Interventions in midwife led care in the Netherlands to achieve optimal birth outcomes:

Effects and women's experiences

Marlies Rijnders

INTERVENTIONS IN MIDWIFE LED CARE IN THE NETHERLANDS TO ACHIEVE OPTIMAL BIRTH OUTCOMES: EFFECTS AND WOMEN'S EXPERIENCES

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CONTENT

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Introduction

Introduction

Culture, history, politics and policy have led to very different ways of organising maternity care in different countries. To date, limited research exists as to how these different contexts relate to the way women feel about their experiences of giving birth. The Dutch maternity care system is internationally renowned for its high level of home births and a non-interventionist policy (1-3). It is characterised by a strong independent midwifery profession (4), a belief in the normality of childbirth (4-6), a positive attitude towards home births (7;8) and low obstetric intervention rates compared to other European countries. In 2007 the Dutch home birth rate was 24% (9) and the Caesarean section rate 15% (10). It is assumed that this so called social model of maternity care is associated with more positive psychosocial states for women (3;11).
One factor within the Dutch maternity care system that is likely to influence women's experiences to a large extent is referral to a different caregiver (12;13). Referral from primary midwife-led care to secondary obstetrician-led care is very common. During pregnancy 32% of women who started their prenatal care with a midwife are referred and another 11% are referred during labour (10). Therefore, referral can be considered one of the most important medical interventions in primary care that is aimed at improving maternal and neonatal outcomes. Like other medical interventions, referral of care has side effects. Women who remain in primary care maintain their choice of place of birth, are more likely to have autonomy in birthing positions and will be looked after by the caregivers they got to know during pregnancy. Furthermore, referral in itself is associated with more negative birth experiences (12;13). Taking into account the implications of the specific features of Dutch maternity care for the well-being of women, it is all the more surprising that minimal research has been carried out investigating Dutch women's experiences of birth and maternity care. And although one can debate whether experiences of women with pregnancy and birth are not somewhat universal, it is almost certain that interpretations and implications of research are limited by the setting in which the research was carried out, the ways in which questions were asked and the cultural norms that govern people's responses (14). One objective of this thesis was to make a contribution to the scientific knowledge of women's experiences with maternity care in the Netherlands.

Aim of this thesis
This thesis aims to provide insight into women's experiences and feelings about birth and maternity care in the Netherlands. Furthermore, it aims to gain insight into rates, effects and women's experiences of two medical interventions in primary care, i.e. external cephalic version and amniotomy for induction of post date pregnancy.

Research questions

1. What perinatal factors are related to women's appraisal of birth on the long term?
2. What is the effect of place of birth, referral and continuity of care and caregiver on women's recalled emotions during birth?
3. Do women in the Netherlands, who had an emergency caesarean section, look back differently at their birth experience than women in England who had an emergency caesarean section?
4. What are the trends and patterns of referral from midwives to obstetricians within the Dutch maternity care system from 1988 to 2004 and what are the differences in referral patterns between nulliparous and parous women?
5. What are the success rate, safety and effectiveness of external cephalic version without tocolysis performed in a specialised midwifery centre in the Netherlands?
6. What are the prevalence, outcome, and women's experiences of external cephalic version in a low-risk population?
7. What are the effects and women's experiences with amniotomy at home for induction of labour for post date pregnancy?
8. What is known in the literature on women's expectations, preferences and experiences with pregnancy, birth and interventions in primary care in the Netherlands?

Outline of thesis

The research questions are answered in chapter 2 to 9.

In **chapter 2** the results are described of a retrospective cohort study in 2004 among 1309 women in eight midwifery practices. A questionnaire was mailed to all women who had given birth in 2001 and who had at least one prenatal, perinatal, or postnatal visit to the participating midwifery practice. In **chapter 3** the effect of place and mode of birth, referral, continuity in care and care giver on women's emotions during birth are described. Data were derived from the same dataset as used in chapter 2.

In **chapter 4,** a comparison is made between women's retrospective experiences with birth in the United Kingdom and the Netherlands. As women's appraisals are likely to be influenced by the culture in which they give birth and the predominant norms at that time, it was hypothesised that Dutch women who had an emergency caesarean birth would look back more negatively on the experience than women in England.

Referral during birth is an important factor in women's appraisal of birth. To gain a better understanding of the magnitude of this factor, the data of 1 977 006 pregnancies in the Dutch midwifery database (LVR1) were analysed for trends in referral rates over the years 1988-2004. Results are presented in **chapter 5**.

In **chapter 6, 7 and 8** the effects of two interventions in pregnancy are described. Both interventions are aimed at the prevention of referral during pregnancy or birth, thus maintaining women's options in choice of birth place, care giver and related choices in the birth process (such as birthing positions).
In **chapter 6** the results are presented of an effective intervention to prevent breech presentation during birth. A retrospective cohort study was conducted into all (n=924) external cephalic versions (ECV) performed between 1996 and 2000 in a specialised midwifery centre. Success rate and complications are described.
Although ECV is proven to be an effective and safe intervention, the success of implementation of ECV in the Netherlands is unknown. Therefore, in **chapter 7** the results are presented of a prospective study into the prevalence of ECV in the Netherlands. Between June 2007 and January 2008 all women with a suspected breech presentation at 34 weeks gestation in 46 midwifery practices throughout the Netherlands were followed. Furthermore the experiences of women who received an ECV were asked about their experiences with ECV. In **chapter 8** the results are presented of a randomised controlled trial conducted in 43 midwifery practices, looking at birth outcomes and women's experiences, after a more experimental intervention to prevent referral in pregnancy: amniotomy at home for near post dates pregnancy.
In **chapter 9** a summary is presented of the literature identified in Pubmed or Midirs that address women's preferences, expectations and experiences with birth, maternity care and interventions in low risk pregnancies in the Netherlands. Excluded are studies addressing women's preferences, expectations and experiences with prenatal screening, (treatment for) miscarriage or stillbirth, or preconception care.
Finally, the results of our findings are summarized and discussed and implications for practice and further research are being presented.

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2

Perinatal factors related to negative or positive recall of birth experience, in women three years postpartum in the Netherlands

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Abstract

Background

Little research has been conducted to date on women's postnatal emotional well-being and satisfaction with the care received in the Netherlands. The aim of this study was to investigate Dutch women's views of their birth experience 3 years after the event.

Methods

A questionnaire was mailed to all women who had given birth in 2001 and who had at least one prenatal, perinatal, or postnatal visit to the participating midwifery practice. Women who had a subsequent birth after the index birth in 2001 were not excluded. We specifically asked respondents to reflect on the birth that occurred in 2001. Women were asked to say how they felt now looking back on their labor and birth, with five response options from ''very happy'' to "very unhappy".

Results

We received 1,309 postnatal questionnaires (response rate 44%). The sample was fairly representative with respect to the mode of delivery, place of birth, and obstetric interventions compared with the total Dutch population of pregnant women; however, the sample was not representative for ethnicity and initial caregiver. Three years after delivery, most women looked back positively on their birth experience, but more than 16 percent looked back negatively. More than 1 in 5 primiparas looked back negatively compared with 1 in 9 multiparas. Adjusted odds ratios (OR) for looking back negatively 3 years later included having had an assisted vaginal delivery or unplanned cesarean delivery (OR 2.6, 95% CI 1.59–4.14), no home birth (OR 1.4, 95% CI 1.04–1.93), referral during labor (OR 2.4, 95% CI 1.48–3.77), not having had a choice in pain relief (OR 2.9, 95% CI 1.91–4.45), not being satisfied in coping with pain (OR 4.9, 95% CI 2.55–9.40), a negative description of the caregivers (OR 2.9, 95% CI 1.85–4.40), or having had fear for the baby's life or her own life (OR 2.3, 95% CI 1.47–3.48).

Conclusions

A substantial proportion of Dutch women looked back negatively on their birth experience 3 years postpartum. Further research needs to be undertaken to understand women's expectations and experiences of birth within the Dutch maternity system and an examination of maternity care changes designed to reduce or modify controllable factors that are associated with negative recall.

Key word

Experience with birth, Dutch, long-term, recall

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Introduction

As patient satisfaction with health care delivery receives increasing attention, women's experiences of childbirth have become of interest to researchers in Western countries. The experience of childbirth is an important life event that may affect women's short (1) and long-term well-being (2,3). It may influence both the mother-child relationship (4,5) and the mother-partner relationship (6). Negative birth experiences can also influence reproductive choices (7–9) or preferred management during subsequent deliveries, such as a request for a cesarean section (10–12). Furthermore, they may increase the risk of depression either after birth or around the time of the next pregnancy (13,14).

Several factors have been associated with level of satisfaction, such as age at labor and level of education (15), pain level during labor (16), sense of being in control (16,17), support from a partner (15,16), caregiver support (18), and satisfaction with the birth environment (15). Women's recollection of actual birth events does not change much over time (2), but women seem to rate their birth pain as more severe directly after birth than a year or more later (1). Conversely, they rate negative events more negatively a year or longer after birth than directly after birth (1,2).

The Dutch maternity care system is viewed by many as a model of care in which support, informed choice, continuity of care, and potential for the woman to be in control are essential elements (19– 21). In this system, low-risk women have a free choice for the place of birth, that is, at home or in the hospital under the supervision of a midwife. Low-risk Dutch women receive care during pregnancy, birth, and the postnatal period from a limited number of caregivers collaborating in independent midwifery practices. It is often assumed that this model leads to more feelings of control by the woman and a higher level of satisfaction with pregnancy and birth compared with other models of care (19–22).

However, when complications arise or a woman is considered to be at risk for an adverse pregnancy outcome, she will be referred to a hospital for further obstetric care. The consequence of a referral is that the woman will no longer receive care from her primary caregiver or, at least for the duration of the referral period, will often not have further contact with this caregiver. Failure to receive continuous support during labor can lead to lower satisfaction with the childbirth experience (23).

Approximately 85 percent of all pregnant women in the Netherlands start prenatal care in a primary care setting, mostly an independent midwifery practice. Twenty-eight percent are referred to an obstetrician during pregnancy and 17 percent during birth (24). The result is that of all Dutch women, only 40 percent receive all perinatal care from an independent midwife, which implies that for most women, factors within the

Dutch maternity care system that supposedly maximize the chance of a good birth experience (i.e., continuous support and freedom of place of birth) will be minimized in situations of potential labor complications and possible maternal distress. These situations increase the likelihood that a woman will perceive her birth experiences negatively (16).

Only a few studies in the Netherlands have addressed the issue of satisfaction with childbirth and perinatal care. Referral during labor has been shown to lead to more negative perceptions of birth experiences compared with not being referred (25,26). No difference was found among referrals during a planned home or a planned hospital delivery on the woman's experience of birth, her satisfaction with the midwife, well-being in the direct postpartum period (25,26), or well-being 6 months postpartum (25). Of women who were not referred during birth, both multiparas and nulliparas with a planned home birth were more satisfied with the care provided by a midwife and nulliparas who delivered at home were also more satisfied with the postpartum care than those with a hospital birth (26).

In the present study, we investigated how Dutch women look back at birth 3 years postpartum. We studied ''looking back at birth'' in relation to maternal demographic factors and perinatal factors, such as mode of delivery, use of pain relief, and referral during pregnancy, birth, or the postpartum period, in addition to subjective factors, such as satisfaction with the caregiver and recall of pain during labor.

This study was originally conducted to investigate women's long-term perception of birth in relation to mode of delivery in the Netherlands compared with the United Kingdom. It was hypothesized that women's appraisals of their birth experience would be different in cultures with different birth norms. Specifically, it was hypothesized that women in the Netherlands who had a surgical birth would be less happy looking back on their experience than similar women in the U.K., where the incidence of cesarean section is much higher and such births may therefore be more widely anticipated. The Dutch study that is reported in the present paper built on a U.K. study by Baston (27), which was a 3-year follow-up of women who had taken part in a large prospective study Greater Expectations? in 2000 (28). Other publications comparing the English and Dutch data are in preparation.

Methods

Sample

Eight primary care midwifery practices from across the Netherlands were invited to participate; they were randomly selected from the Dutch Midwifery Association Registration. A sampling frame was used to recruit practices with different levels of

urbanization based on the number of addresses per square kilometers. For this study, we used three categories: urban (at least 1,500 households/km^2), semiurban (1,000–1,499 households/km^2), and rural (<1,000 households/km^2). Of all 8 practices agreeing to participate, 2 were urban, 3 semiurban, and 3 rural.

The sample comprised women who had given birth in 2001 and who had at least one prenatal, perinatal, or postnatal visit to the participating midwifery practice. By using this method, women were included if they received care from a midwife only or from both a midwife and an obstetrician. Women who had a subsequent birth after the index birth in 2001 were not excluded. We specifically asked respondents to reflect on the birth in 2001. Women were excluded if it was known to the midwife, either from the perinatal record or from any other source, that they had experienced a perinatal death or a deceased child in the past 3 years. Data about parity, mode of delivery, type of caregiver, and urbanization level were collected about all women before they were sent the questionnaire. Women received only one mailing. No second attempt was made to acquire data from nonresponders due to time and money constraint. Approval of a medical ethics board was not required in the Netherlands because no invasive procedures were involved.

Our aim was to recruit a sample that contained sufficient numbers of women with each mode of delivery to permit comparison with the U.K. sample (27). To achieve this goal, we had to be aware of different cesarean delivery rates: 15 percent in the Netherlands (30) compared with 26 percent in Baston's study (27). We also anticipated different response rates due to the different methodologies employed (29). U.K. women had been recruited into the original study when pregnant and then approached again 3 years later. Reminders had been sent to nonresponders. In the Dutch study, the initial approach to women was 3 years postpartum and no reminders were sent. We had little basis for estimating the response rate under these circumstances and made the conservative assumption of 40 percent. On this basis, we calculated that we needed to approach 3,200 women.

Questionnaire

For the Dutch study, the questionnaire used in the 3-year follow-up of Greater Expectations? (27) was translated. Questions related to the maternity system were added or altered to adapt the questionnaire for the Dutch situation. The questionnaire contained 26 open and 140 closed questions that addressed demographics, the organization of perinatal care, mode of labor and delivery, experiences with cesarean section, medical interventions during labor, experiences with childbirth, experiences with the caregivers, pain relief during labor, postpartum period emotional well-being 3 years after the birth, the women's relationship with her child and her partner,

experiences with breastfeeding, and decisions concerning reproduction.

One of the key questions that addressed positive or negative recall in the questionnaire was ‘‘How do you feel when you look back on your experience of birth in 2000?’’ Women were given five response options: ‘‘I’m very happy with the way things went,’’ ‘‘I’m quite happy with the way things went,’’ ‘‘I have no particular feelings,’’ ‘‘I am quite unhappy with the way things went,’’ and ‘‘I am very unhappy with the way things went.’’ For analyses, the outcome for recall of birth was dichotomized. As in Baston’s study (27), ‘‘I am quite unhappy with the way things went’’ and ‘‘I am very unhappy with the way things went’’ were labeled as looking back negatively or negative recall and other responses as looking back positively or positive recall.

The questionnaire presented women with a list of 15 adjectives, as used in the three original Greater Expectations? study (28), and asked them to circle all the words that described any of the staff seen during labor. The descriptive words could be used for any or all the caregivers involved. If 30 percent or more of the words chosen were negative, then that woman’s description of caregivers was defined as negative.

Only the translation of the adjective checklists was carried out by official native-speaking translators in a forward and backward way. The procedure was conducted by an officially licensed translation center. We considered the other questions very straightforward and not requiring specialized translation.

Data Analysis

Univariate analysis was carried out using the chi-square test for categorical variables and one-way analysis of variance for continuous variables. We selected variables based on theoretical or clinical perspectives and entered them into a logistic regression model using backward stepwise selection. This method started with all variables in the model. At each step, the variable that was the weakest predictor of the outcome variable was removed from the model. For each variable in the model, the significance level was then calculated for a change in -2 log likelihood of the model if the variable was taken out. If the significance level for a change in -2 log likelihood was above 0.1, the variable was removed.

As an independent variable to control for social adversity in the regression analyses, we constructed a composite variable ‘‘background’’ based on the variables of marital status, education, and ethnicity. A woman was considered to have a background ‘‘at risk’’ for obstetric or psychosocial outcomes if she had at least one of the risk factors: single, low education level, or non-Dutch origin (15,16,30,31).

All statistical tests were two tailed, and p values less than 0.05 were considered statistically significant. SPSS version 11.5 for Windows was used for data analysis (32).

Results

Of the 3,200 postal questionnaires that were sent, 228 were returned unopened because the respondent no longer lived at that address and 1,310 questionnaires were returned, resulting in a 44 percent valid response rate, with a 21 to 53 percent range per midwifery practice. Table 1 shows the basic characteristics of the respondents.

The basic characteristics of our sample were compared with data from the Dutch Perinatal Registry (24,30) to estimate whether our sample was representative for the Netherlands. Our sample was reasonably representative for mean age at birth, parity, mode of delivery, place of delivery, and moment of referral. However, it contained more Dutch respondents and women starting labor with their midwife. In our sample, levels of urbanization (urban, semiurban, and rural) were divided equally over the group. Reference data for marital status and education were not available. The nonresponders differed from the responders only in parity, with the latter group containing slightly fewer primiparas (42% vs 48%).

Table 1: Basic Characteristics of the Study Respondents at 3 Years Postpartum and of the Reference Group

Characteristic	**Respondents** *No. (%) or {SD}*	**Reference Group** *%*
Parity (n = 1,227)		
Primiparous	580 (44.3)	47.1*
Multiparous	728 (55.7)	52.9*
Age (yr) (n = 1,297)		
Mean	31.3 {4.01}	30.3*
Education (n = 1,294)		
Low	257 (19.8)	NA
Middle	556 (42.8)	
High	487 (37.5)	
Marital status (n = 1,309)		
Married/living together	1,230 (94)	NA
Single, divorced, widowed	79 (6.0)	
Ethnicity (n = 1,309)		
Dutch	1,231 (94.6)	84.8*
Not Dutch	70 (5.4)	17.7*
Mode of delivery (n = 1,309)		
Vaginal spontaneous	991 (75.7)	73.4†
Vaginal assisted	146 (11.2)	11.6†
Cesarean section	172 (13.1)	15.0†
Place of delivery (n = 1,309)		
At home	439 (33.6)	30.3*
In hospital	870 (66.4)	69.7*
Referral (n = 1,293)		
None	634 (48.9)	45.7*
During labor	264 (20.4)	16.8*
During pregnancy	395 (30.6)	27.5*

* Data from De Galan-Roosen Tet. Dutch National Perinatal Data Registry [Perinatal Care in the Netherlands 2001. Foundation Perinatal Registry Netherlands. Bilthoven 2005] (30).

† Data from the Dutch National Perinatal Data Registry of 182,729 pregnancies in 2001.

NA = not applicable.

Birth Experience Recall 3 Years after Delivery

Most women said that they could remember the birth in 2001 ‘‘very clearly’’ (35%) or remembered ‘‘most things’’ (59%). Only 7 percent stated that ‘‘only a few things were clear.’’ Most women (83%) looked back positively on their birth experience, saying they were very or quite happy with the way things went during birth. However, 16.5 percent answered that they were very or quite unhappy with the way things went during birth. More than 1 in 5 primiparas looked back negatively compared with 1 in 9 multiparas (Table 2). No statistically significant differences in outcome variables were seen among the eight midwifery practices.

Table 2: Women’s Recall of Birth at 3 Years Postpartum, by Parity

‘‘How Do You Feel When You Look Back on Your Experience of Birth in 2001?’’			
Recall of Birth	**Total Group**	**Primiparas**	**Multiparas**
	No. (%)	*No. (%)*	*No. (%)*
Very happy	681 (56.1)	246 (47.3)	435 (62.8)
Quite happy	284 (23.4)	132 (25.4)	152 (21.9)
No particular feelings	51 (4.2)	25 (4.8)	26 (3.7)
Quite unhappy	133 (11)	75 (14.4)	58 (8.4)
Very unhappy	64 (5.3)	42 (8.1)	22 (3.2)
Total	1213 (100)	520 (100)	693 (100)

Only 4 percent of the women who gave birth at home looked back negatively compared with 23 percent who gave birth in hospital. Of the women who looked back negatively after a home birth, 50 percent wanted to have a home birth again in a future pregnancy compared with 90 percent of those who looked back positively at their home birth. Of the women who looked back negatively after a hospital birth (either by choice or after referral), 40 percent wanted to have a home birth if they were to have more children, as did 35 percent of the women who had positive recall of their hospital birth.

Women who had a planned cesarean delivery were not significantly more negative compared with women who had a spontaneous delivery: 16 percent (n = 14) versus 11 percent (n = 105), respectively. However, women who had an assisted vaginal delivery or unplanned cesarean delivery recalled birth more negatively: 42 percent (n = 59) and 47 percent (n = 36), respectively, compared with women who had a spontaneous vaginal delivery.

Description of Caregivers

Women chose mainly positive adjectives to describe staff. Overall, the most frequently chosen positive adjectives were ‘‘supportive’’ (72%) and ‘‘considerate’’ (66%). More

than 40 percent of all women did not use the positive adjectives ‘‘informative,’’ ‘‘warm,’’ and/or ‘‘polite.’’ Thirty percent of all women described staff as being sensitive. Staff being ‘‘rushed’’ was the most frequently chosen negative adjective (17%). An association appeared to exist between negative recall of the birth experience and describing the caregiver more negatively. Figure 1 shows the percentages of women with negative or positive recall and the chosen adjectives. Marked differences occurred between women with negative or positive recall and their choices for positive adjectives and negative adjectives.

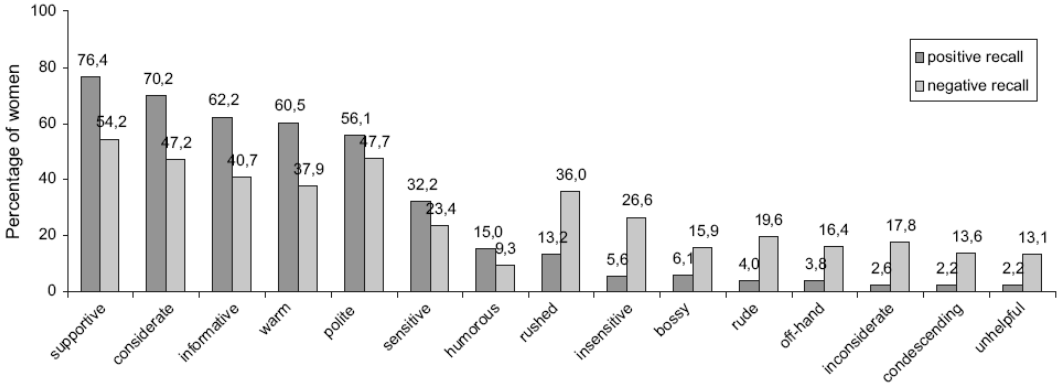

Figure. 1: Percentage of women selecting each adjective to describe their caregivers by looking back positively or negatively (n=1,293)

Table 3: Perinatal Factors Associated with Negative Recall of Birth 3 Years Later among Women Who Experienced Labor, Using Univariate Analysis (n = 1,293)

Perinatal Factors	**Looking Back Positively (n= 1,079)**	**Looking Back Negatively (n= 214)**		
	No. (%) or {SD}	*No. (%) or {SD}*	*Crude OR*	*95% CI*
Maternal characteristics				
Background				
Not at risk	811 (83.9)	156 (16.1)		
At risk	268 (82.2)	58 (17.8)	1.13	0.81–1.57
Parity				
Multipara	613 (88.5)	80 (11.5)		
Primipara	403 (72.1)	117 (27.9)	2.25	1.63–3.03
Age (yr)				
Mean age	31.4 {4.0}	30.9 {4.1}	p = 0.109	
Birth characteristics				
Mode of delivery				
Spontaneous	879 (89.3)	105 (10.7)		
Assisted vaginal or unplanned	190 (65.3)	101 (34.7)	4.53	3.25–6.10
Cesarean delivery				
Place of birth				
Home	419 (91.5)	18 (8.5)		
Hospital	660 (87.3)	96 (12.7)	6.94	4.20–11.37
Referral during labor				
No	904 (88.9)	113 (11.1)		
Yes	161 (61.9)	99 (38.1)	4.93	3.58–6.76
Received pain relief				
No	956 (86.2)	153 (13.8)		
Yes	123(66.9)	61 (33.1)	3.1	2.18–4.40
Birth experience				
Received a choice in pain relief				
Yes	633 (91.3)	60 (8.7)		
No	256 (69.2)	114 (30.8)	4.7	3.33–6.63
Satisfied coping with pain				
Yes	962 (86.8)	153 (13.2)		
No	26 (39.4)	40 (60.6)	10.1	5.93–17.06

Note: Different denominators due to missing data.

Factors Associated with Negative Recall

Table 3 shows the unadjusted odds ratios (ORs) that were associated with negative recall. Women with a planned cesarean delivery were excluded from this analysis since some important factors related to recall of the birth experience (such as the choice in or use of pain relief during labor) were missing for these women.

Of all demographic variables, neither ‘‘background of risk’’ nor age contributed to negative recall after univariate analysis. All variables selected for univariate analysis as shown in Table 3 were also entered into a logistic regression model using backward stepwise selection. After correction for all variables in the model, parity and having had pain relief no longer contributed significantly to recall of birth. Adjusted ORs are shown in Table 4. Having had an assisted vaginal or unplanned cesarean delivery and being referred during labor both increased the risk of negative recall, as did not having had a home birth. If a woman indicated that she was not satisfied with the way she had coped with pain, her risk of negative recall overall was almost five times higher. Feeling that she had not received a choice in pain relief and using more negative adjectives to describe her caregiver(s) was associated with an almost three-fold increase in the odds of negative recall. Reporting that during the birth she had feared for her own life or the life of the baby was associated with negative recall of the birth experience (Table 4). The Nagelkerke R2 for this model was 0.386, indicating that almost 39 percent of looking back negatively can be explained by this model.

Table 4: Perinatal Factors Associated with Negative Recall of Birth 3 Years Later among Women Who Experienced Labor (n = 946), after Logistic Regression Using Backward Stepwise Selection

Perinatal Factors	**Adjusted OR**	**95% CI**
Assisted vaginal or unplanned cesarean delivery	2.6	1.59–4.14
Hospital birth	1.4	1.04–1.93
Referral during labor	2.4	1.48–3.77
Receiving a choice in pain relief	2.9	1.91–4.45
Satisfied coping with pain	4.9	2.55–9.40
Negative description of caregiver	2.9	1.85–4.40
Fear for baby’s life or own life	2.3	1.47–3.48

Discussion

Three years after their birth, most women recalled it as a positive event. However, 16.5 percent were reportedly unhappy or very unhappy when asked how they looked back on their birth experience. Primiparas were unhappy in 23.2 percent of cases and multiparas in 11.4 percent. These substantive percentages are the reason for concern since long-

term negative birth experiences may influence reproductive choices of the woman herself (8,9,33) and other women's choices around childbirth (10–12).

Several factors were related to the risk of having negative recall of the birth event. After controlling for other factors, referral during labor, having feared for her own or the baby's life, not having had a choice in pain relief, not being satisfied with the way she coped with pain relief, and describing caregivers negatively all contributed to the risk that a woman reported a negative birth experience 3 years later.

The proportion of women with negative recall among those who had a planned cesarean section was comparable with women who had a spontaneous vaginal delivery. Pain relief as such and parity were no longer related to the likelihood of negative recall after controlling for the other factors in the model.

Limitations of the Study

External Validity

Data were collected once, and no reminders were sent because of time and money constraints. Reminder systems increase the response rate of mailed questionnaires by an average of 13 percent (33). Our resulting response rate was 44 percent. The length of the questionnaire probably also contributed to a low response rate (34,35). Two midwifery practices had more than 30 percent of non-Dutch clients. The fact that the questionnaire was issued only in Dutch also might have contributed to a low response rate from non-Dutch women. The resulting overall percentage of non-Dutch women in our sample was lower compared with national perinatal data (30). Except for the factor of ethnicity, our sample seemed fairly representative of Dutch women who received perinatal care from an independent midwife.

It is unlikely that the relatively low response rate inflated the observed percentage of women with a negative recall. Reminders do not seem necessary to estimate satisfaction of overall potential respondents (29,36). Moreover, people with negative experiences are, in general, not more likely to participate in surveys in which they are asked to report (34,36). Our sample contained fewer primiparas compared with the nonresponders' group, but no differences were observed in the proportion of variables potentially strongly associated with negative recall such as ''unplanned cesarean delivery'' and ''assisted vaginal delivery'' between the responders' and the nonresponders' groups.

Internal Validity

In the questionnaire, we collected subjective data on experiences with the birth 3 years before birth and data about the course of the pregnancy, delivery, and postpartum

period. The latter were self-reported data by the responding women. Self-reported reproductive history and medical procedures have high to moderate reliability (37), but it varies depending on the nature of complications examined (38). The obstetric data we used in our analysis were very unlikely to be misreported or misinterpreted, namely mode and place of delivery and having had pain relief during delivery.

Recall Bias

The questionnaire was sent to all women 3 years after a delivery in 2001. Despite a self-reported good memory, recall bias might still be a problem in our study. It is likely that subjective independent variables, such as the adjectives used to describe the caregiver or the experienced fear during delivery, and the outcome variable ‘‘recall’’ interact. Therefore, describing the caregiver more positively or negatively 3 years postpartum does not necessarily reflect a positively or negatively perceived experience with the caregiver at the time of the delivery itself. It only implies that how a woman looks back at her delivery 3 years later is associated with her perception of the caregivers involved and her experienced fear 3 years before.

Interpreting Results

After controlling for other factors, not having had a choice in pain relief was associated with negative recall. Women who had not been given a choice in pain relief were three times more likely to recall their birth experience negatively. After logistic regression, having had pain relief per se did not increase the risk of negative recall. In the Netherlands, pain relief is not common; less than 10 percent of all laboring women receive epidural analgesia (39). In our study, 20 percent of the women without a planned cesarean delivery had received some form of pharmaceutical pain relief. A demand for pain relief is a reason for referral to a hospital. However, epidural analgesia is not always a 24-hour service, and it is not actively advocated by midwives or obstetricians (40,41). Some studies have reported that having received pain relief increases the risk of a negative birth experience (16,42), and this effect is stronger if the woman had a feeling of being pressured to use it or not (42) or if the pain relief reduced the woman’s feelings of control and fulfillment (16). The mode and content of counseling by Dutch midwives or obstetricians in preparation for birth have not been researched in the Netherlands. It is unknown how the issue of pain relief is discussed and whether women are given an informed choice in pain relief during labor. The high percentage of the women in our study (25%) who mentioned that they had not felt able to make a choice in pain relief indicates that this factor might not be the case.

Referral during labor also remained a significant risk factor for negative recall of the birth experience. In a previous Dutch study, also, referral during labor was significantly

associated with reporting of a negative birth experience 10 days postpartum (25). However, other Dutch studies do not find a difference in satisfaction with the experience of birth 3 weeks postpartum (26) or an increase in postpartum blues or depression (43) after referral during labor.

Referral practices within the Dutch maternity system are not in concordance with the concept of continuous support during labor. We hypothesize that this factor may be one of the underlying reasons for negative recall. Continuous support either by a clinical caregiver or by a nonclinical caregiver has been shown to reduce negative perceptions of women's birth experiences and to provide other benefits as well (18,23). In the Netherlands, the need for continuous support during labor either at a home birth or at a birth after referral has only recently been addressed (44,45). Giving birth in the hospital remained a significant risk factor for negative recall after controlling for other variables. In addition, home remained a popular place for the next delivery, both for women who looked back positively or negatively.

In our study, we used the same adjectives to describe staff as were used in Green et al's study Greater Expectations? (28). In their study, all adjectives, and especially the adjective ''considerate,'' were significantly related to feeling in control (17). Considerate was a term used by 66 percent of all women in our study compared with 72 percent in Green et al's study. Of the women who had negative recall, only 47 percent used the adjective considerate. It seems likely that Green and Baston's (17) conclusion that ''the extent to which women feel that they are actually cared about, rather than care being something that is done to them, will contribute to satisfaction and emotional well-being'' (p 247) applies to Dutch women as well. In our sample, major differences between women who had positive recall and those who had negative recall were found in the frequency with which the adjectives ''warm,'' ''bossy,'' ''considerate,'' and ''rushed'' were used. It is worth noting that fewer than one-third of all women described staff as being sensitive.

Due to the retrospective nature of our data collection, expectations during pregnancy toward the pregnancy, the delivery, the postpartum period, and parenthood could not be measured. Hence, we were unable to measure the extent to which differences between expectations and actual outcome influenced the chances of negative recall. It can be argued that the choice for place of delivery and type of caregiver can be related to underlying perceptions of childbirth (25,46). Since 85 percent of all women start care with an independent midwife and 70 percent opt for a home delivery, it can be assumed that most Dutch women have positive expectations toward childbirth. Positive expectations toward birth are related to positive experiences looking back (4,16,46). However, in our study, the percentage of women with negative recall is 16.3. This percentage is significantly higher ($p<0.01$) than the 11 percent negative recall in

Baston's study, where the same questionnaire during the same time frame was used (27). Further analyses to explain these differences are currently being undertaken.

Conclusions

A substantive proportion of Dutch women have negative recall of their birth experience 3 years postpartum. Factors that are associated with this outcome are linked not to demographic variables but to obstetric interventions and referral during labor. In addition, a negative description of caregivers 3 years later, recalling having experienced fear during birth, and having received no choice in pain relief are all related to negative feelings toward the delivery 3 years before. These feelings cannot be trivialized since long-term negative birth experiences may influence reproductive choices of the woman herself and other women.

Further research needs to be undertaken to understand women's expectations and experiences of birth within the Dutch maternity system and examination of maternity care changes designed to reduce or modify those controllable factors that are associated with negative recall.

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3

Factors related to birth and maternity care that affect women's self reported emotions during birth

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Submitted

Abstract

Objective

To explore the relationship between factors related to birth and maternity care on women's feelings during birth.

Methods

A questionnaire was mailed in 2004 to all women in eight midwifery practices in the Netherlands, who had given birth in 2001 and who had at least one prenatal, perinatal, or postnatal visit to the participating midwifery practice. Women who had a subsequent birth after the index birth in 2001 were not excluded. Women were excluded if it was known to the midwife, either from the perinatal record or from any other source, that they had experienced a perinatal death or a deceased child in the past 3 years.Women were asked to fill in positive and negative emotions they may have experienced during the birth.

Results

We received 1309 questionnaires (response rate 44%). On average women filled out 31% of all possible positive emotions versus 20.3% of all possible negative emotions ($F(1, 1283) = 109.57$, $p < 0.001$. Univariate analyses showed that most positive and least negative emotions were experienced when women had given birth at home whereas an assisted birth after referral resulted in least positive and most negative emotions ($F(3, 1280) = 39.54$, $p < 0.001$). A planned hospital birth and a spontaneous birth after referral were in between these two extremes with respect to the positive and negative emotions they had evoked and did not differ from each other. Furthermore, a known caregiver ($F(1,1257) = 10.17$, $p = 0.001$) and continuity of care ($F(1,1257) = 35,69$, $p < 0.001$) resulted in more positive and fewer negative emotions as did multiparity ($F(1, 1281) = 26.83$, $p < 0.001$).

We assessed the simultaneous effects of birth categories (defined by place and mode of birth and status of referral), familiarity with the caregiver or continuity of care on the ratio of positive to negative emotions. The ratio was affected by the category of birth ($F(3, 1245) = 16.80$, $p < 0.001$), as well as by continuity of care ($F(1, 1245) = 12.93$, $p < 0.001$), but not by familiarity with the caregiver ($F(1, 1245) = 1.62$, $p = 0.203$).

Conclusion

An assisted birth, referral during pregnancy or birth and a hospital birth are associated with more negative emotions during birth. Continuity of care and home birth are associated with more positive emotions during birth. Continuity of care should be provided to all childbearing women and women should be given the freedom to choose their place of birth. Finally, interventions should be studied that may prevent negative emotions and can increase the chance of positive emotions during birth for women.

However, women should also be better prepared to be able to cope with unexpected negative emotions.

