

Birth centre care in the Netherlands: added value?!

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ISBN 978 94 6299 982 4

Printing and layout: Ridderprint BV, www.ridderprint.nl

Financial support by the Royal Dutch Organisation of Midwives (KNOV) for the publication of this thesis is gratefully acknowledged.

Birth centre care in the Netherlands: added value?!

Proefschrift

ter verkrijging van

de graad van Doctor aan de Universiteit Leiden,
op gezag van Rector Magnificus prof. mr. C.J.J.M. Stolker
volgens besluit van het College voor Promoties
te verdedigen op woensdag 26 september 2018
klokke 12.30 uur

door

Maria Antonetta Adriana Klapwijk-Hermus

geboren te Oosterhout (N.Br.)
op 13 maart 1977

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Voor ons Mam

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Chapter

01

General Introduction

Background

Abroad the Netherlands is known for its high percentages of women who give birth at home. Over the last couple of years this trend is changing: the number of people who plan to give birth at home has been decreasing rapidly: In 2015, 15.7 % of all births in the Netherlands took place at home compared to 30.3 % in 2000 [1]. Several different reasons can be thought of to explain this. It may be the result of changing attitudes of Dutch women but also the media attention given to the outcome of the Peristat report in 2008 contributed to this change [2,3]. Also, more and more low risk women are opting for a hospital birth, because they do not feel safe at home, or are asking for referral to receive medication for pain relief that cannot be given in primary care [4]. This all led to an increase of number of women who needed an accommodation near or in a hospital to give birth. In the last decade an unknown number of birth centres have been instituted in the Netherlands. Internationally birth centres are regarded as settings where women with uncomplicated pregnancies can give birth, assisted by a midwife. In case of a complication or when there is a need for pain relief, the women will be referred to secondary care [5–9]. In the Netherlands a clear definition of 'birth centre is lacking'. Studies on birth centre care in other countries showed that low risk women who planned to give birth in a birth centre experienced significantly fewer interventions (including intra partum caesarean sections, use of obstetric analgesia and augmentation of labour) compared to women who planned to give birth in a conventional labour setting [6,7,11–13]. The Birthplace study in England showed that adverse perinatal outcomes were not significantly different for low risk nulliparous women who planned birth in freestanding midwifery units and alongside midwifery units compared with planned birth in an obstetric unit. For multiparous women, birth in freestanding and alongside midwifery units significantly and substantially reduced the odds of experiencing an unplanned caesarean section, instrumental birth or episiotomy. No significant differences in adverse perinatal outcomes were found between planned home births or midwifery unit births and planned births in obstetric units for multiparous women [6]. Earlier research on the effect of planned place of birth in the Netherlands focused on the evaluation of planned birth in a conventional labour setting in a hospital and planned home birth [13–15]. No research on the effect of planned birth centre births has been undertaken on a national level before. In 2009 a steering committee instituted by the Dutch ministry of Health published a report called 'A good start' (in Dutch: 'Een goed begin') [16]. This report pointed out that birth centres might play a role in improving perinatal outcome but only if the added value could be demonstrated.

Research objectives

The Dutch Birth Centre Study is designed to evaluate the performance of birth centres and their possible added value to the quality of the Dutch maternity care. The study was funded by ZonMw (the Netherlands Organization for Health Research and Development) in the context of the research program Pregnancy and Childbirth. This program contributes to the reduction of preventable perinatal mortality and morbidity through applied research conducted within regional consortia and through national research. Evaluation of birth centres was a national theme within this program, prioritized by the Minister of Health. This national study presents evidence-based recommendations for organization and functioning of future birth centres. The study was performed by a unique collaboration of research institutes and universities: Jan van Es Institute, NIVEL, TNO, University Medical Centre Utrecht, Erasmus University Medical Centre, Leiden University Medical Centre, and Tilburg University. The research in this thesis is mostly based on data derived from the Dutch Birth Centre Study.

The aim of this thesis was to study the effect of a planned place of birth in a birth centre on perinatal outcomes, costs and experiences of clients and caregivers. Therefore, first all Dutch birth centres needed to be identified and a combined perinatal outcome measurement tool needed to be adapted to the Dutch situation.

Research Questions

The following research questions are addressed in this thesis:

- 1) What is the definition of birth centres in the Netherlands and how can these birth centres, as identified based on this definition, be characterised?
- 2) What is the effect of planned place of birth in a birth centre on
 - a. the Optimality Index-NL 2015, an outcome index that focuses on optimal instead of adverse outcomes?
 - b. Costs in relation to outcomes (the Optimality Index-NL 2015)?
 - c. Transfer during birth and the chances on referral?
 - d. Experiences of women?
- 3) Does working with a birth centre influence the job satisfaction of maternity care providers?

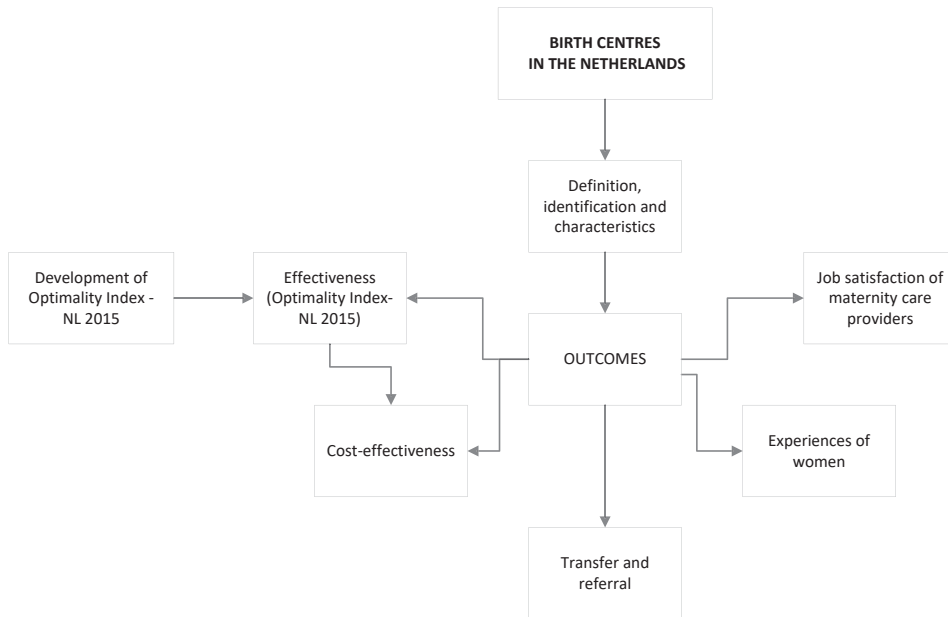


Figure 1 • Overview thesis

Outline of Thesis

Chapter 2 includes the study design of the Dutch Birth Centre Study, on which most of the studies in this thesis are based. The Dutch Birth Centre Study consists of five sub studies who are linked to one another. This thesis is one of the three theses based on data from this research.

Chapter 3 describes the formulation of a definition for Dutch birth centres and the identification of birth centres in the Netherlands. The characteristics of all Dutch birth centres (dd September 2013) were described. (Q1)

Chapter 4 describes the redevelopment of an outcome measurement tool for women with low risk pregnancies who start labour under care of a community midwife. This tool, the Optimality Index NL-2015, focuses on optimality instead of the presence of perinatal complications or adverse events.

In **Chapter 5** the effects of different planned place of birth on the Optimality Index NL-2015 are presented. (Q2a)

Chapter 6 compares the costs in relation to the Optimality Index NL-2015 of different planned places of birth in a birth centre, in a hospital or at home. (Q2b)

Chapter 7 describes the process of transfer of nulliparous women who plan to give birth in a birth centre during and after childbirth. Also the effect of a vaginal examination at home prior to the voluntary transfer from home to the birth centre is discussed. (Q2c)

In **Chapter 8** the experiences of women who planned birth in a birth centre are compared to women who planned birth at home or at the hospital. The women who actually arrived at the birth centre were also asked about their experiences with the birth centre and its facilities and services. (Q2d)

Chapter 9 describes the job satisfaction for different maternity care providers working in or with a birth centre or in a different setting. (Q3)

Chapter 10 represents an overview of the main findings of this thesis and a reflection on its findings. It also describes the implications for practice and research.

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The Dutch Birth Centre Study:
study design of a programmatic
evaluation of the effect of birth
centre care in the Netherlands

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Abstract

Background Birth centres are regarded as settings where women with uncomplicated pregnancies can give birth, assisted by a midwife and a maternity care assistant. In case of (threatening) complications referral to a maternity unit of a hospital is necessary. In the last decade up to 20 different birth centres have been instituted in the Netherlands. This increase in birth centres is attributed to various reasons such as a safe and easy accessible place of birth, organizational efficiency in integration of care and direct access to obstetric hospital care if needed, and better use of maternity care assistance. Birth centres are assumed to offer increased integration and quality of care and thus to contribute to better perinatal and maternal outcomes. So far there is no evidence for this assumption as no previous studies of birth centres have been carried out in the Netherlands.

