

Are First-Time Mothers Who Plan Home Birth More Likely to Receive Evidence-Based Care? A Comparative Study of Home and Hospital Care Provided by the Same Midwives

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ABSTRACT: **Background:** "Place of birth" studies have consistently shown reduced rates of obstetric intervention in low-technology birth settings, but the extent to which the place of birth per se has influenced the outcomes remains unclear. The objective of this study was to compare birth outcomes for nulliparous women giving birth at home or in hospital, within the practice of the same midwives. **Methods:** An innovative survey was generated following a focus group discussion that compared midwifery practice in different settings. Two groups of matched, low-risk first-time mothers, one group who planned to give birth at home and the other in hospital, were compared with respect to birth outcomes and midwifery care, and in relation to evidenced-based care guidelines for low-risk women. **Results:** Survey data (response rate: 72%) revealed that women in the planned hospital birth group ($n = 116$) used more pharmacological pain management techniques, experienced more obstetric interventions, had a greater rate of postpartum hemorrhage, and achieved spontaneous vaginal birth less often than those in the planned home birth group ($n = 109$). All results were significant ($p < 0.05$). **Conclusions:** Despite care by the same midwives, first-time mothers who chose to give birth at home were not only more likely to give birth with no intervention but were also more likely to receive evidence-based care. (BIRTH 39:2 June 2012)

Key words: birth place, evidence-based care, home childbirth, intrapartum care, midwifery, primiparas

The setting in which a woman chooses to give birth can be powerfully influential in determining the outcome of her labor. Evidence is growing that disturbances in the birth environment can potentially alter physiology by disrupting normal hormonal flows (1,2), and also that health professionals should not interfere in physiological birth for healthy women and babies. This evidence includes supporting an upright position in labor and birth (3–7), avoiding artificial rupture of the membranes (5,7,8), avoiding a time limit on labor and birth if all is well (5,7,9,10),

delaying cord clamping (7,11,12), and avoiding the procedure of newborn suctioning, even in the presence of meconium liquor (7,13). Healthy women with uncomplicated pregnancies can and do achieve safe and satisfying birth experiences when they labor in low-technology birth settings, with minimal or no intervention under the intelligent and watchful presence of a midwife (5,14).

In contrast, there is still widespread acceptance that a hospital setting with ready access to, and use of, technology is optimal for safe birthing. This

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contention has been challenged recently by several studies reporting reduced rates of intervention when women give birth in out-of-hospital settings. Procedures included the use of induction or augmentation of labor, electronic fetal monitoring, analgesics, assisted and surgical birth, and episiotomy (15–19). Higher maternal morbidity rates were reported in hospital cohorts in relation to increased rates of assisted or surgical birth (15–19).

The extent to which the setting for birth influences outcomes is difficult to determine. Some studies have controlled for parity (18,19) and others have not (15–17). In some studies, the same midwives have provided care at home and in hospital (15,16,19), whereas in others the midwives are different in the two settings (17,18). Two studies also contain a family physician comparison group in hospital (15,16).

Our study focuses on nulliparous women only who were matched for risk status. The same midwives provided care to women regardless of setting. Therefore, important sources of variation were controlled that permitted a more critical examination of differences between settings. The objective of this study was to compare outcomes for first-time mothers who gave birth at home or in hospital, within the practice of the same midwives. We also considered other dimensions of care that may contribute to outcomes, such as the use of complementary therapies and consultation practices of the midwives. The study included a focus group with midwives who discussed their perceptions of how the birth environment impacted on the care they provided; these results are reported elsewhere (20).

The study was undertaken in New Zealand, where 80 percent of women have a midwife as their maternity caregiver (21). Midwifery-led continuity of care is the norm and home birth is freely available and supported. Midwives who work in the community provide continuity of care and can support women to give birth either at home or in hospital. This unique context facilitated our ability to undertake this study.

Methods

A postal questionnaire was developed that aimed to compare labor care and birth outcomes for two groups of women, one who had planned home births and the other who had planned to give birth in hospitals where anesthetic, pediatric, obstetric, and surgical services were available. All study women were giving birth for the first time, were at low risk, and were cared for by the same midwives to minimize the influence of “practitioner philosophy” variance.