Introduction

The current maternity care system in the Netherlands distinguishes between three levels of care: primary care provided by independently practicing midwives and secondary care and tertiary care provided by obstetricians in non academic and academic hospitals, respectively. Maternity care in the Netherlands is based on the assumption that pregnancy, birth and postpartum period are physiological processes that do not usually require intervention. Risk selection in pregnancy and during birth is performed by a midwife and based upon a national set of guidelines describing when to refer to or consult an obstetrician (1). If the course of a pregnancy is uncomplicated, a woman has a free choice in place of birth: home birth, birth in a midwife led centre or a hospital birth with her primary care giver. At home a specialized maternity care assistant ("kraamverzorgende") will be present during the second and third stage of labour (2).
Because of the high rate of home births, the Dutch maternity care system has been applauded (3-6) and it is often assumed that such a model increases feelings of control by the woman and levels of satisfaction with pregnancy and birth compared with other models of care (3;5;6). Indeed, most women in the Netherlands look back positively on their birth (7-10). However, a study by Rijnders et al (10) showed that although three years after birth 83% of women looked back positively, 23% of primiparous women and 11% of multiparous women looked back negatively. Compared to Belgian (11) women and English (12) women, Dutch women looked back more negatively. Perinatal factors associated with looking back negatively three years after birth in the Netherlands are: an assisted vaginal or unplanned caesarean birth, hospital birth, referral during labour, having feared for own or the baby's life, not having had a choice in pain relief, not being satisfied coping with pain, and describing caregivers negatively (10).

One factor specific to the Dutch maternity care system that is associated with negative experiences is referral during pregnancy or birth from primary midwife-led care to secondary obstetrician-led care in hospital (7;10;13;14). Referral is very common in Dutch maternity care. During pregnancy 32% of women who start their prenatal care with a midwife are referred and another 11% are referred during labour (15). One of the most striking aspects of a referral is the complete change of caregivers during the course of treatment. If a woman is referred during pregnancy or during the first stage of labour, the original attending midwife will no longer provide care and will in general not be present at birth. Thus, if a woman is referred during labour, continuity of care is

frequently not available to her. Continuity of care, defined as having one caregiver, although not necessarily a known caregiver, throughout labour has shown to be important for women's positive experiences with birth (16-19). On the other hand, a factor in Dutch maternity care associated with a positive experience of birth is having had a home birth (7;9-11). Johnson et al. (20) describe the empowerment and fulfilment that Dutch women attributed to childbirth at home and being a mother.

Place of birth, referral, and mode of birth are intertwined with each other. A home birth is always a spontaneous birth, but a hospital birth can be a planned hospital birth, attended by a woman's own primary care midwife or an obstetrician, or a birth after a referral, subsequently followed by different modes of birth. Given that a referral often implies discontinuity of care during labour, continuity of care is intertwined with place of birth, referral, and mode of birth. In the present study we want to disentangle these factors. For instance, we wondered whether negative experiences associated with an assisted vaginal or unplanned caesarean birth, hospital birth, or referral during labour would decrease in frequency if a caregiver provides continuity of care during these events. Another related factor is parity: more nulliparous women compared to multiparous women are referred, have a planned hospital birth or have an assisted birth (8;15;21).

This study was undertaken to gain more insight in the separate and combined effects of home birth and referral, mode of birth and parity on women's feelings during birth. Furthermore, we explored whether continuity of care and /or having a known caregiver could dampen or strenghten the impact of the birth related factors on women's feelings during birth.

Methods

Participants and procedures

To explore whether characteristics of the birth and of the caregiver influence women's emotions during birth, we analyzed data derived from a survey carried out in 2004 on women's experience with birth three years earlier. Women completed a self administered questionnaire about their birth experience. Eight primary care midwifery practices were randomly selected from the Dutch Midwifery Association Registration and were invited to participate. All agreed and 3200 women who had given birth in 2001 and had attended at least one consultation by the midwife, either during pregnancy, birth or postpartum period, were sent a one time postal questionnaire. The only exclusion criterion was the occurrence of a perinatal death. Non-repsonders did not receive a follow-up mailing.

Measures

The questionnaires included open and closed questions with multiple choice responses. Questions were in sections and covered the index baby's health and behaviour, previous pregnancies, the index birth experience, postnatal care and maternal health. The primary outcome variables were the experienced emotions during birth three years ago. Women were asked to circle adjectives that described their own feelings. Seven of these words were negative: overwhelmed, frightened, detached, out of control, dopey, powerless, and helpless, and eight were positive: excited, powerful, calm, involved, in control, alert, confident and challenged. Two indexes were formed for each participant by calculating (1) the percentage of positive emotions ticked from the eight positive emotion terms, and (2) the percentage of negative adjectives ticked from the seven negative emotion terms.

Continuity of care was asked with the question "were you cared for by the same midwife or obstetrician through your labour from start to finish (possibly intermittantly)?" Having had a known caregiver was asked with the question "Had you in pregnancy already met the caregiver who looked after you during labour?" For further details of the methodology see Rijnders et al (10).

Data analysis

We used the SPSS 17.0 package for data analysis. We calculated frequencies (means, standard deviations) and chi-squares to describe the study population and to test associations between variables. The main outcome measure was the comparison between the percentage of positive emotions to the percentage of negative emotions, to assess which valence of emotions prevailed during birth. Therefore, we conducted analysis of variance (ANOVAs) in which the index of positive emotions and the index of negative emotions constituted a within-participants factor. This within-participants factor assessed the ratio between these two indexes of emotions. To measure the impact of the three birth characteristics (referral, place of birth, mode of birth), the two characteristics of the caregiver (a known caregiver, continuity of care), and parity on the experienced emotions, these six characteristics served as between-participants factors in several ANOVAs. First, we assessed the separate effect of each between-participants factor by conducting ANOVAs with the index of positive emotions and the index of negative emotions as a within-participants factor (see Table 3). Significant effects of factors comprising of more than two levels were followed up with post hoc comparisons between the various levels. Second, we conducted ANOVAs with both indexes of emotions as a within-participants factor, and combinations of several between-participants factors in order to assess (1) the unique contribution of each factor on the experienced emotions, and (2) possible interaction effects between the factors. For

instance, did primiparous women experience their mode of birth differently than multiparous women? The number of missing values differed between the various factors. Therefore, the number of participants included in the ANOVAs also varied as did the reported degrees of freedom.

Results

Participant characteristics

The postal questionnaire was sent to 3200 women, 228 were returned unopened because the respondent no longer lived at that address and 1309 questionnaires were returned, resulting in a 44% valid response rate (1309/2972). Table 1 displays sociodemographic and birth characteristics of the participating women. Most respondents (94%) were of Dutch origin and 56% had given birth before. Over 75% of the respondents gave birth spontaneously, 33% gave birth at home and 52% were referred during pregnancy or birth. The majority of the women (68%) received continuity of care, although 43% had not met their birth caregiver before. Only 19 women had a forceps delivery, therefore these women were grouped with the 126 women who had a ventouse, into the "assisted vaginal" category.

Experienced emotions during birth

Twenty-five women (2%) did not fill in which emotions they experienced during the birth. On average women filled out 31% of all possible positive emotions versus 20.3% of all possible negative emotions ($F(1, 1283) = 109.57$, $p < 0.001$; see Table 3). Table 2 describes which specific emotions women experienced. If they reported positive emotions, women most often felt powerful and confident, if they reported negative emotions they most often felt out of control and overwhelmed.

Birth characteristics

Table 3 shows the univariate effects of the separate birth characteristics on the percentages of positive and negative emotion words (i.e., interaction effects in the ANOVAs). Being referred during pregnancy or birth resulted in fewer positive and more negative emotions than no referral. It made no difference whether one was referred during pregnancy or birth. Therefore, this characteristic was recoded into "no referral during pregnancy or birth" versus "referral during pregnancy or birth". So, 13 additional women could be coded as "referral during pregnancy or birth", because we knew they were referred, but did not know whether this occurred during pregnancy or birth. Having the birth at home resulted in more positive and fewer negative feelings than a birth in hospital. Mode of birth had an impact on the experienced emotions: a

spontaneous vaginal birth elicited the most positive and least negative responses compared to the other modes. The unplanned caesarean and the assisted vaginal birth were experienced as the most negative and least positive. The planned caesarean was in between the spontaneous birth and the other two modes. The three non-spontaneous birth modes did not differ that much in experienced emotions, therefore we recoded mode of birth in two categories: spontaneous versus assisted birth. The three birth characteristics are not independent of each other as shown in Table 4. Especially, a home birth is always a spontaneous birth without a referral. Therefore, it is not possible to assess the unique effects of the three birth factors simultaneously. Thus, we created a new factor consisting of four groups (see Tables 1 and 4): (a) home birth (i.e., no referral, spontaneous birth, n=439), (b) planned hospital birth (i.e. no referral, women receiving care from a midwife or obstetrician by choice, having a spontaneous or assisted birth, n=169+14=183), (c) after referral a spontaneous birth (n=384), and (d) after referral an assisted birth (n=303). As Table 3 shows, the home birth was experienced as the most positive and least negative, whereas the assisted birth after referral was experienced as the least positive and most negative. The planned hospital and spontaneous birth after referral were in between these two extremes and did not differ from each other.

Caregiver characteristics

Table 3 also displays the univariate effects of the separate caregiver characteristics on the percentages of positive and negative emotion words (i.e., interaction effects in the ANOVAs). Women who had a familiar caregiver described more positive and fewer negative emotions than women who had an unfamiliar caregiver during birth. More positive and fewer negative emotions were experienced when the caregiver provided continuity of care. These two caregiver characteristics were related: continuity of care was more often provided by a familiar caregiver (67.5%) than an unfamiliar one (32.5%), whereas non-continuity of care more often involved an unfamiliar caregiver (63.1%) than a familiar one (36.9%) (chi^2 (n= 1280, df = 1) = 106.61, $p < 0.001$). However, if both characteristics were entered as two between-participants factors in the ANOVA (a) continuity ($F(1,1257) = 35,69$, $p < 0.001$) and familiarity ($F(1,1257) = 10.17$, $p = 0.001$) remained significant effects, and (b) no interaction was observed ($F(1,1257) = 0.47$, $p = 0.492$). Thus, continuity of care and familiarity of caregiver both have their unique effect on the experienced emotions, and are independent of each other.

Both caregiver characteristics were strongly related to the four categories of birth as Table 5 displays. Continuity of care was most pronounced in its effect when women had given birth at home, followed by a planned hospital birth, and least after a referral,

irrespective of mode of birth. Familiarity of the caregiver was strongly related to the four birth categories. It followed the same pattern as continuity of care, but after a referral the caregiver was more often reported to be unfamiliar in case the birth was spontaneous compared to assisted.

To assess the effects of these three characteristics on the ratio of positive to negative emotions experienced during pregnancy, these were entered as three between-participants factors in the ANOVA[1]. An effect of birth category was observed ($F(3, 1245) = 16.80$, $p < 0.001$), as well as of continuity of care ($F(1, 1245) = 12.93$, $p < 0.001$), but the effect of familiarity disappeared ($F(1, 1245) = 1.62$, $p = 0.203$). In addition, none of the interaction effects between these factors on the ratio positive to negative emotions reached significance (F-values < 1.31, p-values > 0.269). Thus, irrespective of category of birth, continuous care elicited more positive and fewer negative emotions during birth than non-continuous care.

Parity

Women who gave birth to their first baby experienced fewer positive and more negative emotions than multiparous women (see Table 3). Parity and the four birth categories were strongly related (see Table 5): a first baby was more often born after referral with an assisted birth and less frequently after a spontaneous home birth, whereas multiparous women more often gave birth to their child at home and not after a referred assisted birth. However, if both parity and birth category were entered as between-particpants factors in the ANOVA to assess their impact on the ratio positive to negative emotions, (a) parity ($F(1, 1275) = 9.38$, $p= 0.002$) and birth category ($F(3, 1275) = 30.68$, $p< 0.001$) remained significant as effects, and (b) no interaction was observed ($F(3, 1275) = 1.21$, $p = 0.306$). Thus, irrespective of whether the birth was to a first or subsequent child, a home birth was experienced as the most positive and an assisted birth after referral as the least positive. Similarly, irrespective of the category of birth, giving birth to a first child was less positive than giving birth to a subsequent child.

Parity and the characteristics of the caregiver were weakly related. Familiarity with the caregiver was not related to parity (chi^2 ($n= 1287$, $df = 1$) $= 0.96$, $p = 0.327$). Less continuity of care was observed when giving birth to a first child (63.9%) than to a subsequent child (71.7%) (chi^2 ($n= 1281$, $df = 1$) $= 8.78$, $p = 0.003$). In addition, the previously observed relationship between familiarity and continuity of care in the whole group was also shown separately for primiparous and multiparous women (chi^2-values > 41.85, p-values < 0.001). Analyzing the ratio of positive to negative emotions with

[1] This analysis entails 16 separate between-participants cells, and the number of participants in each cell varies between 14 and 310.

familiarity of the caregiver, continuity of care and parity as three between-participants factors, only showed the known effects of these three factors and no interaction effects.
Assessing the simultaneous effects of parity, categories of birth, familiarity with the caregiver, and continuity of care was not possible because the number of participants in certain cells was too low (i.e., 3 and 9 participants). However, the number of participants per cell was acceptable (i.e., > 16 participants per cell) when we analyzed the effects of parity, categories of birth, and either familiarity with the caregiver or continuity of care. Both analyses showed that the ratio positive to negative emotions was affected by the category of birth (F-values > 16.50, p-values < 0.001) and parity (F-values > 5.46, p-values < 0.02). One analysis showed the effect of familiarity ($F(1, 1251) = 5.83$ $p = 0.016$), and the other of continuity of care $F(1, 1246) = 22.87$ $p < 0.001$). Both analyses did not show any interaction effects between these factors.

Conclusion and discussion

The aim of this study was to explore the relationship between factors associated with home birth and referral on the one hand and women's self reported emotions during birth on the other hand. We found that irrespective of parity and caregivers' characteristics, women's emotions were most often positive and least often negative after a home birth and least often positive and most often negative after referral followed by an assisted birth. Furthermore, irrespective of mode and place of birth, referral status and caregiver characteristics, primiparous women expressed fewer positive and more negative emotions compared to multiparous women. Finally, irrespective of birth characteristics and parity, familiarity with the caregiver and continuity of care contributed to more positive and fewer negative emotions during birth. However, the impact of familiarity with the caregiver was overruled by the impact of the birth characteristics on the reported emotions during birth.

Strenght of this study
To our knowledge, this is the first quantitative study that explores women's perceived emotions during birth in relation to aspects of home birth and referral during (home) birth, although numerous studies have adressed factors associated with women's overall appraisal with birth or birth care (7-11;13;22-24). Womens emotions during birth are likely to be an important factor that contributes to the overall experience. For example, a sense of control has been shown to be a factor that is essential to feeling satisfied with birth and to feeling empowered (25-27).
Another strength of this study is that we disentangled ed the effects of birth characteristics (i.e., home birth and referral), caregiver characteristics (i.e., continuity of

care and familiarity) and parity. We not only addressed their seperate and unique effect on the emotions experienced during birth, but also examined whether these characterics had a combined impact on women's emotions during birth.

Limitations of this study

We did not enter other well-known variables related to experiences with birth such as experiences of women with care and caregiver, labour pain or personal control (28). Because women were questioned three years after birth we expected their recalled emotions during birth to interact with their recall of pain, appraisal of care or caregiver and recall of feelings of control.

Women were not included in this study if it was known to the midwife, either from the perinatal record or from any other source, that they had experienced a perinatal death or a deceased child in the past 3 years. However, no data were collected on adverse foetal outcomes such as admission to a neonatal care unit. This is a known risk factor for negative experiecencs with birth (46) and it is likely that women's recalled emotions during birth are also more negative if an adverse perinatal outcome did occurr. The chance of an adverse perinatal outcome is increased after referral or assisted birth. Therefore, we do not know to what extent the more negative emotions women reported after referral or assisted birth are caused by adverse perinatal outcomes. However, we found the same results in a subgroup analysis of only low risk women who were not referred. As the inicidence of adverse perinatal outcomes in this group is rare and at comparable in the home and the hospital birth group, it appears that, indeed, place of birth in itself rather than the condition of the child has an effect on women's emotions during birth.

The planned hospital group consisted of women who planned to have their birth in hospital cared for by a midwife (78%) or cared for by an obstetrician (22%). In the latter group 14 women had an assisted birth. This could have affected the outcomes for the total group. Separate analyses leaving out these 14 women revealed no differences in results.

Furthermore, the interpretation of the emotions reported three years after birth are likely to differ from those that are reported during or immediately after birth. Waldenström et al (29;30) demonstrated that measures of satisfaction with childbirth soon after birth may be colored by relief that labour is over and the happy birth of a baby. She argues that more negative aspects may take longer to integrate. Therefore, it is likely that recalled emotions during birth also change over time, although maybe to a lesser extent as the overall experience with birth. It has been demonstrated that labour pain is remembered accurately or as less negative on recall, whereas the global birth experience became more negative over time (29;31).

However, the significance women attach to negative events and consequently to negative emotions they perceived during birth is intensified and increases over time, whereas the positive aspects remain consistently positive in most cases. Caregivers should be aware of this time-effect, as they rarely follow women beyond a few days to a few weeks, and therefore they may have little awareness of the true effects of their actions (31). Therefore, the lesson to be learned from this study is that, although a woman might express positive feelings immediately after birth, the caregiver should be aware that the woman's birth experience on the long term might turn out to become less positive if continuity of care was not provided, home birth had not been a viable option and an unexpected referral had taken place.

External validity

Our resulting response rate was 44 percent. The length of the questionnaire and not having sent a reminder likely resulted in a lower response rate (32) . It is unlikely, however, that the relatively low response rate inflated the ratio of observed positive and negative emotions (33;34). People with negative experiences are, in general, not more likely to participate in surveys in which they are asked to report (34;35). Our sample contained fewer primiparous women compared with the non responders' group, but no differences were observed in the proportion of variables potentially strongly associated with negative emotions during birth such as ''unplanned cesarean delivery'' and ''assisted vaginal delivery'' between the responders' and the non responders' groups. Compared to *all* women who gave birth in 2001 in the Netherlands, our sample consisted of significantly more multiparous women and fewer primiparous women (56% and 44% vs. 53% and 47% respectively), fewer non Dutch women (5% vs. 18%), older women (31 vs 30 years), more home birth (34% vs 30%) and more referrals (51% vs. 44%) (10). Therefore, except for the difference in nationality, our sample appears to be fairly representative of women who receive at least part of their perinatal care from a midwife.

This study reports on emotions of women who gave birh in 2001. Due to the relatively high perinatal mortality rate (36;37) the "Dutch" assumption in maternity care that pregnancy and birth are normal processes, and home birth attended by a midwife is a safe option for women, has recently been the topic of vigorous public debate in the Netherlands (21;24;38;39;41;41). We do not know if and how the discussion on home birth in relation to perinatal mortality has influenced womens wishes and expectations and, subsequently, their emotions during birth. However, we do know that the home birth rate has declined from 32% in 2001 to 24% in 2009 (42), indicating that women may make other choices now than they did in 2001. Expectations of birth are known to determine women's satisfation with birth (22;43;44) and women's emotions during

birth. Women whose expectations of childbirth are being met are more satisfied than those whose expectations are not fulfilled.
In this study, the more universal factors (assisted birth, parity and caregiver characteristics) all had an effect on women's emotions during birth irrespective of the presence of factors more associated with Dutch maternity care (home birth and referral). Therefore, the results in our study seem generisable to childbearing women in other maternity care systems.

Comparison with literature
Our findings that home birth, referral, mode of birth, continuity of care and parity all impact women's emotions during birth is supported by the literature relating these factors to overall satisfaction with birth (7-12;17;24;28;44-49). In our study, the effect of familiarity with the caregiver on women's experienced emotions disappeared when home birth, referral, mode of birth, and continuity of care already affected these emotions. Homer showed that knowing the caregiver can contribute to feeling in control (18) but continuity of care seems more important than a known caregiver (16;50). This is in line with the observations in the present study.
We found that after a referral ít was more often reported that the caregiver was unfamiliar in a spontaneous compared to an assisted birth. This can be explained by the fact that a midwife tends to continue her care if a woman is referred during the second stage of labor, often for failure of progress. However, if a woman is referred during the first stage, continuity of care by the midwife is less likely to occur.

Implications for practice
In our study continuity of care was related to more reported positive emotions and fewer reported negative emotions, but no interaction was found with any of the other factors. This implies that continuity of care is important to all women, irrespective of place of birth and the actual birth process. Therefore, the current referral policy in the Netherlands, characterised by a lack of continuity of care, has to be changed. The attending midwife should continue her care for a woman even if she has to be referred to a hospital. Interestingly, continuity of care did not diminish the negative emotions related to factors such as an assisted birth, referral or parity. Thus, apart from providing continuity of care for all women, other interventions should be looked into that prevent negative emotions during birth in case of hospital birth, referral, assisted birth or giving birth for the first time. However, as women will logically be more disappointed if these events occur, they should also be prepared to deal with more negative emotions.

Women's positive experience with a home birth have often been explained by the fact that home birth is associated with a spontaneous birth, continuity of care, a known caregiver or multiparity. However, this study disentangled these interrelated factors by showing that a spontaneous home birth is experienced as more positive and less negative than a planned (i.e. non-reffered) hospital birth and a referred spontaneous hospital birth. This effect of a homebirth was not moderated by parity, familiarity with the caregiver or continuity of care. Therefore, we conclude that the place of birth in itself contributes to the emotions women have during birth. Further research is needed to reveal what factors explain the effect of place of birth on womens emotions.
Since this study was performed, many initiatives have been undertaken in the Netherlands that may have changed care and therefore women's emotions during birth. Guidelines have been issued on failure of progress during the first stage, stressing the need for early and continuous support for childbearing women. Another guideline on the use of medical pain relief (51;52), stressed the need for more easy access to such pain relief in hospital. Further research is needed to determine whether care has actually changed and what the impact of these changes is on women's emotions during birth.

Conclusion

An assisted birth, referral during pregnancy or birth, and a hospital birth are associated with more negative emotions during birth. Continuity of care is associated with more positive emotions during birth, irrespective of place of birth, mode of birth and parity. Continuity of care should therefore be provided to all childbearing women. A home birth is associated with more positive emotions during birth, also when compared to a planned, spontaneous hospital birth and irrespective of parity and continuity of caregiver. Women should therfore be given the freedom to choose their place of birth. Finally, other interventions should be looked into that prevent negative emotions and increase positive emotions during birth for women. However, women should also be better prepared to be able to cope with unexpected negative emotions.

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Tables

Table 1: Characteristics of the study sample (n = 1309).

Variable		**n (%) or mean [SD]**	**Total n**
Sociodemographic			
Mean age during birth		31.3 [4.0]	1300
Married or cohabiting	Yes	1231 (95)	1301
Nationality	Dutch	1232 (94)	1310
Educational level	High	487 (37)	1301
Parity	Primiparous	580 (44.3)	1308
Birth			
Referral: No		622 (47.5)	1309
Yes	During pregnancy During labor Moment unknown	395 (30.2) 279 (21.3) 13 (1.0)	
Mode of birth:	Spontaneous Assisted Vaginal Planned Cesarean Unplanned Cesarean	992 (75.8) 145 (11.1) 93 (7.1) 79 (6.0)	1309
Birth category:	Home Planned hospital Referral spontaneous Referral assisted	439 (33.5) 183 (14.0) 384 (29.3) 303 (23.1)	1309
Caregiver			
Known beforehand: Yes		743 (57.7)	1288
Continuity of care: Yes		875 (68.3)	1282

Table 2: Percentage of women that experienced specific positieve and negative emotions during birth (n = 1284).

Positive emotions	**n (%)**	**Negative emotions**	**n (%)**
powerful	649 (50.5)	overwhelmed	482 (37.5)
confident	588 (45.8)	out of control	307 (23.9)
calm	508 (39.6)	powerless	292 (22.7)
involved	378 (29.4)	frightened	288 (22.4)
excited	352 (27.4)	helpless	217 (16.9)
alert	338 (26.3)	dopey	204 (15.9)
in control	252 (19.6)	detached	34 (2.6)
challenged	116 (9.0)		

Table 3: Univariate effects of birth characteristics, caregiver characteristics and parity on (1) the percentage of positive emotions ticked from the eight positive emotion terms and (2) the percentage of negative adjectives ticked from the seven negative emotion terms.

	Positive words	**Negative words**	**df, F-value**	**P-value**
	% (sd)	**% (sd)**		
Total	31.0 (22.7)	20.3 (20.3)	1, 1283=109.57	< 0.001
Referral status[*]				
None[a]	35.9 (22.9)[a]	15.9 (17.4)[a]	2, 1268=41.87	< 0.001
During pregnancy[b]	26.6 (20.6)[b]	23.3 (21.5)[b]		
During birth[b]	26.2 (23.1)[b]	26.2 (22.7)[b]		
No referral during pregnancy or birth	35.9 (22.9)	15.9 (17.4)	1, 1282=81.77	< 0.001
Referral during pregnancy or birth	26.4 (21.6)	24.3 (21.9)		
Place of birth				
Home	37.6 (22.7)	14.6 (16.8)	1, 1282=80.45	< 0.001
Hospital	27.6 (22.0)	23.2 (21.3)		
*Mode of birth**				
Spontaneous[a]	33.3 (23.0)[a]	17.5 (18.4)[a]	3, 1280=29.63	< 0.001
Planned cesarean[b]	26.2 (20.1)[b]	24.0 (24.0)[b]		
Unplanned cesarean[cb]	23.7 (21.9)[cb]	31.0 (20.5)[cb]		
Assisted vaginal[c]	22.3 (19.6)[c]	31.3 (24.1)[c]		
Spontaneous	33.2 (23.0)	17.5 (18.4)	1, 1282=82.98	< 0.001
Assisted vaginal	23.7 (20.3)	29.1 (23.4)		
*Category of birth**				
Home[a]	37.6 (22.7)[a]	14.6 (16.8)[a]	3, 1280=39.54	< 0.001
Planned hospital[b]	31.7 (22.8)[b]	19.2 (18.4)[b]		
Referral spontaneous[b]	28.5 (22.2)[b]	20.7 (19.8)[b]		
Referral assisted[c]	23.7 (20.6)[c]	29.0 (23.7)[c]		
Known caregiver				
yes	33.3 (23.1)	18.3 (19.3)	1, 1266=25.75	< 0.001
no	27.6 (21.9)	23.0 (21.4)		
Continuity of care				
yes	33.5 (22.8)	18.0 (19.4)	1, 1261=50.75	< 0.001
no	25.5 (21.8)	25.4 (21.3)		
Parity				
Primiparous	28.9 (22.4)	24.1 (21.7)	1, 1281=26.83	< 0.001
Multiparous	32.6 (22.9)	17.3 (18.7)		

* Results of post hoc comparisons between levels of between-participants factors comprising more than two levels are presented as follows. The ratio of the percentage positive emotions to the percentage of negative emotions differs significantly between levels of a factor when these levels share no common superscript.

Table 4: Combination of the three birth characteristics into four groups (n = 1309)

columns: n (%)	**Home birth n= 439**		**Hospital birth n=870**	
Mode of birth	Spontaneous n= 439	Assisted n=0	Spontaneous n=553	Assisted n=317
No referral during pregnancy or birth	439 (100)	-	169 (19)	14 (2)
referral during pregnancy or birth	-	-	384 (44)	303 (35)

Table 5: Relationship between caregiver characteristics and parity with birth categories (n = 1308)

columns: n(%)	**Not referred during pregnancy or birth**		**Referred during pregnancy or birth**	
Category of birth	**Home**	**Planned hospital**	**Spontaneous**	**Assisted**
Familiar caregiver	357 (83.2)	119 (65.7)	119 (31.2)	148 (50.0)
Unfamiliar caregiver	72 (16.8)	62 (34.3)	263 (68.8)	148 (50.0)
chi^2 (n= 1288, df = 3) = 236.73, p < 0.001				
Continuous care	371 (87.3)	131 (72.4)	206 (53.9)	167 (56.8)
No continuous care	54 (12.7)	50 (27.6)	176 (46.1)	127 (43.2)
chi^2 (n= 1282, df = 3) = 126.51, p < 0.001				
Parity				
primiparous	138 (31.4)	83 (45.4)	154 (40.2)	205 (67.6)
multiparous	301 (68.6)	100 (54.6)	229 (59.8)	98 (32.4)
chi^2 (n= 1308, df = 3) = 99.10, p < 0.001				

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4

Looking back on birth three years later: Factors associated with a negative appraisal in England and in the Netherlands

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Abstract

In 2003 research was conducted in England (n = 738) to further our understanding of factors that relate to women's longer-term appraisal of their birth experience. Women's appraisals are likely to be influenced by the culture in which they give birth and the predominant norms at that time. To explore this further, the study was replicated in the Netherlands in 2004 (n = 1310), where a culture of birth at home is well established. It was hypothesised that Dutch women who had an emergency caesarean birth would look back more negatively on the experience than their counterparts in England. While there was some support for this hypothesis, more women in the Netherlands were found to look back negatively than women in England irrespective of mode of birth. Binary logistic regression models were constructed for each country and common factors for a negative appraisal were: emergency caesarean and instrumental birth; feeling that the baby's life had been in danger; negative perception of the staff; and major health problems since the birth. Induction of labour and feeling that her own life had been in danger were also predictive of looking back negatively for Dutch women.
Keywords
birth; satisfaction; mode of delivery; perception of staff; Dutch; induction

Introduction

Culture, history, politics and policy have led to very different ways of organising maternity care in different countries, but there has been limited research investigating how these different contexts relate to the way that women feel about their experiences of giving birth. In particular, the Dutch maternity care system is renowned for its high level of home births and its attitude towards birth as a normal physiological process rather than one requiring medical or surgical intervention. It is thus all the more surprising that minimal research has been carried out investigating Dutch women's experiences of maternity care. Comparing Dutch and English women's appraisal of their birth is the focus of this paper.

Maternity care in England

The National Health Service Act in 1946 and the subsequent provision of free maternity services heralded an increase in the popularity of hospital care with women. Prior to this, most babies were born at home with the support of the local midwife and/or General Practitioner (GP). Successive reviews of maternity services by the government (1;2) advocated the provision of hospital maternity care for increasing proportions of women. In 1980 it was recommended that home births be phased out altogether (3).

In the 1980s, various lay and professional bodies argued against a single pattern of service, advocating that women should have more choice and that maternity care in the community was safe for low risk women (4;5). In 1992 there was a major governmental review of maternity services by the Health Committee of the House of Commons (6). The government responded with the publication of 'Changing Childbirth'[7] in which a blueprint for change was laid down, with choice, continuity and control for women its central themes. Despite over a decade of government policy promoting choice for women regarding place of birth (7-9), birth at home has remained a rare event occurring in only 2.6% of all births in 2005–06 (10). A community midwife in primary care provides the majority of antenatal and postnatal care. Most births take place in hospital, 64% conducted by a midwife (10). If a woman is referred to an obstetrician, she continues to receive care from a midwife.

Maternity care in the Netherlands

The Dutch maternity care system has been heralded for its high rate of home birth (11). However, between 1965 and 1978 the rate decreased from 68.5% to 35.8% (12). It is likely that a number of factors contributed to this decline, including: an increase in use of technology; women's preference (13); and access of hospitals to primary care givers who were not their employees (14). Also around this time, a selection system to

differentiate between women eligible for primary or secondary care was introduced (15). After a period of stability, the home birth rate decline further to 29.4% in 2002 (16). It varies regionally, being higher in rural populations and lower in urban districts.
The current maternity care system in the Netherlands distinguishes between three levels of care: primary care provided by independent practicing midwives (in a few rural areas by GPs); secondary care provided by obstetricians in non-academic hospitals; and tertiary care in academic hospitals. Maternity care in the Netherlands is based on the assumption that pregnancy, birth and the postpartum period are in principle physiological processes that do not usually require intervention. Risk selection in pregnancy and during birth is performed by a midwife and based upon a national set of guidelines describing when to refer to or consult an obstetrician (17). If the course of a pregnancy is uncomplicated, a woman has a free choice in place of birth: home birth, birth in a midwife-led centre or a hospital birth with her primary caregiver. At home, a specialised birth assistant ('kraamverzorgende') will also be present during the second and third stages of labour (18).
In 2001 approximately 85% of all pregnant women in the Netherlands started antenatal care in a primary care setting. Twenty-eight percent were referred to an obstetrician during pregnancy and 17% during birth (19). The result is that of all Dutch women only 40% received all perinatal care from an independent midwife (20). Almost 70% of the referrals during birth took place during the first stage of labour. A woman who is referred during pregnancy does not receive any care from her midwife for the rest of the pregnancy or during birth. If a woman starts labour within primary care and is referred during the first stage of labour, in most cases her midwife will not continue to be present for the remaining period of the birth. However, if a woman is referred during the second stage of labour, she is often accompanied by her midwife to the hospital for general support.

The current study

We postulated that how women evaluate their birth experience is likely to be influenced by the culture in which they gave birth and the predominant norms at that time. In 2003 research was conducted in England to contribute to our understanding of what factors relate to a woman's appraisal of her birth three years later. To explore this further and identify which elements may be fundamental, irrespective of local culture, and which may be more culturally specific, the study was replicated in the Netherlands in 2004.
Studies that have investigated women's perception of the birth experience have collected data at different points in time. It has been suggested that data collected soon after the birth reflect the woman's relief that the birth is over (21;22). Robinson (23) disputes the application of the 'halo effect' as an explanation of why women's attitudes

towards their birth change over time. She asserts that initially woman want to believe that their carers had their best interests at heart but later, as they try to make sense of what happened to them, they find such an evaluation incongruent. The potential to re-evaluate an event is increased as more time goes by. As one women in the Cambridge Fetal Abnormality Study said 'you're satisfied as far as you know', going on to explain that this evaluation might change if new information came to light about action that should have been taken (24). Such re-evaluation can go either way.

Hypothesis

It was hypothesised that women in the Netherlands who had an emergency caesarean birth would be less happy looking back on their experience than women in England who also had an emergency caesarean.

Methods

Both studies surveyed women three years after giving birth, only excluding women if they were known to have experienced a perinatal death. Multi-centre research ethics approval was granted for the English study, but was not required for the study conducted in the Netherlands as no invasive procedures were involved. The methods for each study are described in turn.

The English study followed women who had participated in a large prospective survey of women booked for care at one of eight maternity units: four in the south of England and four in the north of England. That study, known as 'Greater Expectations?', surveyed women who were due to give birth on or after the first of April 2000 (25). It examined the interrelationships between women's expectations and experiences of decision-making, continuity, choice and control in labour, and psychological outcomes. 'Greater Expectations?' replicated a study conducted in 1987 called 'Great Expectations' (26) with the aim of exploring how women's expectations and experiences had changed in the intervening 13 years. Women were surveyed by postal questionnaire, twice antenatally and at six weeks postnatally in both 'Great' and 'Greater' Expectations. The methodology for Greater Expectations? is described in further detail in Green and Baston (27). Of the respondents in 2000, 1266 were sent a follow-up questionnaire in 2003. Following one reminder, a total of 738 valid questionnaires were returned giving a response rate of 58%. Figure 1 summarises the time line.

In the Netherlands study, eight primary care midwifery practices were randomly selected from the Dutch Midwifery Association Registration and invited to participate.

All agreed and 3200 women who had given birth in 2001 were sent a postal questionnaire; 1310 completed questionnaires were returned giving a response rate of 44%. For further details of the methodology see Rijnders et al (28).

Measures

The English questionnaire was translated into Dutch by bilingual speakers. Additional questions were added that had either already been asked earlier of the English sample or were specific for the Dutch situation, for example, regarding referral to an obstetrician during pregnancy and birth or having had an trained birth assistant. Both questionnaires were purpose designed and comprised open and closed questions with multiple choice responses in the form of an A5 booklet. Questions were in sections and covered the index baby's health and behaviour; previous pregnancies; the index birth experience; postnatal care and maternal health. The English follow-up study already had data relating to women's expectations and experiences of birth. For the purposes of this paper, only those variables that were collected at three years or those that were sufficiently robust to have been collected at any time point, for example age, were used in the analysis.

The *primary outcome measure* was a woman's appraisal of her birth three years later. Women were asked 'How do you feel when you look back on your experience of birth in 2000?' (or 2001 in the case of the Netherlands). There were five response options: 'I'm very happy with the way things went', 'I'm quite happy with the way things went', 'I have no particular feelings', 'I am quite unhappy with the way things went' and 'I am very unhappy with the way things went'. For the purpose of this analysis, women who were 'very happy' or 'quite happy' were grouped together and coded 'happy', and women who were 'very unhappy' or 'quite unhappy' were grouped together and coded 'unhappy'. Cross-tabulations of key covariates revealed that the small number of women who responded 'no particular feelings' did not consistently group with either the happy or unhappy women on a wide range of variables; hence, it was decided to exclude the women who had 'no particular feelings' from this analysis 27 (3.7%) English women and 56 (4.3%) Dutch women). This binary variable is referred to as 'looking back'.

Mode of birth was coded: 'planned caesarean (elective)', 'unplanned caesarean (emergency)', 'instrumental' (vacuum (ventouse) or forceps), and 'normal (vaginal)'.