Design The aims are 1) Identification of birth centres and measuring integration of organization and care; 2) Measuring the quality of birth centre care; 3) Effects of introducing a birth centre on regional quality and provision of care; 4) Cost-effectiveness analysis; 5) In depth longitudinal analysis of the organization and processes in birth centres. Different qualitative and quantitative methods will be used in the different sub studies. The design is a multi-centre, multi-method study, including surveys, interviews, observations, and analysis of registration data and documents.

Discussion The results of this study will enable users of maternity care, professionals, policy makers and health care financiers to make an informed choice about the kind of birth location that is appropriate for their needs and wishes.

Background

The Dutch maternity care system is based on the notion that pregnancy, birth and the puerperium are primarily physiological processes. Most pregnant women are initially considered as 'low risk' and in 2012 85 % of them initially received antenatal care from an independently operating community midwife. The remaining 15 % of pregnant women received antenatal care from a secondary or tertiary obstetrician from the beginning of pregnancy onwards mostly due to a history of medical or obstetrical problems (1). If risk factors arise during pregnancy, during labour or in the postpartum period, a woman is referred to secondary care. Secondary care is provided under the responsibility of an obstetrician and clinical midwives or trainee obstetricians can be involved. This risk selection and role division between the professions is based on the List of Obstetric Indications, a document that designates the appropriate level of care for more than a hundred obstetrical conditions (2). Interventions such as augmentation of labour, pharmacological pain relief, continuous foetal monitoring or instrumental birth only take place in secondary or tertiary care. One important aim of the Dutch model is to ensure safe midwifery-led care under the responsibility of an independent community midwife for women with low risk pregnancies, regardless whether they prefer to give birth at home, in a birth centre or in a hospital. The percentage of home births in the Netherlands is high compared to other developed countries but is decreasing rapidly. In 2012, 15.7 % of all births in the Netherlands took place at home compared to 30.3 % in 2000 (1) This may be due to a changing trend in women's choices for the planned place of birth, shifting from home to hospital, as well as to a considerable rise in non-urgent referrals to obstetrician-led care for pain relief (3,4).

These trends led to a substantial increase of births in obstetric hospital units. To accommodate the growing number of low-risk women who do not want to deliver at home several birth centres were established in the Netherlands with a large variation in their philosophies, characteristics and service delivery (5-7). Studies on birth centre care in other countries than the Netherlands show that low risk women who planned birth in a birth centre experience significantly fewer interventions compared to women who planned birth in a conventional labour setting, including fewer intra partum caesarean sections, and less frequent use of obstetric analgesia and augmentation of labour (8-12) The Birth Place study in England showed that adverse perinatal outcomes were not significantly different for low risk nulliparous women who planned birth in freestanding midwifery units and alongside midwifery units compared with planned birth in an obstetric unit. For multiparous women, birth in freestanding and alongside midwifery units significantly and substantially reduced the odds of experiencing an unplanned caesarean section, instrumental birth or episiotomy (8).

The effect of the introduction of a relatively large number of birth centres on the quality and the effectiveness of the Dutch maternity care system have not been studied up to now. The objectives of the Dutch Birth Centre Study can be summarized as follows:

1. To determine process, structure and outcome quality indicators enabling the assessment of the quality of birth and postpartum care in a birth centre, in collaboration with the various care providers and clients involved;
2. To develop a typology of birth centres based on the level of integration of organization and care, also making use of the quality indicators mentioned;
3. To assess the effect of birth centre care in relation to the different types of birth centres in terms of optimality and adverse outcomes;
4. To study the impact of the introduction of birth centre care on the local adjacent birth and postpartum care system by comparing process indicators and perinatal and maternal outcomes before and after the introduction of a birth centre;
5. To study the cost effectiveness of birth centre care compared with usual care (home birth and birth under community midwifery led care in a hospital);
6. To assess experiences of both clients and care givers (working either within or in collaboration with a birth centre);
7. To perform a longitudinal multiple case study investigating the organizational processes in a limited number of selected birth centres from an operational, medical, behavioural and administrative perspective;
8. To translate results of this study into recommendations for future birth and postpartum care in the Netherlands;

In this paper we introduce the Dutch Birth Centre Study and its design.

Methods/design

Study design

The Dutch Birth Centre Study consists of five sub studies which are linked to one another:

1. Inventory of birth centres, development of quality indicators, definition of Birth Centre, measuring integration of organization and care
2. Measuring the quality of birth centre care
3. Effects of introducing a birth centre on regional quality and provision of care
4. Cost-effectiveness analysis
5. In depth longitudinal analysis of the organization and processes in birth centres

Different qualitative and quantitative methods will be used in the sub studies. Data collection includes observations, interviews (individual and group interviews), questionnaires (clients, caregivers, managers of birth centres), standard registered data

and additional registrations. Data collected in one sub study will be shared with other sub studies as much as possible to make sure that the birth centres and other professionals involved in birth and postpartum care are minimally burdened by participating in the various evaluations. This study will be conducted in the period 2013–2015.

Instruments

Dutch Birth Centre questionnaire

To characterize all Dutch birth centres the Dutch Birth Centre questionnaire will be developed based on the questionnaire of Laws et al. to characterize Australian birth centres (13). This questionnaire includes questions about background, organisation and service of the birth setting: location, size, personnel, equipment, vision, management, judicial status, financial status, use of protocols, inter-professional cooperation and level of integration on six different domains (see below: measuring integration of organisation and care). It shall be adjusted to the Dutch situation with questions about transfer in case of referral, reasons for an obstetrician to come to the birth centre in case of urgent referral, facilities, postpartum stay, responsibility of care and potential quality indicators. Because quality indicators for birth centre care in the Netherlands are not available, they will be developed.

Repro-Q

Client-experiences will be assessed by using the postnatal part of the Repro-Q (14). The Repro-Q consists of the following components: 1) characteristics of the process of care; 2) questions about the 8 domains of the concept of responsiveness of the World Health Organisation (WHO); 3) additional questions including experienced outcomes; 4) the valuation of the relative importance of the various domains; 5) the respondent's socio-demographic characteristics (15).

Case report form

Individual baseline and outcome data are collected from the Netherlands Perinatal Registry (<http://www.perinatreg.nl>). The Netherlands Perinatal Registry (PRN-foundation) is a joint effort of the four professional organisations that provide perinatal care in the Netherlands: KNOV (Royal Organisation of Midwives in the Netherlands), LHV (National Organisation of General Practitioners), NVOG (Dutch Association of Obstetrics & Gynaecology) and NvK (Paediatric Association of the Netherlands). All professional organisations have their own voluntary based medical registry. Those registries are linked to one combined PRN-registry. The participation rate of obstetric caregivers (gynaecologists and midwives) is almost 100 %. All Dutch paediatricians working in a hospital with a neonatal intensive care unit (NICU) participate, as well as 60 % of the

paediatricians working in hospitals without NICU (1).

To collect all additional process indicators and volumes for the different parts of the study a case record form shall be developed that includes (if applicable) date, time of day and dilatation at first and last visit at home before the actual birth and referral. We will also collect the time of start of continuous support by midwife and birth attendant, transport and arrival at birth centre or hospital, time of first action by secondary caregiver, time of arrival in birth centre postpartum and of the return home postpartum and number of hours of maternity care assistance at home. Furthermore data are collected about place of referral, type of transport in case of referral, discipline of the birth attendant and if the situation occurred that the preferred hospital or birth centre was fully booked.

Outcome measures

Serious adverse outcomes are expected to be very low as the study population consists of women with an uncomplicated pregnancy who will start labour under midwifery-led care. Therefore the two main outcome measures will be composite measures: the Optimality Index (OI) and a composite measure of adverse neonatal and maternal outcomes (16).

The Optimality Index is a composite score combining background and outcome data based on a simple scoring system: optimal or not optimal. The optimal score is maximal perinatal outcome with minimal intervention placed against the woman's health status. The OI is very suitable to compare groups with comparable risk profile or to correct group comparisons for differences in risk profile (17,18) [17, 18]. Background data include age, parity, obstetric history, postal codes to characterize neighbourhood effects and social economic status, origin (Dutch or non-Dutch), together indicating the risk profile (19). Elements included in the outcome part of the Optimality Index are for example: colour of amniotic fluid, induction/augmentation of labour, episiotomy, instrumental (vaginal) birth, Caesarean section, placental retention (>30 min) and Apgar score at 5 min.

The composite adverse outcome score will include maternal and neonatal outcome indicators. Adverse maternal outcome indicators are maternal death (within 42 days of giving birth), third or fourth degree of perineal trauma, placental retention, postpartum haemorrhage (>1000 ml), and admission to an intensive care unit or obstetric high care unit. Adverse neonatal outcome indicators are stillbirth after presentation in labour, early neonatal death (<7 days), Apgar score <7 after 5 min, neonatal encephalopathy, meconium aspiration, admission to neonatal unit within 48 h of birth and birth weight below 5th percentile.

Description of sub studies

Sub study 1: Identification of birth centres, development of quality indicators, definition of Birth Centre, measuring integration of organization and care.

The aim is to study the way birth centres are organised, what services are provided, who is responsible, and to measure the level of integration of care of birth centres.