The survey questions were based on an audit tool in widespread use by midwives in New Zealand that is used to gather data relating to midwifery practice outcomes, and that forms part of every midwife's biennial practice review. The midwives in the focus group were invited to help design this questionnaire. After reading the first draft, they proposed distinguishing between a consultation in labor with another midwife and with an obstetrician. They also suggested adding a question about whether meconium-exposed babies were suctioned at birth. The draft survey was then pretested by three midwives who had not participated in the focus group; no further refinements were made.

Midwives participating in the survey were asked to supply labor and birth outcome data for their most recent 10 first-time mothers planning a home birth and their most recent 10 first-time mothers planning a hospital birth. The place of birth was defined as the planned place of birth at the onset of spontaneous labor. The survey asked about birth outcomes, including gestation at onset and length of labor, use of obstetric interventions, birth type, third stage outcomes, Apgar scores, and birthweights. In addition, it sought information on use of prelabor and in-labor complementary therapies; early labor visits by the midwife; the number of vaginal examinations in labor, and how many different caregivers had performed them on the same woman; the presence of meconium and practice relating to it; birth position and location; accoucheur; the number of people supporting the laboring woman; and the consultation practices of the midwives.

Ethical approval was gained from the New Zealand Multi-Region Health and Disability Ethics Committee. The study data collection took place between November 2006 and April 2007.

Study Participants

The two groups of women (planned home birth and planned hospital birth) were matched for parity (all first-time mothers) and risk status. Women were eligible if they had started labor spontaneously at term and were expecting a singleton baby. As they were suitable for primary care, they had no risk factors that would have necessitated transfer of clinical responsibility to a secondary caregiver.

Interest for participation in the survey was sought by means of existing midwifery e-mail discussion groups, advertising in the national midwifery newsletter, and through distribution of a flyer during a national midwifery conference. Eighteen questionnaires were posted to midwives who had expressed interest.

Thirteen replies were received (a response rate of 72%), yielding labor and birth data for 109 home birth mothers and 116 hospital birth mothers. Of the 13 replies, one midwife had no home birth clients who were first-time mothers; the 12 remaining midwives submitted data for 228 women. Not all the midwives submitted 10 cases in each group, as some did not have 10 first-time mothers who planned a home birth, and one midwife included only nine planned hospital cases. Three hospital cases were excluded because they had involved induction of labor and thus did not meet the inclusion criteria. The data from the final sample of 225 women (109 home births and 116 hospital births) were analyzed. Differences between groups were considered statistically significant where $p < 0.05$. The researchers relied on midwives' accurate reporting from their case notes; verification of survey data was not possible because all the submitted data were anonymous.

Data Collection and Analyses

Data were entered into the SPSS analysis program (22) and analyzed descriptively and inferentially. Differences between groups were sought using parametric (independent t test) and nonparametric (Mann-Whitney U , chi-square, and Fisher exact) tests. Additional descriptive and inferential analyses were performed on group subsets. Data were analyzed and are reported in this paper by an intention-to-treat process. Outcomes of women in the home birth group who transferred to hospital were analyzed within the home birth data set. No women in the planned hospital group gave birth at home.

Results

Study Participants

All study midwives were experienced; 10 of the 12 had over 10 years of midwifery practice experience (Table 1). Eight midwives also had a nursing qualification that reflected the length of time they had been in practice as direct entry education is a more recent qualification in New Zealand. Wide variation existed in the proportion of home to hospital births within their individual caseloads (1–66% home birth); three midwives had extensive hospital-employed practice experience, and five had never been employed in a hospital setting. The midwives practiced in a range of locations around New Zealand. Age distribution and ethnic origins of the two groups of women appeared similar, but some data were missing (Table 1).