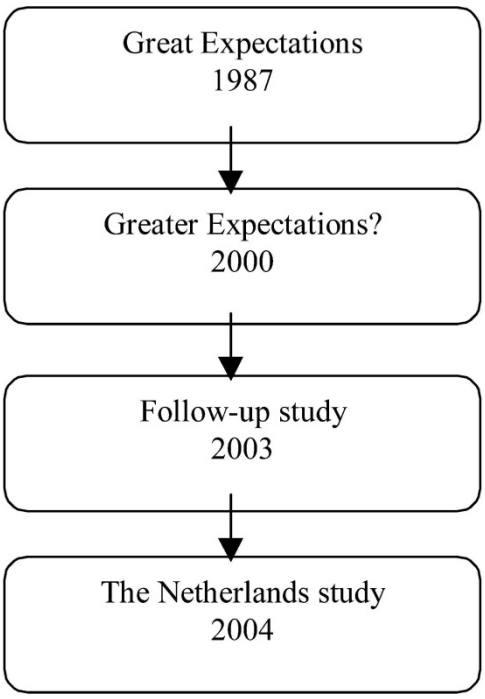

Figure 1: Time line for the studies involved.

Obstetric interventions were also considered, including: use of pethidine (or equivalent); having had an epidural in labour; and induction of labour. Women were also asked 'Did you feel that your life was in danger at any time during the birth?' and 'Did you feel that your baby was in danger at any time during the birth?' The response options in both cases were: 'yes' and 'no'.

With regard to *postnatal experiences*, women were asked: 'How has your health been since your Millennium baby was born?' Response options were: 'no problems', 'minor problems', 'major problems', and 'both minor and major'. (For analysis, the first two options were combined and compared with the last two.) They were also asked: 'Do you feel that you had enough help generally, in the first few weeks after the birth?' Response options were: 'yes', 'no' and 'I can't remember' and, for analysis, 'I can't remember' was excluded.

Emotional well-being was also explored using the Edinburgh Postnatal Depression Scale (EPDS) (29) and the Rosenberg Self Esteem Score (RSE) (30). Each of these measures was dichotomised according to their authors' positive screening criteria: more than 12 on the EPDS and less than 15 on the RSE. Women were also asked, 'How do you feel about the way your body looks now?' Response options were: 'I am happy

with the way I look', 'I have no particular feelings', and 'I am unhappy with the way I look'.

How women perceive their carers is known to influence their appraisal of the birth experience (for example, Waldenström, Hildingsson, Rubertsson, & Radstad) (31). In both studies women were asked to circle adjectives, from a list of 15, that described any of the staff who cared for them in labour. They could choose as many or as few words as they wanted. Eight of these words were negative (rushed, insensitive, unhelpful, off-hand, rude, inconsiderate, bossy and condescending) and for the purpose of analysis, women were dichotomised into those who chose 30% or fewer negative words and those who chose more than 30%. Using a proportion controlled for the difference in the number of words chosen as described by Green, Richards, Kitzinger and Coupland (32) and 30% was chosen as the cut of to differentiate between women who had mixed feelings and those who were making a substantial negative appraisal. With the adjective check lists it was particularly important that the words were as close as possible to the English version, as there was no question to contextualise the words used. Hence, translation of the adjective check-list from English to Dutch was undertaken by official native-speaking translators in a forward and backward way. The procedure was undertaken by an officially licensed translation centre. This process was not considered necessary for the remaining instruments as the Dutch researcher was bilingual.

A measure of *how women perceived their child* was taken from the question, 'Compared with other children, how easy would you say your child has been to look after?' The three responses were dichotomised into 'about the same and/or easier' and 'much more difficult'. Women were also asked to circle adjectives which they felt described their child, from a grid of 16 (8 positive and 8 negative). Green et al (26) recommend using a ratio score to control for differences in the number of words chosen, and grouping of the ratios into 0–30% negative words and more than 30% negative words; that was therefore the procedure followed in the present study.

When considering *women's evaluation of events*, only those data that were collected at the same time point for both studies (three years after the index birth) were considered in the analyses to avoid the difficulty of interpreting data from the same questions but asked at different time points. For example, in the Greater Expectations? Study (25), women were asked how they felt they responded to the pain in labour six weeks after the birth. However, in the Dutch study (28), this question was not asked until three years after the index birth. This appraisal of how a woman felt she coped with her labour pain, although potentially important, was therefore not considered in this analysis.

Analyses

Bivariate analyses were used initially to explore the hypothesis and describe the data, using chi-squared for categorical data and analysis of variance (ANOVA) for continuous data. The findings were further investigated using binary logistic regression and two models were constructed for women from England and the Netherlands, respectively, using data items that were common to both studies. Each model was constructed using a forward step-wise binary multiple regression whereby the programme determines the order of the variables to find the best fit. This method was chosen to ensure a consistent approach for all the models. Further analysis was undertaken to explore if the effect of the variables in the model was modified by country of birth. All analyses were conducted using SPSS version 15 (33).

Results

The characteristics of respondents are shown in Table 1. The two samples reflected national trends and demographics. They did not, however, represent women from minority ethnic groups; 97% of the sample in England were English and 95% of those in the Netherlands were Dutch. This is a well-documented shortcoming of the postal survey method (34;35). The results of the bivariate analyses by country, including all women, are presented in Table 2. The numbers vary from 617 to 735 for the English data and 1134 to 1307 for the Dutch data because not all women answered all questions. The results of the question, 'How do you feel when you look back on your experience of birth in 2000?', prior to dichotomisation, are presented in Table 3. In both countries, the majority of women were 'very happy'. However, a higher proportion of Dutch women than English women were either 'quite unhappy' or 'very unhappy' looking back.

These analyses rely on women's memories of their experiences. When asked 'How clear are your memories of the birth in 2000/2001?', 95% (n=699) of the English women and 93% (1208) of the Dutch women said that they had clear recall of events, with 19% (n=138) and 22% (n=282) of women, respectively, 'often' thinking about the birth.

As expected, the emergency caesarean rate was significantly higher in England than in the Netherlands (Table 2), particularly for women having their first baby where it is more than double (20.3%) the rate in the Netherlands (9.3%) (χ^2=7.1, df=3, p<0.001). The original hypothesis was that women from the Netherlands who had an emergency caesarean birth would be less happy looking back on their experience than women in England who also had an emergency caesarean. Table 4 shows cautious support for this

hypothesis: 48.6% of the Dutch women who had an emergency caesarean birth were unhappy looking back cf. 33.3% of the English women. This difference was of borderline significance (χ^2=3,829 df=1 p=0.05). However, it was also evident that women in the Netherlands were less happy looking back than women in England for all modes of birth (except the small numbers having an elective caesarean section).

Table 1: Characteristics of the respondents.

	England n=738 (%)	**Netherlands n=1310 (%)**	**p**
Age			
Mean age	31.03	31.27	0.251
Age range	15–43	17–45	
Education			
Degree/higher degree	193 (27.4)	487 (37)	<0.001
Professional/qualifications gained after	237 (33.6)	557 (43)	0.002
additional schooling			
Qualifications gained at the end of compulsory	222 (31.5)	236 (18)	<0.001
schooling			
No qualification	53 (7.5)	21 (2.5)	<0.001
Marital status			
Married or living as married	737 (94.6)	1301 (94.6)	0.964
Parity			
Primigravida	296 (40.1)	580 (44.3	0.065
Multigravida	442 (59.9)	729 (55.7)	

Table 2: Results of bivariate analyses by country (all women).

	England n (%)	**Netherlands n (%)**	**p**
Mode of birth			
Planned caesarean	58 (7.9)	92 (7.0)	0.489
Emergency caesarean	87 (11.8)	79 (6)	<0.001
Instrumental birth	89 (12.1)	146 (11.2)	0.537
Normal birth	504 (68.3)	992 (75.8)	<0.001
Birth at home	22 (3.2)	443 (36.4)	<0.001
Labour induced	182 (24.8)	300 (25.0)	0.912
Injection of Pethidine or similar	245 (37.0)	127 (9.7)	<0.001
Epidural in labour	237 (35.6)	70 (5.9)	<0.001
Felt life in danger during the birth	43 (5.9)	77 (6.0)	0.910
Felt baby's life in danger during birth	161 (21.9)	249 (19.4)	0.180
Description of staff .30% negative	154 (21.1)	247 (19.3)	0.352
Enough help with baby afterwards	609 (85.6)	1172 (91.8)	<0.001
Edinburgh postnatal depression scale (EPDS) .12	77 (11.5)	104 (8.5)	0.038
Rosenberg self-esteem score15 or below (low self-esteem)	84 (11.4)	73 (5.6)	<0.001
Description of child > 30% negative	237 (32.2)	281 (21.8)	<0.001
Child perceived as more difficult than others	103 (14.1)	78 (6.1)	<0.001

Further bivariate anaylses were therefore undertaken to explore this phenomenon.

It was postulated that women who had an EPDS score >12 and/or lower self-esteem (score <15) three years after the birth might be more likely to evaluate their birth negatively. Bivariate analysis of EPDS by 'looking back' showed that women in the Netherlands with a high EPDS were significantly more likely to look back negatively (29.2% (n=28) than women with a low EPDS (16.7% (*n*=177) χ^2=9.3, df=1, p=0.002). Although there was the same trend for women from England, 18.1% (n=13) versus 10.9% (n=62), this did not reach statistical significance, probably due to smaller numbers (χ^2=3.2, df=1, p=0.073). There was no association with self-esteem, as measured by the Rosenberg self-esteem scale, and 'looking back' for women from either country. Fewer Dutch women had a high EPDS score (8.5% (n=104) versus 11.5% (n=77) [χ^2=4.3, df=1, p=0.038]) and lower incidence of low Rosenberg scores (5.6% (n=73) versus 11.4% (n =84) [χ^2=22.1, df=1, p<0.001]) than women in England three years after the index birth (Table 2). A complex picture was therefore emerging with women in the Netherlands having lower EPDS scores and higher self-esteem, yet with more having a negative evaluation of their birth compared to the English women.

Also, Dutch women were consistently more positive about their child than English women (Table 2).

Table 3: How women feel looking back on the birth three years later by country.

	England n (%)	**Netherlands n (%)**	**p**
Very happy	347 (47.3)	719 (55.6)	<0.001
Quite happy	279 (38.1)	304 (23.5)	<0.001
No particular feelings	27 (3.7)	56 (4.3)	0.482
Quite unhappy	52 (7.1)	140 (10.8)	0.006
Very unhappy	28 (3.8)	75 (5.8)	0.052
Total	733 (100)	1294 (100)	

Table 4: Unhappy looking back x mode of birth in England and the Netherlands.

	Unhappy looking back		
	England n (%)	**Netherlands n (%)**	**p**
Planned caesarean	6 (10.9)	17 (17.3)	0.303
Emergency caesarean	28 (33.3)	36 (48.6)	0.050
Instrumental birth	17 (21.5)	58 (44.6)	<0.001
Normal birth	29 (5.9)	107 (11.2)	<0.001
All modes of birth	80 (11.3)	215 (17.4)	<0.001

Binary logistic regression

Variables were identified that could potentially relate to how women looked back on their experience three years after the birth based on clinical or theoretical concepts. We wished to focus on variables that might plausibly *lead* to a negative appraisal rather than co-occurring outcomes. For this reason EPDS score and descriptions of the child were not considered as candidates for inclusion in the regression models. Place of birth (home or hospital) was considered for inclusion. However, the English sample was not large enough for this analyses as only 22 women gave birth at home and none of them looked back negatively on the birth.

Women who give birth at home in the Netherlands do not have access to any pain relief, and pain relief is also not actively advocated during birth in hospital. This contributes to a significant difference between the countries regarding the use of analgesia (Table 2). Differences were particularly marked for first-time mothers. For example, 57% (n=153) of English primigravidas had an epidural in labour compared with 9% (n=46) in the Netherlands (χ^2=95.98, df=1, p<0.001). Similarly, 49% (130) of primigravida in

England had Pethidine in labour compared with 14% (n=76) of primigravida in the Netherlands (χ^2=112.10, df=1, p<0.001).

Another factor that could potentially influence women's evaluation of their birth is their perception of safety during the process. Six percent of both English and Dutch women felt that their own life had been in danger (n=43 and 77, respectively) and 22% (n=161) of the English and 19% (n=249) of Dutch thought that their baby's life had been in danger.

Having identified relevant and comparable explanatory variables, bivariate analyses were undertaken with each, with 'looking back' as the dependent variable. The following variables were found to be significant for both samples: first birth, induction, epidural, pethidine, mode of birth, baby in danger, own life in danger, perception of the staff, and health since the birth. The variables how the body looks now and postnatal support were significant for the Dutch sample only, and education was significant for the English sample only. A variable was only included in the regression model if bivariate analysis was significant.

Women who had an elective caesarean were excluded from the analyses as they had not experienced labour and therefore lacked data for a number of included variables. Two separate models were created for the English (Table 5) and the Dutch data (Table 6).

Common factors contributing to a negative appraisal of the birth were: emergency caesarean and instrumental birth, feeling that the baby's life had been in danger, negative perception of the staff and major health problems since the birth.

Table 5: English model – binary logistic regression with 'looking back negatively' as the dependent variable (n=614).

	B	**Sig**	**OR**	**95% CI for OR**	
				Lower	**Upper**
Mode of birth					
Spontaneous vaginal Birth (reference)					
Emergency caesarean	1.84	0.001	6.28	2.93	13.46
Instrumental birth	1.04	0.009	2.84	1.30	6.19
Feeling baby's life in danger during labour	0.92	0.005	2.51	1.31	4.79
Staff adjectives (more than 30% negative)	2.19	0.001	8.95	4.87	19.46
Major health problems since the birth	1.27	0.004	3.57	1.49	8.53

One variable that the English study does not have the equivalent of is being transferred from home to hospital in labour. If this is put into the Dutch model it makes a significant contribution (OR=3.36, CI 2.16–5.21, p<0.001).

Table 6: Dutch model – binary logistic regression with 'looking back negatively' as the dependent variable (n=1023).

	B	**Sig**	**OR**	**95% CI for OR**	
				Lower	**Upper**
First birth	0.051	0.016	1.66	1.10	2.50
Labour induced	0.051	0.015	1.67	1.11	2.51
Mode of birth					
Spontaneous vaginal Birth (reference)					
Emergency caesarean	1.54	0.001	4.66	2.45	8.84
Instrumental birth	1.33	0.001	3.78	2.28	6.26
Feeling baby's life in danger during labour	0.92	0.001	2.50	1.65	3.80
Feeling woman's life in danger during labour	1.33	0.001	3.76	1.90	7.44
Staff adjectives (more than 30% negative)	1.31	0.001	3.69	2.45	5.56
Major health problems since the birth	0.49	0.038	1.63	1.03	2.59

Discussion

The relatively low response rates had the potential to skew the findings. However, the respondents reflected the demographics of the two countries and national trends. The only major demographic difference between the two counties were that the Dutch sample were more educated than the English. However, bivariate analysis of birth evaluation and education did not reveal a propensity for educated Dutch women to be more critical of their experience than English women. These data did not reflect the experiences of women from minority ethnic groups and this was the case for both samples.

That women provided retrospective self-reports of obstetric interventions, might be considered a potential source of inaccuracy. However, the overwhelming majority of women reported having clear memories of their birth and there is multiple evidence that women are a reliable source of information regarding the details of their experience (36-

38). To compare the two cultures it was necessary to use the same variables, and where relevant, only those collected at the same time point. In doing so, however, the models subsequently developed were limited in terms of the variables they could include, due to the differences in the two methodologies. For example, in the Greater Expectations? Study (25), questions were asked antenatally regarding expectations and feelings which were potentially important factors in relation to how women felt looking back on their experience. Similarly, women were asked questions six weeks postnatally that captured their experiences of the birth while they were still relatively fresh in their minds. However, the Dutch study did not have such prospective data, therefore the analysis could only draw on women's evaluations three years after the event. It was a considerable strength that the Dutch study was designed to replicate the English one and therefore used the same postnatal measures.

Due to the different models of maternity care there were issues that would be particularly influential in one group but less prevalent in another. For example, in the English group only 22 women gave birth at home (compared with 435 Dutch women). However, there were no data regarding how many women who had planned to have a home birth were transferred to hospital in labour. This is known to be a potential source of disappointment for Dutch women in the short (11;40) and long term. (28) However, Wiegers et al.(12) did not find that intrapartum transfer from home to hospital influenced women's appraisal of the birth three weeks postpartum. Further research is needed to clarify the impact of referral to hospital from home which should include the criteria used to make such decisions and women's involvement in them.

There may have been seasonal differences in women's appraisal of the birth that impact on the results. Data were collected from women in the Netherlands in January whereas data collection form the English women took place in April. Although winter is known to influence the affect (41) this phenomenon was not reflected in other measures; for example, perception of their child, which was more positive in Dutch than English women (Table 2) and is unlikely to have had a significant impact.

More women who gave birth in the Netherlands were negative about the way the birth went than women in the English sample. As they had not previously been involved in the study, as the English women had, perhaps this negative appraisal can be partly explained by their distance from the research seeing it as 'a one-off'. For women in the English study, this was their fourth questionnaire, having received the first when they were pregnant and they may well have felt more connected to the findings and less able to be reproachful. In the Netherlands in 2000 and 2001 there was a serious shortage of midwives resulting in a higher case-load which might have affected the care given. However, data collected after this critical period also showed Dutch women to be more negative than Belgian women two weeks after birth (39).

The original hypothesis, that following emergency caesarean women in the Netherlands would be more negative, received cautious support, the finding being of borderline significance. Moreover, more Dutch women looked back negatively irrespective of mode of birth and this phenomenon persisted, even when obstetric interventions and the different way women might perceive the staff were taken into account. It is possible that their appraisal reflected their antenatal expectations. It has been suggested that to form a positive appraisal of birth depends on how well events lived up to expectations and studies have shown that when such expectations are fulfilled women report higher levels of satisfaction (12;42;43). The English may have lower expectations about how positive an experience childbirth can be. In a study of women who had given birth at home in the Netherlands, Johnson, Callister, Freeborn, Beckstrand and Huender (44) reported the empowerment and fulfillment that Dutch women attributed to childbirth and being a mother. In a study comparing Dutch and Belgian women's experiences of birth (44). Dutch women had lower expectations and less positive experiences than Belgian women. Yet as Crow et al.(35) identified in their review of the literature regarding the measurement of patient satisfaction, despite the relevance of expectations in relation to satisfaction, only 20% of studies took these into consideration. This lack of prospectivity needs to be addressed in future evaluation of childbirth experience.

A further consideration when reflecting on the responses to the looking back question, is how respondents interpreted the response options. It is possible that 'the way things went' was perceived differently by different groups. For example, to some women, the options may have led them to consider the outcome of the birth, rather than their experience of getting to that end point. The options could potentially have led some women to focus purely on the birth whereas others may have included their intrapartum and postnatal experiences in the evaluation.

Redshaw (46) asserts that when women's experiences of childbirth are evaluated they should have the opportunity to comment on the many aspects that contribute to their overall 'satisfaction'; to commend and critique their care and carers. In the current study, choosing more than 30% negative words from the staff adjective check list three years after the birth was a strong predictor of a negative birth appraisal. Although the two samples were equivalent in the percentage of women giving a negative appraisal of the staff (c. 20%), this was more than twice as predictive of looking back negatively on the overall experience for English women as it was for Dutch women (OR 8.95 vs. 3.69). Many studies have identified the contribution of supportive care to a positive evaluation of the birth (27;31,47-49). A woman's expectations and perceptions of what constitutes support will also vary depending on her cultural norms (4;50). Whatever her culture, being 'with woman' necessitates tuning into her individual needs (51). Stadlmayr et al. (52) suggest that women at risk of developing a negative long-term

appraisal of the birth can be identified in the early postpartum period by taking account of their experience and perception of their intrapartum relationship with caregivers. However, describing the caregiver more positively or negatively three years postpartum does not necessarily reflect a positively or negatively perceived experience with the caregiver at the time of birth itself. It only implies that how a woman looks back at her birth three years later is associated with her perception of the caregivers involved. When the staff adjectives chosen in 2000 (six weeks after the birth) were compared with those chosen in 2003, it was observed that women had become more critical of the staff in the intervening three years.

That having an emergency caesarean leads to a negative birth experience was supported by the outcome of previous research using multivariate analysis (21;28;53;54). Many other studies using bivariate analysis have found significant associations between emergency caesarean birth and dissatisfaction (25;26;55-58) when measured up to six weeks postpartum. In a large Australian study (59), 790 women were surveyed between eight and nine months after the birth and having an emergency caesarean was associated with dissatisfaction for both primiparous and multiparous women in univariate analyses. In a multivariate model, high exposure to intervention (which included emergency caesarean birth); limited role in decision-making; not enough information; and limited helpfulness of caregivers were the most predictive of dissatisfaction.

Having an instrumental birth was also associated with looking back negatively on the birth. Saisto et al. (54) investigated the factors associated with tokophobia in 100 second pregnancies in Sweden. They found that emergency caesarean or vacuum extraction were the most important contributors to this subsequent dread of childbirth. In an Austrian study conducted by Schindl, Birner, Reingrabner, Joura, Husslein and Langer (60), instrumental birth was associated with a higher negative appraisal of birth than emergency caesarean both at three days after the birth and four months later. Maclean, McDermott and May (61) reported more distress during the birth and dissatisfaction with postnatal analgesia in women who had an assisted birth compared to other women. They also perceived themselves to be most at risk of serious injury.

Fear that they or their baby might die in childbirth was a strong predictor of a negative birth appraisal three years later. It was not known to what extent the women in this study had a pre-existing fear. They may already have been suffering from symptoms of anxiety or pre-existing tokophobia. Odent (62) argues that fear of death is a common phenomenon even during physiologically efficient labours. A perceived threat to life during childbirth has also been associated with the development of post-traumatic stress symptoms (63) and post-traumatic stress disorder[64] in non-caesarean births. Therefore, as significant predictors of persistent unhappiness with the way the birth went and with the potential to invoke mental ill health, further research is needed to explore and

account for this phenomenon so that strategies can be employed to prevent its occurrence.

Induction of labour featured in the Dutch model showing that having labour started artificially resulted in a 1.67-fold increase in the odds of feeling unhappy with the birth, independent of mode of birth. In a large case-controlled study comparing women who had their labour induced with women who had a spontaneous labour (65) significantly more women in the spontaneous group were satisfied with their labour (79.5% versus 70.4%, RR 0.89, CI 0.8–0.96, p=0.006). Having had major health problems since the birth was associated with an increase in the odds of a negative birth appraisal. The severity of any health problem was based on the woman's perception. What constitutes a major problem to one woman may not be so for another. Research in Sweden (66) suggests that childbirth experience may have a long-term impact on women's self-rated health. In the Dutch model being a primigravida was associated with a 1.66-fold increase in the odds of looking back negatively on the birth; first birth is frequently associated with a negative birth appraisal (31).

Conclusion

Common factors that contributed to a negative appraisal of birth in England and the Netherlands, respectively, were: unplanned operative birth, negative appraisal of the intrapartum carers, feeling that her baby's life had been in danger and having had major health problems since the birth. In addition, for Dutch women, induction of labour, being a primigravida and feeling that her own life had been in danger, were also important factors. More Dutch women than English woman were found to be negative when they looked back on their birth experience three years later. These results should be interpreted with caution in view of the potential differences in the way that women from different cultures interpret the questions and their response options. Further prospective research is needed between the two countries that uses the same measures, collected at the same time that takes account of antenatal expectations, intrapartum and postnatal experiences and their evaluation.

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5

A trend analysis in referrals during pregnancy and labour in Dutch midwifery care 1988-2004

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Abstract

Objective
To assess the trends and patterns of referral from midwives to obstetricians within the Dutch maternity care system from 1988 to 2004; to study the differences in referral patterns between nulliparous and parous women
Design
A descriptive study
Setting
The Dutch midwifery database (LVR1), which monitored 74 % (1988) to 94 % (2004) of all midwifery care in the Netherlands between 1988 and 2004
Population
1,977,006 pregnancies, attended by a primary care level midwife
Methods
The indications for referral from midwifery to obstetric care were classified into fifteen groups (eight antepartum, six intrapartum and one postpartum). The trends in referrals of these indications were analysed by general linear models.
Main outcome measures
Trends in the percentage of antepartum, intrapartum and postpartum referrals from midwifery care to obstetric care; trends in the specific indications for referral; contribution of different groups of the indications to the trend
Results
From 1988 to 2004 an increase of 14.5% (from 36.9% to 51.4%) occurred in referrals from primary midwifery care to secondary obstetric care either during pregnancy, childbirth or in the postpartum period. The timing of the referrals was as follows: antepartum + 9.0%, intrapartum + 5.2% and postpartum + 0.3%. In parous women the increase in referrals was greater (+ 16.6%) than in nulliparous women (+ 12.3%) (p=0.001).
The commonest indications for referrals in nulliparous women were anticipated or evident complications due to ‘failure to progress in the first or second stage’ and ‘fetal distress’. Parous women were most commonly referred for anticipated or evident complications due to ‘medical history’ and ‘fetal distress’.
In nulliparous women 52 % of the increase in referrals was related to the need of pain relief and occurrence of meconium stained amniotic fluid; in parous women 54 % of the increase in referrals was related to the general medical and obstetrical history of the women, particularly previous caesarean section , and the occurrence of meconium stained amniotic fluid .
Conclusions
During a 17- year period there was a continuous increase in the referral rate from midwives to obstetricians. Previous caesarean section, requirement for pain relief and

the presence of meconuim stained amniotic fluid were the main contributors to the changes in referral rate. Primary prevention of caesarean section and antenatal preparation for childbirth are important interventions in the maintenance of primary obstetric care for low-risk pregnant women.

Keywords

Maternity care, midwife, obstetric care, primary care, referral, risk assessment, the Netherlands.

Introduction

One of the key elements of the health care system in the Netherlands is the clear distinction that is made between the three levels of care provision: primary, secondary and tertiary care. General medical practitioners and independently practising midwives are examples of primary care professionals. Secondary care is provided in general hospitals, and tertiary care in academic hospitals. Primary care generally is the entry point into the health care system and all insured persons have free access to this form of care (1;2).

Maternity care in the Netherlands is founded on the principal that pregnancy, delivery and the puerperium are physiological processes (3). Pregnant women are initially considered 'low-risk' and so book with a primary care midwife for care provision during pregnancy, birth and the puerperium. In some rural areas this care is provided by a general medical practitioner.

If no problems occur during the course of pregnancy, the woman can choose to give birth at home, in a birth clinic or in a hospital. In all three settings, she will be cared for by her own midwife without an obstetrician being involved. In the event of an anticipated risk or evident complications, the midwife refers the woman to the secondary or tertiary care provider, namely the obstetrician.

To ensure that referral takes place in an optimal fashion, guidelines for consultation and collaboration between midwives and obstetricians have been formulated in the Obstetric Manual and in the so-called List of Obstetric Indications (3;4). In this document, all professional groups involved in maternity care reach general agreement on the indications for consultation and referral. The List forms the foundation for agreements and protocols in individual consultations between midwives and obstetricians. Approximately 80 % of pregnant women start antenatal care with an independent midwife and 5 % with a general practitioner (GP), and 15 % with a secondary or tertiary care obstetrician (5). The last group of women characteristically have a history of medical or obstetrical problems.

This division of tasks and responsibilities implies that one of the most important aspects of midwifery care is risk selection. This pivotal role of the midwife in the identification of risk in the Dutch maternity care system has relevance to systems in other countries as well, given the increasing number of midwife-led birth centres (both alongside and freestanding) in Western countries (6;7). This study provides evidence of trends in risks and referral rates from midwife to obstetrician and their relationship with the indications for referral.

Material and methods

Midwifery database (LVR1)

Since 1985 the midwives and 1982, the obstetricians have recorded information about mothers, newborns and care provision in the Netherlands Perinatal Registry, the LVR. There are two databases, the LVR1 for midwives and the LVR2 for obstetricians. To gain insight into the referral practice of the caregivers responsible for the risk selection, we decided to analyse the LVR1. The LVR1 records all cases of care provided by independently practising midwives, with no lower limit of gestational age.

The percentage of midwifery practices participating in the LVR1 increased from 74% in 1988 to 94% in 2004. The LVR1 presently covers a large majority of pregnancies in the Netherlands. The coverage, excluding cases of midwifery care in the postpartum period only, increased from 42% in 1988 to 72% in 2004 (8) (Figure 1).

During the registered years the ratio of nulliparous to parous women in the database remained almost equal at about 50% : 50%. This implies a slight overrepresentation of nulliparous women in the LVR1, as the national ratio of nulliparous and parous women is 45% : 55% (8).

The first three years of registration (1985–87) were excluded from the analysis, since a renewed List of Obstetric Indications, differing significantly from previous lists, was launched in 1987 (9). Cases in which primary care was limited to the postpartum period only, and spontaneous abortions (< 16 weeks) were excluded as well. One million,nine-hundred and seventy-seven thousand, and six (1 977 006) cases of women under midwifery care at the start of pregnancy in the period 1988 - 2004 were included in the analysis.

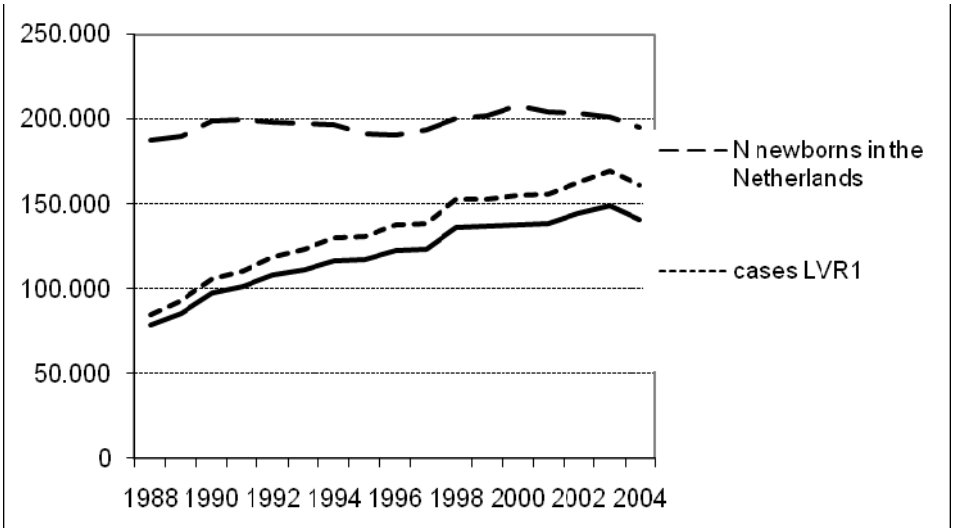

Figure 1: Coverage data LVR1, in relation to numbers of newborns in the Netherlands 1988–2004.[8]

Indications for referral

When a referral to secondary care occurs, the LVR1 records at least one and at a maximum three indications for referral, in any random order. In 11% of the cases more than one indication for referral was recorded. The LVR1 lists 152 different indications for referral. For problems which are not covered by these indications, a 'remaining' category can be chosen. This category is recorded as 'not otherwise specified' (NOS).

To identify how often indications for referral were being used, all three positions in the form were searched and counted. A decision-tree was developed to perform a hierarchy in indications, to end up with a total of a 100% with one 'main indication'. This decision-tree based on clinical experience takes into account the emergency of the indication and the time in pregnancy or delivery the indication occurred, which resulted in 15 main indications. As an example, in the case of a referral with the two indications 'preterm birth' and 'breech presentation', the main indication was 'preterm birth' whereas in the combination of 'pre-labour rupture of membranes' and 'meconium stained amniotic fluid' the latter was identified as main indication. 'Need for pain relief' and 'slow progress during first stage of labour' were combined in the main indication 'failure to progress first stage', whereas 'haemorrhage post partum' and 'retained placenta' were combined in the main indication 'post partum indications', etcetera. The rationale of this decision-tree has been described in a previous publication (10). In line with previous studies, referrals for prematurity or postmaturity were considered as referrals antepartum (10-13).

All analyses were conducted with the statistical software package SPSS 15.0 (SPSS, Chicago, IL, USA). The analyses were carried out for all cases registered, and stratified by nulliparous and parous women. General linear models were performed to test the difference in trend per main indication, and between the nulliparous and parous women. P values < 0.01 were considered significant.

Results

During the course of the study period, referral from primary to secondary care increased by 14.5% from 36.9 to 51.4%, of which 9.0% were for antepartum indications and 5.2% for intrapartum indications, while the proportion of referrals during the puerperium (directly postpartum and during first week) remained small (+ 0.3%) (Table 1).

The most common indications for antepartum referral were, successively, medical history (including obstetrical history) and pregnancy indications-NOS. The commonest indications for intrapartum referral were fetal distress and failure to progress during the firts stage (Table 2).

Comparing the first and the last year of the study period, it turns out that the percentages per indication changed (Figure 2). Four indications are particularly noteworthy because of their increase: failure to progress first stage, fetal distress, medical history, and pregnancy indications-NOS. The other indications increased to a smaller degree or even decreased (Figure 2).

In Table 3, the indications for referral are ranked for nulliparous and parous women separately. In 2004, 63.3% of all nulliparous women were referred to secondary care, at any time during pregnancy, childbirth or postpartum. This is a significant increase of 12.3% from 1988. Amongst parous women, 40.4% were referred in 2004, a marked increase of 16.6% compared to 1988 (Table 3). The trend in referrals in parous women is more pronounced compared to nulliparous women (p=0.001; Figure 3).

An analysis of the four most increased main indications for referral (Figure 2) is shown in figure 4A-D, for nulliparous women and parous women, respectively.

The increase in the main indication ‘failure to progress first stage’ (+2.8%) was related to an increase in nulliparous women requiring pain relief (from 0.7% in 1988 to 3.8% in 2004) and in ‘slow progress first stage’ (from 5.9 to 7.3 %) (Figure 4A). In parous women the need for pain relief increased from 0.1% in 1988 to 0.6% in 2004, whereas ‘slow progress first stage’ increased from 1.1 to 1.9 % (Figure 4A).

Table 1: Number and percentages of recorded cases and referrals, LVR1 1988–2004*

Year	N of cases **	% referral antepartum	% referral intrapartum	% referral puerperium	% referral (total)	% without referral
1988	77,040	18.1%	18.6%	0.2%	36.9	63.1%
1989	83,576	18.9%	18.8%	0.3%	38.0	62.0%
1990	05,343	18.9%	19.3%	0.2%	38.4	61.6%
1991	98,933	19.1%	20.6%	0.2%	39.9	60.1%
1992	105,281	18.8%	20.6%	0.2%	39.6	60.4%
1993	108,515	20.3%	21.0%	0.2%	41.5	58.5%
1994	112,811	22,1%	20.7%	0.2%	43.0	57.0%
1995	113,131	22.9%	21.4%	0.2%	44.5	55.5%
1996	118,168	23.6%	22.0%	0.3%	45.8	54.2%
1997	119,022	24.7%	22.1%	0.2%	47.0	53.0%
1998	131,125	25.2%	22.8%	0.2%	48.3	51.7%
1999	131,722	25.2%	23.0%	0.2%	48.4	51.6%
2000	132,505	25.9%	23.5%	0.2%	49.6	50.4%
2001	133,227	28.5%	22.1%	0.2%	50.8	49.2%
2002	138,410	25.8%	23.7%	0.4%	49.9	50.1%
2003	143,288	26.8%	22.3%	0.5%	49.7	50.3%
2004	134,909	27.2%	23.6%	0.5%	51.4	48.6%

* LVR1 selected data (see Materials and methods): all cases in LVR1 except spontaneous abortions (< 16 weeks gestational age), and except cases with postpartum care only

** All cases admitted to midwifery care at start pregnancy, before any risk assessment

Table 2: Referrals per main indication as percentage of all cases, LVR1 1988–2004*

Ranking **	**Main indications**	**period**	**1988**	**1992**	**1996**	**2000**	**2004**
	No referral +++		63.1	60.4	54.2	50.4	48.6
1	Foetal distress +++ *Including: meconium-stained fluid; fetal heart rate irregularities (FHR)*	labour	4.3	5.4	6.4	7.3	7.3
2	Failure to progress first stage +++ *Including: slow progress first stage; need for sedatives; need for pain relief*	labour	3.2	4.0	4.8	5.3	6.0
3	Medical history +++ *Including: general medical history; obstetrical history (incl. C section in history); social risk factors*	pregn	1.8	1.7	3.1	4.2	5.4
4	Pregnancy indications - not otherwise specified ++	pregn	1.3	1.3	1.1	1.5	5.0
5	Post-term pregnancy +++	pregn	2.3	2.9	3.6	4.3	3.8
6	Hypertensive disorder +++ *Including: pregnancy induced hypertension; pre-eclampsia; HELLP-syndrome. proteïnuria*	pregn	2.8	2.9	4.1	4.1	3.6
7	Failure to progress second stage	labour	3.9	3.9	4.0	4.0	3.3
8	Abnormal presentation *Including: non-engaged head at term; breech presentation, transverse presentation*	pregn	3.5	3.7	4.1	3.9	3.0

9	PROM at term (> 24 hours)	labour	3.2	3.3	3.0	3.3	2.9
10	Preterm birth *Including threat of or actual preterm labour; premature prelabour ROM*	pregn	2.9	2.9	3.2	3.2	2.6
11	Pregnancy indications with small numbers *Including: diabetes; LGA; blood loss ante partum; solutio placentae; fetal death; placenta previa; (suspection of) fetal anomalities*	pregn	2.6	2.1	2.8	2.7	2.3
12	Post partum indications + *Including: HPP > 1000 cc; retentio placentae; complicated rupture; puerperium problems*	labour	2.3	2.4	2.4	2.4	2.1
13	Labour indications - not otherwise specified (NOS) +++	labour	0.6	0.5	0.6	0.8	2.1
14	(Suspected) intrauterine growth retardation *Including: SGA; insufficient fetal movements*	pregn	1.5	1.8	1.8	1.6	1.4
15	Multiple pregnancy	pregn	0.7	0.8	0.9	0.8	0.7

Significance of trends per main indication, tested by linear regression. +++P ≤ 0.005; ++P < 0.01; +P < 0.05. *LVR1 selected data (see Materials and methods): all cases in LVR1 except spontaneous abortions (<16 weeks gestational age), and except cases with postpartum care only.