Identification of birth centres

Birth centres in their current presentation are relatively new in the Netherlands. Therefore no clear definition and no list of birth locations that can be considered a birth centre is currently available. To examine the large variety of possible birth centres criteria for inclusion are selected: birth settings where out-of-home community midwifery led care is provided in a home-like environment to women at low risk of medical complications at the onset of labour. Every birth location that can be included will be invited to participate in this part of the study. Based on the characteristics birth centres are examined by three independent researchers and a selection of all potential Dutch birth centres is made.

- Inclusion criteria participants: all locations in the Netherlands that could be considered a birth centre
- Method: systematic inquiries
- Expected outcome: identification of all potential Dutch birth centres (reference date August 2013)

Developing a comprehensive set of structure and process quality indicators for birth centre care

A comprehensive set of structure and process quality indicators will be developed to evaluate birth centre care using a multi-staged approach. The development process consists of three phases: 1) identification of existing structure and process quality indicators in birth care (literature study); 2) translating indicators for maternity care in general into determinants for measuring structure and process quality of birth centre care; 3) determinant selection of relevant structure and process quality indicators (two-step web-based Delphi consultation) (20). The web-based, anonymous nature of the Delphi technique ensures that a single individual cannot dominate the consensus formation. Professionals from different disciplines who are working with or in a birth centre-like setting with several years of experience, representatives of health insurance companies, policy makers and advisors will be invited to participate in the Delphi consultation. The experts are instructed to rate the determinants both on relevance to a birth centre setting and on feasibility of use and, if necessary, to comment on them or

add new topics. Each determinant will be rated by each expert on a sevenpoint Likert scale (1 = not at all relevant/feasible; 4 = neutral; 7 = very much relevant/feasible). Agreement among experts is defined as 80 % or more of the ratings within a range of three (i.e. 5-6-7 of 4-5-6). In the first round determinants with a median score of ≥ 6 with agreement on both ratings are considered to be relevant and feasible to collect and are accepted instantly. Determinants scored with a median score of ≤ 3 are rejected. Median scores of >3 and <6 with agreement or ≥ 6 without agreement are scored again in the second Delphi round. In the second round, the experts are informed about the median scores of relevance and feasibility of the total expert group, their own scores and the comments of the respondents regarding determinants for which no consensus is reached in the first round. They are instructed to reconsider their own rating of the determinants presented in the first round as well as to rate and comment possible new elements the same way as in the first round.

This procedure will result in a list of potential structure and process quality indicators for birth centres in the Netherlands. In order to test whether these quality indicators actually can measure the quality of birth centres, they will be validated within the presumed selection of birth centres.

- Inclusion criteria participants: professionals working with or in a birth centre, representatives of health insurance companies, policymakers and advisors
- Method: two-step web-based Delphi consultation Instrument: web-based questionnaire
- Expected outcome: a list of potential structure and process quality indicators for birth centres in the Netherlands

Definition of a birth centre in the Netherlands

The Dutch Birth Centre questionnaire will be sent to a (management) representative of each birth location as identified in the first step of the study. A definition for different types of birth centres in the Netherlands will be developed based on internationally used definitions and the information obtained through our questionnaire. The characteristics of all Dutch birth centres will be described.

- Inclusion criteria participants: management representatives in all birth locations identified previously
- Method: survey
- Instrument: Dutch Birth Centre questionnaire (adjusted Laws questionnaire)
- Expected outcome: preliminary classification/ typology of birth locations into birth centres and other birth settings

Measuring integration of organization and care

To construct a typology of birth centres we will use the concept of integrated care. This concept was developed first for the increasing number of people with a chronic disease. Different (health-related) disciplines are involved in the continuous care for persons with a chronic disease. For instance, care for a person with diabetes mellitus type II may involve a general practitioner, a dietician, and a physiotherapist, but also an endocrinologist. The essence of integrated care is a continuum of care for service users which crosses the boundaries of primary, secondary, tertiary and public health care (20-22) The definition of the WHO illustrates the extensive conceptualization of integrated care: "a concept bringing together inputs, delivery, management and organization of services related to diagnosis, treatment, care, rehabilitation and health promotion. Integration is a means to improve the services in relation to access, quality, user satisfaction and efficiency" (23) Domains of integration are 1) clinical, 2) professional, 3) organisational, 4) systemic, 5) functional, and 6) normative integration [24]. Based on the scores on the different domains an overall score of integration will be calculated to define the level of integration for each birth centre as low, medium or high.

- Inclusion criteria participants: all birth locations identified preliminary as birth centre
- Method: survey and interview
- Instruments: Dutch Birth Centre questionnaire, interview topic list, conceptual framework on integrated care
- Expected outcome: level of integration for each birth centre

Sub study 2: Measuring the quality of birth centre care

The aim is to study the process and outcomes of birth centre care, compared to birth at home and birth in a hospital, for pregnant women under the responsibility of the independently operating community midwife at the start of labour. Client experiences and provider satisfaction are included in the outcome measures. At the end of the total study all different outcomes will be linked with each other.

Measuring process and outcomes of birth centre care

Midwifery practices in the area of all birth locations in this study will record the data for each birth under their care during 3 months: data routinely recorded in the Netherlands Perinatal Registry and additional process indicators not available from the Netherlands Perinatal Registry.

- Inclusion criteria participants: all low risk women starting labour while in care with a participating community midwife for a period of three months
- Method: standard and additional health care registration

- Instruments: Optimality Index and a composite measure of adverse neonatal and maternal outcome
- Expected outcome: quality of care in birth centre versus home or hospital birth for low risk women.

Client experiences

To assess client experiences the postnatal part of the Repro-Q will be used. Especially for this study, questions about facilities and transfer are added for women who received care in a birth centre. The same midwifery practices as in sub study 2.1 will be asked to distribute information of this part of the study and an acceptance paper form to each woman that receives care in their postpartum period regardless who gave natal care to them. These women will be approached 6 to 8 weeks after they give birth by the way they preferred to answer the questions on client experiences i.e. by email, by post or by telephone. A reminder will be sent after 4 weeks.

- Inclusion criteria participants: all women in their postpartum period under care of participating community midwives for a period of 3 months
- Method: Survey
- Instrument: Repro-Q with added questions
- Expected outcome: women's experiences with perinatal care

Care providers experiences

To assess the experiences of professionals working within and with a birth centre a questionnaire will be developed based on earlier questionnaires used in workforce planning (25,26) The development will be a joint effort with other Dutch researchers to create a multipurpose questionnaire. The questionnaire will contain questions about personal background, current job situation, cooperation with other care providers, current job evaluation and future job situation and will be sent to all care givers working in or with a birth centre like community midwives, clinical midwives, obstetricians, paediatricians and maternity care assistants.

- Inclusion criteria participants: all care providers working in and with birth centres in the Netherlands
- Method: Survey
- Instruments: Care provider questionnaire
- Expected outcome: providers' experiences and satisfaction

Sub study 3: Effects of introducing a birth centre on regional quality and provision of care

The aim of the evaluation is to gain insight into the effect of the introduction of a birth centre in a region on planned place of birth and the outcomes of the provided birth and postpartum care.

Process and outcome

In May 2011 a baseline assessment was performed in areas where a birth centre was intended to start before June 2013. Ten regions collected data for more than 3 months. Midwifery practices in the area of an intended birth centre recorded the following data for each birth under their care: data routinely recorded in the Netherlands Perinatal Registry and additional process indicators not available from the Netherlands Perinatal Registry (see sub study 2). The follow-up measurement has been conducted in the second half of 2013. Data collection has resulted in around 3000 births for the pre-test period and will result in 3000 births for the post-test period. These numbers are sufficient to describe changes in the region between the period before the birth centre started and afterwards. Logistic regression analysis will be performed to study the difference in planned place of birth between the period before and after the start of the birth centre. Linear regression analysis will be performed to test the mean differences in the Optimality Index between the period before and after the birth centre started. All analyses will be adjusted for potential confounders such as maternal age, parity and gestational age.

- Inclusion criteria participants: all low risk women starting labour while in care with a participating community midwife for a period of at least 3 months before the start of the birth centre and a minimum of 3 months afterwards
- Method: standard and additional health care registration
- Instruments: case record form, Optimality Index and a composite measure of adverse neonatal and maternal outcome
- Expected outcome: effect of the start of a birth centre on regional quality of care for low risk women

Sub study 4: Cost-effectiveness analysis

The costs and effects of women with planned place of birth at a birth centre will be compared to women with a planned place of birth home and hospital under midwifery led care.

Effects

The outcome measure for the effect study will be the Optimality Index. At least three midwifery practices in the area of each birth centre in this study will record data for each birth that started under their care during 3 months: data routinely recorded in the Netherlands Perinatal Registry and additional process indicators not available from the Netherlands Perinatal Registry (see sub study 2). A sample size of nine birth centres per level of integration (low, medium, high, see sub study 1.4) with 66 women per centre achieves 80 % power to detect an effect size of 0.2 (ICC = 0.005, alpha = 0.05).