Intervention and Outcome Data

Before the onset of established labor, approximately half of the women in each group used complementary therapies, or had a membrane sweep to stimulate the onset of labor. More women in the home birth group used acupuncture ($p = 0.022$) or homeopathy ($p < 0.001$), and the percentage having a membrane sweep

Table 1. Demographic Profile of the Midwives and their Cases

<i>Demographic Profile</i>	<i>No. (%) (n = 12)</i>		
Type of midwifery registration			
RGON/RM	4 (33.0)		
RCompN/RM	2 (17.0)		
BMid/RM	4 (33.0)		
ADN/RM	2 (17.0)		
Registered as a midwife (yr)	0 (0.0)		
0–5	0 (0.0)		
6–10	2 (17.0)		
11–15	1 (8.0)		
16–20	5 (42.0)		
21–25	0 (0.0)		
Over 25	4 (33.0)		
	<i>Mean (SD)</i>	<i>Median</i>	<i>Range</i>
Hospital-based practice (yr)	4.42 (6.39)	1.5	0–20 yr
Community-based practice (yr)	11.75 (4.67)	12.0	5–17 yr
Case load of home birth (%)	34.17 (23.23)	32.5	1–66
Case load of hospital birth (%)	50.00 (22.30)	50.0	13–90
<i>Demographic Profile of Women</i>	<i>Planned Home Birth Group</i>	<i>Planned Hospital Birth Group</i>	
Age range (yr)	(n = 90) 18–40	(n = 96) 16–38	
Mean (SD)	29.70 (5.37)	27.04 (6.29)	
Ethnicity	(n = 109) (100%)	(n = 116) (100%)	
Pakeha (European)	85 (77.9)	71 (61.2)	
Maori	9 (8.3)	18 (15.5)	
Pacific	4 (3.7)	5 (4.3)	
Other	11 (10.1)	12 (10.3)	
Missing	0 (0.0)	10 (8.6)	

*Because of the level of missing age and ethnicity data, no tests of significance have been applied.

RGON = Registered General and Obstetric Nurse; RM = Registered Midwife; RCompN = Registered Comprehensive Nurse; BMid = Bachelor of Midwifery; ADN = Advanced Diploma of Nursing.

was similar (home: 13.8%; hospital: 16.5%). The mean gestation at the onset of labor in the home birth group was 280 days (40 weeks \pm SD 8 days) and in the hospital group was 281 days (40 weeks 1 day \pm SD 9.2 days); this difference was not significant.

The mean length of the first stage of labor was similar for the two groups. At home the length was 7 hours 57 minutes (\pm 4.82 hr), compared with 9 hours 5 minutes (\pm 5.72 hr) in hospital; the difference was not significant. Women who planned to give birth in hospital were more likely to receive intravenous fluid therapy, and to have artificial rupture of the membranes (Table 2). On average they had one more vaginal examination performed ($p < 0.001$). Women planning to give birth at home were three times more likely to have no vaginal examinations in labor compared with those in hospital.

Midwives assisted women to manage their pain in labor differently between groups (Table 2). Water immersion was the most popular method chosen for managing labor pain, with 83 percent (planned home birth) and 67 percent (planned hospital birth) using a birth pool or bath during first stage. In the planned home group, 11.2 percent of women who used water immersion went on to use pharmacological pain relief compared with 42.3 percent of the planned hospital group. The 11 women in the planned home group who used a mix of pharmacological and nonpharmacological pain management techniques will have done so after transfer to hospital, because midwives in New Zealand do not carry pharmaceuticals (including nitrous oxide) for use in home birth.

The method of monitoring fetal heart rates differed between the groups (Table 2). Midwives used more intermittent auscultation with a hand-held Doppler device at home. Women were three times more likely to have intermittent or continuous cardiotocography if they planned a hospital birth (41%) than if they planned a home birth (13%). Those who had admission cardiotocography were more likely to experience a range of additional interventions, including referral to an obstetrician, intravenous fluids, continuous electronic fetal monitoring, episiotomy, ventouse birth, and active third stage management (Table 3).