**Main indications in order of proportion as in 2004.

The main indication ‘fetal distress’ (+ 3.0%) was related to an increase in referral for meconium stained amniotic fluid, both in nulliparous women (from 4.5% in 1988 to 7.8% in 2004) and parous women (2.0- 4.7%). During the same period, referral for fetal heart irregularities remained stable at around 2.0% in nulliparous women and 0.5% in parous women (Figure 4B).
The rise in the main indication ‘medical history’ (+3.6%) was mainly due to an increased number of women with a history of caesarean section (Figure 4C). In parous women, the percentage of referrals for this indication increased from 0.9% in 1988 to 6.1% in 2004, whereas referrals for ‘other obstetrical history reasons’ and ‘general medical reasons’ showed a smaller increase as well (1.3-1.6 and 0.-1.3%, respectively). In nulliparous women the percentages of referrals due to general medical history and obstetrical history remained small (0.2-0.4% and 1.3-1.5%, respectively) (Figure 4C).

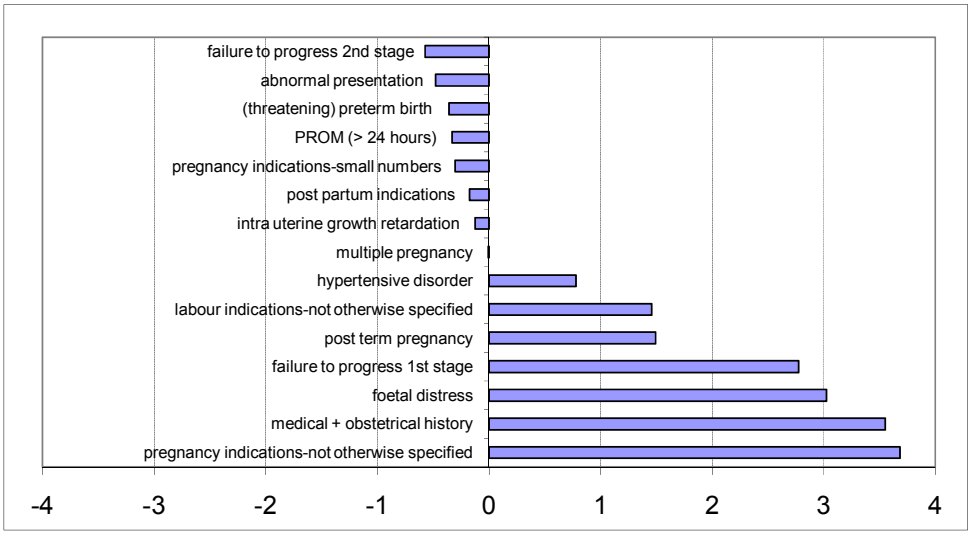

Figure 2: Increase (%) of referrals by main indication; differences between 1988 and 2004 (all cases).

Table 3: Referrals per main indication in nulliparous and parous women, respectively, as percentage of all cases of nulliparous and parous women, respectively, LVR1 1988–2004*

Main indications **	**% of all primiparae**			**Ranking *****	**Main indications ****	**% of all multiparae**		
Primiparae	1988	mean	2004		**Multiparae**	1988	mean	2004
No referral	49.0	41.6	36.7		No referral	76.1	68.0	59.6
Failure to progress first stage	5.5	7.6	9.9	**1**	Medical history	2.4	5.0	8.7
Fetal distress	6.3	8.5	9.7	**2**	Pregnancy indications - not otherwise specified	1.2	2.0	5.4
Failure to progress second stage	7.1	7.0	6.0	**3**	Fetal distress	2.4	4.1	5.2
Hypertensive disorder	4.6	5.8	5.5	**4**	Post term pregnancy	1.5	2.7	3.0
Post term pregnancy	3.2	4.6	4.7	**5**	Pregnancy indications with small numbers	2.6	2.6	2.4
Pregnancy indications - not otherwise specified	1.4	1.6	4.4	**6**	Failure to progress first stage	1.0	1.7	2.4
Abnormal presentation	4.8	5.1	4.2	**7**	Post partum indications	2.0	2.2	2.0
PROM at term (> 24 hours)	4.4	4.3	4.1	**8**	Abnormal presentation	2.3	2.4	2.0
(threatening) Preterm birth	3.8	3.9	3.6	**9**	PROM at term (> 24 hours)	2.1	2.0	1.8

Labour indications - not otherwise specified	0.7	1.0	2.6	**10**	Hypertensive disorder	1.1	1.6	1.7
Post partum indications	2.7	2.5	2.2	**11**	(threatening) Preterm birth	2.1	1.9	1.6
Pregnancy indications with small numbers	2.6	2.5	2.1	**12**	Labour indications - not otherwise specified	0.6	0.7	1.6
(Suspected) intrauterine growth retardation	2.2	2.2	1.7	**13**	(Suspected) intrauterine growth retardation	0.9	1.2	1.1
Medical history	1.2	1.2	1.7	**14**	Failure to progress second stage	0.9	1.0	0.8
Multiple pregnancy	0.6	0.7	0.6	**15**	Multiple pregnancy	0.8	0.0	0.7

*LVR1 selected data (see Materials and methods): all cases in LVR1 except spontaneous abortions (<16 weeks gestational age), and except cases with postpartum care only.
**For content of main indications: see Table 2.
***Main indications in order of proportion as in 2004, nulliparous and parous women, respectively.

By definition, the database does not provide information about the category 'pregnancy indications-NOS' (Figure 4D, + 3.7%). Informal evidence from practising midwives reports that this category is used for conditions such as 'rare pathological conditions' (e.g. breast cancer), 'new guidance' (e.g. a new policy for the management of Group B Streptococcal carrier), and 'new conditions' (e.g. hemoglobinopathies) (14). Figure 4D shows a marked increase in this unspecified reason for referral from the year 2000 onwards, both for nulliparous women (from 1.4% in 1988 to 1.2% in 2000 to 4.4% in 2004) and parous women (from 1.2% in 1988 to 1.8% in 2000 to 5.4% in 2004).
The proportion of non-Dutch pregnant women in the study population increased with 6.1% from 13.0% in 1988 to 19.1% 2004. The mean maternal age at childbirth in the

LVR1 increased by 2.3 years from 27.9 in 1988 to 30.2 in 2004. The mean maternal age in nulliparous women increased with 2.2 years, from 26.4 to 28.6.

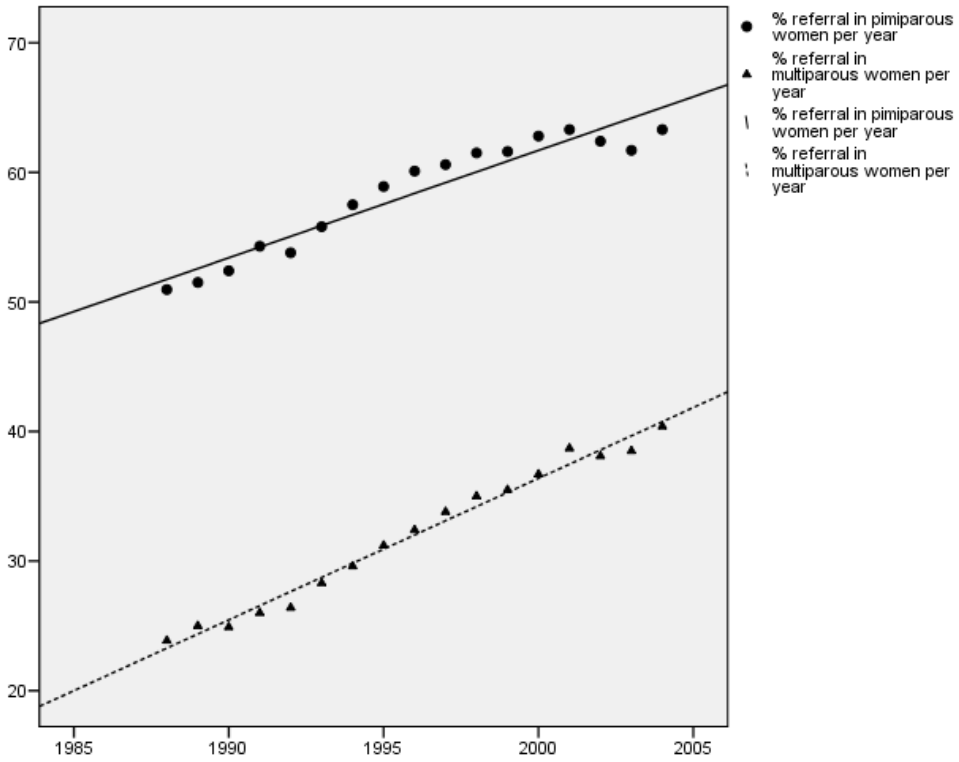

Figure 3: Trends in referrals by parity as % of all midwifery cases 1988–2004.

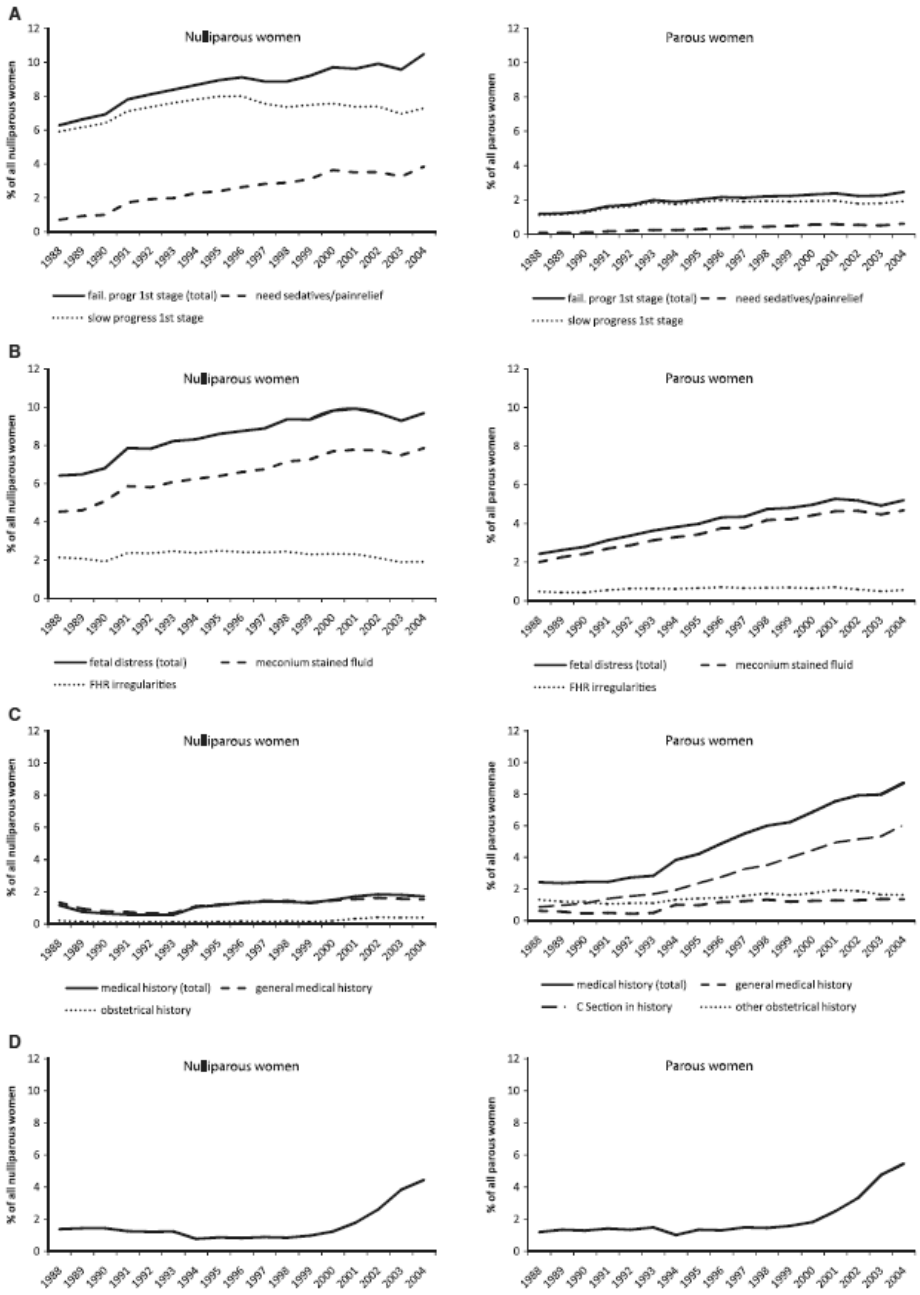

Figure 4: Trends in indications for referral 1988–2004, shown as % of all nulliparous and parous women with the indication concerned. (A) Failure to progress first stage. (B) Fetal distress. (C) Medical + obstetrical history. (D) Pregnancy indications not otherwise specified.

Discussion

Our study showed that an increasing percentage of women in the Netherlands who started pregnancy under midwifery care were being referred to secondary care. The increase in referrals between 1988 and 2004 was significantly larger in parous women than in nulliparous women.

The strength of this study lies in the longitudinal approach, based on data provided by the care providers themselves. The fact that the LVR1 database covers the national primary care population enables an analysis of trends in midwifery care and facilitates an exploration of the trends.

We found that population characteristics and the histories of the women attending midwifery practices are likely to have had an important influence on the changing referral rate. Firstly, for example in parous women, 38 % of the total increase in referrals was due to the general medical or obstetrical history, particularly that of caesarean section. This could be explained by a changing risk profile of the population in midwifery practices in the course of the study period. Secondly, in nulliparous women, the growing demand for pain relief accounted for 25% of the increase in referrals, suggesting a more active role of the patient (15). Thirdly, the increase in referrals due to meconium stained amniotic fluid is striking. It explains 27% of the increase in referrals in nulliparous women and 16% of the increase in parous women. Several studies have shown an association between ethnicity and the prevalence of meconium stained amniotic fluid (16-18). In our study this condition was an indication for referral in 4.8% of Dutch women and in 7.0% of non-Dutch women ($p < 0.001$). As the proportion of non-Dutch pregnant women in LVR1 increased by 6.1% during the study period, it is likely that the increase in prevalence could, at least in part, be attributable to a change in population. Lastly, the mean maternal age in the study increased by 2.3 years. A high maternal age is related to significantly elevated risks of pregnancy complications such as hypertensive disorders, and prolonged- or dysfunctional labour (19-21).

One can only speculate about additional explanations, if any, for the increasing trend in referrals as described in our study. Medical claims and litigation are still exceptional in Dutch midwifery. ‘Defensive medicine’ and litigation as an explicit incentive for referral is therefore unlikely to play a large role (22). Nevertheless, it appears that on a global level the birth process is becoming more and more medicalised (23;24). It is conceivable that this trend affects both the attitude of Dutch women in their demands, and of Dutch midwives in their assessment of ‘normality’ (24-28).

Our study has some limitations. Firstly, the LVR1 database covered 74% (1988) to 94% (2004) of all midwifery practices. It is unknown whether the missing data represent a random selection of midwifery practices or a biased selection. Secondly, the LVR1 does not represent the Dutch national data on maternity care, as the obstetric data are being

recorded in a separate database (LVR2) and the data from general practitioners involved in maternity care are lacking. Further, the ultimate objectives of maternity care are to achieve good outcomes for mother and child. Within the framework of this study it is not possible to analyse whether these objectives are being achieved, since outcome data of cases referred during pregnancy are lacking in LVR1 (as these are recorded in LVR2). However, other Dutch studies have reported good outcomes and low perinatal mortality in midwifery practices, even in case of intrapartum referral (10;11;13;29). Whether improvement of these outcomes in midwifery care may be possible, will be one of the issues addressed in the perinatal audit system being implemented on national level in 2009 (30).
The Dutch maternity care system, with its high percentage of planned home-deliveries (about 30 %) (5) and its specific role for the independently practising midwife, cannot easily be compared with systems in other countries. However, the growing number of midwife-led birth centres in a number of Western countries allows for a cautious international comparison. Recent studies in the UK, Sweden and Australia describe referral rates during pregnancy and childbirth in birth centres ranging between 32% to 54% (31-38). In one Australian study of 18 birth centres the average transfer rate within a 5-year period was 40%; during the study period (1991-95) the rate increased by 8% (37). These studies indicate that the trends apparent from our data apply not only to the Netherlands, but also to other countries .

Referral during labor has been shown to lead to more negative perceptions of birth experiences on the short and long term compared to not being referred (39-42). Further research is required to address women's expectations and attitudes towards birth, birthplace and caregiver. Furthermore, it has to be explored whether the antenatal criteria for the assessment 'low risk at start labour' can be improved, in order to decrease the referral rate during delivery.
There is a large body of published evidence that primary obstetric care for low risk patients is associated with a reduced risk of medical interventions, increased odds of high maternal satisfaction, one-to-one midwifery care, the choice between home- or hospital birth, low use of medication, more mobility, decreased likelihood of episiotomy and perineal tears, increased likelihood of breastfeeding initiation and continuation , and a low level of neonatal morbidity or mortality (10;32-34;38;42-51). If the trend, shown in Figure 3, continues at this pace in the Netherlands, the availability of primary obstetric care will be at risk, resulting in an increase in referrals which may not necessarily benefit the woman or the baby (41;42).
Therefore, it is a challenge for Dutch midwives, obstetricians and policymakers to examine critically the increase in referrals and to work together in order to maintain primary obstetric care for low risk pregnant women. This challenge can be met with preventive measures at a public health level (e.g. preconception counselling and

education) (52), at the pregnant women's level (e.g. improved utilization of the advantages of continuous support during labour) (53;54), and at the caregiver's level (e.g. awareness and multidisciplinary cooperation) (3;14;55). In view of the comparable trend in other industrialised countries, we recommend that this challenge be taken up as an international collaborative effort .

Contribution to authorship

MA designed the study and developed the method of data analysis, performed the analyses, drafted the manuscript and revised it. M.R. and S.B. commented on the study design and data analysis. They critically reviewed draft versions of the manuscript. All authors read and approved the final manuscript.

Details of ethics approval

The Netherlands Perinatal Registry is an anonymous register. No ethical approval is required.

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There are no competing interests.

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6

A retrospective study of the success, safety and effectiveness of external cephalic version without tocolysis in a specialised midwifery centre in the Netherlands

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Abstract

Background
To evaluate the effectiveness of external cephalic version (ECV) without tocolysis or epidural analgesia, the complications associated with the procedure and the association between the number of ECV attempts and cephalic presentation at birth and caesarean section.
Methods
Retrospective cohort study of all (n = 924) ECVs carried out between 1996 and 2000 in a specialised midwifery centre in the Netherlands. After bivariate analysis, those variables with a p value under 0.05 were considered statistically significant and were tested in a logistic regression model using backward stepwise selection. Analyses were carried out separately for first ECV attempts and second ECV attempts.
Findings
In total, 958 ECVs were analysed, 889 first attempts and 69 repeat attempts. Seventy per cent of all first ECVs were carried out before 37 weeks, but half of those were carried out between 36 and 37 weeks. The success rate for first ECV was 41% and for the second ECV 29%. Bivariate analysis showed that the success of the first ECV was positively influenced by parity, non-Dutch origin, higher birth weight, higher age and longer duration of pregnancy. After logistic regression, parity (odds ratio [OR] 2.8, 95% CI 2.1 to 3.7), non-Dutch origin (OR 1.8, 95% CI 1.2 to 2.8) and birth weight (OR 1.7, 95% CI 1.4 to 2.0) remained factors that independently influenced the success of ECV. The odds ratio for duration of pregnancy at first ECV was borderline significant: OR 1.2 (1.0 to 1.4). After an unsuccessful first ECV, only 13% of the women received a second ECV. The prevalence of cephalic presentation at birth increased with 3% after a second ECV. Three cases of complications were reported during or very shortly after the first ECV, and these did not result in serious complications. No complications were reported after a second ECV.
Conclusion
ECV without tocolysis is a safe procedure for pregnant women and their babies. Repeat ECV increases the number of cephalic presentations at birth and should be considered after an unsuccessful ECV.
Keywords
Cephalic version; Success; Safety; Breech; ECV; External cephalic version

Introduction

The obstetric system in the Netherlands is unique in its focus on physiological childbirth. Historically, vaginal breech birth has always been considered a reasonable and safe option.

This policy resulted in a relatively low number of caesarean sections for breech presentation in the Netherlands compared with other Western countries (1). However, the number of caesarean sections for breech presentation began slowly to increase in the second half of the 1990s, from 42% in 1996 to 50% in 2000 (2). After the publication of the Term Breech Trial at the end of 2000 (3), the percentage of caesarean sections for breech presentation increased substantially to 80%. The primary caesarean section rate for breech presentation doubled during the same period from 30–60% (4). The choice for caesarean section in case of breech presentation is rapidly becoming standard policy in the Netherlands, and is used as a means of preventing the neonatal mortality and morbidity shown to be a consequence of vaginal breech birth.

Reducing the number of breech presentations at birth lowers the risks associated with vaginal breech birth. External cephalic version (ECV) has been shown to be effective as a preventive measure for reducing the number of breech presentations at birth, as well as the number of caesarean sections because of breech presentation (5) This procedure was once widely accepted and used in obstetrics and midwifery, but lost its popularity among both obstetricians and midwives around the mid 1970s, primarily because of concerns about the safety of the procedure (6;7).[7] Since the publication of the Term Breech Trial (3), there has been growing interest in (re) introducing this procedure into practice (8-10). The Royal College of Obstetricians and Gynaecologists recommends that a skilled service for external version should be available and offered for breech presentation at term (11).

The effectiveness of ECV is influenced by various factors. Studies show that maternal and fetal characteristics, such as parity, type of breech presentation, uterine contractility, duration of pregnancy, breech position, ease in palpation of fetal head, uterine contractibility, liquor volume, skills of practitioner and placental position may contribute to the success of ECV (12-15). The use of tocolysis, epidural anaesthesia and fetal acoustic stimulation may positively influence the success percentage of ECV (16-17).

However, the issue of the safety of ECV has also been addressed. Complications associated with ECV include uterine rupture, placental abruption, early onset of contractions, premature rupture of membranes, umbilical cord complications, fetal–maternal transfusion, vaginal blood loss, Rhesus antagonism, fetal heart rate pathology, stillbirth and asphyxia (18-24). The most common of these complications is transient

fetal bradycardia not associated with fetal morbidity (25).
A meta-analysis showed no difference in neonatal morbidity (Apgar score under 7 at 5 mins, low pH in umbilical vein) and mortality between the ECV groups and those not having ECV (17).
A recent systematic review of version-related risks, analysing 44 studies covering a total of 7377 women, showed no increase in fetal mortality or serious morbidity after cephalic version. However, variable patterns in fetal heart rate as seen in electronic fetal monitoring (EFM) (i.e. transient bradycardia or decelerations in the fetal heart rate) frequently occurred, but rarely led to caesarean section (26).
Most studies describe the effects and risks of ECV performed with the use of tocolysis. In the Netherlands, the use of tocolysis or anaesthesia is not standard practice. In about 50% of the hospitals in which ECV is carried out, no tocolytics are used (10). Furthermore, ECVs are also carried out by midwives in primary-care settings, and midwives in the Netherlands are not regulated to prescribe tocolytic or anaesthetic medication. The Dutch guideline for obstetricians on ECV does not contain specific recommendations regarding the use of tocolysis or anaesthesia during ECV (10).
The aim of this study was to gain insight into the success percentage of ECV without the use of tocolysis, and to examine factors associated with a successful ECV. We also looked into the effect of the number of ECV attempts on the number of cephalic presentations at birth and the number of caesarean sections. Finally, we examined complications that may have resulted from the procedure.
This study is unique because of the large amount of data on ECVs carried out without tocolysis. These data can be added to the existing body of evidence addressing the benefits and safety of ECV. We also describe the outcomes of a second ECV without tocolysis, which, as far as we know, has not been addressed before.

Methods

This study was developed as part of the education and research collaboration between the Midwifery School in Amsterdam and the research institute TNO (Institute for Applied Scientific Research) Quality of Life. Eleven final-year midwifery students designed and carried out the study under the supervision of two midwife-researchers (KH, MR).
The ‘Slotervaart’ Hospital (SLVZ), a regional hospital affiliated with the Midwifery School of Amsterdam, has a long tradition of carrying out ECVs during pregnancy. An average of 200 ECVs are carried out each year primarily by one single midwife and, in her absence, by one single obstetrician. Pregnant women with a breech presentation are referred from obstetricians working at the SLVZ and from midwifery practices in

Amsterdam and throughout the country. In 1993, the midwife set up an ECV data registration system for annual review.
Students collected data from ECVs carried out between 1996 and 2000 from SLVZ hospital records. Data pertaining to the remainder of the pregnancy and to the birth were collected from the handwritten birth notes and registration forms from 35 different midwifery practices. Approval from a Research Ethics Committee was not required to carry out this study.
Data collected from the ECV register included parity, duration of pregnancy, success of ECV and the use of ultrasound or electronic fetal monitoring before or after the procedure. From midwifery practices, data were collected pertaining to the women (age, ethnicity), the pregnancy (complications and referrals or consultations for complications possibly associated with the ECV), the birth (presentation at birth and mode of delivery) and the baby (neonatal morbidity and mortality).
Analysis was conducted using SPSS (version 11.5). For the bivariate analyses, the Chi square test was used for categorical variables, the student t-test for continuous variables and the Mann–Whitney U test in case of a skewed distribution. Variables with a p value under 0.05 were considered statistically significant and were tested in a logistic regression model using backward stepwise selection. Analyses were undertaken separately for first and second ECV attempts.

Findings

The study population consisted of 924 women referred for ECV in the study period. Thirty-five cases could not be included in the analysis. In 25 of these cases (2.8%), the women did not undergo the procedure because of the following reasons: cephalic presentation at the time of the consultation (n = 21); the baby's head was positioned behind the placenta (n = 1); or unknown reason (n = 3). In 10 cases (1.1%), no documentation was available about the success of the ECV. In total, 958 ECVs were carried out on; 889 first attempts and 69 repeat attempts. All ECVs were carried out without the use of tocolysis or epidural anaesthesia.
The distribution of baseline characteristics of the study population that may influence the success of ECV are shown in Table 1. Results are shown separately for women who had only one ECV and those who had two ECVs. No significant differences were found between women with one or two ECV attempts.
The results of all first and second ECVs, type of professional who carried out the procedures and the weeks of gestation in which they were carried out are shown in Table 2. The success rate for ECV was 41% (364/889) for first attempts and 29% (20/69) for second attempts. More than two-thirds of the first version attempts were carried

out before term, between 34 and 37 weeks gestation. Ten per cent (7/69) of all second version attempts were after 37 weeks. The chance of success of the first ECV attempt increased with every additional parity and with an increase in birth weight of the baby. The chance of success was more than double for multiparous women (64%; 184/290) compared with nulliparous women (29%; 172/598), and almost double for non-Dutch women (60%; 87/146) compared with Dutch women (38%; 214/561). First attempt ECV was also positively influenced by higher age and longer duration of pregnancy.

After adjustment, parity, non-Dutch origin and birth weight remained factors that independently influenced the success of ECV (Table 3). With every pregnancy, the odds ratio for success of ECV increased almost threefold. Non-Dutch origin and an incremental increase of 500 g birthweight increased the odds ratio for success almost twofold. A 20% increase in success was found with every additional week of pregnancy, but this was borderline significant. Only 13% of women with an unsuccessful ECV received a second ECV. Parity was the only factor contributing to the success of repeat ECV: adjusted OR 4.0 (95% CI 1.4 to 11.3) for every additional parity.

The effects of having at least one ECV on clinically relevant outcomes are shown in Table 4. A successful ECV (either at the first or second attempt) is associated with a large proportion (94%) of women with a baby in cephalic presentation at birth. In 6% of these cases, the baby turned back to breech presentation. The proportion of cephalic presentations at birth increased by 3% after a successful second ECV. A repeat ECV did not result in a significant reduction of the proportion of women undergoing caesarean section, but the numbers involved were small.

Table 1 Baseline characteristics of women (and their babies) who underwent one or two external cephalic version attempts.*

Characteristics	Women with one ECV attempt ($n = 820$)		Women with two ECV attempts ($n = 69$)	
	n	%	*n*	%
Parity				
Nulliparous	552	67	46	67
Multiparous	267	33	23	33
Origin				
Dutch	523	80	38	75
Non-Dutch	133	20	13	25
Age of woman (years)				
Mean (SD)	31	(4.5)	31	(5.3)
Median	31		31	
Birth weight baby (g)				
Mean (SD)	3394	(476)	3438	(465)
Median	3400	3493		
Baby's gender				
Male	356	46	38	59
Female	423	54	26	41

*Denominators differ due to missing data. ECV, external cephalic version.

Table 2 Characteristics of the external cephalic version.*

Characteristics	First ECV attempts ($n = 889$)						Second attempt ECV ($n = 69$)					
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
	Total		Successful		Not successful		Total		Successful		Not successful	
			364	41	525	59			20	29	49	71
Person carrying out ECV												
Midwife (%)	750	85	307	86	396	85	47	68	17	85	30	61
Obstetrician (%)	126	14	44	12	60	13	22	32	3	15	19	39
Midwife and obstetrician (%)	5	1	2	1	3	1	0	—	0	—	0	—
Duration of pregnancy at diagnosis of breech												
Mean (SD)	31	(3.6)	31	(3.6)	31	(3.6)	31	(3.4)	31	(3.7)	31	(3.3)
Median	31		31		30		31		30		31	
Duration of pregnancy at time of first ECV												
32–33 completed weeks	7	1	5	1	2	—	0	—	0	—	0	—
34–36 completed weeks	613	69	215	61	336	73	62	90	17	85	45	92
37 weeks and more	266	30	135	138	124	27	7	10	3	15	4	8
Mean (SD)	36	(1.1)	37	(1.2)	36	(1.1)	36	(0.8)	36	(1.0)	36	(0.8)
Median	36		36		36		36		36		36	

*Denominators differ due to missing data; ECV, external cephalic version.

Table 3 Logistic regression using backward stepwise selection with crude and adjusted odds ratios for factors that may influence the success of a first external cephalic version attempt.

Independent variables	Outcome of first ECV attempts ($n = 889$)			
	Successful ECV (%) or (mean)	Unsuccessful ECV (%) or (mean)	Crude OR with CI 95% or p value	Adjusted OR with CI 95%
Origin				
Dutch ($n = 561$)	38.1	61.9		
Non-Dutch ($n = 146$)	59.6	40.4	2.4 (1.7 to 3.5)	1.8 (1.2 to 2.8)
Baby's gender				
Male ($n = 394$)	40.6	59.4		
Female ($n = 449$)	40.8	59.2	1.0 (0.8 to 1.3)	—
Person carrying out ECV				
Obstetrician ($n = 126$)	35.7	64.3		
Midwife ($n = 750$)	41.9	58.1	0.8 (0.5 to 1.1)	—
Parity	(0.86)	(0.23)	$p<0.001$	2.8 (2.1 to 3.7)
Age of mother	(31.6)	(30.4)	$p<0.001$	NS
Birth weight of baby (lbs)	(7.1)	(6.6)	$p<0.001$	1.7 (1.4 to 2.0)
Duration of pregnancy at ECV	(36.6)	(36.2)	$p<0.001$	1.2 (1.0 to 1.4)
Duration of pregnancy at diagnosis of breech	(31.1)	(30.9)	$p<0.4$	—

ECV, external cephalic version.

Table 4 Presentation at birth and method of delivery by success of external cephalic version in first attempt and second attempt external cephalic version during pregnancy.

	Presentation at birth and mode of delivery							
	Cephalic ($n = 352$)				Non-cephalic ($n = 474$)			
	Vaginal ($n = 315$)		Caesarean ($n = 37$)		Vaginal ($n = 280$)		Caesarean ($n = 194$)	
	n	%	n	%	n	%	n	%
Women with only one ECV attempt								
Success	283	87	25	8	9	3	10	3
No success	16	4	9	2	243	56	168	38
Women with two ECV attempts								
Success	15	79	3	16	1	5	0	—
No success	1	2	0	—	27	61	16	36

Percentages do not add up exactly to 100% due to rounding.

In all the ECVs, the fetal heart rate was checked with a hand-held Doppler before and after the procedure. An abnormality in the fetal heart rate was found in 21 cases (2.2%), most of which were cases of transient bradycardia (Table 5). In most of these cases, continuous electronic-fetal monitoring was used for further investigation.

Three complications were reported that occurred during or very shortly after the first ECV had been attempted (Table 5). There was one case of ruptured membranes during the ECV, resulting in a spontaneous vaginal breech birth of a healthy baby. One woman was admitted to hospital for abdominal pain on the same day she had undergone ECV. A few hours after admission, she underwent an emergency caesarean section because of

vaginal blood loss and a compromised baby. Although this baby was born in poor condition, it recovered quickly enough to be able to leave the hospital with the mother within a week of birth. One woman had vaginal blood loss and fetal heart rate pathology after ECV, which resulted in an emergency caesarean section for placental abruption and the birth of a healthy baby. No complications were reported after a second attempt at ECV. There were no cases of fetal or maternal mortality.

Table 5 Number of complications in external cephalic version study population.

Number of cases in which electronic fetal monitoring was undertaken after fetal heart rate pathology was detected	21
Bradycardia lasting less than 10 mins	15
Bradycardia lasting less than 4 hrs	2
Tachycardia with fast return to normal	2
No electronic fetal monitoring data available	2
Other risk factors for neonatal morbidity	3
Rupture of membranes during ECV at 37.5 weeks	
Healthy baby born after vaginal breech birth	1
Abdominal pain the same evening after an unsuccessful ECV at 36 weeks without complications.	1
Admission to hospital. No fetal heart rate abnormalities. Several hours later vaginal blood loss with indication of compromised fetal condition. Suspected abruption. Emergency caesarean. Baby born in poor condition (apgar of 5 mins = 6 and pH 6.59)	
Vaginal blood loss and fetal heat rate pathology after an unsuccessful ECV at 35+6 weeks. Emergency caesarean. Partial abruption confirmed. Baby born in good condition.	1

ECV, external cephalic version.

Discussion

The core data for this study were obtained retrospectively from a database of practice that had not earlier been analysed except for annual reporting purposes. The additional data collected by student midwives enabled the researchers to link the practice of ECV with individual characteristics of the women who underwent the procedure. Although data pertaining to a large cohort of women were collected, the retrospective design must be considered a limitation of the study. Despite this, we feel that this study adds valuable insight into the ECV carried out by a skilled clinician and without tocolysis, as there is little research into this procedure. In addition, conclusions concerning second attempt ECV are inconclusive owing to the small numbers and the selection process used for women receiving a second ECV. We feel, however, that this information can contribute to the discussion on the value of repeat ECV as it addresses repeat ECV without tocolysis, which as far as we know has not been reported before.

The study population consisted of women referred by obstetricians and midwives to a specialised centre for ECV. It is not known how many obstetric caregivers in the Netherlands practice ECV, but it is assumed that this is not common practice. Primary practitioners referred 90% of the women in this study without attempting an ECV themselves. Therefore, it can be assumed that the ECVs undertaken in this study were

not the ‘difficult cases’ that are referred after a failed first attempt. The results of this study, therefore, reflect the effectiveness and safety of ECV when carried out by skilled and experienced practitioners, without tocolysis or epidural anaesthesia.