- Inclusion criteria participants: all low risk women starting labour while in care with a participating community midwife and living and having a birth centre as an option for planned place of birth for a period of at least 3 months
- Method: standard and additional health care registration
- Instruments: case record form, Optimality Index and a composite measure of adverse neonatal and maternal outcome
- Expected outcome: effect of planned place of birth (home, conventional labour setting or birth centre) on regional quality of care for low risk women

Costs

For the births included in the effectiveness part the costs will be assessed. Costs of birth in this study include the health care costs from the start of labour until 7 days after birth. These costs consist of a) medical interventions during birth such as: referral, augmentation, pharmaceutical and non-pharmaceutical pain relief, continuous foetal monitoring, intra partum antibiotics prophylaxis, continuous support of labour, birth by caesarean section, instrumental vaginal birth, manual placenta removal and blood transfusion, b) use of hospital facilities such as: hospital admission and length of stay, and c) staffing such as: attending midwife or obstetrician or both, maternity care assistance during childbirth and in the days thereafter.

Volume of health care resource use will be registered prospectively on the case record form used by the attending midwife. Costs of birth and postpartum care are estimated by a detailed cost price analysis. Other resource use (e.g. hospital days) will be translated into costs using standard prices (25).

Total costs per woman according to planned place of birth will be calculated. Mean differences between the groups and their 95 % confidence intervals will be estimated using non parametric bootstrapping due to the skewed nature of cost data.

- Inclusion criteria participants: all low risk women starting labour while in care with a participating community midwife and living and having a birth centre as an option for planned place of birth for a period of at least 3 months
- Method: measurement of quantities and assignment of unit costs by detailed

- cost price analysis and use of standard prices
- Instruments: case record forms
- Expected outcome: effect of planned place of birth on costs

Economic evaluation

The aim of the economic evaluation is to study the cost-effectiveness of the care provided by different types of birth centres compared to home birth and hospital birth under midwifery led care. The economic evaluation will be performed from a health care perspective. The time horizon of the economic evaluation is from the start of labour until 7 days after birth. Due to this short time frame no discounting will take place.

Costs and effects (as measured by the Optimality Index) will be transformed in a net-monetary benefit (NMB) estimate. Using the net benefit regression approach cost-effectiveness acceptability curves will be generated which show the probability of being cost-effective for the different planned places of birth: at home, the different types of birth centres and hospital birth for all acceptable levels of the willingness to pay (27).

- Inclusion criteria participants: all women starting labour while in care with a participating community midwife during a period of 3 months
- Method: incremental net benefit method
- Instruments: case record form and Optimality Index Expected outcome: cost-effectiveness of birth centre care compared to home or hospital birth for low risk women

Sub study 5: In depth longitudinal analysis of the organization and processes in birth centres

The aim of this study is to assess to what extent different degrees of organizational integration (on the continuum from partial to fully integrated obstetric care) lead to differences in performance.

Design and longitudinal in depth analysis

This longitudinal qualitative research focuses on arriving at a deeper level of understanding of the process of care and cooperation and its development over time. The research design for this study is that of a process study using the grounded theory methodology (28). Seven birth centres will be selected after an initial first exploratory round of visits by theory-driven case selection (29).

Data will be collected through investigating from a so-called engaged scholarship/ quasi-ethnographic perspective, in which from a variety of data sources over a substantial period of time conclusions will be drawn. This means that observations will take place in each of the birth centres for a number of days at a time, during daytime

and during night-time, to observe ongoing activities and to interview care providers as well as clients.

Data will be analysed using the constant comparative method. The purpose is to attain new insights by breaking through standard ways of thinking about phenomena reflected in the data (28). In this way concepts emerge as theory is formed. Analysis will start as soon as the first data are collected and continue with each additional data collection. The first step in the analysis will be coding the transcripts of the observations and interviews. The analysis and findings will be based on a triangulation of different types of data (30). First, the researcher will make comprehensive detailed field notes of the observations and informal conversations. Second, surveys will be used. Third, qualitative dimensions such as distances between birth centre and obstetrical ward and time needed for transfer in case of referral will be measured. Fourth, a member-check will be conducted to verify the collected information. Fifth, the researcher will keep a diary in which she reports her own behaviour and feelings, as distinct from her observations in the field notes. Sixth, peer-reviewing will be conducted by evaluation of the work by one or more colleagues.

- Inclusion criteria participants: birth centres selected by theory-drive selection
- Method: observations and interviews
- Instruments: fly-on-the-wall observations, topic list for interviews, member checks and peer reviews
- Expected outcome: improved understanding how different aspects of organizational design, care processes and collaboration (a) interrelate and (b) how they affect (non-medical) outcomes

Overall analysis

The insights of all sub studies will be put together, whereby the various elements of the research will be integrated. The national quantitative results will be combined with the insights from the interviews, the cost effectiveness results, client and professional experiences and the information and mirror sessions of the in-depth study, to provide insight in the quality of birth centre care in the Netherlands. The regional quantitative results will provide insight into the development over time in a changing health care setting. Based on the confrontation of the various kinds of information more insight can be gained about birth centre care in general and about the strengths and weaknesses of different ways to organise birth centres in particular.

This form of triangulation of information that results from various scientific paradigms is an exciting process that will be carried out by the principal investigators of the participating organizations. It will lead to recommendations for further development of birth centres in the Netherlands.

Considerations

This study will be carried out by an unique collaboration of several organizations, each with their own proven expertise in the field of the organization of health care and perinatal care in particular. Prior to as well as during the study period all organizations will be involved in both the planning and execution of all related sub studies. A broad advisory committee will be formed by representatives of all different kind of maternity care providers, research consortia, professional organizations, health insurance companies, national health department and clients to discuss the process and preliminary outcomes of this study. Design and planning of the study were presented to the Medical Ethics Committee of the UMCU (University Medical Centre Utrecht). They confirmed that this study agrees with Dutch legal regulations for the methods used for this study and because of that official ethical approval of this study is not required (31).

Discussion

The Dutch Birth Centre study will evaluate the effect of birth centre care in the Netherlands from different angles and combining different research methods. In this way the Dutch Birth Centre Study will provide information on the functioning of different birth centres as well as their contribution to the quality of birth and postpartum care and the effect of the level of integration on the organisation of birth centre care; it also will evaluate the quality of birth centre care in terms of process and health outcomes, compared to birth at home or on a maternity ward in a hospital. Client and provider experiences are included in the outcome measures. An economic evaluation will assess cost-effectiveness of birth centre care compared to care as usual (i.e. home birth and hospital birth). In-depth analysis will provide information on how different degrees of organizational integration on the continuum from partial to fully integrated birth care will lead to differences in performance.

In 2009 a steering committee instituted by the Dutch ministry of Health published a report called 'A good start' (in Dutch: 'Een goed begin') (32). This offered Dutch maternity care givers tools to help to improve their performance and because of that perhaps lower the relatively high mortality rates in the Netherlands (33) This report also pointed out that birth centres might play a role in improving perinatal outcome but only if the surplus value could be demonstrated. This study aims to evaluate the performance of birth centres and their possible added value to the Dutch maternity care system.

The sudden increase in birth centres as integral part of the maternity care system is a relatively new development in the Netherlands. Until now, it seems that each region is developing its own version, based on local preferences, available space, and (lack of)

mutual trust. Generally applicable standards for birth centre care are not available and there is no evidence of their added value. This study is designed to fill these gaps in our knowledge, to provide minimum standards for birth centre care and to compare their performance to the traditional care provision at home or in a hospital.

The results of this study will enable care providers, policy makers, health care financiers, professionals and users of maternity care to make an educated choice about the kind of birth location that is appropriate for their needs and wishes.

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03

Chapter

Defining and describing birth centres in the Netherlands a component study of the Dutch Birth Centre Study

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Abstract

Background During the last decade, a rapid increase of birth locations for low-risk births, other than conventional obstetric units, has been seen in the Netherlands. Internationally some of such locations are called birth centres. The varying international definitions for birth centres are not directly applicable for use within the Dutch obstetric system. A standard definition for a birth centre in the Netherlands is lacking. This study aimed to develop a definition of birth centres for use in the Netherlands, to identify these centres and to describe their characteristics.

Methods International definitions of birth centres were analysed to find common descriptions. In July 2013 the Dutch Birth Centre Questionnaire was sent to 46 selected Dutch birth locations that might qualify as birth centre. Questions included: location, reason for establishment, women served, philosophies, facilities that support physiological birth, hotel-facilities, management, environment and transfer procedures in case of referral. Birth centres were visited to confirm the findings from the Dutch Birth Centre Questionnaire and to measure distance and time in case of referral to obstetric care.

Results From all 46 birth locations the questionnaires were received. Based on this information a Dutch definition of a birth centre was constructed. This definition reads: 'Birth centres are midwifery-managed locations that offer care to low risk women during labour and birth. They have a homelike environment and provide facilities to support physiological birth. Community midwives take primary professional responsibility for care. In case of referral the obstetric caregiver takes over the professional responsibility of care.' Of the 46 selected birth locations 23 fulfilled this definition. Three types of birth centres were distinguished based on their location in relation to the nearest obstetric unit: freestanding ($n = 3$), alongside ($n = 14$) and on-site ($n = 6$). Transfer in case of referral was necessary for all freestanding and alongside birth centres. Birth centres varied in their reason for establishment and their characteristics.