The mean length of second stage was not significantly different between groups; planned for home 1 hour 28 minutes (\pm SD 52 min) and planned for hospital 1 hour 19 minutes (\pm SD 52 min). Of the one-third ($n = 37$) planned home birth women who had a second stage of over 2 hours, 28 stayed at home and 92 percent achieved a spontaneous vaginal birth. Of the 9 women who transferred, 6 had a spontaneous vaginal birth, 2 had assisted vaginal births, and 1 had a cesarean section. Less than one-fifth of the women in the planned hospital group had a second stage over

2 hours, of whom only 59 percent had a spontaneous vaginal birth; 9 women had an assisted vaginal birth. Thus, women planning a home birth were much more likely to achieve a normal birth if they had a second stage over 2 hours than women planning a hospital birth ($p = 0.006$).

In the total sample, 87.3 percent ($n = 196$) of the women achieved a normal birth. This rate contrasts markedly with the current national normal birth rate for first-time mothers of 61.3 percent (23). Overall, the number of normal births was significantly higher

Table 2. First Stage of Labor: Common Labor Interventions

Intervention	Planned Home Birth Group (n = 109) (100%)	Planned Hospital Group (n = 116) (100%)	p
Intravenous fluids	15 (13.7)	46 (39.6)	<0.001
Syntocinon augmentation	11 (10.1)	23 (19.8)	0.068
ARM	14 (12.8)	31 (27.0)	0.015
Number of vaginal exams			
Mean (SD)	1.89 (1.77)	2.61 (1.7)	<0.001
Median	1.00	2.00	
Range	0–9	0–8	
Pain management			
None	6 (5.5)	6 (5.2)	<0.001
Nonpharmacological only	92 (84.4)	58 (50.0)	
Pharmacological only	0 (0.0)	14 (12.1)	
Mixed	11 (10.1)	38 (32.7)	
Type of pain management			
Massage	35 (32.1)	27 (23.3)	
Acupressure	38 (34.8)	27 (23.3)	
Water	90 (82.6)	78 (67.2)	
Acupuncture	14 (12.8)	4 (3.4)	
Homeopathy	43 (39.4)	23 (19.8)	
TENS	1 (0.9)	1 (0.9)	
Entonox	4 (3.7)	25 (21.6)	
Pethidine	0 (0.0)	6 (5.2)	
Epidural	12 (11.0)	28 (24.0)	
Spinal	0 (0.0)	8 (6.9)	
Monitoring in labor			
Pinard only	2 (1.8)	0 (0.0)	<0.001
Handheld Doppler	91 (83.5)	68 (58.6)	
Intermittent CTG	2 (1.8)	21 (18.1)	
Continuous CTG	13 (11.9)	27 (23.3)	

ARM = artificial rupture of membranes; TENS = transcutaneous electronic nerve stimulation; CTG = cardiotocography.

Table 3. Outcomes Associated with Admission Cardiotocography—Planned Hospital Group Only

Intervention	No Admission, CTG Performed (n = 88) (100%)	Admission, CTG Performed (n = 28) (100%)	p
	No. (%)	No. (%)	
Referral to obstetrician	32 (36.3)	20 (71.4)	0.002
ARM	20 (22.7)	11 (39.2)	0.139
Syntocinon augmentation	16 (18.2)	7 (25.0)	0.606
Intravenous fluids	21 (23.8)	16 (57.1)	0.010
Continuous EFM	16 (18.2)	11 (39.2)	0.041
Epidural analgesia	18 (20.5)	10 (35.7)	0.165
Episiotomy	5 (5.7)	9 (32.1)	0.001
Ventouse	3 (3.4)	8 (28.5)	<0.001
Cesarean section	7 (8.0)	4 (14.3)	0.457
Active third stage management	34 (38.6)	20 (71.4)	0.005

CTG = cardiotocography; ARM = artificial rupture of membranes; EFM = electronic fetal monitoring.

among the planned home birth women, even though the same midwives cared for both groups (Table 4). One-fifth of the planned hospital group experienced an assisted or surgical birth compared with one-twentieth of the planned home birth group.