The variation in success percentage of ECV reported in various studies may be caused by the different methods and techniques used in carrying out ECV (i.e. tocolysis and epidural anaesthesia). The success percentage of first ECV found in this study (41%) is consistent with the findings in the Cochrane review 95) for term ECV carried out without tocolysis. The same was found for the percentage of cephalic presentations at birth after ECV.

A few investigators have looked explicitly at the success of repeat attempts of ECV in the same pregnancy (27-29). They reported success rates ranging from 17–56%. Our study, with a success rate of 29%, may not be comparable to these studies for two reasons. First, the ECVs in our study, including all second attempts, were carried out without any form of tocolysis or anaesthesia, whereas, in other studies the repeat ECVs were carried out with either tocolysis or epidural anaesthesia after first attempts with tocolysis. Second, most studies report the success percentage of second attempt ECV in a selected group of women undergoing the procedure. The selection criteria for second attempt ECV varied in the different studies, which may have influenced the overall success percentage.

In our study, second ECV was not routinely offered to all women after a failed first ECV attempt. According to the midwife who carried out most of the first ECV attempts, women were referred for a second attempt when she estimated the chance of success as being good. This estimate was based on the course of the first ECV and the motivation of the pregnant woman.

More important than the success percentage of second ECV is the effect of repeat ECV on the number of cephalic presentations at birth and the number of caesarean sections. This study shows that the number of cephalic presentations at birth increases by 3% when only a small number of women undergo a second ECV after an unsuccessful first attempt. A further increase in the percentage of cephalic presentations at birth may be expected when a larger group of women are being offered repeat ECV.

In this study, a clinically significant decrease in the percentage of caesarean sections after a successful repeat ECV cannot be deducted. This is not consistent with other studies conducted in the USA and France on the effect of repeat ECV (27-30). The protective effect of repeat ECV may not have been detected in the present study because of the low numbers involved and the comparatively low percentage of caesarean births for breech presentation (41%) during this period in this hospital. In general, the benefits of ECV are shown to be greater when the caesarean birth rate for breech presentation is higher (31). In view of the increase in primary caesarean births for breech presentation

in the Netherlands, it can be expected that future studies will detect a reduction of caesarean births due to repeat ECV. However, the decrease in operative deliveries might be lower than expected owing to a higher incidence of obstetric interventions after successful ECV (30).

The data pertaining to predictive factors for successful ECV collected in this retrospective study were limited. Of the available data, only previous pregnancy, non-Dutch origin and higher birth weight, contributed to the success of the first ECV. Parity was the only factor contributing to the success of repeat ECV. This is consistent with other published studies (12;13;15;30-32). The success of ECV is not only related to physical, obstetric and neonatal factors but may be influenced by other factors such as skill of practitioner and maternal attitude, expectations and stress.

One of the most feared complications related to ECV is placental abruption. In the present study, abruption was diagnosed in one case but may have occurred in a second case where the diagnosis was uncertain (Table 5). Two (possible) abruptions in a total of 958 ECV attempts (0.2%) is comparable with the incidence of abruption in the general population of pregnant women in the Netherlands, which is 0.2% (33) and with the 0.34 in a general term population as described in the systematic review of Collaris and Oei (26). In addition, of the three reported complications relating to ECV, only one resulted in short-term neonatal morbidity.

All cases of neonatal morbidity occured with a first attempt ECV. It is not known from the published literature whether the risk of complications increases after a second ECV attempt. However, several studies have suggested that a large proportion of severe complications result from the use of tocolysis or anaesthesia leading to a lack of pain signals as a warning that too much force may be applied (26;29). In our study, first and repeat ECV were carried out in a setting without the use of tocolysis or anaesthetics.

In this study, first and second attempt ECV is shown to be a safe and effective procedure for pregnant women and their babies in preventing breech presentations at the onset of labour. Moreover, repeat ECV increases the number of cephalic presentations at birth and should be considered after an unsuccessful first attempt.

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7

Prevalence, Outcome, and Women's Experiences of External Cephalic Version in a Low-Risk Population

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Abstract

Background

Until recently, external cephalic version to prevent breech presentation at birth was not widely accepted. The objective of our study was to assess the prevalence, outcomes, and women's experiences of external cephalic version to improve the implementation of the procedure in the Netherlands.

Methods

A prospective cohort study was conducted of 167 women under the care of a midwife with confirmed breech presentation at a gestational age of 33 completed weeks or more.

Results

Between June 2007 and January 2008, 167 women with a confirmed breech presentation were offered an external cephalic version. Of this group, 123 women (73.7%, 95% CI: 65.5–80.5) subsequently received the version. These women had about a ninefold increased probability of a cephalic presentation at birth compared with women who did not undergo a version (relative risk [RR]: 8.8, 95% CI: 2.2–34.8). The chance of a vaginal birth after an external cephalic version was almost threefold (RR: 2.7, 95% CI: 1.5–5.0). The success rate was 39 percent, although considerable differences existed associated with region and parity. Ninety-four percent of women with a successful version rated it as a good experience compared with 71 percent of women who had a failed version ($p = 0.015$). Significant pain during the version was experienced by 34 percent of women, of whom 18 percent also experienced fear during the version, compared with no women who reported little or no pain ($p = 0.006$). Women who reported significant pain or fear during the version experienced the version more negatively (OR: 6.0, 95% CI: 3.3–12.2 and OR: 2.7, 95% CI: 1.1–6.0, respectively).

Conclusions

One in every four women with a breech presentation in independent midwifery care did not receive an exter¬nal cephalic version. Of the women who received a version one third experienced significant pain during the procedure. Considerable regional variation in success rate existed. (BIRTH
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Key words

Dutch, external cephalic version, pain, prevalence, women's experiences

Introduction

Until recently, external cephalic version to prevent breech presentation at birth was not widely accepted . In the Netherlands, obstetricians, and to a lesser extent midwives, considered the procedure an inefficient and potentially risky intervention for the baby (1–3). As a result, it was not offered systematically to all women, at term (4;5), and vaginal breech birth was relatively common. After publication of the Term Breech Trial in 2000 (6), the cesarean section rate for breech presentation increased from 50 to 80 percent in 2001 in the Netherlands (7;8). The rise in cesareans for breech presentation renewed the interest in external cephalic version (9), and a reevaluation of available evidence indicated that this procedure was a safe and effective intervention (10–16). It was introduced into Dutch National Guidelines by the Royal Dutch Association of Midwives (17) and the Dutch Association of Obstetricians and Gynaecologists (18) in 2001 and 2002.

In the Netherlands, a distinction is being made within the maternity care system between women with a low risk and those with a high risk of complications. Most women enter maternity care at the primary care level, and early pregnancy care is delivered by an independently practicing midwife. If pregnancy, childbirth, and the postpartum period are uncomplicated, the woman remains under the care of the midwife. If complications occur or threaten to occur, the midwife refers the woman to an obstetrician.

Breech presentation at term is an indication for referral to an obstetrician (19), and an external cephalic version may be offered and performed in secondary care. However, a version can also be performed by the pri¬mary care midwife (20). In the Netherlands, 93 percent of all midwives refer to an obstetrician for a version (4). When the procedure is successful, the woman returns to her own midwife for the remaining prenatal and perinatal care.

At present, 94 percent of Dutch midwives (21) and 92 percent of all obstetricians (5) state that they offer women the option for a version. The reported incidence of external cephalic versions in the Dutch Perinatal Registry ranges from 0.21 to 0.25 percent of all pregnancies (22). As the prevalence of breech presentations at term is approximately 3 percent, versions are either under-reported or infrequently performed. Analyses of data of the Dutch Perinatal Registry with respect to presentation at birth show that since the introduction of the aforementioned guidelines in 2001 and 2002, the numbers of vaginal breech birth at term remain stable, implying a low implementation or a low success rate of external cephalic version.

The objective of our study was, first, to assess the prevalence and outcomes of external cephalic version to improve the implementation of the procedure in the Netherlands.

Second, to gain more insight into the barriers to this procedure, we studied the reasons presented by women and practitioners for not undergoing or performing a version, respectively (23;24). The perceived low success rate, perceived lack of safety, and concerns about pain during the version are also known to be the reasons for decline (23;25). Therefore, third, as secondary outcomes in this study we explored factors that may influence women's experience with a version such as pain, success rate, receipt of counseling, and medication.

Methods

Design

A prospective cohort study was undertaken to identify the prevalence of external cephalic version among women with breech presentation receiving prenatal care in a representative sample of independent midwifery practices. The study was carried out between June 2007 and January 2008.

All women with suspected breech presentation at a gestational age of 33 completed weeks or more were identified by their midwife and reported to the research team on a weekly basis using questionnaires. In the case of incomplete data on offer and performance of an external cephalic version, active follow-up was performed by weekly telephone contact with the midwifery practices.

The midwife collected data on the basic characteristics of all women with a suspected breech presentation. After confirmation of breech presentation, more detailed questionnaires were provided to the women, the primary midwife, and the caregiver who was to perform the version. The questionnaires included multiple choice questions and some open-ended questions that addressed procedures and outcomes, possible explanations for decline or nonperformance of the version, women's experiences, and the outcome and mode of birth. Women were asked to complete the questionnaire after the version but before the birth to prevent recall bias by mode of birth. Pain and fear during the version were measured separately on a five-point scale with the following response options: ''extreme pain (respectively fear)''; ''a lot of pain (respectively fear)''; ''pain (respectively fear)''; ''little pain (respectively fear)''; and ''no pain at all (respectively fear).'' For data analyses, the first three categories were formed into one category ''yes'' pain (respectively fear) and the last two categories were formed into one category ''no'' pain (respectively fear).

The outcome variable ''experience with ECV'' was also measured on a five-point scale with the following response options: ''very positive experience''; ''positive experience''; ''no positive or negative experience''; ''negative experience''; and ''very negative experience.'' For data analyses, the last two categories were formed into one

category ‘‘negative experience’’ because of the low numbers of women in the category ‘‘very negative experience.’’

Sample Size

Midwifery practices in the Netherlands differ in size. Based on the number of midwives in a practice, we estimated an average annual practice size. A practice with one full-time working midwife is expected to provide care to an average of 110 women. Accordingly, a middle and large practice with two and three, respectively, or more midwives was estimated to have corresponding practice sizes of 240 or 360 and more women.

Based on data from the Dutch Perinatal Registry, we assumed a prevalence of breech presentation of 2.2 percent at 34 weeks of gestation among our specific study population of low-risk women receiving prenatal care by an independent midwife (17;22). We assumed that 50 percent of women with a confirmed breech presentation would receive an external cephalic version. To estimate a point prevalence performance of the version plus or minus 7.5 percent with a 95% confidence interval (CI), 162 pregnant women with confirmed breech presentation were needed to be included tolerating a reasonable sample error with a feasible sample size. To be able to register 162 women with confirmed breech presentation, 39 midwifery practices had to participate during a period of 6 months. A stratified sample was drawn based on practice size (i.e., the number of midwives per practice) per region (north, central, and south) (26).

As we assumed a participation rate of 60 percent, a sample size of 65 midwifery practices were selected. The sampling frame was constructed by the Netherlands Institute for Health Services Research. Midwifery practices were approached by mail for participation. If a practice declined, the reason for nonparticipation was registered.

Data Analysis

The chi-square test was used to compare proportions and analysis of variance (ANOVA) was used to compare means between groups. Logistic regression analyses were used to predict pain during the version procedure. Ordinal regression analysis using a probit link function was used to predict experience with the version (order response category variable). The link function specifies what transformation is applied to the dependent variable (i.e., experience with the version). A probit link function was used because the dependent variable was normally distributed. Risks were compared by calculating relative risks (RR) and 95 percent CIs (95% CI). All statistical tests were two-tailed, and $p < 0.05$ were considered statistically significant. Data analyses were performed with SPSS Version 14.0 (27).

Results

Population

Of the 65 midwifery practices approached, 49 (75%) agreed to participate. The reasons cited for nonparticipation included ''too busy'' (six practices), ''involved in other research projects'' (3), ''we do not perform versions'' (2), ''not practicing anymore'' (2), and ''just started practicing'' (1). Of the 49 participating midwifery practices, 3 never returned any data despite active follow-up. Therefore, data of 46 midwifery practices were analyzed. No statistical differences were identified in region or caseload between approached and actual participating midwifery practices or between number of actual confirmed breech presentation and expected numbers (data not shown).

Table 1 shows the characteristics of all women with a suspected breech presentation during the study period. Compared with the National Perinatal Registry that contains data on all pregnant women in 2005, our sample had significantly more ethnically Dutch women. Other demographic variables did not differ significantly. Most of (suspected) the breech presentations were diagnosed before 36 weeks' gestation, and most versions were performed after 37 weeks of pregnancy.

Performance of External Cephalic Version

Figure 1 shows the course of all pregnancies with confirmed breech presentation including their birth outcomes. All women with suspected breech were referred to an obstetrician for an external cephalic version in 41 different hospitals. One version was performed in a midwifery practice, without success. The flow chart shows that 73.7 percent (95% CI: 65.5–80.5) of women with a confirmed breech presentation received a version. Of the 44 women (26%) who did not receive a version, reasons were known for 42 women. Of these, 15 women (37%) did not want a version, 7 gave birth before the version was performed, and for 20 (48%) the obstetrician decided not to perform it. Reasons stated for not performing a version were ''logistic reasons,'' such as breech detected during birth, premature birth before planned version; ''reasons given by women'' to decline version, such as perceived high risk, low success rate, negative stories from others; and ''reasons given by professionals,'' such as not enough amniotic fluid or tight abdominal muscles, breech engaged, placenta anterior (not low), child small for gestational age or with congenital malformation(s), unstable lie, low umbilical cord, and previous cesarean section. Receiving a version did not differ significantly with respect to region, midwifery caseload, or women's parity, background, or age (data not shown). However, if a breech presentation was detected before 37 weeks, 78 percent of the women received a version (n = 107/138) versus 50 percent if a breech presentation was detected after 37 weeks (n =11/22; p = 0.006).

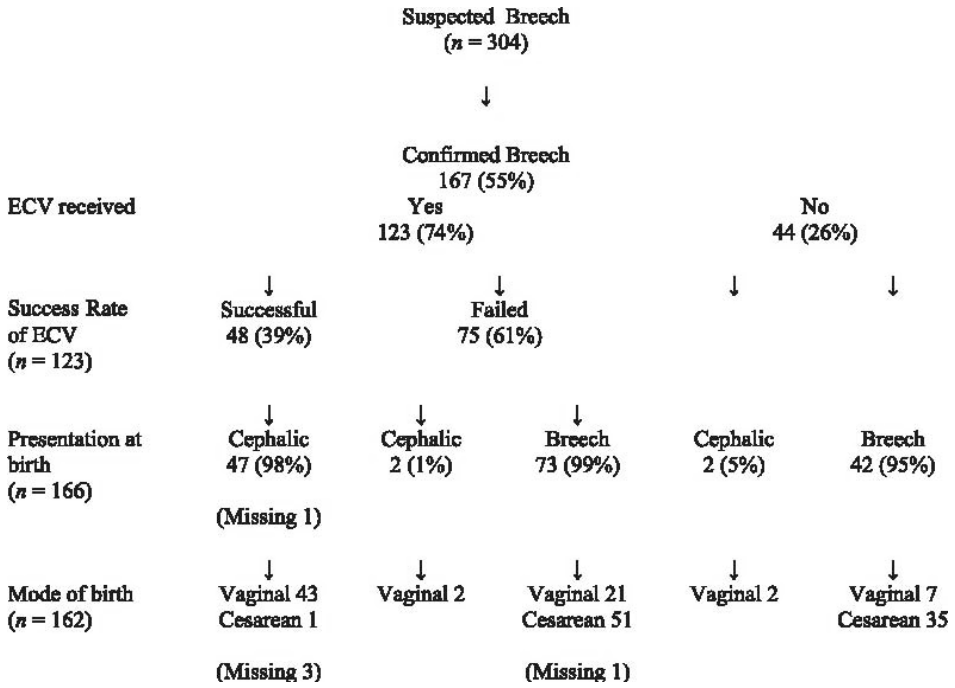

Figure. 1: Flow chart depicting numbers and outcomes of external cephalic version.

Table 1: Demographic Characteristics of Women with Suspected Breech Presentation in 46 Midwifery Practices in the Netherlands Between June 2007 and January 2008 in Comparison with a Reference Group (n = 304)

	Study Population		**Reference Group[a] Percent or (Mean ± SD)**
Characteristics	No.	Percent or (Mean ± SD)	
Parity (n = 281)			
Nulliparas	140	50	46
Multiparas	141	50	54
Ethnic background* (n = 282)			
Dutch	251	89	81
Non-Dutch	31	11	19
Age (yr; n = 275)			
Age (yr)		(31.1 ± 5.3)	(30.6 ± 4.9)
<25	18	7	12
25–35	195	71	67
>35	60	22	21
Education (n = 266)			
Low[c]	40	15	27[b]
Medium[d]	111	42	53[b]
High	115	43	20[b]
Diagnosis of (suspected) breech (*n* = 297)			NA
Duration of pregnancy (wk)		(35.5 ± 1.4)	
<36	199	67	
<36	98	33	
Performance of ECV (*n* = 101)			NA
Duration of pregnancy (wk)		(36.6 ± 1.1)	
<37	72	72	
≥37	29	29	

* $p < 0.05$.

[a] Data from the Dutch Perinatal Registry of 174,581 pregnancies in 2005;

[b] data from all women aged 15–44 years in Statline Statistics Netherlands;

[c] no qualification or qualifications gained at the end of compulsory schooling;

[d] professional/qualifications gained after additional schooling.

NA = not available; ECV = external cephalic version.

Procedure

In 85 percent of the women the number of version attempts carried out to achieve a cephalic presentation, was registered, but not whether these attempts had been done in one or more sessions. More then one attempt was recorded in one-third of the women (36/105). In 108 women (88%), use of medication during the version was recorded. In the recorded cases, 37/108 (37%) of the women received tocolytic medication. No records were available about the use of pain relief during the version, which most likely indicated it was not actually used. The use of medication was significant less in the north (12%) compared with the central (36%) and south regions (51%; $p < 0.001$).

Complications

Four minor complications were recorded. Three fetuses had bradycardia lasting less than 10 minutes, two after a successful and one after a failed version. On ultrasound examination, a low umbilical cord was detected in one fetus that resolved spontaneously after 1 day. All four newborns were born vaginally and in good condition.

Success Rate

The success rate of external cephalic version was 39 percent. No significant differences were seen in success rate among women with respect to their educational level, age, or ethnicity (data not shown). Furthermore, the size of midwifery practice, number of versions performed per hospital, duration of pregnancy at the time of breech detection or the performance of the version, or the use of tocolysis was not associated with significant differences in success rate (data not shown).

As expected, a significant difference occurred in success rate by parity: nulliparas had a lower success rate compared with multiparas: 27 percent (n =18/66) versus 57 percent (n =26/46; $p = 0.002$).

Furthermore, considerable differences existed among the three regions of midwifery practices in the Netherlands. The south region had a success rate of 16 percent (5/32) compared with 42 percent (20/48) in the central region, and 54 percent (23/43) in the north ($p = 0.004$). The success rate in the south remained significantly

lower for multiparas, that is, 11 percent versus 67 percent in the north and 69 percent in the central region ($p = 0.006$). For nulliparas, the success percentage in the south was 14 percent compared with 39 percent in the north and 31 percent in the central region. The difference was not significant. The adjusted odds ratios (parity and region) for failed versions were 5.5 (95% CI: 1.6– 19.2) for the south region compared with the north region, and 3.1 (95% CI: 1.3–7.2) for nulliparas compared with multiparas. The lower success rate in the south could partially be ascribed to one hospital where 16 women with confirmed breeches were referred. A version was performed in 11 women, but

none was successful. However, even after exclusion of this particular hospital, the success rate of 20 percent (4/20) in the south remained significantly lower (p = 0.04) than that of the other two regions.

Women who received a version had an almost ninefold increased probability of a cephalic presentation at birth compared with women who did not receive the procedure, RR = 8.8 (95% CI: 2.2–34.8). The chance of a vaginal birth was almost threefold (RR: 2.7, 95% CI: 1.5–5.0).

Experiences of Women

The questionnaire response rate of women who received a version was 80 percent (97/123) compared with 93 percent (41/44) of those who did not receive it. Information about external cephalic version was provided to 93 percent of the women, more frequently to those who actually received one (96%) than to those who did not (85%; p = 0.06). The information was provided verbally (88%), by information leaflet (53%), and/or by referral to a website (15%).

Women who had received a version were asked to score the counseling by their midwife and the performer of the version. Six percent thought that the counseling at the time of breech detection by their own midwife had been very poor, whereas 23 percent considered it to be adequate and 71 percent good or very good. Counseling by the version's performer (in all but one case an obstetrician) provided at the time of confirmation of presentation or performance was rated poor by 3 percent, adequate by 9 percent, and good or very good by 87 percent of the women. Counseling scores were not associated with success rate or region (data not shown).

Of the 37 (37%) women who received tocolysis, 13 (37%) said it was unpleasant, 19 (54%) were neutral, and 3 (9%) were positive.

Most women (55%) were neutral about the fact they had to go to hospital for a version, 7 percent found it unpleasant, and 38 percent experienced it as pleasant. Most women were positive about the fact they had received an ultrasound examination (94%) and fetal monitoring (84%) during the procedure.

Sixty-eight percent of the women (65/95) stated that the experience of a version was, by and large, as they had expected, and of those 83 percent (54/65) considered it to be a good experience. Of the 32 percent (30/95) who stated that it had not been as they had expected, 67 percent (20/30) said that it had been a good experience. Of the women with a successful version, 94 percent (30/32) rated the intervention as a good experience compared with 71 percent (45/63) of women with a failed version (p = 0.015).

Eleven percent (10/95) of the women who received a version said they experienced no pain at all during the procedure, 30 percent (28/95) experienced little pain, 34 percent

(32/95) experienced pain, 17 percent (16/95) experienced a lot of pain, and 10 percent (9/95) experienced extreme pain. After dichotomizing pain levels into ''no pain or a little pain'' versus ''pain, a lot of pain, or extreme pain,'' factors significantly associated with the latter were success, region, and diagnosis before 36 completed weeks of pregnancy. Parity, performance before 36 completed weeks, or tocolysis were not associated with pain levels (data not shown). Table 2 shows the adjusted odds ratios for those factors that, after univariate analysis, were significantly associated with pain during the version. Women who received a version in the south or central region compared with the north or women who had a failed version, had an increased chance of experiencing pain, a lot of pain, or extreme pain.

Table 2: Results of the (Multivariate) Logistic Regression Analyses on the (Independent) Effect of Factors on Pain During External Cephalic Version (ECV; n = 95)

	No or Little Pain (n = 38)	**Significant Pain (n=57)**		
Variables	**No. (%)**	**No. (%)**	**OR (95% CI)**	**Adjusted OR (95% CI)**
Region				
North	18 (64)	10 (36)	1	1
Central	13 (33)	26 (67)	3.5 (1.2–9.6)	4.0 (1.2–12.6)
South	7 (25)	21 (75)	5.4 (1.7–17.1)	4.7 (1.3–16.9)
Successful ECV				
Yes	22 (67)	11 (33)	1	1
No	16 (26)	46 (64)	6.3 (2.5–16.2)	5.3 (1.9–14.7)
Gestation at				
diagnosis (wk)				
≥36	17 (57)	13 (43)	1	1
<36	21 (32)	44 (68)	2.7 (1.1–6.5)	2.3 (0.8–6.5)

Table 3: Results of the Multivariate Ordinal Regression Analyses on the Impact of Factors on the Experience with External Cephalic Version (ECV; n = 96)

	Very Positive Experience	**Positive Experience**	**Neither Positive nor Negative**	**Negative Experience**	**Adjusted OR (95% CI)**
	(n = 15)	(n = 37)	(n = 24)	(n = 20)	
Variables	No. (%)	No. (%)	No. (%)	No. (%)	
Successful ECV (n = 96)					
Yes	10 (67)	17 (46)	4 (17)	2 (10)	1
No	5 (33)	20 (54)	20 (83)	18 (90)	1.6 (0.7–3.0)
Pain (*n* = 95)					
No (or little)	14 (93)	22 (61)	2 (9)	0 (0)	1
Yes	1 (7)	15 (39)	21 (91)	20 (100)	6.0 (3.3–12.2)
Fear during ECV (*n* = 94)					
No	15 (100)	36 (100)	19 (83)	14 (70)	1
Yes	0	0	4 (17)	6 (30)	2.7 (1.1–6.0)
Counseling caregiver (*n* = 96)					
Good	15 (100)	34 (92)	23 (96)	16 (80)	1
Bad or different among caregivers	0 (0)	3 (8)	1 (4)	4 (20)	1.3 (0.5–3.3)

Notes: Thresholds: very positive experience, estimate 0.9 (95% CI: 0.5 to 0.4); positive experience, estimate 1.8 (95% CI: 1.1–2.4); no positive or negative experience, estimate 2.8 (95% CI: 2.1–3.6).

One-third (33%) of the women who expressed fear before the version also experienced fear during the version compared with 7 percent of the women who had no fear before the version (44⁄76; p = 0.006). However, no significant relationship between fear before the version and pain during the version existed. Sixty-seven percent of the women who expressed fear before the version experienced pain compared with 58 percent of the women without fear before the version. On the other hand, all women who experienced fear during the version experienced significant pain (n = 11) compared with 55 percent (46⁄84) of the women who did not experience fear during the version (p = 0.003). All women who rated the counseling as poor (n = 7) experienced significant pain compared with 57 percent (50 ⁄88) of the women who rated the counseling as good. Poor counseling was not associated with expressed fear before or during the version.

Furthermore, after ordinal regression, pain and fear during the version significantly increased the probability of women rating their experience negatively. The adjusted odds ratio for women having had pain to rate their experience more negatively was 6.0 (95% CI: 3.3– 12.2) compared with women who had no or little pain. No woman who had experienced fear during the version rated the experience as (very) positive. The adjusted odds ratio to rate their experience more negatively was 2.7 (95% CI: 1.1–6.0; Table 3). The explained variance (Nagelkerke R2) for this model was 54 percent.

Discussion

All women in this study were offered an external cephalic version by their midwife and were subsequently referred. Seventy-three percent of these women accepted the offer. This rate is comparable with that reported in other populations (23;25;28). It is also in concordance with the claim of 94 percent of the Dutch midwives that they offer a version to all their pregnant women with suspected breech at term (21).

However, 26 percent of all women in our study did not receive a version. It has been shown that the acceptance rate varies significantly according to the health professional offering the procedure (29). The reasons given in our study for not performing a version suggest there is room for improvement. The most frequently mentioned unfavorable clinical factors were ‘‘not enough amniotic fluid’’ or ‘‘tight abdominal muscles’’ and ‘‘breech engaged.’’ In a vignette study among Dutch obstetricians these reasons were found to explain 80 percent of the decisions not to perform a version (30). Oligohydramnios is perceived as a relative contraindication (31). Insufficient amniotic fluid and engagement of breech as decisional factors not to perform an external cephalic version, however, are not evidence-based contraindications. In this study, no absolute contraindications were stated. The indications ‘‘low umbilical cord,’’ ‘‘anterior placenta,’’ and ‘‘previous cesarean section’’ are not considered to be contraindications according to national and international guidelines (18;31). Further-more, major differences were observed in actual performance and in success rates among regions, suggesting that further implementation of external cephalic version should not only address the improvement of competencies to perform the procedure but should also focus on more adequate evidence-based decision making.

The willingness of women in our study to accept a version appears higher than that reported elsewhere. Only 15 women, 9 percent of all women with confirmed breech, did not want it. Reported rates of maternal refusal range from 18 to 76 percent (23;24;28), although over 90 percent of the women reportedly preferred a vaginal birth rather than a cesarean (24;29;32). In an Australian study 39 percent of the women responded that they would not choose a version, another 39 percent would, and the remaining 22

percent were uncertain (23). A similar study from Israel in 1999 reported that more than half of the women (53%) had heard of a version, and 54 percent were willing to consider it, whereas in 2001, 73 percent had heard of it but only 24 percent were willing to consider it (24). To our knowledge, only one United Kingdom study showed a comparable rate (65%) of women with a breech presentation opting for a version (32).

Recently, studies have reported about women's attitude toward and knowledge of external cephalic version (23,25,33) and about interventions to help them in their decision (34). The most frequently mentioned reasons for not having a version by women were ''perceived risks'' or ''pain'' and ''perceived success rate.''

In our study the chance of a child in cephalic presentation at birth and the chance of a vaginal birth increased significantly after a version, even with an average success rate of ''only'' 39 percent. No major complications were reported in this study. Although the absence of complications in our study may partially be owing to its limited sample size, it has been shown in other studies that complications are rare and that a version can be considered to be a safe procedure (10–12;14–16;35). Improved counseling techniques and better dissemination of information to the women and their partners with more emphasis on the advantages and less on the risks seems justifiable.

However, pain is an aspect that should be emphasized more in counseling. Fok et al reported that a version without analgesia was associated with a moderate degree of pain (36). They measured pain on a visual analog scale (VAS) among 97 women and found a median score of 5.7 on a scale from 0 to 10, where 0 was no pain at all and 10 was as severe a pain as imaginable. They concluded that the pain was well tolerated by pregnant women because of its short duration (36). In a Czech Republic study among 110 women, a mean value of 4.9 on a VAS scale was found and eight versions (7%) were discontinued for reasons of pain (37).

In our study, which measured pain using five categorical levels, 60 percent of women experienced more than significant pain, and 25 percent even experienced a lot of pain. In the study by Fok et al, only 2 percent rated no pain, a score below 3 was found by 28 percent, and a score over 7 by 20 percent (36). In our study we had a higher rate of women reporting ''no pain at all'' (11%), and the other rates were comparable with those found in the literature with 30 percent reporting a ''little pain'' and 27 percent ''a lot of pain.''

As in our study, pain during the version was related to success in other studies (36;37) but not to parity. As in the study by Hutton et al, we did not find an association between pain and performance before or after 36 completed weeks of gestation (38). Women in the north reported significantly less pain compared with women in the two other regions after correction for time of diagnosis and success rate. This finding cannot be explained by other factors such as differences in time of performance, parity, counseling scores, or

increased use of tocolytic medication. Therefore, we are as yet unable to understand the relationship between region and reported pain.
In our study no pain or just a little pain was associated with an overall positive appraisal. In agreement with the results of Hutton et al, most women (79%) were willing to undergo a version in a subsequent pregnancy. In addition, in our study 80 percent of the women stated that the version had turned out to be better than expected. However, women with a more negative experience were those who more likely had experienced pain, a lot of pain, or extreme pain or fear during the version.

Limitations
Our study was conducted among low-risk women receiving prenatal care in an independent midwifery practice. The high acceptance of an external cephalic version might be related to the target population studied. A successful version results in women having the choice to receive the remaining perinatal care from their initial chosen caregiver and in a choice of place of birth. Therefore, the prevalence of offer, acceptance, and performance may not be completely generalized to other populations of pregnant women.
Although the sample was identified by an independent research institute and reasons for nonparticipation did not seem to have any association with acceptance of a version, it is still possible that the sample was not representative. Significantly fewer non-Dutch women were entered into the study compared with the national population of pregnant women in 2005. However, other characteristics of pregnant women and the expected and actual numbers of participating practices and prevalence of breech presentations seem to indicate accurate sampling.
In our study only one version was performed by an independent midwife, although nationally the percentage is expected to be around 7 percent (4). In our sample the results are presented of women from 10 percent of all Dutch midwifery practices and 41 percent of all Dutch hospitals equally divided over the Netherlands. We therefore expect our study population to be representative of low-risk women in the Dutch maternity system. To assess the accuracy of estimated prevalence of offer and performance of external cephalic version, we undertook intensive weekly follow-up by telephone. We decided not to perform an extra check for underreporting in the medical records, as it was unlikely this check would have yielded more complete results. Registration of versions in the medical records or in the Dutch Perinatal Registry is far from perfect (4;5;17). One-third of the midwives report that they never register a version attempt in their medical record (4), and only 19 percent of the obstetric units have a formal registration of number and outcome of versions (5).

We designed a special short questionnaire to explore women's experiences with the version because no validated questionnaires on experience with this intervention exist. The results are intended to be explorative for future research and should be interpreted with caution.
The data collected among women who did not receive an external cephalic version are limited, and further research into the inhibiting and enhancing factors of receiving a (successful) version is needed. A recent Dutch study has already shown an improved success rate by using a specific protocol and limiting its performance to a small team (39).

Conclusions

External cephalic version is an important procedure for the prevention of breech presentation at birth and of subsequent cesarean section. The procedure appears to be safe and can increase the chances of a vaginal birth by a factor of two. Nevertheless, one in every four women with a breech presentation in independent midwifery care did not receive an external cephalic version. Women with a baby in breech presentation who are approaching term should be counseled on the importance of the procedure. They should also be prepared for experiencing some discomfort and pain during the procedure. Of the women who received a version, one third experienced significant pain during the procedure. Caregivers should be trained in the technique, as the chance of success appears to differ substantially among centers.

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8

A Randomised Controlled Trial of Amniotomy at Home for Induction between 292 and 294 days gestation

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Submitted

Abstract

Objective
To evaluate the effect of amniotomy at home between 292 and 294 days of pregnancy on intervention rate during delivery and perinatal outcome
Design
An unblinded multicentre Randomized Controlled Trial
Participants
Low risk nulliparous and multiparous women with a singleton cephalic presentation between 292 and 294 days gestation in 43 midwifery practices in the Netherlands.
Interventions
Women were individually randomized by computer to amniotomy at home followed by 12 hours expectant management or referral to an obstetrician for induction of labour.
Main outcome measures
Spontaneous vaginal birth and adverse neonatal outcomes (neonatal infection, low Apgar score or neonatal admission to an intensive care unit)
Results
270 Women were allocated to amniotomy at home and 251 to obstetric referral. Women in the amniotomy group were more likely to have a birth without intervention (OR 1.6 95% CI 1.1 to 2.3, NNT 8.3) or a home birth (OR 2.3 95% CI 1.5 to 3.5). Women more often expressed a preference for the experimental treatment in a next pregnancy (87% vs. 77% p 0.0001). No differences were found between the groups in rate of assisted birth, need for pain relief, need for antibiotic treatment, perinatal death, neonatal infection, low Apgar score or neonatal admission to an intensive care unit (NICU).
Conclusion
Amniotomy at home is an effective method for induction of pregnancy between 292 and 294 days gestation in low risk women to reduce intervention. In a maternity care system with well organised midwifery-led care at home, amniotomy can be offered as an outpatient method of induction between 292 and 294 days gestation.
Trial registration
International Standard Randomized Controlled Trial number ISRCTN47736435

Background

Post term pregnancy is defined as a pregnancy that extends to or beyond 42 weeks of gestation (294 days) and occurs worldwide in approximately 4% of all pregnancies ((1). After 42 weeks of pregnancy an increase in perinatal morbidity and mortality occurs (2-4). The majority of normal post term pregnancies are not at higher risk of perinatal morbidity and mortality, but can rather be viewed as a biological variation in the duration of pregnancy (5-8). However, differentiation between normal and pathological post term pregnancy through policies of foetal surveillance using ultrasound, cardiotocography or doppler flow has not been successful in preventing adverse perinatal outcomes. Therefore, elective induction of labour at or before 42 weeks is frequently being employed in obstetric practice. Amniotomy when possible followed by oxytocin infusion is the method of choice. Because hyper stimulation can occur electronic foetal monitoring is recommended.

However, it is not known when to start oxytocin infusion after amniotomy and circumstances can exist in which amniotomy alone may be favoured. For example, in clinical settings where resources are limited and only an outpatient setting is available or if an individual woman prefers not to undergo pharmacological interventions. Bricker and Luckas (9) concluded in their Cochrane Review of 2001 that further research into the method of amniotomy alone for the induction of labour was needed since the available literature did not provide enough clarity about the value of the combination of amniotomy and oxytocin compared to only one of the separate methods (10). In addition another recent Cochrane Review of induction of labour in an outpatient setting concluded that not enough information exists to determine whether induction of labour was effective and safe (11). In the Netherlands, with a home birth percentage of 24 % (12) and a wish to give birth at home in 61 % of women in primary care (13), induction between 292 and 294 days gestation with amniotomy at home might be a desirable option for women.

We therefore carried out a randomized controlled trial comparing birth outcomes of women who received amniotomy in an outpatient setting (at home) for induction between 292 and 294 days gestation compared to those who received routine care. Routine care is defined as following the Dutch guideline for management of post term pregnancy at that time. The Guideline prescribed referral to an obstetrician for foetal assessment. Induction of labour was advised but could be postponed in optimal circumstances (14).