Conclusions Twenty-three Dutch birth centres were identified and divided into three different types based on location according to the situation in September 2013. Birth centres differed in their reason for establishment, facilities, philosophies, staffing and service delivery.

Background

Throughout the world, birth centres are regarded as homelike settings where women with uncomplicated pregnancies can give birth with a midwife with the assistance of a maternity care assistant (MCA). When complications arise or when medicinal pain relief is requested, referral to a hospital obstetric unit takes place [1–5]. Birth centres differ from hospital obstetric units in management, staffing and the absence of medical obstetrical services as induction of labour, pharmacological pain relief, continuous foetal monitoring and instrumental birth. In general, birth centres focus on a model of care (e.g. the midwifery model) which ensures continuity of caregiver, a family-centred approach and informed client participation in choices related to the management of care [1, 6, 7]. In some countries they have been implemented as a response to counter the medicalization of childbirth by putting into practice the philosophy that in most cases childbirth is a physiological process [1, 8]. There are various nomenclatures for the birth centre concept based on their location in relation to hospital obstetric services: freestanding from a hospital (separate from a hospital, within a non-obstetric hospital, 'stand-alone') or attached to/within a hospital (alongside, co-located, inhospital, integrated within or on the same campus) [1–3, 8–11]. Besides this distinction, differences are seen in their founding philosophies [1, 9]. Dutch women, considered at the start of labour to have low obstetric risk, can choose the place where they want to give birth: at home or out of home. Out of home birth can take place within a hospital setting or in a birth location outside of a hospital. The woman's own community midwife is the responsible caregiver during labour and birth, regardless the location. She works autonomous and independent in a local midwifery practice. To work as a midwife in the Netherlands four years of education at the midwifery academy (Bachelor) have to be completed. After that, you are obliged to register in a nationwide register for health professionals [12]. Dutch midwives have not been trained or educated as nurses. During childbirth the community midwife is assisted by a maternity care assistant (a vocational education of three years). The maternity care assistant is employed by a maternity care assistance organization. A woman is referred to secondary care if risk factors arise during any time from the start of the pregnancy, until the postpartum period or if medicinal pain relief is requested during childbirth. Secondary care is provided under the responsibility of an obstetrician and clinical midwives or trainee obstetricians can be involved. This risk selection and role division between the professions is based on the List of Obstetric Indications, a document that designates the appropriate level of care for more than a hundred obstetrical conditions [13, 14]. During the last decade, a rapid increase in the number of out of home birth locations has been seen in the Netherlands. Several factors may be responsible for this sudden increase: women's choice for home birth has

decreased in recent years, leading to a higher demand for alternative birth locations that could not be provided by hospitals [15]. Besides that, birth centres are assumed to be a birth location that could provide more organizational efficiency by integration of perinatal care with better use of maternity care assistance [16, 17]. Thereby birth centres are seen as a safe alternative place of birth with fast access to an obstetric unit in case of referral [12]. Identification of these 'birth centres' is challenging as the term itself is used loosely: not all locations that call themselves birth centre in the Netherlands are places where women can actually give birth [13–16]. The term is also used for locations that house for example community midwifery practices, maternity care assistance organizations and ultrasound facilities. The varying international definitions for birth centre are not directly applicable for use within the Dutch obstetric system where the place of birth is interrelated with the clear role division between primary and secondary obstetric care. Between 2013 and 2016 the Dutch Birth Centre Study was carried out to evaluate birth centre care provision and its effects on perinatal outcomes, experiences of clients and caregivers and economic outcomes [17]. This evaluation was not possible without a consistent definition of birth centres for the Netherlands and information about their characteristics regarding location, available equipment and services and the model of care provided. This study is part of the Dutch Birth Centre Study and aimed to develop a standard definition of birth centre for use in the Netherlands in order to identify all Dutch birth centres and to describe their characteristics.

Methods

The methods used in the development of the birth centre definition were 1) the primary data collection, 2) a literature review and 3) a consensus process.

Data collection tools

Three different data collection tools were used. The first one was a short digital survey to make a basic selection of potential birth centres in the Netherlands. The second one was the Dutch Birth Centre Questionnaire, used to get more information about the characteristics of these presumed birth centres and the third tool was the semistructured interview for the confirmation and elucidation of earlier findings.

Short digital survey for potential birth centres

This tool was developed to obtain information about the place of birth options for low obstetric risk women in the Netherlands. It enquired about the existence of a) a homelike location for birth services for b) low risk women, that c) differed from the conventional

hospital labour and birth setting. It was sent to the chair of every group of obstetricians associated with each of the 98 hospitals with maternity care in the Netherlands and to the chair of the local midwifery peer group in the vicinity of each of those hospitals.

Development of the Dutch Birth Centre Questionnaire (DBCQ)

A measurement tool for use in the Netherlands was developed based on an Australian questionnaire used to study birth centres (Laws, 2009)[1]. Permission was obtained for this survey tool that contains questions regarding issues as staffing, founding philosophies and physical characteristics of birth centres. Additional questions were added relating specifically to birth centre care provision in the Netherlands. These covered issues as initiators, reason for establishment, estimated number of births in 2013, need for transfer in case of urgent referrals and judicial status. The DBCQ consisted of 150 questions and was used to collect data from birthing locations that were presumed to be birth centres. In January 2014 all selected birth centres were asked to provide the number of actual births that took place at the birth centre in 2013.

Semi-structured interviews

Semi-structured interviews were designed to gather information from directing managers of those birth locations that qualified as presumed birth centre. Topics addressed included aspects of management and clinical leadership. During these interviews, information received from the DBCQ was confirmed and additional information was collected regarding time and distance from the birth centre to the hospital obstetric unit. Depending on the local situation, the distance from the birth centre to the obstetric unit was measured by counting steps or by kilometres on a navigation system. Time for transfer by bed or car was measured using a stopwatch during a simulated referral with transfer situation. All interviews were conducted by one researcher (IB).

Development of a definition for birth centre in the Dutch context

In March 2013, international definitions of birth centres were searched in Pubmed and common elements within these definitions were identified. Using literature and data from the DBCQ, the characteristics of these elements were identified for the definition. A concept definition for birth centre was developed and discussed with the Dutch Birth Centre Study research group. Members of this group included 2 professors of obstetrics, 4 senior researchers and 3 PhD-students, two of whom were midwives (one practising). In addition, the Dutch Birth Centre Study Advisory Committee discussed and adjusted the concept definition until consensus was reached [17]. After a final agreement from

the project group, the definition was finalized.

Identification of Birth Centres

Between April 2013 and June 2013, the locations that might qualify as a birth centre were collected in collaboration with The Royal Dutch Organisation of Midwives (KNOV), College of Perinatal Care (CPZ) and STBN (foundation for project management and innovation in natal care). A call was also posted in the popular LinkedIn Group “Dutch birth care in motion” to obtain information about other potential birth centres. The Short Digital Survey was sent to midwives and obstetricians working in the vicinity of the identified potential birth centres. If they responded positively for all three questions, the location was presumed to be a birth centre. This resulted in a list of presumed birth centres for the study. Representatives from each presumed birth centre were contacted by telephone, informed about the study and asked to participate. The local manager of each birth location was the primary person asked to answer the DBCQ. If the local manager was not available, the Chair of the Board or a midwife associated with the birth location was asked to respond on behalf of the birth centre. In July 2013, the DBCQ was sent by email to all presumed birth centres. Non-responders were contacted again in August 2013. All answers to the open-ended questions were analysed by two researchers (MHe and IB) and categorized after consensus was reached. The semi-structured interviews with managers of the presumed birth centres were conducted by one researcher (IB) between January 2014 and April 2015. In May 2015 all birth centres were identified made in line with the Dutch definition of a birth centre and based on the information from September 2013

Analyses

Descriptive data analyses were conducted using the Statistical Package for Social Sciences (SPSS) version 22.0 (SPSS Inc., Chicago, IL, USA).

Results

In total, 93 birth locations were identified as potential birth centres. After completion of the short digital survey, 47 birth locations were excluded because they were not homelike ($n = 35$), did not differ from the conventional labour ward on the obstetric unit ($n = 27$) or were not accessible as a birth location for low risk women who start labour under care of a community midwife ($n = 8$). More reasons for exclusion could be appropriate for one birth location. The remaining 46 locations were considered to be presumed birth centres and received the DBCQ. All questionnaires were returned of

which 44 were fully completed. Two questionnaires were returned incomplete because the questions were not applicable for these two birth locations as being a presumed birth centre.

Definition of a Dutch birth centre

Seven recurring elements were found after review of international birth centre definitions: 1) population to be served, 2) responsible professional for care provided, 3) environment, 4) philosophy, 5) location in relation to the nearest obstetric unit, 6) need for transfer in case of referral and 7) management structure (midwife/obstetrician). Using the information from the DBCQ (Table 1), characteristics were identified and formulated for the seven elements.

