Interventions in midwife led care in the Netherlands to achieve optimal birth outcomes: effects and women’s experiences
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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 meconium 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.
A trend analysis in referrals during pregnancy

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

**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 first 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*

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

* 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*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No referral +++</td>
<td></td>
<td></td>
<td>63.1</td>
<td>60.4</td>
<td>54.2</td>
<td>50.4</td>
<td>48.6</td>
</tr>
<tr>
<td>1</td>
<td>Foetal distress +++</td>
<td>labour</td>
<td>4.3</td>
<td>5.4</td>
<td>6.4</td>
<td>7.3</td>
<td>7.3</td>
</tr>
<tr>
<td>Including: meconium-stained fluid; fetal heart rate irregularities (FHR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Failure to progress first stage +++</td>
<td>labour</td>
<td>3.2</td>
<td>4.0</td>
<td>4.8</td>
<td>5.3</td>
<td>6.0</td>
</tr>
<tr>
<td>Including: slow progress first stage; need for sedatives; need for pain relief</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Medical history +++</td>
<td>pregn</td>
<td>1.8</td>
<td>1.7</td>
<td>3.1</td>
<td>4.2</td>
<td>5.4</td>
</tr>
<tr>
<td>Including: general medical history; obstetrical history (incl. C section in history); social risk factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Pregnancy indications - not otherwise specified ++</td>
<td>pregn</td>
<td>1.3</td>
<td>1.3</td>
<td>1.1</td>
<td>1.5</td>
<td>5.0</td>
</tr>
<tr>
<td>5</td>
<td>Post-term pregnancy +++</td>
<td>pregn</td>
<td>2.3</td>
<td>2.9</td>
<td>3.6</td>
<td>4.3</td>
<td>3.8</td>
</tr>
<tr>
<td>6</td>
<td>Hypertensive disorder +++</td>
<td>pregn</td>
<td>2.8</td>
<td>2.9</td>
<td>4.1</td>
<td>4.1</td>
<td>3.6</td>
</tr>
<tr>
<td>Including: pregnancy induced hypertension; pre-eclampsia; HELLP-syndrome. proteinuria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Failure to progress second stage</td>
<td>labour</td>
<td>3.9</td>
<td>3.9</td>
<td>4.0</td>
<td>4.0</td>
<td>3.3</td>
</tr>
<tr>
<td>8</td>
<td>Abnormal presentation</td>
<td>pregn</td>
<td>3.5</td>
<td>3.7</td>
<td>4.1</td>
<td>3.9</td>
<td>3.0</td>
</tr>
<tr>
<td>Including: non-engaged head at term; breech presentation, transverse presentation</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>9</td>
<td>PROM at term (&gt; 24 hours)</td>
<td>labour</td>
<td>3.2</td>
<td>3.3</td>
<td>3.0</td>
<td>3.3</td>
<td>2.9</td>
</tr>
</tbody>
</table>
| 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 placenta; fetal death; placenta previa; (suspection of) fetal anomalies* | pregn | 2.6 | 2.1 | 2.8 | 2.7 | 2.3 |
| 12 | Post partum indications  
*Including: HPP > 1000 cc; retentio placenta; 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*

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

* LVR1 1988–2004
** Main indications:
- No referral
- Failure to progress first stage
- Medical history
- Pregnancy indications
- Hypertensive disorder
- Fetal distress
- Post term pregnancy
- Pregnancy indications with small numbers
- Failure to progress first stage
- Post partum indications
- Abnormal presentation
- PROM at term (> 24 hours)
- Preterm birth
*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

| Labour indications - not otherwise specified | 0.7 | 1.0 | 2.6 | 10 |
| Post partum indications | 2.7 | 2.5 | 2.2 | 11 |
| Pregnancy indications with small numbers | 2.6 | 2.5 | 2.1 | 12 |
| (Suspected) intrauterine growth retardation | 2.2 | 2.2 | 1.7 | 13 |
| Medical history | 1.2 | 1.2 | 1.7 | 14 |
| Multiple pregnancy | 0.6 | 0.7 | 0.6 | 15 |

| Hypertensive disorder | 1.1 | 1.6 | 1.7 |
| (threatening) Preterm birth | 2.1 | 1.9 | 1.6 |
| Labour indications - not otherwise specified | 0.6 | 0.7 | 1.6 |
| (Suspected) intrauterine growth retardation | 0.9 | 1.2 | 1.1 |
| Failure to progress second stage | 0.9 | 1.0 | 0.8 |
| Multiple pregnancy | 0.8 | 0.0 | 0.7 |
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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