Methods

Recruitment

Recruitment ran from October 2004 to January 2008. The study began in four midwifery practices, but by the end of the study period recruitment had been rolled out to 46 midwifery practices in the Netherlands. We estimated that a midwifery practice with an average caseload of 300 women per year would recruit only 50% of all eligible women between 292 and 294 days gestation.

Participants

Low risk pregnant women who had a singleton fetus in cephalic presentation and received prenatal care in an independent midwifery practice were invited by their midwife to take part in the study after 290 days gestation. Gestation was estimated according to routine practice in the participating midwifery practices i.e. either by ultrasound in the first trimester or in case of a regular menstrual cycle by last menstrual period. Exclusion criteria were: being under 18 years of age, having had a previous birth resulting in a neonatal infection, maternal culture positive for group B streptococcus (GBS), foetal heartbeat abnormalities, being in labour, pre-labour rupture of membranes (PROM), non-descended head, temperature > 37.5 Celsius or language barriers. Women who fulfilled the criteria and those who gave written informed consent were enrolled between 292 and 294 days gestation.

Randomisation

A computerized randomisation service was carried out by an independent Medical Call Centre available for telephone contact 24 hours per day, 7 days a week. Women were randomly allocated to either amniotomy at home or obstetric referral in a 1:1 ratio using block randomization per 20 women with stratification for parity (nulliparous or parous women). However, after 140 allocations in the group of primiparous women, an error in the programming of the randomisation procedure was revealed. More primiparous women than expected had been enrolled in the intervention group. In addition, if a midwife called twice about one patient, for instance to give additional information, the woman was entered again into the randomisation database. As a result, eight allocations to the study population were erroneously eliminated. The women, however, were always treated according to the first allocation they received. After detection of these two errors the software program was adjusted back to a 1:1 ratio and allocation was again related to an individual woman. Subsequently, no adjustments were made for the slightly larger number of primiparous women (19 more) that were randomly enrolled in the intervention group. It was not possible to blind participants, midwives, other

caregivers or outcome assessors. Written informed consent was obtained from all participants before randomization.

Intervention group

In the intervention group amniotomy was performed with a disposable amniotic forceps (Romed-Holland). A minimum Bishop score was not required before performance of amniotomy. Midwives were free to choose any (time of) day between 292 and 294 days of pregnancy to perform amniotomy, depending on their working schedule, caseload or arrangements with local hospitals. However, they were requested to perform amniotomy at day 293 if possible and to do so preferably in the evening.

After amniotomy, 12 hours of expectant management at home was allowed. This management consisted of regular check-ups at home of mother and foetus including temperature control of the mother, foetal heartbeat monitoring with intermittent auscultation, physical examination of engagement of the head, position and estimated weight of the foetus. No further vaginal internal examination was performed until the woman was in established labour. This policy is consistent with the Dutch management of low risk women with spontaneous pre-labour ruptured membranes. A duration of ruptured membranes to active labour between 12 to <24 hours compared to <12 hours is not associated with suspected or established neonatal infection (15).

If after 12 hours of expectant management labour had not started, women were referred to an obstetrician for augmentation of labour. Women were also referred to an obstetrician if amniotomy was not feasible and in case of no progress in cervical dilatation had occurred after onset of labour (defined as increase in dilation of at least 1 cm /hr). Referrals were further allowed by clinical judgement of the midwife. Those could be the need of pain relief or any other reason in accordance with the national guidelines for referral by the professional organizations of midwives and obstetricians (16).

Control group

Women in the control group received the usual care, which is referral to an obstetrician on the morning of day 294. Obstetricians were asked to follow the Dutch obstetric guideline for post term pregnancy at that time. The guideline indicated foetal monitoring and induction of labour in case of an increased risk of foetal distress. Induction of labour in hospital usually is performed by method of using prostaglandins or mechanical methods in case of an unripe cervix or amniotomy in combination with oxytocin in case of a ripe cervix (14). Midwives were allowed to sweep membranes before and after randomisation but they were explicitly asked to conduct a similar policy in both groups.

Outcomes

The primary outcome of our trial was a spontaneous birth without intervention. These were defined as induction other than amniotomy, augmentation of labour, pharmacological pain relief or intra partum antibiotic treatment. A non-medical birth could include continuous or intermittent electronic foetal monitoring with cardiotocography or an episiotomy.

Secondary outcomes were a composite of adverse neonatal outcomes (mortality, admission to NICU, neonatal infection, Apgar score < 7 after 5 minutes) and maternal outcomes (mode and place of birth, duration of birth, medical interventions, use of antibiotics intrapartum), costs, and satisfaction of the woman with the birth. Within the intervention group, we further recorded the percentage of women that started labour after amniotomy, the duration between amniotomy and the onset of labour and the duration between amniotomy and birth.

Data collection

Midwives collected the basic characteristics of all women under their care before randomization at 290 days of pregnancy. At that time women were also asked to fill out a questionnaire with items that addressed their expectations of the birth and the different treatment options, of the planned place of birth and of anxiety, measured with the 6 item State-Trait Anxiety Inventory (STAI) scale (17).

After randomization and prior to the amniotomy, the admitting midwife performed a vaginal examination to assess cervical dilation in the intervention group and reported cervical dilatation (0-3 points), effacement (0-3 points), consistency (0-2 points) and position (0-2 points) as well as engagement of the head (0-3 points).

After birth, data on interventions and on neonatal and maternal outcomes were collected by the midwife and, in case of referral, by the hospital staff. Neonatal infection was considered to be present if there was a positive blood culture and/or biomedical infection parameters (CRP above 20 mg/l) or clinical signs of infection (apnoea, fever respiratory distress, hemodynamic instability) with positive surface cultures. The definition of a confirmed neonatal infection was determined by an independent paediatrician, who was blinded to the intervention and who assessed all discharge letters.

Finally, women were asked to fill out a questionnaire after birth addressing their experience with birth, pain, received treatment and care. Questions were purposely designed and a five point Likert scale was used with the answering options”I strongly agree, I agree, I don’t know, I disagree, I strongly disagree”.

Study design, Sample size and analysis
An unblinded multicentre randomized controlled trial was conducted.
In the intervention group we expected 80% of the women to receive amniotomy alone for induction of labour. We estimated that of those, 45% of the women would have a birth without medical intervention (100*0.8*0.45) (18). Furthermore, we estimated that 5% of the women in the intervention group who would not receive amniotomy also would have a non-medical birth (100*0.2*0.05). This corresponds with an estimated 37% of the women in the intervention group to have a non-medical birth. The estimated chance of a non-medical birth in the control group was 20% (19). To detect a statistically significant difference of 17% (with two-sided $\alpha = 0.05$, and $1- \beta = 0.80$) and an anticipated loss to follow up of 10%, 246 women per arm were needed, thus 492 in total.
Data were analyzed by intention-to-treat method and per protocol. A two-tailed α of 0.05 was used as statistical significance level. For ccontinuous variables, differences between groups were tested using the independent sample *t* test. Results are reported as mean, standard deviation, mean difference and 95% confidence interval. For categorical variables, differences between groups were tested using the X^2 test. Binary logistic regression was used to estimate the magnitude of the effect between groups, and to correct for possible confounders. Results are presented as numbers with percentages and odds ratios with a 95% confidence interval.
We performed post hoc analyses to compare outcomes of amniotomy with those of external monitoring in subgroups defined according to the following factors: parity (primiparous or multiparous), and membrane sweeping (performed versus not performed). We tested for interactions between treatment and each of these three factors for the composite end points of birth and adverse neonatal outcomes. All statistical analyses were performed in SPSS version 17.0 (20). Forest plots were created with Comprehensive Meta Analysis, Version 2 (21).

Results

A total of 767 potentially eligible women were recruited. Of these women, 81 declined randomization and 162 were excluded before randomization, in most cases because labor had already started (figure 1). This left 524 women who were enrolled in the study. Three primigravid women were excluded for analysis after randomisation: in both groups one woman was excluded because of established labour before randomisation and in the control group a woman was excluded because the randomisation and the birth had taken place before 292 days of pregnancy (figure 1). Therefore the final study population consisted of 521 women: 144 primigravid and 126

multiparous women in the intervention group (n=270) and 125 primigravid and 126 multiparous women in the control group (n=251). Parity, however, did not differ significantly between both groups. Other basic characteristics also did not differ significantly between both groups except that sweeping of membranes was carried out in a significantly larger percentage of women in the control group compared to the intervention group (73% versus 77%, p =0.014) (table 1).
In the intervention group 189 women (70%) and in the control group 21 women (8%) received amniotomy as the only method for induction of labour. After amniotomy 160 women (85%) in the intervention group started labour spontaneously within 12 hours (figure 2). The majority (n=130, 81%) did so within eight hours of expectant management. In the control group 47% of the women were induced after referral. Of those 67 (57%) were induced with oxytocin, 32 (27%) by prostaglandins, 6 (4%) by a combination of prostaglandins and oxytocin or Foley catheter and oxytocin. Of 12 women (10%) data about the type of induction were missing.

In table 2 the maternal and neonatal outcomes according to the intention to treat analyses are presented. Women in the intervention group were more likely to have a birth without intervention (OR 2.9; 95% CI 2.0 to 4.4) and a home birth (OR 3.8; 95% CI 2.4 to 6.0). They were less likely to receive augmentation or induction (OR 0.8; 95% CI 0.5 to 1.2) compared to women in the control group. The numbers needed to treat are 8, 7 and 9 respectively. No significant differences were found between both groups for adverse neonatal outcomes in percentages suspected or confirmed neonatal infection or in other neonatal outcomes.
Post hoc analyses showed no significant interactions for birth without medical intervention, assisted birth or admission to NICU between treatment group and parity (primiparous or multiparous, p values for interaction 0.79, 0.41 and 0.24 respectively) or membrane sweeping (performed versus not performed , p values for interaction 0.046, 0.82 and 0.33 respectively) (Fig. 3).

Per- protocol analyses
Since only 70% of the women in the intervention group actually received amniotomy we also performed per-protocol analyses. Women who received amniotomy for induction of labour ("amniotomy group", n=189) were compared to women in the control group who did not receive amniotomy for induction of labour ("non-amniotomy group", n=230) (see figure1). As in the intention to treat analysis women in the amniotomy group had a higher chance of a non-medical birth and a home birth (OR 2.9; 95% CI 2.0 to 4.4 and OR 3.8; 95% CI 2.4 to 6.0 respectively) and a lower chance of an

induced or augmented birth (OR 0.4; 95% CI 0.3 to 0.5). No differences existed in other maternal and neonatal outcomes.
Sixty-one percent (n=116) of the women were induced by amniotomy in the evening after 4 pm and 32% (n= 61) during the day before 4 pm. If women were induced during the day, the duration of the birth was significantly shorter: 7.1 (sd 4.1) hours compared to 8.0 hours (sd 5.5) in the evening group (p 0.03). In the per-protocol analyses we also found no main or moderating effect of swept membranes on any of the outcomes. A moderator analysis showed no significant effect of the interaction term between group and parity on maternal and neonatal outcomes.

Neonatal infection
Of the five babies with a confirmed neonatal infection, three were born of mothers who had received amniotomy for induction of labour. In the two other cases labour had started spontaneously or was induced. No babies with a neonatal infection were born at home. In all cases the mother was either in hospital before the onset of labour or had been referred during the first stage of labour.
In three out of the four cases in which a pathogen could be identified, the infection was caused by GBS. The mean duration of ROM was 28.5 hours (sd 14.9) for women with a baby with neonatal infection compared to 9.0 hours (sd 7.8) for the total group of women without a baby with an infection (p 0.08). No neonatal mortality occurred and all babies were discharged in healthy condition after treatment.

Women's experiences.
After birth, significantly more women in the intervention group (n=221) returned the questionnaire compared to women in the control group (n=183, 82% versus 73%, p < 0.02).The overall response rate was 78%. Table 3 shows that women's experiences were good in both groups and no significant differences between groups were observed in their experience with care received from the midwife, obstetrician or hospital staff, the process of the birth itself and the place of birth. Also, perceived pain during birth and in the first week after birth did not differ between groups. However, women in the intervention group were more likely to prefer the same treatment in a next pregnancy (87% versus 72 %, p 0.0001), to advise the treatment to others (89% versus 79%, p 0.008) and less likely to have preferred another treatment in retrospect (17% versus 21%, p 0.0001).

Discussion

Main results

This is the first randomised trial of amniotomy between 292 and 294 days gestation for induction of labour at home. It showed that low risk women who received prenatal care from a midwife had an almost twofold chance of a spontaneous vaginal birth without intervention and a more than two times increased chance of a planned home birth if they were allocated to receive amniotomy at home, compared to women who received routine care with in-hospital induction of labour. Amniotomy at home resulted in a significantly longer duration of ruptured membranes, but not in a significant increase in adverse maternal and neonatal outcomes. Seventy percent of the women in the intervention group actually received amniotomy and 85% of those women subsequently started labour, mostly within 8 hours after amniotomy. This is in concordance with the rate of spontaneous onset of labour within 24 hours in 90% of 3586 women receiving amniotomy for induction of labour (22). More women in the intervention group would not have preferred another treatment, would like the same treatment in a subsequent pregnancy or advise it to others.

Limitations

A limitation of our study is that assignment could not be concealed and the relatively small number of patients in the group which made it not possible to detect significant differences in rare albeit serious adverse outcomes associated with amniotomy or prolonged rupture of membranes (e.g. neonatal infection, maternal infection or cord prolapse). The outcome “neonatal infection” was assessed by an independent paediatrician who was blinded for the intervention. The assessment was based on the discharge letters.

Due to two software programming errors slightly more primiparous women than multiparous women were randomly enrolled in the intervention group. Although parity did not differ significantly between groups we analyzed our data in the total group as well as in a study population with a random sample of 125 of the 144 primiparous women in the intervention group. We found no differences in outcomes. We feel we can therefore safely assume that we did not inadvertently introduce a bias and that the results of our study are not influenced by differences in profile between the two groups.

Generalisability

We conducted a pragmatic unblinded multicentre randomised controlled trial. A pragmatic trial can be broadly defined as a randomised controlled trial designed to meet the needs of those making decisions about treatment options in the setting in which the

intervention will be implemented (23). Characteristic features of pragmatic trials are that they select clinically relevant alternative interventions to compare, include a diverse population of study participants, recruit participants from heterogeneous practice settings and collect data on a broad range of health outcomes (23).
Its generalization to clinical practice is enhanced since characteristic features of a pragmatic trial are that they select clinically relevant alternative interventions to compare, include a diverse population of study participants, recruit participants from heterogeneous practice settings and collect data on a broad range of health outcomes (23). We therefore based our inclusion criteria only on clinical indications of interest. We performed the study in a variety of midwifery practices in the Netherlands and except for the intervention "amniotomy", we did not alter any of the usual care, nor did we add extra tests or screening.
Furthermore, caregivers were free to choose the time of day they would perform amniotomy since timing of induction of labour does not seem to have an effect on duration of birth, instrumental birth, number of infections or patient satisfaction (24).
We compared amniotomy with care as usual at that time in the Netherlands. "Care as usual" was not the same for all women in the control group. All women in the control group gave birth between 292 and 294 days of pregnancy but just over half of the women in the control group received pharmaceutical induction of labour. Of those, the majority were induced with oxytocin and /or prostaglandins. Therefore, one has to be careful to generalize the results of this study to practices or countries with more planned inductions, other methods of induction or other definitions of post term pregnancy. Furthermore, the results of this study are limited to maternity care settings that include a well functioning and adequate referral system exists with timely access to obstetric care.

Implications for practice

In this study we chose as primary outcome a birth with no medical interventions. The outcomes "birth with no medical interventions" and "home birth" are important outcomes for women since home birth is associated with more satisfaction with birth in the short (25) and long term (26). In case of a non-medical birth chances are increased that women's choices can be met regarding continuity of care provider and place of birth. Weighing the balances of values in choices of pregnant women is important but difficult especially in planning interventions in women with an a priori low chance on adverse events and for interventions that are aimed to fit women's choices. If unnecessary medical interventions can be avoided, the chance is increased that women will undergo other evidence-based positive measures during birth such as freedom of movement, continuous labour support, spontaneous pushing in non-supine positions and staying with their baby after birth without restrictions on breastfeeding (27).

Labour that is artificially induced does result in lower satisfaction rates as compared to labour following spontaneous onset (28) and it corresponds less with women's expectations (29). If planned for induction, women expressed concern about the potential effect of induction on themselves and about the loss of the opportunity of a natural birth. (30). Therefore, if labour is induced in an outpatient setting this may have benefits for the experience of women with induction in terms of satisfaction with birth. In our study, women in the intervention group were more likely to prefer the same treatment in a next pregnancy and would more often advise the treatment they had received to others. Pain during birth and in the first week after birth did not differ between groups. These results are in accordance with the literature (11). Women induced in an outpatient setting were more likely to report high levels of satisfaction with their care and more likely to recommend this treatment to others compared to those induced with the same method in an inpatient setting (31;32). Overall satisfaction measured after birth and pain and anxiety during the first 12 hours of induction were similar (31).

A longer interval between rupture of the foetal membranes and birth is a well-known risk factor for maternal and neonatal infection (33-35). The risk of neonatal infection increases independently with duration of membrane rupture up to 36 hours and with an odds ratio of 1.29 for each 6-hour increase in membrane rupture duration (35). In our study, three cases of neonatal infection occurred after amniotomy was performed. The onset of two of these neonatal infections was detected during the treatment period that followed 12 hours of expectant management. In one case the infection was detected during the first stage of labour and the woman was immediately referred for intrapartum antibiotic treatment. It can be concluded that in all cases of neonatal infection midwives performed adequate risk selection and women were referred timely for additional treatment. Two out of the four cases of neonatal infection with a known pathogen were caused by GBS. GBS is a well known predictor of neonatal infection after PROM. An exclusion criterion in our study was known carriership of GBS. As there is no policy of routine screening for GBS during pregnancy in the Netherlands, women with carriership of GBS were entered without their status being known. To decrease the risk of neonatal infection a policy of detection and exclusion of mothers at risk for early onset GBS disease should be considered when amniotomy for induction of labour is implemented in midwifery practices.
Neonatal infection is a serious outcome and the safety of amniotomy at home may be further improved by a reduction of the duration of expectant management. Secondary analyses assuming pharmaceutical induction of labour and a birth in hospital if labour had not started within eight hours expectant management, showed no effect on the

significance of the primary or secondary outcomes. Since the majority of women started labour within eight hours after amniotomy to reduction of the period of expectant management to eight hours can be considered. Furthermore, immediate pharmaceutical induction after the period of expectant management needs to be guaranteed.
In contrast to spontaneous rupture of membranes, amniotomy does not appear to be a risk factor for cord prolapse (36-38). However, induction of labour is associated with a twofold increase in cord prolapse in one study (39) although not in another study (38). The overall incidence of cord prolapse is 0.23% (37). Because abnormal fetal heart patterns are associated with the possibility of umbilical cord prolapse a vaginal examination should be performed after observing abnormal fetal heart patterns to rule out the possibility of an umbilical cord prolapse. In our study no umbilical cord prolapse was reported.
Finally, in our study we found a shorter duration of labour in women who were induced with amniotomy during the day but no differences in percentage of spontaneous onset of labour or mode of birth. Therefore, it can be recommended to perform amniotomy in the morning since it is more likely that adequate monitoring can be performed by the midwife during the day compared to the night

Conclusion

Amniotomy is an effective method for induction between 292 and 294 days gestation in low risk women in a maternity system with well organised midwifery care at home and good access to obstetric care. It increases the chance of a spontaneous vaginal birth without medical interventions and consequently of a home birth. Women are more satisfied with received treatment in the intervention group. Women should be informed about this option and should be allowed a choice in method of induction.

What is already known on this topic?

- Amniotomy, when possible followed by oxytocin infusion, is the method of choice for induction of post term pregnancy as differentiation between normal and pathological post term pregnancy through policies of foetal surveillance has not been successful in preventing adverse perinatal outcomes.
- Women induced in an outpatient setting are more likely to report high levels of satisfaction with their care and more likely to recommend this treatment to others compared to those induced with the same method in an inpatient setting.

What this study adds

- Amniotomy at home for induction between 292 and 294 days gestation in low risk women increases the chance of a spontaneous vaginal birth without medical interventions and subsequent home birth.

What should be done?

In a system with well-trained midwives, low risk postdate women (women with a pregnancy of 292 tot 294 days of gestation) opting for a home birth or wanting to manage part of the first stage at home, can be given the choice of amniotomy at home. We recommend that amniotomy be performed in the morning and that the period of expectant management does not exceed eight hours.

Notes

We are very grateful to the all the women, midwives and hospital staff who participated in this study. Furthermore we want to thank the students of the Midwifery Academy Amsterdam and Groningen for their assistance. This study would not have been possible without them. Finally we want to thank David J. Taylor, for critically reviewing earlier drafts of this paper.

Contributors: MEBR, MPP, and SEB conceived and contributed to the design of the trial. All authors participated in designing the study, MEBR and MPP recruited participants, and collected data. MEBR, SEB and ED analyzed and interpreted the data. MEBR drafted the report and SEB, ED, MPP and JAMvdP provided background knowledge to the data analysis and interpretation. All authors reviewed the report. All authors have seen and approved the final version.

Other information

Approval by an ethics committee was obtained from the Slotervaart Hospital and Jan van Bremen Institute in Amsterdam. If requested, additional approval was asked at local hospitals. However, independent midwives are not employed by or in any way incorporated in local hospitals and therefore the approval by the primary ethic committee was sufficient to participate.

This Trial is registered in the International Standard Randomized Controlled Trial under number ISRCTN47736435.

The study protocol can be assessed from Marlies.Rijnders@tno.nl.

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Tables and figures

Table 1: Basic characteristics, intention to treat analyses

Basic Characteristics		**Intervention n= 270 n (%) or mean [sd]**	**Control n= 251 n (%) or mean [sd]**	**P value**
Mean maternal age, n=521		31.7 [4.5]	31.1 [4.7]	0.15
Parity, n=521	nulliparous	144 (53)	125 (50)	
	multiparous	126 (47)	126 (50)	0.42
Education, n=469	low	32 (12)	17 (7)	0.17
	middle	77 (29)	77 (31)	
	high	140 (52)	126 (50)	
Anxiety, mean STAI score., n=466		10.3 [1.4]	10.1 [1,4]	0.33
Nationality, n=511	Dutch	230 (85)	209 (83)	0.94
	non Dutch	38 (14)	34 (14)	
Membranes swept, n= 484	yes	197 (73)	192 (77)	0.01*
	no	63 (23)	31 (12)	
EDD confirmed by ultrasound n=480	yes	237 (88)	222 (88)	0.51
	no	9 (3)	12 (5)	
Mean pregnancy duration at time of randomization n= 516		293.4 [0.9]	293.4 [0.9]	0.83
Preference for home birth n=464	yes	174 (64)	152 (60)	1.00
	no	73 (27)	65 (26)	

- $P < 0.05$
- Percentages do not add up to 100% due to missing data

Table 2: Intention to treat analysis: Maternal and neonatal outcomes of women in the intervention group versus control group after intention to treat analysis. N=521

	Intervention, n=270 n (%) or mean [sd]	**Control, n=251 n (%) or mean [sd]**	**OR or mean difference (95% CI)**
Birth without medical interventions	118 (44)	81 (32)	1.6 (1.1 to 2.3)*
Home birth	81 (30)	40 (16)	2.3 (1.5 to 3.5)*
Assisted birth	71 (26)	72 (29)	0.9 (0.6 to 1.3)
Caesarean section	40 (15)	31 (12)	1.2 (0.8 to 2.1)
Assisted vaginal birth	31 (11)	41 (17)	0.7 (0.4 to 1.1)
Augmentation and/or induction	136 (50)	152 (61)	0.7 (0.5 to 0.9)*
Epidural and/or opoids for pain relief	79 (29)	74 (30)	1.0 (0.7 to 1.5)
Antibiotics mother	26 (10)	29 (12)	0.8 (0.5 to 1.5)
Duration birth in hours	8.5 [6.9]	8.1 [6.1]	0.4 (-0.8 to 1.6)
Rupture of membranes in hours	11.1 [8.6]	6.6 [6.5]	4.5 (3.0 to 6.0)*
Admission NICU total	27 (10)	23 (9)	1.1 (0.6 to 2.0)
Suspected infection	17 (6)	11 (5)	1.5 (0.7 to 3.2)
Confirmed infection	4 (2)	1 (0.4)	4.7 (0.6 to 40.7)
Apgar < 7 after 5 minutes	4 (2)	2 (1)	1.9 (0.3 to 10.4)
Gestational age at birth in days	294,1	294,5	-0. 4 (-0.6 to -0.1)*

* P < 0.05

Table 3: Women's experiences with received treatment, caregiver and birth. N=404

	Intervention N= 221 N (%)	**Control N=183 N (%)**	**P value**
Assigned treatment			
I look back positively at the treatment I received (n= 399)			
agree/neutral	205 (94)	164 (90)	
disagree	11 (7)	19 (10)	0.06
In retrospect, I would have preferred another treatment than received (n= 400)			
agree/neutral	36 (17)	80 (44)	
disagree	177 (83)	103 (56)	< 0.01
I prefer the same treatment in a next pregnancy (n= 398)			
agree/neutral	188 (87)	132 (72)	
disagree	27 (13)	51 (28)	< 0.01
I would always recommend amniotomy to others (n=401)			
agree/neutral	194 (89)	146 (79)	
disagree	23 (11)	38 (21)	< 0.01
Caregiver			
I am satisfied with the care I received from the midwife (n=404)			
agree/neutral	217 (99)	182 (100)	
disagree	3 (1)	2	1.00
I am satisfied with the care I received from the obstetrician (n=296)			
agree/neutral	113 (88)	130 (92)	
disagree	15 (3)	11 (2)	0.31
I am satisfied with the care I received from hospital staff (n=293)			
agree/neutral	136 (88)	138 (92)	
disagree	9 (6)	10 (5)	1.00
Birth			
Birth was exactly as I expected it to be (n= 401)			
agree/neutral	118 (54)	87 (48)	
disagree	101 (46)	95 (52)	0.23
I am disappointed with how birth went (n= 403)			
agree/neutral	54 (24)	36 (20)	
Disagree	167 (76)	146 (80)	0.28
I am satisfied with the place of birth (n= 401)			
agree/neutral	203 (94)	169 (92)	
disagree	14 (6)	15 (8)	0.57
Pain during birth (n=404)			
no pain, very little or little pain	13 (6)	11 (6)	
considerable, much or very much pain	208 (94)	172 (94)	1.00
Pain during the first week after birth (n=403)			
no pain, very little or little pain	141 (64)	121 (66)	
considerable, much or very much pain	79 (36)	62 (34)	0.68

Table 4: Per protocol analyses: birth outcomes of women in the intervention group who actually received amniotomy and women allocated to the control group who did not receive amniotomy for induction between 292 and 294 days gestation. N=419

	Amniotomy, n=189 n (%) or mean [sd]	**No amniotomy, n=230 n (%) or mean [sd]**	**OR or mean difference (95%CI)**
Birth without medical interventions	103 (55)	65 (28)	2.9 (2.0 to 4.4)*
Home birth	75 (40)	34 (15)	3.8 (2.4 to 6.0)*
Assisted birth	40 (21)	70 (30)	0.6 (0.4 to 1.0)
Caesarean section	21 (11)	30 (13)	0.8 (0.5 to 1.5)
Assisted vaginal birth	19 (10)	40 (17)	0.5 (0.3 to 1.0)
Augmentation and/or induction	74 (39)	147 (64)	0.4 (0.2 to 0.5)*
Epidural and/or opoids for pain relief	45 (24)	74 (32)	0.7 (0.4 to 1.0)
Antibiotics mother	14 (7)	27 (12)	0.6 (0.3 to 1.2)
Duration of birth	8.1 [7.0]	8.4 [6.2]	-0.3 (-1.6 to 1.0)
Rupture of membranes in hours	11.8 [8.6]	6.7 [6.6]	5.1 (3.4 to 6.7)*
Admission NICU total	19 (10)	22 (10)	1.0 (0.6 to 2.0)
Suspected infection	13 (7)	10 (4)	1.6 (0.7 to 3.8)
Confirmed infection	3 (2)	1 (-)	3.7 (0.4 to 35.4)
Apgar < 7 after 5 minutes	4 (2)	2 (1)	2.4 (0.4 to 13.5)
Gestational age at birth in days	293.5	294.5	-1.0 (-1.2 to -0.8)*

* $P < 0.05$

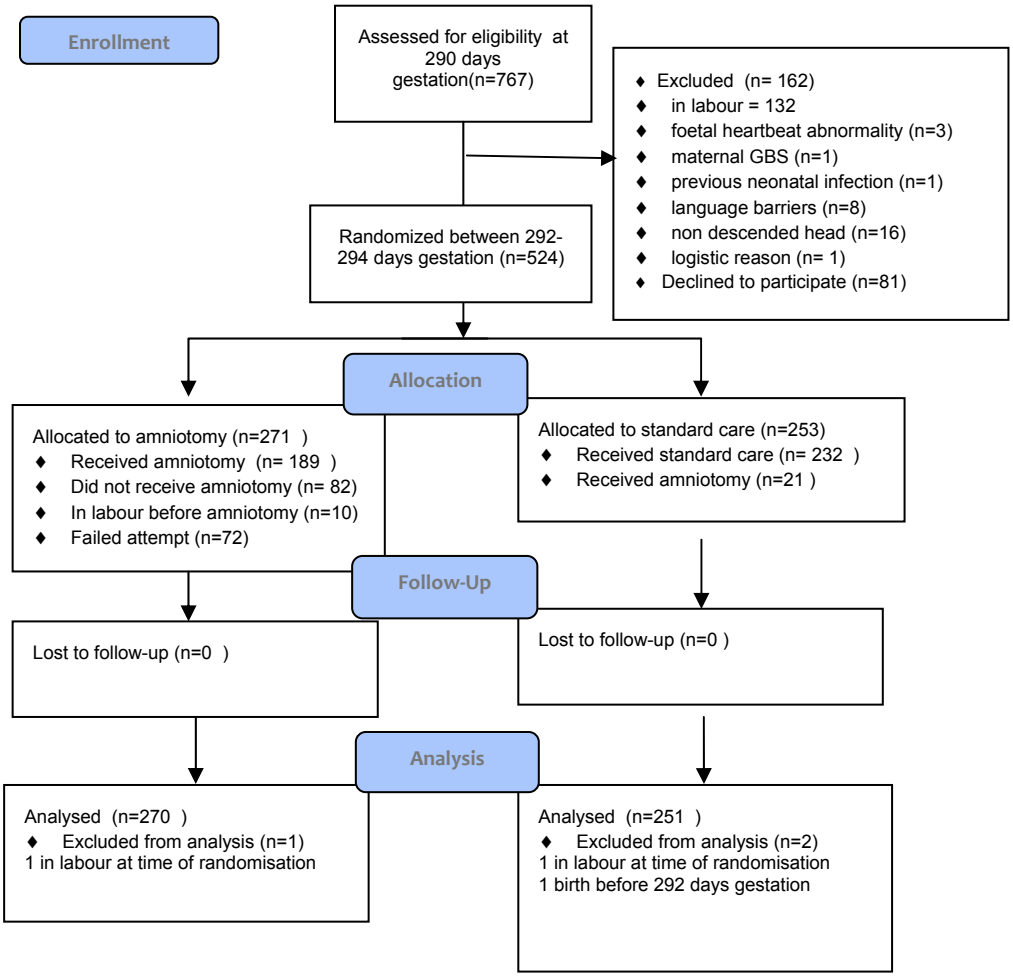
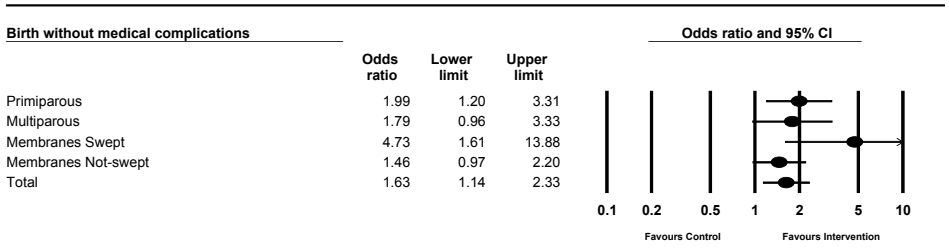
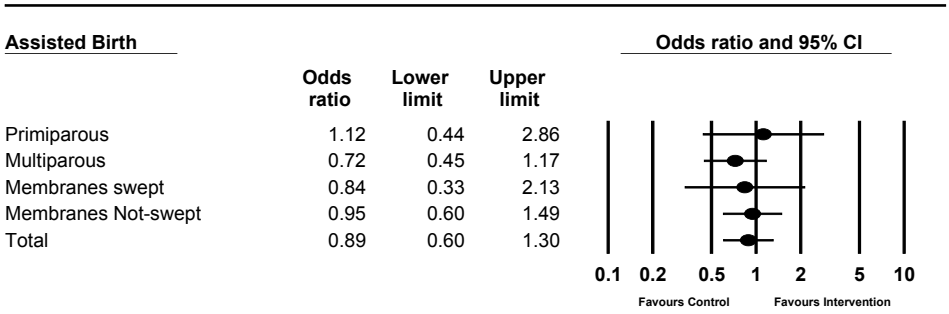


Figure 1: Flow Diagram Serinam Study

Intervention group N=270 (52%)		Control Group N= 251 (48%)	
Amniotomy Yes N=189 (70%)	Amniotomy No N=81 (30%)	Amniotomy Yes N=21 (8%)	Amniotomy No N=230 (92%)
In labour after amniotomy N=160 (85%)	In labour before amniotomy N=9 (11%)	In labour after amniotomy N=18 (86%)	Spontaneous onset of labour N=112 (49%)
Induction of labour after amniotomy N=29 (15%)	Induction of labour after failed attempt N=53 (65%)	Induction of labour after amniotomy N=3 (14%)	Induction of labour 117 (51%)
	Spontaneous onset after failed attempt N=19 (24%)		Planned caesarean N=1

Figure 2: Onset of labour in both trial arms.





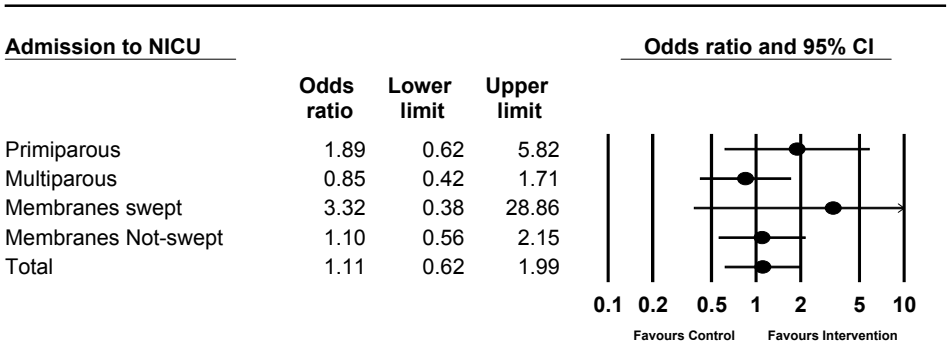


Figure 3: Odds ratio's of birth without medical intervention, assisted birth and NICU admission in Subgroups of Patients, According to the Assigned Treatment.

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9

Summary of the literature of women's experiences with birth and maternity care in the Netherlands

In this chapter a summary is presented of the literature of women's preferences, expectations and experiences with birth, maternity care and interventions in low risk pregnancies in the Netherlands. Not addressed are women's preferences, expectations and experiences with prenatal screening, (birth after) treatment for miscarriage or stillbirth or preconception care.

Method

Pubmed and Midirs were searched until March 1st 2011. The following search terms were entered:
MIDIRS
(Expectat* OR prefer* OR attitude* OR experience* OR satisfaction OR recall) AND (women* OR mother*) AND (Dutch OR Netherlands OR Holland) AND (birth OR deliver* OR pregnanc* OR maternity care OR perinatal care OR midw*) AND NOT (miscarr* OR stillbirth OR prenatal screening OR prenatal testing OR Down syndrome OR neonatal screening OR fertility OR fertilization OR preconception)
PUBMED
In Pubmed (Expectation OR preference OR attitude OR experience OR satisfaction OR recall) AND (women OR mother) AND (Dutch OR Netherlands OR Holland) AND (birth OR delivery OR pregnancy OR maternity care OR perinatal care OR midw*) NOT (miscarriage OR stillbirth) NOT (prenatal screening OR prenatal testing OR Down syndrome OR neonatal screening) NOT (fertility OR fertilization OR preconception). The limitations entered in Pubmed were Humans, Female, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, Review, Case Reports, Comparative Study, Controlled Clinical Trial, Journal Article, Multicenter Study, English, German, Dutch, Complementary Medicine, Core clinical journals, MEDLINE, Nursing journals, Systematic Reviews, Young Adult: 19-24 years, Adult: 19-44 years.