Table 1 • Characteristics of included birth locations as presumed birth centres

Topic	Content	Characteristics	Included birth locations n=46 (%) ¹
Philosophy	Commitment to physiological birth and facilities that contribute to the fulfilment of that philosophy	Facilities for discomfort and pain management which are allowed to be used in primary care (bath, shower, massage, nitrous oxide and/or TENS)	46 (100)
		Facilities to encourage spontaneous pushing in non-supine positions (birth chair, birthing ball)	42 (91)
		Assistance for community midwife during labour and birth by a maternity care assistant	42 (93)
		Providing one-to-one support	23 (51)
Environment	Homelike	Alterable lighting / homelike atmosphere	46 (100)
		No 'medical' equipment in sight	26 (57)
Responsibility for care	Community midwife	A Dutch community midwife is an independent medical professional who has full responsibility for providing care for healthy low risk women during pregnancy, childbirth and postpartum. The midwife conducts antenatal assessments, supports women giving birth at a place of their choice (at home, in a birth centre or in a hospital), and provides postnatal care up to six weeks postpartum. If medical assistance is required, the midwife will refer the women to a secondary caregiver (obstetrician or paediatrician). Community midwives in the Netherlands have a greater degree of autonomy in relation to the other medical professions than do midwives in most countries, but only as far as the low-risk population is concerned.	46 (100)
Population	Low risk women	Low risk women are women with a singleton pregnancy of a child in cephalic presentation who start labour spontaneously between 37 and 42 weeks and who do not have any medical or obstetric risk factors that are an indication for secondary care, such as formulated in the so-called List of Obstetric Indications[12]. They can choose where they would like to give birth (at home, in a hospital or in a birth centre).	46 (100)

Table 1 • Continued Characteristics of included birth locations as presumed birth centres

Topic	Content	Characteristics	Included birth locations n=46 (%) ¹
Population	Medium risk women	Medium risk women are low risk women with a 'medium risk' indication. Due to a specific reason they are advised to give birth in hospital but still under community midwife led care. The official medium risk indications according to the so-called List of Obstetric Indications are postpartum haemorrhage or retained placenta after a previous birth.	23 (50)
Management	Midwifery managed	In the organizational structure it is formally established that an independent community midwife is leading in care content and organization.	23 (50)
	Obstetric managed	In the organizational structure the obstetrician is leading in care content and organization.	23 (50)
Physical transfer in case of referral	Always needed	By wheelchair, bed, car or ambulance	10 (22)
	Always with exceptions	By wheelchair or bed but for some urgent reasons an exception is made and the secondary caregiver (obstetrician or paediatrician) will enter the room	13 (28)
	Not needed	The obstetrician enters the room	23 (50)
Location in relation to obstetric unit	Freestanding	Separate from the obstetric unit, in a different building than the hospital with an obstetric unit	3 (7)
	Alongside	Separate from the obstetric unit but in a hospital with an obstetric unit	17 (37)
	On-site	On the same ward as the obstetric unit	26 (57)

¹ due to one missing value some percentages are calculated based on available data

All 46 presumed birth centres could be considered as locations to serve low risk women under the care of a community midwife at the onset of labour in a homelike environment. They all reported commitment to physiological birth and provided methods to deal with discomfort and pain during labour and birth that are considered standard care in Dutch primary care midwifery practice. Management differed between being midwifery managed and obstetrical managed. To stay in line with international definitions the advisory committee of the Dutch Birth Centre study advised to include only locations that were midwifery managed as one of the conditions for the definition of a birth centre. Midwifery managed was defined as: "In the organizational structure it is formally established that an independent community midwife is actively and constructively involved in policy making and organisation of the content of care." Due to the large variations in answers in the questionnaire and the interviews for this question, we created a list of conditions of which at least one had to be applicable to fulfil this item. These conditions were: the independent community midwife should be either 1) the owner of the birth location; 2) the floor manager of the birth location; 3) a member of the board of the birth location; 4) a member of the board of an integrated organization

in which the birth location is a participant or 5) participating in a committee which is responsible for the local care content of the birth location. The following definition of a birth centre was developed (Fig. 1):

Birth centres are midwifery-managed locations that offer care to low risk women during labour and birth. They have a homelike environment and provide facilities to support physiological birth. Independent community midwives take primary professional responsibility for care. In case of referral the secondary caregiver (obstetrician or paediatrician) takes over the professional responsibility of care.

Three types of birth centres were identified based on location:

- A *freestanding birth centre* is located separate from a hospital with obstetric services. In case of referral the woman needs to be transferred to a hospital with obstetric services which will normally be by car or ambulance.
- An *alongside birth centre* is located in a hospital with obstetric services or on such a hospital's grounds, but separate from the obstetric unit. In case of referral the woman needs to be transferred which will normally be by bed or wheelchair.
- An *on-site birth centre* is located within an obstetric unit of a hospital. In case of referral the woman does not need to be transferred: the secondary caregiver (obstetrician or paediatrician) will enter the birthing room.

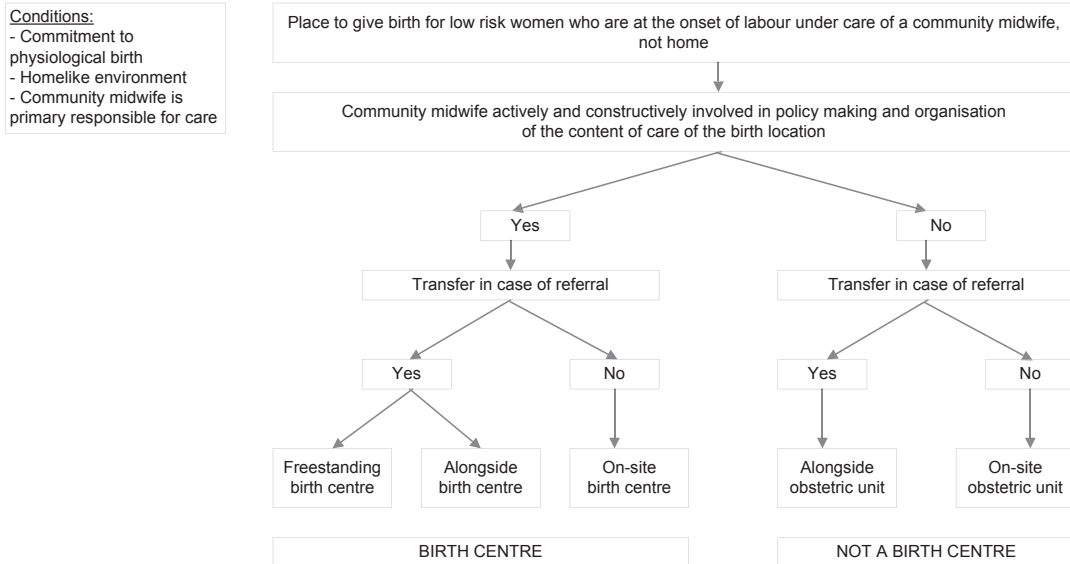


Figure 1 • Flowchart for selection of type of birth location

Selection of birth centres

Nineteen of the 46 presumed birth centres were excluded because they were not midwifery managed (see Figure 2). Twenty seven presumed birth centres appeared to fit the definition based on the answers of the DBCQ. Their managers were interviewed and these locations were visited to confirm the fit of the definition and to obtain additional data. Another four birth centres were excluded because there was no involvement of the community midwife as defined in the definition. In total, 23 birth centres were identified in the Netherlands.

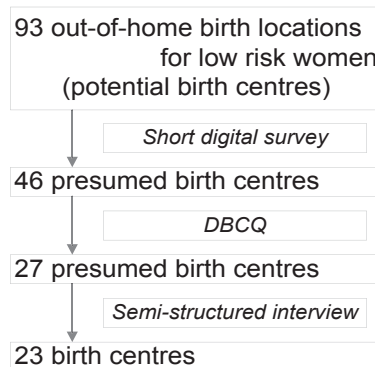


Figure 2 • Flowchart for identification of Dutch birth centres

Characteristics

Establishment

Most of the birth centres ($n = 21$) mentioned more than one reason for establishment. The most stated reasons were: the wish for a more homelike environment as opposed to conventional birthing rooms within the obstetric unit (74%), and the possibility to provide one-to-one support during early labour (57%). Competition and marketing were also mentioned as reasons; Ten birth centres (44%) were opened in order to compete with other hospitals offering a birth location for women with low obstetrical risk. Birth centres also mentioned logistics as a reason for establishment: in two regions (9%) the distance to a referral obstetric unit was perceived as being too large without the establishment of a strategically placed birth location for low obstetrical risk women. Seven birth centres (30%) reported establishment because of a capacity problem in hospitals or in primary care services (shortages of birthing rooms at the conventional labour ward and shortages of midwives and/or maternity care assistants). More than three quarter (78%) of the birth centres reported that local community midwives were responsible for initiating the establishment of the birth centre.