Women planning a home birth were more likely to give birth in an upright (kneeling, squatting, standing, or sitting) position ($p < 0.001$), and those in the planned hospital group were more likely to give birth reclining on a bed ($p < 0.001$). In both groups the birth was most commonly conducted by the midwife (home: 72.5%; hospital: 70.6%), but a significant difference was seen if the birth was conducted by someone other than the midwife: in the planned home group it was the baby's father (supported by the midwife) who more commonly did so, and in the planned hospital group it was a doctor ($p < 0.001$). No significant differences were seen between groups in relation to perineal outcomes (Table 4). Among the women who sustained a perineal laceration, it was more likely to be sutured if the woman gave birth in hospital than if she gave birth at home ($p = 0.048$).

Transfers from home to hospital occurred in 21 percent ($n = 23$) of births (Table 5). Of these women, 18 (16.5%) were in labor, and 5 (4.6%) were postpartum. It was not possible to discern from the data whether the transfers occurred during the first or second stage of labor. No postpartum transfers were made for postpartum hemorrhage; the one that occurred at home was managed there, and the other

Table 4. Second Stage of Labor Outcomes

Outcome	Planned Home Group (n = 109) (100%)	Planned Hospital Group (n = 116) (100%)	p
Birth type			
Spontaneous vaginal	67 (61.5)	65 (56.0)	0.007
Waterbirth	37 (33.9)	27 (23.3)	
Ventouse	1 (0.9)	11 (9.5)	
Forceps	1 (0.9)	2 (1.7)	
Cesarean section	3 (2.8)	11 (9.5)	
Total spontaneous vaginal birth	104 (95.4)	92 (79.3)	<0.001
Total assisted or cesarean section	5 (4.6)	24 (20.7)	
Birth position			
Upright* position	72 (66.0)	48 (44.0)	<0.001
Baby born on a bed	6 (5.5)	62 (56.8)	<0.001
Kneeling	36 (33.0)	25 (21.6)	
Squatting	19 (17.4)	12 (10.3)	
Sitting	13 (11.9)	10 (8.6)	
Standing	4 (3.7)	1 (0.8)	
Left lateral	5 (4.6)	3 (2.6)	
Reclining	32 (29.4)	65 (56.0)	
Accoucheur			
Woman herself	3 (2.8)	0 (0.0)	<0.001
Baby's father	12 (11.0)	4 (3.4)	
Student midwife	9 (8.3)	2 (1.7)	
Midwife	79 (72.5)	82 (70.6)	
Doctor	6 (5.5)	26 (22.4)	
Other	0 (0.0)	2 (1.7)	
Perineal outcomes			
Intact perineum	36 (33.0)	49 (42.2)	0.124†
Labial graze	14 (12.8)	9 (7.8)	
First-degree tear	31 (28.4)	23 (19.8)	
Second-degree tear	20 (18.3)	21 (18.1)	
Third-degree tear	2 (1.8)	0 (0.0)	
Episiotomy	6 (5.5)	14 (12.1)	
If tear sustained, was it sutured?			
Yes	50%	66.7%	0.048
No	50%	33.3%	

*Upright is the total of kneeling, squatting, sitting, and standing.

†Fisher exact test excludes cases where cesarean section was performed.

two recorded in the planned home birth sample were associated with assisted and cesarean birth after transfer to the hospital.

Although the third stage of labor was significantly longer in the home birth sample ($p = 0.007$) (Table 6), the use of oxytocic medications was greater in the

Table 5. Transfer Indications—Planned Home Group Only

<i>Transfer Situation</i>	<i>Number (n = 23) (100%)</i>
In-labor transfer indication*	<i>n</i> = 18 (100%)
Slow progress	13 (72.3)
Fetal heart rate abnormalities	2 (11.1)
Antepartum bleeding	1 (5.5)
Maternal request	4 (27.7)
Outcomes for in-labor transfer	<i>n</i> = 18 (100%)
Spontaneous vaginal birth	13 (72.3)
Forceps	1 (5.5)
Ventouse	1 (5.5)
Cesarean section	3 (16.7)
Postpartum transfer indication	<i>n</i> = 5 (100%)
Suturing of third-degree tear	2 (40.0)
Baby concern	2 (40.0)
Retained placenta	1 (20.0)
Postpartum hemorrhage	0 (0.0)

*Figures do not add to 100% because some women had multiple indications for transfer.