The search terms resulted in 181 hits in Midirs in and 325 hits in Pubmed. All titles and abstracts were reviewed by one researcher (MR).
Research articles were included if they addressed a) women's expectations, preferences or experiences with Dutch maternity care or b) women's experiences with interventions in primary care that could be an alternative to or prevent referral to specialised obstetric care. Not included were articles that addressed experiences with prenatal screening or testing, (birth after) treatment for miscarriage or stillbirth, preconception care, interventions for high risk women or articles addressing psychosocial determinants of women's well-being, or maternal outcomes such as depression, low birth weight or hypertension.

In Midirs 25 articles (1-25) and in PubMed 16 articles (2-5;7;9;12-14;17;19;22;26-29) were identified that fulfilled these criteria. Furthermore, 3 additional articles were identified through references (30-32). In total 33 articles were entered in this summary.

Preferences and expectations

The research that is available on women's preferences focuses predominantly on preference for place of birth (table 1). At the end of the last century the first studies appeared on women's preferences towards place of birth. Kleiverda's study in 1990 (10) showed that the choice of place of birth of low risk nulliparous women in a large urban area was related to women's characteristics such as educational level and feelings of well being in pregnancy. The other major factor however was how women expected that the environment would influence their feelings, attitudes and behaviour. Eight years later, Wiegers (23) also concluded that for women at low risk of obstetric complications the choice of place of birth was based primarily on social factors, with the confidence of family and friends in home birth and the expected influence of the hospital environment on childbirth listed as the strongest determinants. Health related factors, such as perceived health status before and during pregnancy, physical symptoms and fear of pain and complications during birth played an indirect role. Educational level, in Kleiverda's study one of the predicting factors, was unrelated to the preferred place of birth except when urbanization was taken into account as well: in the larger cities women with higher education more often preferred a home birth than those with lesser education levels. A prospective study in 25 midwifery practices by van der Hulst et al. (20) showed that 70% of the women opted for a home birth. Except for age, preference for a home birth was not related to socio-demographic factors. A significant relationship was observed between attitude toward technology and preferred place of birth: the more receptive women's attitude was toward medical technology, the more likely nulliparous and multiparous women were to opt for hospital birth. Only multiparous showed a correlation between their assessment of the chance of ending up with an instrumental delivery and their intended birthplace Twelve years later Hendrix (28) showed again the strength of women's preference in choice of place of birth. She described the impossibility to conduct a randomised controlled trial as women were not willing to be randomly allocated to place of birth. The main reasons for declining their participation were that women had made up their mind about preferred place of birth as early as at 12 weeks gestation and also strongly valued their autonomy of choice. However, Pavlova (15) showed that, although Dutch women still expressed a strong preference for a home birth, the non-availability of medical pain-relief during home birth, could be an increasing incentive to opt for a birth in a hospital. She therefore concluded that to

preserve home birth specific attention is needed for the approach to pain during a home birth. On the other hand, if a hospital birth is needed or desired, efforts should be made in offering a domestic atmosphere to improve hospital-based obstetric care in view of women's preferences. More so, an important determinant of choice in type of maternity care for women was a home like birthing setting while for their partners this was the possibility of pain relief (8).

Remarkably, research into women's expectation of pain during birth and preference for pain management was limited to one study until 2010. In 1988 Senden (18) compared Dutch and American women who gave birth during daytime in two hospital universities. Expectations of pain and preferences in pain relief were asked within two days after birth. It was concluded that the difference in expected pain and the difference in received pain relief could be attributed to fundamental, culturally determined differences between the two societies with respect to women's views of pain during labour.

In 2010 Christiaens (5) compared Dutch and Belgian women regarding their expectation of labour pain in relation to received pain relief. She found that before birth Dutch and Belgian women had a similar labour pain acceptance. However, Dutch women were six times less likely to use pain medication during labour. For both Duchy and Belgian women their attitude towards labour pain predicted the use of pain relief. However, for Dutch women, having personal control of pain relief predicted an even lower use of pain medication whereas personal control was not a predicting factor in use of pain medication for Belgian women. Christiaens therefore concludes that the maternity care context is of major importance in further study of the management of labour pain.

Finally, Douma (29) conducted a randomised controlled trial comparing the analgesic efficacy of remifentanil with meperidine and fentanyl among women requesting analgesia other than epidural analgesia. It was concluded that Remifentanil PCA provided better analgesia than meperidine and fentanyl PCA, but only during the first hour of treatment. Furthermore, the overall satisfaction scores were higher with remifentanil.

Two qualitative studies addressed women's expectations of prenatal and midwifery care. Luyben (13) compared the antenatal care needs of women in Switzerland, Scotland and the Netherlands. Women in different countries felt responsible for their own pregnancy and transition to motherhood. To fulfil this responsibility they expressed the need for antenatal caregivers to help them to feel confident and to respect their individual autonomy. Likewise, Seefat (32) found that Dutch low-risk pregnant women expected their midwives to oversee the transition period and to be capable of supporting them in dealing with changes in pregnancy and in preparing them for birth and motherhood. This would require attentive, proactive, professional psychosocial support

from midwives. Finally, Hendrix showed that the most important attribute to women and their partners in obstetric care was the possibility to have influence on the decision making (8).

Experiences with birth

Themes that predominantly emerge when looking at experiences of women with birth and maternity care during birth are differences in experiences related to place of birth, experiences with referral, and cultural differences in women's experiences with birth (table 2).

Place of birth

In 1990 Kleiverda (11) found no differences in experience and psychological well being between low risk nulliparous women who gave birth at home or voluntarily in hospital without referral. However, of the women who were not referred to specialist care in Wiegers' study (33), both nulliparous and multiparous women with a planned home birth were more positive about the midwife, and the first-time mothers among them were also more positive about their postpartum period than those with a hospital birth. This was confirmed in the study of Borquez (2) in 2006 which found that women with a home-birth perceived less pain, desired less pain-relieving medication, believed they knew their midwife better and rated their birth setting 'higher' compared to women who had a planned birth in a birth-centre. However, in that study women with a home birth were more often multiparous women and results were not corrected for parity.

In 2009, Christiaens (4) compared Dutch and Belgian women and found that in both countries women with a planned home birth were more satisfied compared to women with a hospital birth. These findings remained significant after adjusting for parity, age, and level of education and were true in every sub dimension of satisfaction (i.e. general satisfaction, satisfaction with self, with the baby, the midwife and the partner).

Rijnders (16) (this thesis) showed that not having had a homebirth was also a predicting factor for negative recall of birth three years after birth even after correction for mode of birth, referral, fear during birth for the baby or self, not having had a choice in pain relief, not being satisfied in coping with pain and en giving a negative description of the caregivers.

Finally, in a qualitative study by Johnston (9) fourteen women were interviewed to investigate the meaning of childbirth for women who gave birth at home. These women expressed satisfaction with having given birth in a calm, comfortable environment with a supportive caregiver, and expressed satisfying feelings of empowerment and control of their bodies and birthing experience.

Referral

However, if complications arise and referral is needed this is likely to affect women's experiences with birth. Pop (31) concluded in 1995 that a hospital birth and/or obstetric factors were not related to occurrence of blues and depression in the early puerperium. Nevertheless, referral during labour was associated with a more negative experience with birth on the short term for nulliparous women (11) and for both Dutch and Belgium women (3). It was also related to negative birth experiences in the long term (16) . However, the study of Wiegers (22) showed that, although referral led to more negative experiences compared to no referral, no difference in the experience of the birth, the midwife, or the post-partum period was found between those referred after a planned hospital birth and those referred after a planned home birth. Wiegers concluded that although the latter group also had an unplanned transfer to hospital, this indicated that the unplanned transfer by itself had little influence on the women's evaluation of birth.

In 2006 Wiegers (24) introduced the principles of the Consumer Quality Index to measure women's experience with maternity care. She argued that "client satisfaction is only indirectly related to the quality of the health care system, because it is strongly coloured by expectations and prior experiences. Users tend to value what is available and known to them more than what is new and unexpected. Because satisfaction with care is generally high, regardless of the quality of the care provided (.....) the input of clients in the quality of care discussion has been shifted from client satisfaction to client experience, that is: to the assessment of health care quality from the patient's perspective". She found that women regardless of parity and even if the majority of them (59%) experienced at least once referral from one care provider to another, were very positive about the quality of the maternity care they received. However, with regard to the care during labour and birth, the quality of care scores was higher when women knew their care provider, when they gave birth at home, when they gave birth in primary care and when they were assisted by their own midwife.

Satisfaction with birth

In 2007 Christiaens (26) was the first to study prospectively the influence of expectations about childbirth, labour pain, personal control and self-efficacy on satisfaction with childbirth. Satisfaction is a multidimensional concept, influenced by a variety of factors and women can be satisfied with some aspects of childbirth and dissatisfied with others (34). The four main determinants of childbirth satisfaction are labour pain (35-37), personal control (37;38) self-efficacy (39) and expectations for labour and birth (35-37). Christiaens concluded that for both Dutch and Belgian women satisfaction with childbirth was most dependent on the fulfilment of expectations. The

experience of personal control buffered the negative impact of labour pain and women with high self-efficacy showed more satisfaction with self-, midwife- and physician-related aspects of the birth experience.

Cross-national comparisons

Cross-national comparisons show that Dutch women are less satisfied compared to women in Belgium and the United Kingdom. In Christiaens' study (26) fulfilment of expectations was equally important to childbirth satisfaction of both Dutch and Belgian women but Belgian women's expectations were more easily fulfilled than Dutch women's expectations. It is likely that Belgian women's expectations differed from Dutch women's expectations given the diverging maternity care systems. According to Christiaens the high referral rate and the ambivalent Dutch maternity care, with its "two sciences of maternity care" might explain the unfulfilled Dutch expectations.

For women in the United Kingdom and the Netherlands common factors that contributed to a negative appraisal of birth were an unplanned operative birth, negative description of the caregivers, having had fear for the baby's life and having had major health problems since the birth. In addition, for Dutch women, induction of labour, being a primigravida and feeling that her own life had been in danger, were also important factors. Also in this study more Dutch women than English women were found to be negative when they looked back on their birth three years later. Baston (1) (this thesis) rightfully cautions for the interpretation of these results "in view of the potential differences in the way that women from different cultures interpret the questions and their response options". Referral, as determining factor that might have explained differences in appraisal of birth between the two countries was not included in the analysis as this variable was not available in the UK dataset.

Birth in a specific context

Two studies looked into the experience with birth within a specific context. Van der Hulst (19) described women's experience with birth after sexual abuse and Molkenboer (14) addressed experiences with different modes of breech birth.

Low-risk women with a history of sexual abuse did not appear to have more problems during labour and birth than other women. However, multiparous women with a history of sexual abuse reported more emotional distress and were more likely to suffer pelvic pain. On the other hand, sexually abused women also reported higher levels of autonomy and felt more responsible for their own health in comparison to the non-abused women. These unexpected findings were cautiously explained by a tendency of sexually abused women to prefer to be alone, thus gaining a greater perceived internal control.

Two years after their breech birth, significant more women who had undergone a vaginal birth compared to women who had a caesarean section stated that they liked having experienced labour, liked that childbirth was natural and liked actively participating in the birth, whereas they disliked that the birth experience was very painful, and felt more worried about the health of their baby at the time of delivery. In the planned caesarean group, significantly more women felt reassured about their baby's health and reported more involvement in decision-making.

Aspects of maternity care

Four studies looked more specifically into women's experience in relation to aspects of maternity care.

In 1994 Kerssens (30) looked at how women had experienced accessibility and quality of maternity home care assistance during birth and in the post partum period. It was concluded that maternity home care assistance was not sufficiently accessible but was of good quality. All four investigated functions of the assistant's expertise (assistance of midwife during home birth, care for mother and baby, provision of infant health education to the family, and performance of household services) were rated as very satisfactory by women.

Fontein (7) looked at birth outcomes and women's experiences with care comparing practices with a maximum of two midwives with practices with more than two midwives. Women who had received care in these smaller midwifery practices were significantly more likely to experience lower rates of referral, fewer interventions in general and specifically for pain relief and fewer unplanned caesarean sections. They were also significantly more likely to know their midwife, were more frequently supported by their own midwife after referral and had higher levels of a positive birth experience compared to women in practices with more than two midwives.

Vandenbussche (21) looked at differences in the valuation of birth outcomes among pregnant women, mothers, and obstetricians, and assessed how these would affect a particular obstetric decision. Contrary to nearly all of the pregnant women and mothers, obstetricians tended to view permanent neurological handicap as a worse outcome than neonatal death. Furthermore, obstetricians tended to prefer instrumental vaginal delivery to caesarean section, whereas pregnant women and mothers had no clear preference between these methods. Third, obstetricians differed more among themselves in the values attached to specific outcomes than either mothers or pregnant women. The authors concluded that this implied that the values of an individual woman were more likely to correspond with the average views of pregnant women than with the values of an individual obstetrician.

De Jonge (27) conducted a qualitative study to gain insight in influences on women's use of birthing positions, and into the labour experiences of women in relation to the birthing positions they used. Women, regardless of ethnicity, were most familiar with the supine position. Being encouraged to find the most suitable positions was described as part of having control over labour, which contributed to a good experience and good emotional well-being afterwards for some women. The experience of type and intensity of pain and the accompanying preference for a certain birthing position varied widely. Women expected midwives to provide professional advice on positions and this advice was a stronger influence than their personal preference. De Jonge concludes that midwives should empower women to find the positions that are most suitable for them, by giving practical advice during pregnancy and labour.

Experiences with interventions in pregnancy in a low risk population

Only recently three studies have been conducted that looked at women's expectations and experiences with interventions during pregnancy (table 3). De Miranda (6) studied the effect of sweeping membranes to prevent post term pregnancy. Most women were positive about the intervention but one third considered it painful. However, the majority of those indicated that they were willing to undergo the same treatment in a subsequent pregnancy.
In 2008 Kok (12) looked at preferences of expectant parents with a term foetus in breech position for either planned vaginal delivery or planned caesarean birth. These parents indicated a preference for a caesarean delivery. The mother's preference for mode of delivery was mostly influenced by a change in 2-year neonatal outcome, whereas maternal outcome was only of minor importance. In contrast, the father's preference was mostly influenced by the maternal outcome. Rijnders (17) (this dissertation) looked at the experiences of women with external cephalic version (ECV). It was found that most women rated ECV as a good experience and the majority was willing to undergo a version in a subsequent pregnancy. Significant pain during the version was experienced by one third of the women. Women with a more negative experience were those who more likely had experienced pain, a lot of pain, or extreme pain or fear during the version.

Conclusion

Research into women's expectations, preferences and experiences within Dutch maternity care has been limited. The available research has been focused primarily on preference for and experience with place of birth and women's birthing experiences

after referral. A strong preference for and good experiences with home birth has been demonstrated. Referral is associated with more negative birthing experiences but referral from home to hospital seems not more unfavourable compared to referral within a hospital setting. However, although referral is the main intervention in primary care, it is still unknown *why* women have a more negative experience after referral and subsequently which factors in the process of referral can be improved to lead to a better birth experience.

Furthermore, it is remarkable to see that research into the expectations, preferences and experiences with labour pain and pain relief has never led to any international publication by a Dutch researcher. In the light of the internationally divergent Dutch policy in pain management this can only be interpreted as an omission.

Third, several studies looking at different topics addressed the importance of involving women in decision making and of giving them support. However, it is unknown if and how such an important approach has been implemented in maternity care. Finally, only a few studies were found that addressed interventions in primary midwifery care. Fortunately, these studies were not restricted to perinatal outcomes only but did also address women's preferences and/or experiences. It can be concluded from the available literature that, to understand what women expect, want and how they experience Dutch maternity care, a lot still has to be done in Dutch midwifery and obstetric science.

Table 1: Studies addressing women's expectations with pregnancy, birth or maternity care in the Netherlands (n=10)

author	Theme	Population	Method	Findings
Senden 1988 (18)	Expectations of labour pain and management Comparison USA Netherlands	346 women who gave birth during daytime in 2 university hospitals	Questionnaire within 2 days after birth	American women expected birth to be more painful compared to Dutch women and subsequently received more pain relief. Groups differed not in difference between expected and experienced labour pain.
Kleiverda 1990 (10)	Preference for place of birth	170 low risk nulliparous women	Interviews at 18 weeks gestation	Strongest predictors: Educational level, psychological well-being, anxiety concerning complications at birth, and attitudes towards female social roles accounted
Wiegers 1998 (23)	Preference for place of birth Determinants for choice	1720 low risk women	Postal questionnaire at 36 weeks gestation	Strongest predictors: Social factors, the confidence of significant others in home birth and the expectations of hospital care during childbirth.
Luijben 2005 (13)	Women's needs from antenatal care Comparison Netherlands, Switzerland and UK	24 women	Interviews between 11 and 36 weeks	To be able to bear the responsibility of becoming a mother is the main reason why women seek antenatal care. To achieve this aim they needed to feel confident and to feel that their individual autonomy would be respected
Van der Hulst 2007 (20)	Relation between women's attitude towards place of birth and subsequent interventions	625 low-risk pregnant women	Special designed questionnaire between 20-24 weeks gestation	A large proportion of women desire a home birth Attitudes toward obstetric technology are an important predictor with respect to intended place of delivery. Women who opt for a home delivery are less likely to be referred

author	Theme	Population	Method	Findings
Pavlova 2009 (15)	Preference for place of birth	78 nulliparous women	Discrete choice experiment 8 profiles in a questionnaire in presence of researcher	Women have a preference for a domestic birth setting and possibility of pain relief
Seefat-van Teeffelen 2009 (32)	preferences in support from midwives	21 low-risk pregnant women	qualitative study 3 focus-group interviews	Low-risk pregnant women want attentive, proactive, professional psychosocial support from midwives. They expect their midwives to oversee the transition period and to be capable of supporting them in dealing with changes in pregnancy and in preparing for birth and motherhood.
Hendrix 2010 (28)	Place of birth Willingness to participate in RCT	107 low risk nulliparous women who had declined participation	questionnaire	women refused participation because they had already chosen their place of birth at 12 weeks gestation women strongly value their autonomy of choice
Hendrix 2010 (8)	Preference in obstetric care of women and partners	321 nulliparous women and 212 partners	Discrete choice experiment 8 profiles Postal questionnaire	Most important preference for women: home like birth setting Most important for partner: possibility pain relief treatment
Christiaens 2010 (5)	pain acceptance and personal control in pain relief Comparison Netherlands-Belgium	327 women having a hospital birth without obstetric intervention	Questionnaire at 30 weeks and within 2 weeks postpartum Personal control in pain relief measured with the Personal Control in Pain Relief Scale, by McCrea and Wright	Dutch and Belgian women have a similar labour pain acceptance. Dutch women are 6 times less likely to use pain medication during labour Dutch women: the use of pain medication is lowest if women experience control over the reception of pain medication and have a positive attitude towards labour pain Belgian women: negative attitudes towards labour predicts the use of pain medication, but not personal control over the use of pain relief

Table 2: Identified studies addressing Dutch women's experiences with birth (n=17)

Author	Theme	Population	Method	Findings
Kleiverda 1990 (11)	place of birth and referral	170 nulliparous women	Interviews 10 days and 6 weeks post partum. Physical and psychological well being with Hopkins Symptom Checklist. Overall psychological well being with Bradburn's affect balance scale	No differences in outcomes between home birth and birth in hospital without referral Post partum well being strongly related to well being start pregnancy and less to experiences with birth.
Kerssens 1994 (30)	maternity home care assistance ("kraamzorg") during birth	A total of 1812 women who "recently" gave birth	postal questionnaire after birth VAS scales for accessibility and quality of different aspects of care	Almost one-third of the new mothers rated the availability as inadequate assistant's expertise was rated positively
Pop 1995 (31)	mood disturbances during the early puerperium comparison between home and hospital birth	293 women	4 weeks after birth. Blues defined with Pitt's criteria, depression with Research Diagnostic Criteria	No difference in the incidence of blues and depression between women who gave birth at home and those who gave birth in hospital. Obstetric factors were not related to the occurrence of blues or depression in the early puerperium.
Wiegers 1996 (33)	referral during birth	1640 low risk women	Postal questionnaire at 36 weeks gestation and 3 weeks after birth	an unplanned transfer from a planned home birth to hospital has little influence on the experience of childbirth.
Vanden-bussche 1999 (21)	Valuation of birth outcomes Differences between obstetricians, pregnant women and mothers	12 obstetricians , 15 low risk pregnant women between 33 and 38 weeks gestation, 15 mothers	Cost-utility decision analysis, using standard reference gamble and decision tree analysis	Obstetricians tend to view permanent neurological disability as a worse outcome than neonatal death. Compared to women, obstetricians overestimate the burden caused by caesarean delivery Obstetricians differed more among themselves than women
De Jonge 2004 (27)	Birthing position	Experience of 20 women who started the second stage of labour under the care of the midwife	Qualitative study interviews between 7 and 19 weeks after birth	Choice of birthing positions was determined more by midwives' advice than by women's personal preferences. Midwives should empower women to find the positions that are most suitable for them, by giving practical advice during pregnancy and labour

Author	Theme	Population	Method	Findings
Vd Hulst 2006 (19)	Birth experience after sexual abuse	Experience of 625 low risk women	Questionnaire at 20-24 weeks gestation Psychological characteristics with the General Health Questionnaire Locus of control with Multidimensional Health Locus of Control Scale Autonomy with the 12-item Autonomy Questionnaire.	Sexually-abused women reported higher levels of autonomy Sexually-abused multiparous women reported more emotional distress, more internal beliefs concerning health and were more likely to suffer pelvic pain Sexually-abused low-risk women do not seem to have more problems during labour and birth than other women
Borquez 2006 (2)	home birth compared to birth centre	193 women giving birth at home or in a birthing centre without complications	postal questionnaires 1-6 months after birth	home-birth group perceived less pain , desired less pain-relieving medication, believed they knew their midwife better and rated their birth setting 'higher' than the birth-centre group The birth-centre group emphasised safety, having medical help available, and convenience, The home-birth group emphasised the home being trustworthy and dependable, having their own place and belongings, and feeling comfortable and relaxed.
Christiaens 2007 (26)	childbirth experience Comparison Netherlands-Belgium	560 women	Questionnaire at 30 weeks and within 2 weeks postpartum Mackey Satisfaction with Childbirth Rating Scale, Labour pain rated retrospectively with Visual Analogue Scales. Personal control with the Wijma Delivery Expectancy/Experience Questionnaire and Pearlin and Schooler's mastery scale.	Satisfaction with childbirth benefited most consistently from the fulfilment of expectations. The experience of personal control buffered the lowering impact of labour pain. Women with high self-efficacy showed more satisfaction with self-, midwife- and physician-related aspects of the birth experience
Christiaens 2007 (3)	Referral during birth; Comparison Netherlands-Belgium	563 women	Questionnaire at 30 weeks and within 2 weeks postpartum Satisfaction with Mackey Satisfaction Childbirth Rating Scale	After referral: women with planned home birth less satisfied than women with a planned hospital birth and Dutch women less satisfied then Belgium women.

Author	Theme	Population	Method	Findings
Johnson 2007 (9)	Experience with home birth	14 women who had given birth at home	Qualitative study Interviews	Dutch women who gave birth at home felt fulfilled and empowered by the experience.
Rijnders 2008 (16) (this dissertation)	Experience with childbirth	1309 women	postnatal questionnaires three years after birth Questionnaire Greater Expectations follow up study, including EPDS, Rosenberg's self esteem	16.5% negative recall of birth. Perinatal factors associated with negative recall: having had an assisted vaginal delivery or unplanned caesarean delivery, no home birth, referral during labour, not having had a choice in pain relief, not being satisfied in coping with pain, a negative description of the caregivers ,having had fear for the baby's life or own life
Baston 2008 (1) (this dissertation)	Experience with childbirth Comparison Netherlands -UK	738 UK women 1309 Dutch women	postnatal questionnaires three years after birth questionnaire Greater expectations follow up study, including EPDS, Rosenberg's self esteem	Dutch women more negative compared to English women Common factors that contributed to a negative appraisal of birth: unplanned operative birth, negative description of the caregivers, having had fear for the baby's life and having had major health problems since the birth
Molkenboer 2008 (14)	Experience with vaginal birth versus caesarean section for term breech birth	183 women	Postal questionnaire two years after birth	More women in the planned vaginal birth group recalled having been worried about their child's health at the time of delivery, experienced more pain than expected, and reported less involvement in decision-making.
Wiegers 2009 (24)	Experience with quality of maternity care	793 Pregnant women	Postal questionnaire to develop the 'Consumer Quality Index': *informative questions* (what happened?) *evaluative questions* (how often did you experience) *general ratings (1-10)*	Women, regardless of parity, were very positive about the quality of the maternity care they received. For care during labour and birth the quality of care scores are higher when women know their care provider, when they give birth at home, when they give birth in primary care and when they are assisted by their own midwife.

Author	Theme	Population	Method	Findings
Christiaens 2009 (4)	Experience with place of birth Comparison Netherlands or Belgium	580 women	Questionnaire at 30 weeks and within 2 weeks postpartum Satisfaction with Mackey Satisfaction with Childbirth Rating Scale	Women with planned a home birth are most satisfied in both countries. Belgian women are more satisfied than Dutch women for both home and hospital births.
Douma 2010 (29)	comparison of patient-controlled meperidine, remifentanil, and fentanyl in labour	RCT 159 women requesting analgesia other than epidural analgesia	Two hours after delivery, pain and satisfaction on a 10-point VAS scale	Remifentanil PCA provided better analgesia than meperidine and fentanyl PCA, but only during the first hour of treatment. In all groups, pain scores returned to pre-treatment values within 3 hours after the initiation of treatment Overall satisfaction scores were higher with remifentanil, but remifentanil produced more sedation and itching.
Fontein 2010 (7)	Birth experiences in different sized midwifery practices.	718 low-risk women	postal questionnaires six weeks after the estimated due date experiences of women were recorded on a Numerical Descriptor Scale questionnaire was predominantly based on questionnaires from Winters et al., the Mason Survey, van Teijlingen et al., PLDS, W-DEQ, CWS and EPDS.	in midwifery practices consisting of 1 or 2 midwives: compared to more then 2 midwives: less referrals fewer medical interventions during birth compared to women in practices higher levels of satisfaction with the birth experience more often knew their midwife and had a known midwife after referral

Table 3: Identified studies addressing Dutch women's expectations or experiences with interventions in pregnancy (n=3)

Author	Theme	Population	Method	Findings
deMiranda 2006 (6)	Sweeping membranes for near post term pregnancy	750 low risk women	woman's satisfaction by self-reported questionnaires after birth	88% indicated that they would choose membrane sweeping in a next pregnancy. Even among the 239 women who described sweeping as painful, 88 % would choose membrane sweeping again in the next pregnancy.
Kok 2008 (12)	Parents preferences external cephalic version	40 women with and 40 women without breech presentation at term and 27 partners	Interviews after 36 weeks gestation with treatment preferences and outcome trade-offs scenario's	65% of the patients preferred Caesarean birth for breech presentation
Rijnders 2010 (this dissertation)	Experiences ECV	137 women with confirmed breech	Questionnaire after ECV	Women rated ECV as a good experience and the majority was willing to undergo a version in a subsequent pregnancy. Significant pain during the version was experienced by one third of the women

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Summary / Samenvatting

Summary

In chapter 2 the results are presented of a retrospective cohort study into perinatal factors associated with women's appraisal of birth. A questionnaire was mailed in 2004 to 1309 women who had given birth in 2001 in 8 midwifery practices and who had at least one prenatal, perinatal, or postnatal visit to the participating midwifery practice. Three years after birth, most women looked back positively on their birth experience, but more than 16 percent looked back negatively. More than 1 in 5 primiparous women looked back negatively compared with 1 in 9 multiparous women. Adjusted odds ratios (OR) for looking back negatively 3 years later included having had an assisted vaginal delivery or unplanned caesarean delivery (OR 2.6, 95% CI 1.59–4.14), no home birth (OR 1.4, 95% CI 1.04–1.93), referral during labour (OR 2.4, 95% CI 1.48–3.77), not having had a choice in pain relief (OR 2.9, 95% CI 1.91–4.45), not being satisfied in coping with pain (OR 4.9, 95% CI 2.55–9.40), a negative description of the caregivers (OR 2.9, 95% CI 1.85–4.40), or having had fear for the baby's life or her own life (OR 2.3, 95% CI 1.47–3.48). It was concluded that research needs to be undertaken to understand women's expectations and experiences of birth within the Dutch maternity system and examination of maternity care changes designed to reduce or modify those controllable factors that are associated with negative recall.

In chapter 3 factors within Dutch maternity care that affect women's emotions during birth are described. This was a secondary analysis of the same dataset as used in chapter 2. We received 1309 questionnaires (response rate 44%). On average women filled out 31% of all possible positive emotions versus 20.3% of all possible negative emotions ($F(1, 1283) = 109.57$, $p < .001$. Univariate analyses showed that most positive and least negative emotions were experienced when women had given birth at home whereas an assisted birth after referral resulted in least positive and most negative emotions ($F(3, 1280) = 39.54$, $p < 0.001$). A planned hospital birth and a spontaneous birth after referral were in between these two extremes with respect to the positive and negative emotions they had evoked and did not differ from each other. Furthermore, a known caregiver ($F(1,1257) = 10.17$, $p = 0.001$) and continuity of care ($F(1,1257) = 35,69$, $p < 0.001$) resulted in more positive and fewer negative emotions as did multiparity ($F(1, 1281) = 26.83$, $p < 0.001$).
We assessed the simultaneous effects of birth categories (defined by place and mode of birth and status of referral), familiarity with the caregiver or continuity of care on the ratio of positive to negative emotions. The ratio was affected by the category of birth ($F(3, 1245) = 16.80$, $p < 0.001$), as well as by continuity of care ($F(1, 1245) = 12.93$, $p < 0.001$), but not by familiarity with the caregiver ($F(1, 1245) = 1.62$, $p = 0.203$).

Conclusion: an assisted birth, referral during pregnancy or birth, and a hospital birth are associated with more negative emotions during birth. Continuity of care and home birth are associated with more positive emotions during birth. Continuity of care should be provided to all childbearing women and women should be given the freedom to choose their place of birth. Finally, other interventions should be looked into that prevent negative emotions and increase positive emotions during birth for women. However, women should also be better prepared to be able to cope with unexpected negative emotions.

In chapter 4 the retrospective experiences of 1310 Dutch women with mode of birth were compared with those of 738 English women three years after birth. The Dutch questionnaire as described in chapter 1 and 2 was based upon the English questionnaire thus enabling comparison of the data. It was hypothesised that Dutch women who had an emergency caesarean birth would look back more negatively on the experience than their counterparts in England. There was some support for this hypothesis: 48.6% of the Dutch women who had an emergency caesarean birth were unhappy looking back cf. 33.3% of the English women. This difference was of borderline significance (X^2 53,829 df51 p= 0.05). However more women in the Netherlands were found to look back negatively than women in England irrespective of mode of birth. Common factors for a negative appraisal in both countries were: emergency caesarean and instrumental birth; feeling that the baby's life had been in danger; negative perception of the staff; and major health problems since the birth. Induction of labour and feeling that her own life had been in danger were also predictive of looking back negatively for Dutch women. One variable that the English study did not have the equivalent of was being transferred from home to hospital in labour. If this was put into the Dutch model it made a significant contribution (OR 3.36, CI 2.16–5.21, p< 0.001). It was concluded that prospective research was needed between the two countries that uses the same measures, collected at the same time and also takes into account the antenatal expectations.

In chapter 5 the trends in referral rate of 1 977 006 pregnancies attended by a primary care level midwife and registered in the Dutch midwifery database (LVR1) are presented. The trends in referrals of these indications were analysed by general linear models. From 1988 to 2004 an increase of 14.5% (from 36.9 to 51.4%) occurred in referrals from primary midwifery care to secondary obstetric care either during pregnancy, childbirth or in the postpartum period. In parous women, the increase in referrals was greater (+16.6%) than in nulliparous women (+12.3%) (P = 0.001).

The most common indications for referrals in nulliparous women were anticipated or evident complications due to 'failure to progress in the first or second stage' and 'foetal distresses. Parous women were most commonly referred for anticipated or evident complications due to 'medical history' and 'foetal distress'. In nulliparous women, 52% of the increase in referrals was related to the need of pain relief and occurrence of meconium-stained amniotic fluid; in parous women, 54% of the increase in referrals was related to the general medical and obstetrical history of the women, particularly previous caesarean section, and the occurrence of meconium stained amniotic fluid. It was concluded that Dutch midwives, obstetricians and policymakers should examine critically the increase in referrals and work together to maintain primary obstetric care for low-risk pregnant women. Primary prevention of caesarean section and antenatal preparation for childbirth are seen as important interventions in the maintenance of primary obstetric care for low-risk pregnant women.

In Chapter 6 the results of a retrospective cohort study are presented into the effectiveness of all external cephalic versions (ECV) carried out between 1996 and 2000 in a specialised midwifery centre in the Netherlands. Furthermore complications associated with the procedure and the association between the number of ECV attempts and cephalic presentation at birth and caesarean section are reported.
In total 958 ECVs were analysed, 889 first attempts and 69 repeat attempts. Seventy per cent of all first ECVs were carried out before 37 weeks, but half of those were carried out between 36 and 37 weeks. The success rate for first ECV was 41% and for the second ECV 29%. Bivariate analysis showed that the success of the first ECV was positively influenced by parity, non-Dutch origin, higher birth weight, higher age and longer duration of pregnancy. After logistic regression, parity (odds ratio [OR] 2.8, 95% CI 2.1 to 3.7), non-Dutch origin (OR 1.8, 95% CI 1.2 to 2.8) and birth weight (OR 1.7, 95% CI 1.4 to 2.0) remained factors that independently influenced the success of ECV. The odds ratio for duration of pregnancy at first ECV was borderline significant: OR 1.2 (1.0 to 1.4). After an unsuccessful first ECV, only 13% of the women received a second ECV. The prevalence of cephalic presentation at birth increased with 3% after a second ECV. Three cases of complications were reported during or very shortly after the first ECV, and these did not result in serious complications. No complications were reported after a second ECV. It was concluded that ECV without tocolysis a safe procedure is for pregnant women and their babies. Furthermore, repeat ECV increases the number of cephalic presentations at birth and should be considered after an unsuccessful ECV.

In Chapter 7 the results are shown of a prospective cohort study of all women with a suspected breech presentation at a gestational age of 33 completed weeks identified in

46 midwifery practices between June 2007 and January 2008. Of the 304 women with a suspected breech presentation 168 women had a confirmed breech presentation and all of them were offered an ECV. Of those, 123 (73.2%, 95% CI 65.5-80.5) subsequently received an ECV. Women who received an ECV had about a 9-fold increased probability of a cephalic presentation at birth compared with women who did not undergo ECV (RR = 8.7, 95% CI 2.2-34.1). The chance of a vaginal birth was more than doubled (RR = 2.3, 95% C.I: 1.3-3.9). The success rate of ECV (cephalic presentation after ECV) was 39%, but there were considerable differences in success rate associated with region and parity. Ninety four percent of women with a successful ECV rated ECV as a good experience compared with 71% of women who had a failed ECV (p=0.015). Significant pain during the ECV was experienced by 34% of the women. Eighteen percent of these women had fear during ECV compared to none of the women who experienced little or no pain (p=0.006). Women who had significant pain or fear during ECV experienced ECV more negatively (OR= 6.0, 95% CI 3.3-12.2 and OR=2.7, 95% CI 1.1-6.0 respectively). It was concluded that women with a baby in breech presentation who are approaching term should be counselled on the importance of the procedure. They should also be prepared for experiencing some discomfort and pain during the procedure. The chance of success appears to differ substantially between regions.