Table 2 • Characteristics of Dutch birth centres (September 2013)

	Freestanding birth centre n=3	Alongside birth centre n=14	On-site birth centre n=6	TOTAL n=23 (%)
Length of operation (in years)				
< 2	1	7	4	12 (52)
2 to 6	1	5	1	7 (30)
6+	1	2	1	4 (17)
Location				
Not in a hospital	1			1 (4)
In a hospital without obstetric unit	2			2 (9)
Attached to a hospital with an obstetric unit		1		1 (4)
In a hospital on a different floor than the obstetric unit		5		5 (22)
In a hospital on the same floor but on a different ward than the obstetric unit		6		6 (27)
In a hospital on the same floor on the same ward as the obstetric unit		2	6	8 (35)
Number of women receiving intrapartum birth centre care in 2013¹				
0-300	3	3	2	8 (35)
301-1000		8	2	10 (43)
1000+		2	1	3 (23)
No 'medical' equipment in sight	3	11	3	17 (74)
Birth chair	3	13	6	22 (96)
Medium risk-indications in birth centre			4	4 (17)
24/7 caregiver at birth centre	1	6	5	12 (52)
Moment of admittance at birth centre for women in labour				
As indicated by the woman	3	7	2	12 (52)
As indicated by the community midwife		7	4	11 (48)
Physical transfer needed in case of referral				
Always	3	4		7 (30)
Always, with exceptions		10		10 (43)
Not needed			6	6 (27)
Birth assistance by a maternity care assistant (maternity care assistant)	3	14	6	23 (100)
One-to-one support by maternity care assistant	1	7	4	12 (52)
Possibility to stay over postpartum (without medical indication)	1	7	5	13 (57)
Change rooms postpartum for stay over		3	1	4 (17)
Hotel facilities in the birthing room				
Television	2	12	5	19 (83)
WiFi	2	14	4 (67)	20 (87)
Music-installation	3	10	3 (50)	16 (70)
Normal bed for partner	1	4	2 (33)	7 (30)
Coffee maker	3	12	3 (50)	18 (78)
Fridge	1	9	6	16 (70)
Microwave	2	10	1	13 (57)

¹ for two birth centres these data are not available because they started during 2013

Location

Table 2 shows that three birth centres were freestanding and two of them were located in a hospital without obstetric unit. In case of referral, the distance to the nearest hospital obstetric unit was between 3.7 and 30 km and took respectively 15 to 27 min by car or ambulance (from departure out of the birth centre to arrival at the obstetric unit).

Fourteen birth centres were located in a hospital but separate from its obstetric unit (alongside). In six of these birth centres referral with transfer to secondary care meant a move to another floor by elevator. Exceptions for transfer were locally described and included situations as shoulder dystocia (n = 9), resuscitation of the neonate (n = 8), postpartum haemorrhage (n = 4), (eclamptic) insult (n = 4), Apgar score below 7 after 5 min (n = 4), placental retention (n = 3), prolapse of the umbilical cord (n = 3) and foetal distress (n = 2). In those situations the secondary caregiver came to the birth centre in case of referral. In five of the 14 hospitals with an alongside birth centre there was also the possibility for low risk women to give birth under the care of their own community midwife on the conventional labour ward. The rooms on this ward were different in environment, staffing, service and facilities compared to the rooms in the birth centre. Transfer time from the alongside birth centre to the nearest obstetric unit varied between 10 s and 3.5 min.

Six birth centres were located within an obstetric unit (on-site). For low risk women who gave birth at an onsite birth centre transfer was not needed in case of referral because the obstetrician with the obstetric team entered the room. Besides the other conditions as noted in Figure 1, they were distinctive from the conventional obstetric unit because of the active participation and responsibility of independent community midwives in the content of care and organization of this location. In case all beds in the obstetric unit were occupied the birthing rooms in the birth centre were used as obstetric birthing rooms as well. This was in contrast to the situation in freestanding and alongside birth centres.

Facilities to support physiological birth

All birth centres had a non-clinical homelike atmosphere. 74% of the birth centres had no medical equipment like a cardiotocography machine or a resuscitation bag and mask in sight. At the other birth centres this equipment in sight was minimized by putting it not in a front position. All birth centres provided facilities to support pushing in a non-supine position (birthing stool, birthing ball), methods for discomfort and pain management that were allowed to be used in primary care (bath and shower) and one-to-one or one-to-two support by a maternity care assistant (MCA) as much as wanted and needed by the woman in labour and her partner.

Staffing

In all birth centres a MCA assisted the community midwife during labour, birth and postpartum. The MCA was part of the staffing of the birth centre in thirteen out of twenty three birth centres (57%). In twelve of these birth centres the MCA was 24/7 present. When not part of the staffing the MCA was on call for assistance during labour and came to the birth centre after a request by the community midwife. Midwives were not part of the staffing of the birth centre itself but were independent workers or part of the staffing of the larger organization that included the birth centre. They arrived at the birth centre only with a woman in labour or for postpartum care if applicable.

Family centred care

In thirteen birth centres (57%) it was possible for the woman to stay for up to 10 days postpartum. In four of these centres the woman stayed in the same room as where she gave birth; in the other she had to change rooms on the ward or in the building. In all except one of these thirteen birth centres it was possible for the partner to stay one or more nights as well if desired. During the postpartum stay, a maternity care assistant was available on the ward 24 h per day in every birth centre. Hotel-like facilities were present in all 23 birth centres.

Philosophies

Philosophies were ranked each from 'not important' to 'very important'. The number of birth centres that ranked a philosophy as important or very important on the five point Likert scale are shown in Table 3 divided by type of birth centre. The philosophies 'to provide a non-clinical homelike environment' and 'commitment to physiological birth' were shared among all birth centres. These philosophies are part of the definition of a birth centre and the identification of birth centres was based on this definition. Two out of six of the on-site birth centres claimed that 'minimal obstetric interventions' was an important or very important philosophy for their birth centre. For the philosophy 'minimal pharmacological pain management' this was the case for three out of six of the on-site birth centres.

Finance and legal entity

The establishment of the birth centres was financed in many different ways. In 55% the local hospital was involved, in 32% a maternity care assistance organization, in 23% an insurance company, in 23% STBN and in 14% the community midwives. For two locations this information was unknown by the person who filled out the questionnaire. In 61% the birth centre itself was an independent legal entity.

Table 3 • Important or very important founding philosophies for birth centres

	Freestanding birth centre n=3	Alongside birth centre n=14	On-site birth centre n=6	TOTAL n=23 (%)
To provide a non-clinical homelike environment	3	14	6	23 (100)
To facilitate one-to-one/two support by maternity care assistant	3	13	5	22 (96)
Commitment to physiological birth	3	14	6	23 (100)
Encourage women's rights and choices towards place to give birth	2	11	4	17(74)
Encourage women's rights and choices towards the way to give birth	2	13	4	19 (83)
Encourage family involvement	1	7	3	11 (48)
Minimal obstetric intervention	3	10	2	15 (65)
Minimal pharmacological pain management	3	10	3	16 (70)

Discussion

This study was undertaken to better understand the phenomenon 'birth centre' in the Netherlands. A standard definition for birth centre was developed, 23 birth centres were identified and their characteristics were described. Based on their location in relation to the nearest hospital obstetric unit, three different types of birth centres were seen: freestanding, alongside and on-site. Dutch birth centres differed in their reasons for establishment, services provided, founding philosophies, staffing and service delivery.

In the Netherlands, the term 'birth centre' has a broad scale of meanings, varying from midwifery practices to locations for preconception consults, which is confusing [13–16]. To have clarity about the term birth centre, we developed a definition for 'birth centre' for use in the Netherlands that is in line with international definitions i.e., it is a place to give birth [1–5]. In general, there was not much discussion in the project group of the Dutch Birth Centre Study to describe the different options for the characteristics within the definition as provided by the answers of the DBCQ (as shown in Table 2) [17]. In the definition created for use in the English Birthplace study, the term 'straightforward pregnancies' was used to describe the group of woman who were eligible to give birth in a birth centre [5]. Although this was taken in consideration, it was decided that the term 'low risk' was a more appropriate term to use in the Dutch maternity system with its clear risk selection as written in the List of Obstetric Indications [18].

This is the first study in the Netherlands that looked into the classification and description of the characteristics of birth centres. With this classification, it will be possible to study the effects of birth centre care provision on many different aspects such

as perinatal outcomes and client and healthcare provider satisfaction [19]. The interest in the evaluation of birth centre care in the Netherlands is shown by the enthusiastic participation with this sub-study by the professionals working in or with a birth centre. We identified all birth centres operating in September 2013 with some interviews held 1.5 year after filling out the DBCQ. Although it was specifically asked during these interviews to answer the questions as how the situation appeared at September 2013 some recall bias is not ruled out. It is important to acknowledge that as birth centres evolve quickly in number, location, organization and characteristics, current practice might already be different in some ways.

All Dutch birth centres claimed that it was important to be committed to a physiological way of birth. We found that at on-site birth centres medical equipment was more often in sight than in alongside or freestanding birth centres. In addition, as on-site birth centres are located on the obstetric unit, there is easy access to technology and medical interventions during labour and birth. Physicians working at the obstetric unit are trained to look for pathology, and maybe therefore more likely to intervene. Stark et al. found that the support of physiological labour and birth for low risk women when giving birth at the obstetric unit is more difficult than at another location different from the hospital obstetric unit [20]. Therefore, it might be more challenging to support physiological labour and birth at an on-site birth centre than at an alongside or freestanding birth centre.

