistent with the current literature [9].

Concerning neonatal parameters, significantly fewer infants of midwife patients had an APGAR score < 7 at 1 minute and a cord pH < 7.1. These findings are not in line with recent studies reporting similar APGAR scores at 1 and 5 minutes and a similar cord-pH in both study groups [6, 9, 12]. A possible explanation for our results could be that midwife patients with different complications at the end of the second stage of labor (e.g. pathologic cardiotocography) were handed over to physician management and thus excluded from the study, whereas physician patients with similar complications but ending in a normal vaginal delivery remained in the control group. In agreement with the literature, the APGAR score at 5 minutes was similar in both groups [6, 9, 12].

Because of the retrospective design of our study we are aware that definitive conclusions cannot be drawn, and further prospective randomized clinical trials are necessary to determine the real role of midwifery-led care in obstetrics.

In our opinion it is interesting that for most of the women with interrupted midwife care a normal vaginal delivery was possible and only a few patients required a cesarean section. These findings are of great importance as women, even in cases of interruption of midwife management, have a high probability of normal vaginal delivery.

In conclusion, this study clearly demonstrates the ability of certified midwives to successfully provide prenatal care and delivery to low-risk maternity patients, with neonatal outcomes comparable to those of physician patients. We therefore suggest that midwifery-led care is a safe and effective birthing alternative that should be offered to every low-risk pregnant woman. Furthermore, the expanded use of certified midwives in the hospital setting has deep implications for the delivery of health services to the maternity population. As care of the low-risk maternity patient is assumed by midwives, physicians will be free to concentrate on high-risk cases.

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