Chapter 8 shows the results of an unblinded multicentre Randomized Controlled Trial in which the effect of amniotomy at home between 292 and 294 days of pregnancy is evaluated on intervention rate during delivery and perinatal outcome.
In the Netherlands, with a home birth percentage of 24 % (1) and a wish to give birth at home in 61 % of women in primary care (2), induction of post dates pregnancy with amniotomy at home might be a desirable option for some women. Low risk nulliparous and multiparous women with a singleton cephalic presentation in 43 midwifery practices in the Netherlands were individually randomized by computer to amniotomy at home followed by 12 hours expectant management or to referral to an obstetrician for induction of labour.
Two hundred and seventy women were allocated to amniotomy at home between 292 and 294 days gestation and 251 to obstetric referral at 294 days gestation. Women in the amniotomy group were more likely to have a birth without intervention (OR 1.6 95% CI 1.1 to 2.3, NNT 8.3) or a home birth (OR 2.3 95% CI 1.5 to 3.5). Women in the amniotomy group more often expressed a preference for the experimental treatment in a next pregnancy compared to women in the control group (87% vs. 77% p 0.0001).
No differences were found between the groups in rate of Caesarean section, assisted vaginal birth, need for pain relief, need for antibiotic treatment, perinatal death, neonatal

infection, low Apgar score or neonatal admission to an intensive care unit (NICU). It was concluded that within well organised midwifery-led care, amniotomy can be offered as an outpatient method of induction for near post term pregnancy. Also, it is recommended that amniotomy is performed in the morning and that the period of expectant management does not exceed eight hours.

In chapter 9 an overview is presented of research identified in Pubmed or Midirs until February 2011 that addressed women's preferences, expectations and experiences with birth, maternity care and interventions in low risk pregnancies in the Netherlands. Not included are articles on women's preferences, expectations and experiences with prenatal screening, treatment for miscarriage or stillbirth or preconception care.
Available research has been focussed primarily on preference for and experience with place of birth and women's birthing experiences after referral. A strong preference for and good experiences with home birth has been demonstrated. Referral is associated with a less positive experience, but it is still unknown *why* exactly women have a more negative experience with referral and which factors in the process of referral can be improved to lead to a better birth experience.
Research into the expectations, preferences and experiences with labour pain and pain relief has been limited to two foreign studies comparing Dutch women with respectively American and Belgian women. Furthermore, only a few studies were found that addressed interventions in primary midwifery care. Fortunately, these studies were not restricted to perinatal outcomes only but did also address women's preferences and/or experiences. Concluding: to understand what women expect, prefer and how they experience Dutch maternity care, a lot still has to be done in Dutch midwifery and obstetric science.

Samenvatting

In hoofdstuk 2 worden de resultaten gepresenteerd van een retrospectief cohortonderzoek naar perinatale factoren die van invloed zijn op de ervaring van vrouwen met de bevalling. In 2004 is een vragenlijst gestuurd naar 1309 vrouwen uit 8 verloskundige praktijken, die bevallen waren in 2001, en tenminste éénmalig contact hadden gehad met de deelnemende verloskundige praktijk in de prenatale, perinatale of postnatale periode. Drie jaar na de geboorte keken de meeste vrouwen positief terug op hun bevalling, maar meer dan 16 procent keek negatief terug. Meer dan 1 op de 5 primiparae keek negatief terug in vergelijking tot 1 op de 9 multiparae. Gecorrigeerde odds ratio's (OR) om negatief terug te kijken 3 jaar na de bevalling zijn: een vaginale kunstverlossing of ongeplande keizersnede (OR 2.6, 95% CI 1.59-4.14), geen thuisbevalling (OR 1.4, 95% CI 1.04 tot 1.93), verwezen zijn tijdens de baring (OR 2.4, 95% CI 1.48-3.77), geen keuze hebben gehad in pijnbestrijding (OR 2.9, 95% CI 1.91-4.45), niet tevreden zijn in het omgaan met pijn (OR 4.9, 95% CI 2.55-9.40), een negatieve beoordeling van de zorgverleners (OR 2.9, 95% CI 1.85-4.40), het hebben gehad van angst voor het leven van de baby of het eigen leven (OR 2.3, 95% CI 1.47 - 3.48). Onderzoek is nodig om beter inzicht te krijgen in verwachtingen en ervaringen van vrouwen met de bevalling binnen het Nederlands verloskundige zorgsysteem en naar interventies die erop gericht zijn om controleerbare factoren, die geassocieerd zijn met een negatieve ervaring, te veranderen.

In hoofdstuk 3 zijn factoren binnen de Nederlandse verloskunde beschreven die van invloed kunnen zijn op de gevoelens die vrouwen tijdens de bevalling ervaren. Het betreft een secundaire analyse van dezelfde dataset die gebruikt is in hoofdstuk 2. Vrouwen hebben significant meer positieve gevoelens (31.0%) dan negatieve gevoelens (20.3%) ervaren tijdens de baring ($F (1, 1283) = 109.57$, $p <.001$). Na univariate analyses blijkt dat de meest positieve en minst negatieve gevoelens worden ervaren bij een thuisbevalling terwijl de minst positieve en meest negatieve gevoelens worden ervaren na een verwijzing tijdens zwangerschap of baring gevolgd door een kunstverlossing ($F (3, 1280) = 39.54$, $p <0.001$). De verhouding positieve en negatieve gevoelens tijdens een geplande ziekenhuisbevalling en na een verwijzing die eindigt in een spontane geboorte zit tussen deze twee uitersten in en verschillen niet van elkaar. Een bekende zorgverlener ($F (1, 1266) = 25.75$, $p = 0.001$), continuïteit van zorg ($F (1, 1261) = 50.75$, $p <0.001$) en multipariteit ($F (1, 1281) = 26.83$, $p <0.001$) leiden tot meer positieve en minder negatieve gevoelens.
Analyse van de gecombineerde invloed van pariteit, soort en plaats bevalling, bekende zorgverlener en continuïteit van de zorg laat zien dat de verhouding tussen positieve en

negatieve gevoelens tijdens de baring wordt beïnvloed door soort en plaats van bevalling (F-waarden> 16.50, p-waarden <0.001), pariteit (F- waarden> 5.46, p-waarden <0.02) en continuïteit van de zorg F (1, 1246) = 22.87 p <0.001). Het effect van bekendheid met de zorgverlener verdwijnt (F (1, 1245) = 1.62, p = 0.203).
Conclusie: een verwijzing tijdens zwangerschap of baring, een kunstverlossing en/of in het ziekenhuis bevallen zijn factoren die allemaal van invloed zijn op het hebben van meer negatieve gevoelens van vrouwen tijdens de bevalling. Continuïteit van zorg en thuis bevallen zijn geassocieerd met meer positieve gevoelens tijdens de bevalling. Geconcludeerd kan worden dat continuïteit van zorg aan alle barende vrouwen geboden moet worden en dat vrouwen keuzevrijheid moeten hebben ten aanzien van de plaats van bevallen. Onderzoek is nodig naar interventies die negatieve gevoelens tijdens de bevalling voorkomen en positieve gevoelens versterken. Daarnaast lijkt het zinvol vrouwen goed voor te bereiden om met onverwachte negatieve gevoelens om te kunnen omgaan.

In hoofdstuk 4 zijn de ervaringen over de wijze van bevallen drie jaar na de geboorte van 1310 Nederlandse vrouwen vergeleken met die van 738 Engelse vrouwen. Deze vergelijking was mogelijk omdat de Nederlandse vragenlijst zoals beschreven in de hoofdstukken 2 en 3 was gebaseerd op de Engelse vragenlijst. De hypothese was dat Nederlandse vrouwen die een ongeplande keizersnede krijgen negatiever zullen terugkijken op hun bevalling dan Engelse vrouwen met een ongeplande keizersnede. Deze hypothese wordt marginaal ondersteund door de data: 48.6% van de Nederlandse vrouwen die een ongeplande keizersnede kregen kijken negatiever terug versus 33.3% van de Engels vrouwen. Dit verschil is net niet significant (X^2 53.829 DF51 p = 0.05). Echter, Nederlandse vrouwen kijken vaker negatief terug dan Engelse vrouwen ongeacht de wijze van bevallen. Gemeenschappelijke factoren voor negatief terugkijken in beide landen waren: ongeplande keizersnede of vaginale kunstverlossing, het gevoel dat de baby's leven in gevaar was, negatieve beoordeling van zorgverleners en grote gezondheidsklachten sinds de geboorte. Inleiding van de baring en het gevoel dat het eigen leven in gevaar was waren ook voorspellende factoren voor negatief terugkijken onder Nederlandse vrouwen. Een variabele die in de studie niet is meegenomen omdat deze ontbrak in de Engelse studie was verwijzing tijdens de baring van huis naar het ziekenhuis. Als deze variabele in het Nederlandse model werd meegenomen bleek het in belangrijke mate bij te dragen aan negatief terugkijken (OR 3.36, CI 2.16-5.21, p <0.001). Geconcludeerd wordt dat prospectief onderzoek nodig is waarbij in beide landen dezelfde factoren worden verzameld, op eenzelfde moment en op identieke wijze en waarbij in de analyse rekening wordt gehouden met de antenatale verwachtingen.

In hoofdstuk 5 zijn trends gepresenteerd in verwijzingen tijdens 1. 977 006 zwangerschappen die zijn begeleid door eerste lijns verloskundigen en die geregistreerd staan in de Landelijke Verloskundige Registratie (LVR1). Analyse van trends en indicaties is gedaan met behulp van algemeen lineaire modellen. Van 1988 tot 2004 is er een stijging zichtbaar van 14.5% (36.9 tot 51.4%) in verwijzingen van eerstelijns verloskundige zorg naar de tweedelijns verloskundige zorg tijdens de zwangerschap, bevalling of kraambed. Bij multiparae is de stijging groter (+16.6%) dan bij nulliparae (+12.3%) (P = 0.001). De meest voorkomende indicaties voor verwijzingen bij nulliparae zijn ‘niet of onvoldoende vorderende ontsluiting of uitdrijving’ of 'foetale nood'. Multiparae werden het meest verwezen in verband met een ‘belaste obstetrische anamnese’ of ‘foetale nood’. Onder nulliparae was 52% van de toename in het percentage verwijzingen in verband met ‘noodzaak voor pijnbestrijding’ en het optreden van meconiumhoudend vruchtwater. Bij multiparae was 54% van de toename in het percentage verwijzingen gerelateerd aan de algemene en obstetrische anamnese, vooral een eerdere keizersnede, en het optreden van meconiumhoudend vruchtwater. Geconcludeerd kan worden dat de Nederlandse verloskundigen, gynaecologen en beleidsmakers de toename in het aantal verwijzingen kritisch moeten bekijken en samen moeten werken om eerstelijns verloskundige zorg te behouden voor laag risico zwangeren. Primaire preventie van een keizersnede en prenatale voorbereiding op de bevalling worden beschouwd als belangrijke interventies voor het behoud van eerstelijns verloskundige zorg aan laag risico zwangeren.

In hoofdstuk 6 worden de resultaten gepresenteerd van een retrospectieve cohort studie naar de effectiviteit van alle uitwendige versies die zijn uitgevoerd tussen 1996 en 2000 in een gespecialiseerd centrum in Nederland. Complicaties als gevolg van de procedure en het verband tussen het aantal pogingen enerzijds en het aantal hoofdliggingen tijdens de geboorte en aantal keizersneden anderzijds worden weergegeven.
Er zijn in totaal 958 versies geanalyseerd, 889 eerste pogingen en 69 tweede pogingen. Zeventig procent van alle eerste versies is uitgevoerd vóór 37 weken zwangerschapsduur, waarvan de helft tussen 36 en 37 weken. Het succespercentage van de eerste versie was 41% en van de tweede versie 29%. Univariate analyse laat zien dat het succes van de eerste versie positief wordt beïnvloed door pariteit, niet-Nederlandse afkomst, een hoger geboortegewicht, een hogere leeftijd en langere duur van de zwangerschap. Na logistische regressie blijven pariteit (OR 2.8, 95% CI 2.1 tot 3.7), niet-Nederlandse afkomst (OR 1.8, 95% CI 1.2 tot 2.8) en geboortegewicht (OR 1.7, 95% CI 1.4 tot 2.0) factoren die onafhankelijk van elkaar van invloed zijn op het succes van de versie. De odds ratio voor de duur van de zwangerschap bij een eerste versie is net niet significant (OR 1.2 95% CI 1.0 tot 1.4). Na een mislukte eerste versie krijgt

slechts 13% van de vrouwen een tweede versie aangeboden. Na een tweede versie stijgt de prevalentie van hoofdligging bij de geboorte met 3%. Drie complicaties tijdens of zeer kort na de eerste versie worden beschreven. Deze hebben niet geleid tot ernstige perinatale uitkomsten. Er zijn geen complicaties gemeld na een tweede versie. Geconcludeerd kan worden dat een uitwendige versie zonder tocolyse een veilige procedure is voor zwangeren en hun baby's in het geval van een stuitligging. Een tweede versie verhoogt het aantal hoofd liggingen bij de geboorte en moet overwogen worden na een mislukte versie.

In hoofdstuk 7 worden de resultaten getoond van een prospectieve cohort studie naar de prevalentie van de uitwendige versie in Nederland.
Tussen juni 2007 en januari 2008 zijn in 46 verloskundige praktijken alle vrouwen met een mogelijke stuitligging bij een zwangerschapsduur van 33 volledige weken geïdentificeerd en gevolgd. Van de 304 vrouwen met een mogelijke stuitligging hadden 168 vrouwen uiteindelijk een zekere stuitligging. Allen kregen een versie aangeboden, maar 123 (73.2%, 95% CI 65.5-80.5) onderging vervolgens daadwerkelijk een versie. Vrouwen die een versie kregen hadden een 9-voudig verhoogde kans op een hoofd ligging bij de bevalling vergeleken met vrouwen die geen versie hadden ondergaan (RR 8.7, 95% CI 2.2 tot 34.1). De kans op een vaginale geboorte was na een versie meer dan verdubbeld (RR 2.3, 95% CI 1.3-3.9). Het overall succespercentage van de versie was 39%, maar er waren grote verschillen in succespercentage tussen regio's en per pariteit. Vierennegentig procent van de vrouwen met een succesvolle versie beoordeelde het als een goede ervaring vergeleken met 71% van de vrouwen met een mislukte versie ($p = 0.015$). Aanzienlijke pijn tijdens de versie werd ervaren door 34% van de vrouwen. Achttien procent van deze vrouwen had angst ervaren tijdens de versie vergeleken met geen van de vrouwen die weinig of geen pijn hadden ervaren ($p = 0.006$). Vrouwen waren meer negatief over de versie als zij aanzienlijke pijn of angst hadden ervaren tijdens de versie (OR 6.0, 95% CI 3.3-12.2 en OR 2.7, 95% CI 1.1-6.0 respectievelijk). Geconcludeerd kan worden dat vrouwen met een baby in stuitligging die bijna aterme zijn moeten worden voorgelicht over het belang van een uitwendige versie. Zij moeten worden voorbereid op het ervaren van enig ongemak en pijn tijdens de procedure. Zorgverleners moeten beter worden opgeleid in de techniek, omdat de kans van slagen sterk lijkt te verschillen tussen regio's.

In hoofdstuk 8 worden de resultaten beschreven van een multicenter ongeblindeerde RCT waarin het effect wordt onderzocht van amniotomie thuis tussen 292 en 294 dagen zwangerschapsduur op het percentage interventies tijdens de bevalling en perinatale uitkomsten.

Nederland heeft een thuisbevalling percentage van 24% (1) en 61% van de zwangeren onder zorg in de eerstelijn is er de wens om thuis te bevallen (2). In deze situatie is inleiden van de baring voor serotiene zwangerschap met behulp van amniotomie thuis mogelijk een wenselijke optie voor sommige vrouwen. In 43 verloskundige praktijken in Nederland werden laag risico nulliparae en multiparae met een eenling in hoofd ligging per computer gerandomiseerd naar amniotomie thuis tussen 292 en 294 dagen zwangerschapsduur, gevolgd door 12 uur afwachtend beleid (n=270) of naar verwijzing naar een gynaecoloog voor het inleiden van de baring bij 294 dagen zwangerschapsduur (n=270). Vrouwen in de amniotomie groep hadden een hogere kans op een bevalling zonder medische interventie (OR 1.6 95% BI 1.1 tot 2.3, NNT 8.3) of een thuisbevalling (OR 2.3 95% CI 1.5 tot 3.5). Vrouwen in de amniotomie groep gaven vaker aan in een volgende zwangerschap weer voor dezelfde experimentele behandeling te kiezen vergeleken met vrouwen in de controlegroep (87% vs. 77% p 0.0001).
Er werden geen verschillen gevonden tussen beide groepen in percentage keizersneden, vaginale kunstverlossingen, noodzaak tot pijnstilling, noodzaak voor antibiotica behandeling, perinatale sterfte, neonatale infecties, lage Apgar-score of neonatale opname op de couveuse. Geconcludeerd kan worden dat binnen een goed georganiseerd verloskundige zorgsysteem, amniotomie kan worden aangeboden als een ambulante methode voor inleiden van bijna serotiene zwangeren. Het wordt aanbevolen om amniotomie in de ochtend uit te voeren en een maximale periode van 8 uur afwachtend beleid te hanteren.

In hoofdstuk 9 wordt een overzicht gepresenteerd van alle onderzoeksartikelen, geïdentificeerd in Pubmed of Midirs tot en met februari 2011, met als onderwerp wensen, verwachtingen en ervaringen van vrouwen ten aanzien van zwangerschap, bevalling en kraambed en met interventies in laag risico zwangerschappen in Nederland. Geexcludeerd werden artikelen over wensen, verwachtingen en ervaringen van vrouwen met prenatale screening, preconceptiezorg en de zorg rondom een miskraam of doodgeboren kind. In totaal 33 artikelen zijn in dit overzicht opgenomen.
Het grootste deel van de gevonden artikelen gaat over de wensen en ervaringen van vrouwen ten aanzien van de plaats van bevallen en verwijzingen. Uit de literatuur komt een sterke voorkeur voor, en goede ervaringen met, thuis bevallen naar voren. Verwijzingen worden geassocieerd met minder positieve ervaringen. Het is echter onbekend waarom vrouwen meer negatieve ervaringen hebben na een verwijzing en welke factoren in het verwijzingsproces verbeterd kunnen worden om tot betere bevallingservaringen te komen.
Onderzoek naar wensen, verwachtingen en ervaringen met baringspijn en pijnbestrijding is beperkt tot twee buitenlandse studies waarin Nederlandse vrouwen

met respectievelijk Amerikaanse en Belgische vrouwen zijn vergeleken. Tenslotte zijn slechts enkele studies gericht op interventies in de eerstelijns verloskundige zorg. Deze studies zijn niet beperkt tot perinatale uitkomsten alleen maar er is er ook aandacht besteed aan de wensen en / of ervaringen van vrouwen. Geconcludeerd kan worden dat, om te begrijpen wat de wensen, verwachtingen en ervaringen zijn van vrouwen met het Nederlands verloskundige zorg, er nog veel onderzoek moet worden gedaan in zowel de verloskundige als obstetrische zorg.

Discussion

General discussion

The aim of this thesis was to provide insight into women's experiences and feelings about birth and maternity care in the Netherlands. Furthermore, it aimed to gain insight into rates, effects and women's experiences of two medical interventions in primary care, i.e. external cephalic version and amniotomy for induction of near post date pregnancy.

Women's experiences with birth

Examining women's retrospective evaluation of Dutch maternity care and their experiences with birth it was found that a substantial proportion of women looked back negatively at their birth experience three years later. Furthermore, Dutch women looked back more negatively at birth compared to English women. Comparable findings were presented by Christiaens et al who compared Dutch women to Belgian women (1).

The picture that emerges from the literature and this thesis is that women who gave birth at home were far more likely to have a positive birth experience and more positive emotions during birth compared to women who had a hospital birth either by their own choice or after referral. Women with an assisted birth after referral were least likely to experience their birth positively.

Some argue that a better experience after home birth compared to hospital birth is only caused by a better birth outcome which is in turn merely an effect of population characteristics. However, this does not take into account that elements associated with birthing at home, such as feelings of control and empowerment (2) may be caused by a less technical approach to birth (3;4), which may in turn cause positive such outcomes, at least partly (3). As the effectiveness of a home birth cannot be determined by a randomised clinical trial (5;6) evidence has to be derived from observational studies. In these studies a planned homebirth compared to a planned hospital birth under midwifery care is associated with lower rates of medical interventions including caesarean section, fewer intrapartum transfers of care from midwives to another practitioner, better birthing experiences and comparable maternal and perinatal outcomes (3;7-12). Therefore, given the best evidence available, it can be argued that choosing a home birth should be interpreted as an effective intervention that increases the chance on an optimal birth outcome. However, arguments were put forward recently that those women who have to be referred during birth are at increased risk of a negative experience and possibly of a less optimal perinatal outcomes (13). Although referral is associated with more negative experiences with birth (8;14-16) it has also been shown that women who were referred from home to hospital compared to women who were referred within a hospital setting did not have a more negative experience with the birth,

the midwife, or the post-partum period. (8;17). However, if referred after a home birth, women were less certain or less confident that they would make the same choice next time compared to women referred after a planned hospital birth. On the other hand, women who gave birth in hospital without referral to an obstetrician were not as certain that they would choose the same place of birth again as were the women who had given birth at home. Therefore, in order to improve experiences effort might be directed, as was concluded in Wiegers' study first to reduce the fear of unplanned transfer from home to hospital, especially among nulliparous women, before advising women to choose a hospital birth only in order to avoid such transfer (8).

Nevertheless, it is obvious that negative experiences with referral and less optimal perinatal outcomes after referral (13) have to be taken very seriously. Therefore, research has to focus on *why* women's experiences and perinatal outcomes are less optimal after referral and which interventions can lead to better outcomes.

Creating effective and realistic options for women in choosing their place of birth is a challenge for midwifery and obstetric care. The evidence provided by this thesis and other studies (1;8;9;15) that after home birth, continuity of care, no referral and more spontaneous birth women have the best birthing experience is an important point taking into account by planning research for improvement in maternity care. Studies showing to what extent suboptimal outcomes after referral are present and if present, what the origins of the suboptimal outcomes are should be carried out expeditiously. Preferably, obstetricians as well as midwives should take an interest in this research and should undertake these studies in a concerted effort. Ultimately, the results should be available before any conclusions about effectiveness and safety should enter the public debate. Interventions that have been suggested to be effective and that should urgently be tested in the Netherlands are multidisciplinary emergency training (18;19), continuous support (20) before and after referral and the creation of a more collaborative structure and culture in maternity care (21).

Interventions in primary care

A second approach that can be undertaken to increase the chances that women's experiences improve and their preferences are being met is to design and implement effective and safe interventions in maternity care that prevent not only instrumental birth but also other unnecessary interventions, including unnecessary referrals (as this is the most important intervention in midwifery care). As shown in the article by Amelink et al in chapter 4 of this thesis an increase of 14.5% (from 36.9 to 51.4%) between 1988 and 2004 was observed in referrals from primary midwifery care to secondary obstetric care either during pregnancy, labour or in the postpartum period. In 2007, the referral rate increased further to 56.5% (22). The rise in the referral rate can be partly explained

by changes in demographic features of the population (23). It is also likely that increased possibilities in risk assessment, changing risk perceptions, and an increasing demand for pain relief (24) have contributed to an increasing referral rate.
In the Netherlands, maternity services have been changing from a social to a more medical model, especially in the last decade, and the risk assessment is part of this process. Contemporary midwifery is largely governed by risk assessment. Midwives assess women and allocate them into evidence- and consensus -based risk categories (24). By doing so, they influence the choices available to women throughout pregnancy and around birth (25). Identifying risks and referring women in time to secondary care is an important aspect of primary midwifery care. However, crucial in this process is counselling and the organisation of the care process. Concentrating predominantly on the one very rare adverse event rather than on all the positive outcomes may lead to 'risk magnification' which in turn raises anxiety about the risk rather than putting it in a woman's proper individual perspective. This may subsequently lead to unnecessary referral and increase intervention rates (26). Research from the UK indicates that fear of childbirth has increased over recent years, along with an increased willingness to accept medical interventions during childbirth (27;28). Even midwives generally underestimate the ability of women to progress normally during birth and overestimate the advantages of technological interventions (29).
In this context, one can question why increasing the referral rate has been the only response Dutch midwives appear to provide in response to the changes in risk management and in demands. More efforts have to be undertaken to develop effective strategies within primary care to deal with changes in risk perception. In addition, risk selection should evolve from a consensus based model towards an evidence based model with more dynamic properties. Furthermore, caregivers counselling women should be better trained in helping women to make an informed choice based on the risks and benefits associated with their personal preferences (30-32).

Although the medical and social model of maternity care appear to be two extremes of the spectrum, both models have useful elements. By combining the advantages of the medical model (increased possibilities of risk assessment and improving outcomes on population level) with the advantages of a "social" midwifery model of care (emphasis on socially desirable ways to achieve good outcomes) the most optimal outcomes can be achieved. Furthermore, it can be argued that a woman's experience is the most important outcome of maternity care as this incorporates good perinatal outcomes.
When looking at maternity care from this perspective it seems important to study and/or implement interventions that are not only effective in preventing unnecessary interventions during birth but also meet women's preferences and choices. In this thesis

two such interventions were examined in chapter 6, 7 and 8, i.e. external cephalic version in case of breech presentation and amniotomy for induction of labour in near postdate pregnancy. External cephalic version is an effective and safe intervention that prevents breech presentation at term. The majority of women undergoing ECV rated it as a good experience even if it failed. However, implementation of ECV should be improved as a quarter of the women with a confirmed breech did not receive an ECV.

ECV is found to be a safe procedure. In our study of 956 ECV performed between 1996 and 2000, three serious complications occurred. In one case membranes ruptured during ECV leading to vaginal breech birth of a healthy baby. In two cases an emergency caesarean section was performed: one within 12 hours after ECV for the occurrence of blood loss several hours after ECV and a compromised baby. The baby was born in poor condition, but it recovered quickly enough to be able to leave the hospital within a week. The other emergency caesarean was performed because of vaginal blood loss and fetal heart rate pathology. A healthy baby was born. Grootscholten et al. reported in a meta analysis of almost 13.000 ECV's a pooled complication rate ECV of 6.1% (95% CI 4.7–7.8), 0.24% for serious complications (95% confidence interval [CI] 0.17-0.34), 0.35% for emergency caesarean deliveries (95% CI 0.26-0.47) and a risk of fetal death in 1 per 5,000 external cephalic version attempts (33). In our study the overall complication rate was 2.2% (21/956), 0.31% (3/956) for serious complications and 0.21% (2/956) for emergency caesarean section. There was no foetal death.

Therefore, ECV should be offered to all women with a breech presentation at term. The most effective method for the implementation of ECV is being researched at this moment (34). However, the optimal management of ECV is not yet clear. There is considerable discussion whether the performance of ECV should be restricted to a hospital setting. Grootscholten et al conclude that "considering the risk of an emergency cesarean delivery in 1 per 286 versions, external cephalic version should only be attempted in settings in which cesarean delivery services are readily available". However, unclear is to what extent factors like tocolytics, or indications for performing a caesarean section can influence this outcome. Therefore, further research is needed to determine what the risks and benefits are of performing an ECV whether in a hospital or outpatient setting. Women should be counseled about the risk in a realistic way. Benefits of ECV in a hospital setting could be the use of tocolysis or ECV performed before term. Betamimetic tocolytics during ECV is associated with an increased success rate but also more maternal side effects (35). Nipefidine has not shown to be effective (36) but ritodrine may be effective during a second attempt (37). ECV at 34-35 weeks gestation versus 37 or more weeks of gestation increases the likelihood of cephalic presentation at birth but does not reduce the rate of caesarean section and may increase the rate of preterm birth (38).

In our study the success rate of ECV in the Netherlands differed between regions. It is unknown what caused these differences. Kuppens et al (39) showed a higher success rate of ECV if performed in a regular specialized team following a standardized protocol. Finally, a prediction model for successful ECV, discriminating between women with a poor chance of successful ECV (less than 20%) and women with a good chance of success (more than 60%), is described by Kok et al. After validation, this tool should be used in the counseling of women opting for an ECV (40).

In case of near postdates pregnancy, amniotomy at home resulted in more spontaneous births compared to referral for medical induction of labour. Women were more likely to prefer the experimental treatment in a subsequent pregnancy. More studies into women's experiences and the effectiveness with interventions in primary care are needed.

These results add to the evidence that induction in an outpatient setting is feasible (41) However, contrary tot our results, a Cochrane meta analysis comparing different modes of induction of labour in an outpatient setting versus a hospital setting, showed no differences, either positive positively or negative, in outcomes between the two settings (42).

We found no significant intermediating effects between membrane sweeping and amniotomy. Membrane sweeping significantly decreases the chance of a post term pregnancy (gestation of 42 weeks or more) (43) and is not associated with adverse outcomes. Amniotomy is an irreversible intervention, associated with an increased chance of maternal and neonatal infection. Sweeping membranes should therefore be the first choice to offer all women approaching post term pregnancy, if necessary followed by amniotomy after 292 days gestation. However, the discussion around post term pregnancy has recently shifted towards induction of labour for (near) post term pregnancy at an earlier gestation, i.e. at 41 weeks versus 42 weeks gestation. It is unclear what the benefits and risks are of earlier induction of labour in the Netherlands and even more whether a change in policy coincides with women's preferences. A trial in the Netherlands is being planned. Furthermore, research into the effects of different policies in the management of (near) post term pregnancy should also include alternative options in an outpatient setting.

In our study, not having had a choice in pain relief or not being satisfied in coping with pain were predictive factors for a negative recall with birth. However, research into women's expectations and experiences with pain during labour and demand for pain relief has been only specifically addressed in two other studies one in 1988 and another in 2010. Dutch women's experiences with pain and pain relief were compared to Belgian or American women's experiences (44;46). In both studies it was shown that

Dutch women received less pain medication, but the experienced pain or pain acceptance was not different between Dutch and Belgian or American women.
However, given the differences between the Netherlands and other developed countries in the availability and use of pain relief in maternity care, the lack of national research into women's expectations and experiences with pain management during labour can only be seen as a serious omission. Since the introduction of the Dutch guideline on pain relief by the Association of Anaesthesiologists in 2008 (46) the possibilities for women to receive pain relief have been improved. However, the increased offer of pain relief has been limited to specialist care in a hospital setting and little attention has been paid in de development of effective strategies for pain relief in primary care (32;47-49). Therefore, research into women's expectations, preferences, experiences and choices in pain management is urgently needed. Furthermore, methods or instruments have to be developed that can identify women who are at increased risk of catastrophizing their pain experiences. Identifying women's pain cognitions before labour, raises the possibility for interventions during pregnancy and labour that enhances the acceptance of pain and improves coping strategies (50;51). Finally, research is urgently needed that address effective and safe methods of pain relief in primary care.

However, receiving pain relief is not by itself important for a good birth experience (52). It may be equally important that midwives "tune in to the needs of women" (53;54). In this thesis it is shown that women are more likely to have a negative birth experience or recall more negative emotions during birth if they felt that they were not involved in decision making regarding pain management, did not receive continuity of care, had fear during birth or described their caregiver overall more negatively.
In the treatment of vulnerable populations, whether patients with chronic pain or post-traumatic stress disorder, " clinical empathy " has been proven to be very powerful in helping people retain a sense of agency and control (55). Clinical empathy is defined as the competency of healthcare providers to listen to a patient with emotional attunement and to have the curiosity to learn more about his or her particular feelings and needs (56). Clinical empathy thus seeks cognitive understanding of what in particular is bothering this individual, in contrast to sympathy in which one may feel generic concern for a patient but not seek to understand what is distinct about this person's needs. In the USA, training in such fields as oncology, geriatrics, paediatrics, and rehabilitation medicine now include rigorous attention to developing the precise skills necessary for empathic listening (57;58). To our knowledge, no such training exists in the Netherlands in the fields of obstetrics and midwifery. In the midwifery based literature numerous studies point at what women consider important during their births

suggesting distinct goals for clinical empathy during birth. Women particularly value feeling a sense of agency, of control over their pain and fear (59-63).

Anno 2011 the Dutch maternity system is at a crossroad. The relatively high perinatal mortality rate (64;65) has stirred the professional and public opinion. So far, differences in perinatal mortality between countries does not appear to be explained by differences in population characteristics, although living in a deprived area can be a contributing factor to adverse outcomes (66;67). Recent research has focussed on the possible contributing factor in the organization of maternity care. For instance the effect on perinatal mortality and morbidity by place of birth or type of caregiver (12;13) and the effect of centralization of care (69). Subsequently, a number of initiatives in the organisation of maternity care have been implemented that are aimed at improving perinatal outcomes or experiences of women with pregnancy, birth and received care. There is for instance an increase in number of birthing centres, local policies have been put into place to induce labour for (near) post term pregnancy at an earlier gestation or to provide routine ultrasound in the third trimester of pregnancy to prevent small for gestational age. However, sound evidence of the effectiveness of all these interventions is still lacking and women's preferences and experiences regarding these new policies are unknown. Evidence for the perinatal outcomes of these changing practices and for the concomitant factors that may influence women's preferences should therefore be a topic in future research programmes.

Improving Dutch maternity care by simply imposing a more medical model of care and not looking at home birth as a real option disregards women's preferences and ignores their good experiences with birth in primary care. More attention should be paid to the development and implementation of effective interventions in maternity care that meet with women's preferences.

Implications for practice

Risk selection

Dutch midwives, obstetricians and policymakers should critically examine the increase in referrals and work together to maintain a rational system of maternity care for low-risk pregnant women.

Women's well being
Changes in Dutch maternity care should only be investigated in concurrence with research into their effect on women's experiences with birth, their well being and perinatal outcomes and implemented after all these aspects have been evaluated.

Continuity of care by the initial chosen caregivers before, during and after birth should be offered to all women, irrespective of place and mode of birth and status of referral.

External cephalic version
Strategies that increase the number of women with breech presentation who receive an external cephalic version should be implemented. These should include counselling women with a baby in breech presentation who are approaching term on the importance of the procedure and prepare them for experiencing some discomfort and pain during the procedure.
Repeat ECV increases the number of cephalic presentations at birth and should be offered after an unsuccessful ECV.

Amniotomy before labour near post term
Within midwifery-led care at home, amniotomy increases the chance for spontaneous delivery for near post dates pregnancy. It is recommended that amniotomy is performed in the morning and that the period of expectant management does not exceed eight hours.

Recommendations for research

Research has to focus on *how to optimise* women's experiences and perinatal outcomes in the Netherlands especially after referral and which interventions can lead to better outcomes.

Research is needed into innovative and effective interventions in maternity care that meet with women's preferences for place of birth and prevent unnecessary interventions.

Research is needed into women's coping strategies, preferences, expectations and experiences with pain management during birth.

Research is needed into the development of methods and/or instruments that can identify women who are at increased risk of catastrophizing their pain experiences, as

well as into interventions that enhance the acceptance of pain and improve coping strategies.

Research is needed into effective and safe methods of pain relief during labour in primary care.

Research is needed into the effectiveness of earlier induction of near post term pregnancy, as well as research into methods for induction in outpatient settings.

Research is needed into the effectiveness, risks and benefits of ECV in a hospital setting compared to an outpatient setting.

Research is needed into factors (such as tocolysis) that improve the success rate of first and repeat attempts of ECV.

Prospective research is needed into women's preferences, expectations and experiences with birth and subsequent health and well-being of mothers and their partners in different birthing cultures that use the same standard measures and methodology, thus enabling comparison between countries and across cultural differences.

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About the Author

Marlies Rijnders was born at home in Amsterdam the 21st of November 1959 as the fourth (and last) child of Anna Letschert and Willem Rijnders.

After finishing a Gymnasium-alpha education at the St Ignatius College in Amsterdam in 1978, she started a study of Educational Theory ("Pedagogiek") at the University of Amsterdam. She obtained a Bachelors degree and started Midwifery School in 1986 in Amsterdam. After her graduation in 1989 she worked as an independent midwife in a group practice in Amstelveen until October 1999. She then followed the theoretical part of the Epidemiology-a course at the EMGO / VU University in Amsterdam and subsequently graduated. In 1999 she started working for TNO as a research midwife.

At TNO she participates in several research projects for instance a cost effectiveness study and an implementation study of strategies to prevent early onset of neonatal infection by group B streptococci (GBS), prevention of domestic violence in pregnancy, implementation of prenatal groupcare and implementation of external cephalic version (with the AMC). Furthermore, from 1999 until 2006 she worked at Midwifery Academy Amsterdam as a lecturer in research methods and as coordinator of the scientific practical course for students. Combining her job at TNO and Midwifery Academy Amsterdam she started three research projects in 2004 to ensure that students could participate in midwifery research. The results of these research projects are presented in this thesis.

She is member of the supervisory board of the STBN (Association Home Birth in the Netherlands), advisor of the parentgroup " het Ouderschap", board member of the scientific group GBS, member of ESMEE (international research group into European Survey of Maternity Expectations and Experiences) , the Dutch coordinator for the European Cost Action "childbirth cultures, concerns, and consequences: creating a dynamic EU framework for optimal maternity care", board member of "Het Gewilde Oude Westen" an association that produces local televison in Amsterdam West, and co-founder of the Leonardo da Vinci choir.

Marlies lives in Amsterdam with her partner Betty de Vries and their three children Miro, Djuna and Tom.

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