Table 6. Third Stage of Labor Outcomes

<i>Characteristic</i>	<i>Planned Home Group (n = 109) (100%)</i>	<i>Planned Hospital Group (n = 116) (100%)</i>	<i>p</i>
Mean length of third stage			
Mean (SD)	25 (24 min)	16 (24 min)	0.007
Range	1–185 min	1–192 min	
Mean blood loss			
Mean (SD)	249 (139 mL)*	350 (310 mL)*	0.002†
Range	50–800 mL	30–1,500 mL	
Management			
Physiological (expectant)	81 (74.3)	50 (43.1)	<0.001
Active	17 (15.6)	54 (46.6)	
Treatment	11 (10.1)	12 (10.3)	
Postpartum hemorrhage (>500 mL)	3 (2.7)	14 (12.0)	0.017

*Blood loss values were missing in 3 home birth cases (*n* = 106) and in 1 hospital case (*n* = 115).

†Three hospital cases reported blood loss of 1,500 mL; t test was repeated with these outliers excluded, and the result remained statistically significant, *p* = 0.005.

hospital (*p* < 0.001), and the planned hospital group experienced significantly more postpartum hemorrhage (*p* = 0.017). Given that the same midwives provided care in both settings, it is unlikely that there was differential reporting of blood loss.

No differences were reported with respect to Apgar scores, birthweights, need for resuscitation, urgent or nonurgent referrals to pediatricians, or admission to special care or neonatal intensive care units. We acknowledge that our sample size is too small to detect statistically significant differences in these outcomes. Two areas of difference were identified in relation to the babies. First, although no difference was reported in the number of babies in each group who were meconium exposed—7 in the planned home birth group, and 14 in the planned hospital group—those in the latter group were significantly more likely to be suctioned than those in the former group (14% vs 78%, respectively) (*p* = 0.016). Second (from the total sample), of the 196 babies who experienced normal births, 95 percent (*n* = 186) breastfed within their first hour of life. Of the 29 babies who were born by ventouse, forceps, or cesarean section, 59 percent (*n* = 17) breastfed within an hour (*p* < 0.001).

Support for the Woman in Labor

Apart from one woman in the hospital group who was unaccompanied, all the women had at least one support person present in labor. Women at home tended overall to have more support people present, and the difference was almost statistically significant (*p* = 0.051). No difference was seen in the mean total length of labor between groups; home: 9 hours 10 minutes (\pm SD 5 hr 4 min) and hospital: 10 hours 27 minutes (\pm SD 5 hr 43 min). However, the midwives spent significantly longer in attendance with women who gave birth in hospital, compared with when they attended women who gave birth at home (*p* = 0.014). At home, midwives spent on average 8 hours 40 minutes present (\pm SD 4 hr 21 min) and in hospital 10 hours 8 minutes (\pm SD 4 hr 32 min).

Consultation Practices of the Midwives

When midwives were practicing at home, they consulted with another midwife before consulting with an obstetrician significantly more often than when practicing in hospital (*p* < 0.001). When practicing in the hospital, midwives more often first consulted with a medical colleague (*p* < 0.001). From the total sample (*n* = 225), in situations where a midwife consulted with another midwife *in addition* to an

obstetrician, which occurred in 30 cases, 67.7 percent ($n = 20$) of the women achieved a normal birth. When a midwife consulted directly with an obstetrician without prior discussion with another midwife (39 cases), 51.2 percent ($n = 20$) achieved a normal birth. This finding suggests two possibilities: first, that in situations where labor becomes complex and referral is required, having another midwife involved appears to be protective of normal birth, and second, midwives consult directly with an obstetrician when the problem is deemed serious enough to require rapid intervention. In either case, midwives' commitment to the well-being of mothers and babies is demonstrated.

Discussion

Consistent with the findings of other similar studies (15–19), our study found that higher rates of many obstetric interventions occurred when women chose to give birth in the hospital. These findings also appeared to show that midwives practice more evidence-informed midwifery when they are working in a home setting than in a hospital setting. For example, at home these midwives supported physiological birthing by allowing time for events to unfold without (for the most part) interference. Women's membranes most often ruptured spontaneously, and the women generally enjoyed supportive physical care in the form of massage, acupressure, and water immersion. Healing modalities based on transforming energy were used in the form of acupuncture and homeopathy.

Invasive vaginal examinations were kept to a minimum. The babies' well-being was monitored in such a way that women remained free to be mobile or immersed in water. During the birthing phase, no time limits were applied, with the result that almost all the women achieved spontaneous births. When babies were exposed to meconium, they were mostly observed at birth and not routinely suctioned. Management of the birth of the placenta was the only aspect of care in which midwives deviated from accepted best practice.

The evidence is overwhelming in support of these forms of care. Artificial rupture of the membranes has been shown to increase the pain of labor, resulting in more use of epidurals. Women's perception of having their membranes ruptured is one of interference with their physiological experience (5), which can result in an increase in cesarean section and fetal distress (24). A recent systematic review (8) and National Institute for Clinical Excellence (NICE) Guideline (7) concluded that artificial rupture of membranes should not be routinely offered to women as part of standard care in labor, given the associated risks of potential fetal heart rate and cord problems.

Several studies have described a relationship between vaginal examination and an increased risk of introducing pathogenic organisms to the birth canal (25–27). Hence, it is important to minimize the number of vaginal examinations in labor to avoid infection. They can also be particularly disturbing to women who have a history of sexual abuse or post-traumatic stress disorder (5). The low rate of vaginal examinations among so many study women attests to the midwives' use of other skills to assess labor progress without detriment to birth outcomes.

Although no evidence is available to support the routine use of an admission cardiotocography for low-risk pregnant women (7), one-fourth of women in the planned hospital birth group underwent an admission cardiotocographic procedure. Significant differences in rates of subsequent interventions in labor were shown between those who did and did not have cardiotocography.

The evidence about care in the second stage of labor strongly supports allowing women time to achieve a spontaneous birth. Systematic reviews have found no evidence to support terminating second stage by operative delivery for duration alone, as no association has been reported between the length of second stage and adverse neonatal outcomes and increasing maternal morbidity may be associated with operative birth (9,10,28–30). Meta-analyses of upright birth positions have been shown to result in fewer episiotomies, assisted births, and fetal heart rate abnormalities and also to reveal shorter second stages (3,4,6). Recent evidence refutes the practice of suctioning meconium-exposed babies, as it does not decrease the incidence of meconium aspiration syndrome (13).

In addition, the acceptance of active management of the third stage of labor as an important contributor to the prevention of postpartum hemorrhage has been widespread since the Bristol trial of 1988 (31). A recent Cochrane review (32) reaffirmed this stance. In our study, expectant management of the third stage was much more common in the planned home birth group, reflecting local practice guidelines (33), and this group had significantly less postpartum hemorrhage than the hospital group, who more often experienced active management. This finding is congruent with the results of a large cohort study, also from New Zealand, which demonstrated a lower postpartum hemorrhage rate among women who experienced a physiological third stage (34). Another recent study found no differences in postpartum hemorrhage rates when comparing practice among maternity providers in British Columbia (35). In that study midwives also more commonly adopted an expectant approach to third stage care when compared

with family physicians and obstetricians. Current recommendations favoring active management of the third stage are largely derived from studies that have taken place in hospital settings. As evidence becomes increasingly available about third stage outcomes in out-of-hospital settings, expectant care for well women with uncomplicated pregnancies and physiological labors may become examinable as an optimal pathway of care. The mean increase in the length of third stage (9 min) is short when balanced against the benefits to the women and babies in the home group: less blood loss, increased delayed cord clamping with its benefits to the transition for the baby (11), and enhancement of the undisturbed moments after birth so critical for hormonal imprinting (1,2).

Limitations

Some study limitations should be mentioned. The midwives who completed the survey were self-selected, and they provided both home and hospital birthing services and may have reported biased results. We requested that they provide data for their *last 10* first-time mothers in each birth setting who labored spontaneously, so we are reasonably confident that they did not choose their cases to reflect an enthusiasm for physiological birth. It also is not possible to discern from the data any attitudinal differences between the women who chose to give birth at home and those who chose to give birth in hospital. Booking with these particular midwives who strongly articulated a physiological birth philosophy might indicate that all these women were committed to achieving a natural birth in whichever birth setting they chose, but we have no way of ascertaining if this was the case. The different birth place choices *per se* indicated the possibility of some attitudinal differences and may have affected the study findings. It is also important to bear in mind that these findings relate to a small group of experienced midwives, and that the midwifery population at large may not share the same commitment to physiological birth as this group.

The small size of this descriptive study is also a limitation. We retrospectively described birth outcomes for over 100 women in each group, and were able to demonstrate significant differences in labor and birth outcomes between the planned home birth women and a similar sample planning to give birth in hospital. This information is useful to broaden our understanding, but a larger prospective study would have greater statistical power and external validity. Although questions remain about the feasibility of randomization in place-of-birth studies, making prospective inquiry complex, we believe that

these retrospective data have value in providing an encouraging glimpse of what is possible.

We acknowledge that the factors which contribute to birth outcomes are a complex matrix including the beliefs and attitudes of the laboring woman, her support people and caregiver(s), the setting and personnel for birth, and the nature of the interactions among all these factors. The care that women receive in this context can influence the choices and decisions they make. We argue that offering women care that is evidence-based appears to be easier for midwives when they are supporting women to give birth at home rather than in the hospital, with the possible exception of third stage care. Although emerging research suggests the possibility that best practice in third-stage care could include expectant management in settings where women have experienced physiological labor, the midwives in this study deviated from globally accepted guidelines that recommend active management.

Further research is needed to ascertain if it is possible to assess whether attitudinal differences between women who choose to give birth at home and those who choose to give birth in the hospital contribute to the disparate outcomes that many studies have described. Even though in this study we were unable to control for possible attitudinal differences, the focus for this article is about the provision of evidence-based care. It has demonstrated that midwives seem more able to offer care consistent with current understandings of how best to support physiological birth when practicing in home settings.

Implications for Practice

It seems that when midwives practice in the hospital, it is less easy for them to use the same level of evidence-based care as when practicing at home. They need to take responsibility for making the referrals that so commonly lead to increased interventions, and call on their midwife colleagues to support them in applying evidence-based care. Given midwifery's stated commitment to support and protect normal birth, and bearing in mind the resource implications of highly medicalized care, how can health professionals use this information to encourage change?

Incremental progress might be made in changing the powerful medical culture that exists in hospitals, but because few options exist for primary birth places and care is increasingly concentrated in secondary and tertiary hospitals, intervention rates will continue to climb (23). Given this culture and environment, it seems unlikely that the behavior of midwives can change sufficiently to improve women's birth experiences. The

best opportunity midwives have for influencing change is to educate women about their choices in birth setting and what types of interventions can be anticipated in each.

These findings support those of other studies comparing outcomes between home and hospital settings. The qualitative aspect of this study, reported elsewhere (20), provides some additional appreciation of how midwifery practice is shaped by the women's chosen birth setting. Our quantitative outcomes agree with the findings of a large cohort study (16), in which the outcomes for the hospital-based midwives were more closely aligned with those of their family physician colleagues than they were for *themselves* practicing at home (in the sense that the midwives' outcomes were different between the two settings). Further research is warranted to explore how evidence is applied in all clinical settings and how midwifery practice is shaped by the care setting.

Conclusions

Despite receiving care by the same midwives, the first-time mothers in this study who chose to give birth at home were not only more likely to give birth with no intervention but were also more likely to receive evidence-based care. The structure of the maternity system in New Zealand is underpinned by the belief that the woman is the center-point of any care provided. The woman's caregiver follows her to her chosen birth place, and not vice versa. This context enables researchers in New Zealand to be better able to isolate the effects of the birth place. The study provides information that women and their families may find useful to assist their decision-making. Women use what is around them to support their birthing, including the participation of their family members as desired. If "what is around" is technology and pharmacology, it is not surprising that the woman finds it attractive when she reaches the demanding part of giving birth. This research may contribute to the process of enabling a shift in women's attitudes about birth place choices, because it shows that birth without technology is both safe and achievable.

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