Birth centres are homelike by having decorative changes like a specially designed bed and dim lighting and by providing hotel-like facilities. Facilities like a bath provide an option for non-pharmacological pain management that is associated with a significant reduction in risk of transfer and fewer interventions during labour [21, 22]. A birth environment that is calming and reduces stress supports physiological birth [23]. Although there is a wide variation in the interpretation of the element homelike among Dutch birth centres and the use of the facilities, birth centres could be a stimulating environment for midwives to give a stronger focus on physiological birth to enhance quality in Dutch maternity care. However, the creation of a culture that supports physiological birth involves more than the cosmetic appearance of the birth setting [20].

Worldwide there is discussion about safety and distance of travel time from a freestanding birth centre to a hospital with an obstetric unit in case of referral during birth [24–29]. Travel time differed from 5 to 60 min with a median of 15 min in Germany, to a median duration of 50 min in urgent situations in England [28, 29]. International studies showed that despite the time needed for a intrapartum transfer, planning to give birth in a freestanding birth centre significantly raised the likelihood of having a spontaneous, uncomplicated birth with good outcome for mother and infant [2, 25, 26, 29, 30–32]. In the Netherlands, referred low risk women with a travel time of at least 20

min had no higher risk of adverse outcomes [30]. In this study we found that some birth centres had been established in strategic locations to reduce travel time to secondary care. The maximum transfer time found was 27 min. Although international studies showed positive effects of travel time at freestanding birth centres and the travel time in the Netherlands is shorter, the effect of travel time for freestanding birth centres to obstetric units shall be studied in another part of the Dutch Birth Centre study [2, 17, 25, 26, 29, 30–32].

Conclusions

It was possible to develop a comprehensive definition for a Dutch birth centre that is based on the common elements found in international definitions with context specific characteristics for the Netherlands. From the many locations calling themselves birth centres, it was possible to identify and select birth centres in line with our definition. This methodology has contributed to the ongoing research into the effects of birth centre care provision and could be valuable for future research in this area.

Abbreviations

CPZ: College of Perinatal Care; DMCQ: Dutch Birth Centre Questionnaire; KNOV: The Royal Dutch Organisation of Midwives; MCA : Maternity Care Assistant; SPSS: Statistical Package for Social Sciences; STBN : Foundation for project management and innovation in natal care

Acknowledgements

The authors acknowledge all managerial representatives working in one of the Dutch birth centres for their enthusiastic participation in this research. We would like to thank Paula Laws (Australia) for sharing the survey that she used for creating a definition and describing the characteristics of Australian birth centres. We are also grateful to the other members of the Project Group of the Dutch Birth Centre study who provided their unique expertise for this part of the study. A special thanks to Kathy Herschderfer for her expertise in scientific writing in English.

Funding

This study was funded by the Netherlands Organization for Health Research and Development (ZonMw) [award no: 209,020,012], The Hague, the Netherlands.

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Chapter

04

Development of the Optimality
Index-NL 2015, an instrument
to measure outcomes of
maternity care

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J Midwifery Womens Health 2017;62:580–588

Abstract

Introduction An optimality index is a composite tool to measure maximum outcome with minimal intervention. It focuses on optimality instead of on normality and is useful in comparing differences in processes and perinatal outcomes for women at low risk of complications. The latest Dutch version dates from 2 decades ago, and international versions of the optimality index are not directly applicable to the Dutch maternity system. Most data for perinatal research in the Netherlands are derived from a national perinatal database: the Netherlands Perinatal Registry. The aim of this study was to develop a new Dutch version of the optimality index (OI-NL2015) that could be calculated from data derived from this national perinatal database and to assess the reliability of these data for use in the index.

Methods Potential items were collected by a thorough comparison of earlier (inter) national optimality indexes and the current data collection of the national database. All items were reviewed by 2 experts in maternity care and assessed for importance, relevance for the Dutch maternity care system, and feasibility to retrieve information on these items. For each item a criterion for optimality was formulated based on evidence-based or consensus-based effectiveness of care in pregnancy and childbirth. All selected items were scored on potential problems, with reliability by 20 randomly selected community midwives. The level of agreement was calculated comparing these 2 data sets, which included data of the same women.

Results The final OI-NL2015 consists of 31 items in 3 different components: 22 intrapartum, 7 neonatal, and 2 postpartum. Of the 7 items that were examined because of expected potential problems with reliability, in 6 items a level of 90% agreement was found.

Discussion An optimality index is not a standard measurement instrument but must be validated and adapted to local circumstances and available data.

Introduction

One of the hallmarks of midwifery philosophy is the 'advocacy of nonintervention in the absence of complications'.¹ In line with this philosophy, labor and birth in women at low risk of perinatal complications are seen as physiological events that do not require technological or obstetric interventions unless indicated by a change in risk status.² To evaluate maternity care in these women it is therefore preferable not to focus on perinatal complications and adverse outcomes as these are rare condition in this population. Nonetheless, such variables are often the main outcome measures used when comparing obstetric outcomes among subgroups, such as women with different planned places of birth in the Netherlands.³⁻⁷ In addition, adverse outcomes may vary from mild to severe and they rarely occur alone.

In 1980 Prechtl introduced another approach. He defined a list of criteria of the most favorable and optimal conditions for a representative and comprehensive description of the pre and perinatal condition of the mother, the fetus and the placenta.⁸ This list was based on common clinical experience and on perinatal mortality data. Applying this optimality concept, a list of maternal and newborn optimality criteria was designed. Wiegers updated and adapted this instrument in the early 1990's⁹; later it was revised and validated for use in the United States (the Optimality Index-US^{1,10}) and in the United Kingdom (Optimality Index-UK).¹¹

The Optimality Index (OI) is a composite outcome tool based on the concept of optimality.¹³ Optimality differs from normality because it avoids the problem of choosing a cut-off point on an often continuous scale of what is normal and which is not. In health care 'normal' is often defined as 'without abnormalities' or 'with the highest occurrence'. This does not automatically mean that a 'normal' process or outcome is the most optimal one. For instance, when the majority of women receive labor induction, that may be 'normal', but based on our knowledge of the physiology of labor and birth, it is not an 'optimal' outcome. The OI combines commonly used perinatal outcomes as instrumental birth, birth weight and perinatal death with evidence based processes such as amniotomy, episiotomy and the use of oxytocin for augmentation of labor within one instrument. All items are scored optimal (1) or nonoptimal (0). Individual items within the OI are not weighted, because the instrument as a whole is self-weighting: it reflects the potential cascade of interventions by including items that are closely related. Although an individual sum score is calculated for each woman, the OI is more specifically designed to compare between groups. It can highlight differences in the total of processes and outcomes of care by showing the mean sum scores of optimally scored items within essentially healthy groups of pregnant women in whom adverse outcomes are rare.¹ The OI has been shown to be valuable over a decade of

meaningful use in distinguishing processes of maternity care across and within various groups.¹⁴

Although there is much overlap in the different versions of the OI, all versions include items that are only applicable to a specific health care system or available from a specific perinatal database. In the Netherlands most data for perinatal research are obtained from a national perinatal database: the Netherlands Perinatal Registry.¹⁵ The latest Dutch version of the OI, also partly based on this registry, dates from 2 decades ago.⁹ In 2013 a national study started to evaluate the effects of planned birth centre birth in the Netherlands compared to alternative places to give birth (the Dutch Birth Centre Study).¹⁶ To be able to use the OI in the current Netherlands practice climate and to use the OI as the primary outcome of the Dutch Birth Centre study, an updated version was needed.

The aim of this study was to develop a new version of the optimality index (OI-NL2015) based exclusively on the items in the Netherlands Perinatal Registry, as an outcome measurement tool for women with term pregnancies and at low risk for perinatal complications who were under care of a midwife at the onset of labor. We also investigated the reliability of the items of the OI-NL2015 within the Netherlands Perinatal Registry. The resulting OI-NL2015 will be used in the Dutch Birth Centre Study.¹⁶

Methods

Setting

The Dutch maternity care system is based on the notion that pregnancy, birth and the puerperium are primarily physiological processes. Most pregnant women are initially considered as 'low risk' and in 2015 87% of them initially received antenatal care from an independently practicing community midwife. A woman is referred to secondary care if risk factors arise during pregnancy, during labor or in the postpartum period. Secondary care is provided under the responsibility of an obstetrician and clinical midwives or trainee obstetricians can be involved. This risk selection and role division between the professions is based on the *List of Obstetric Indications*, a document that designates the appropriate level of care for more than a hundred obstetrical conditions. This list recommends that only women without known risk factors for complications in pregnancy and childbirth are under care of a community midwife.^{17,18} Other conditions for this type of care are prepregnancy body mass index below 40 and spontaneous start of labor. Women with (previous) obstetric complications (for example, cesarean at prior birth or preterm contractions) or whose labor is induced are at the onset of

labor under care of the obstetrician. Interventions such as augmentation of labor, pharmacological pain relief, continuous fetal monitoring or instrumental birth only take place in secondary or tertiary care. In 2015, 51.4% of all women who gave birth in the Netherlands were in primary community midwife led care at the onset of labor.¹⁹

Construction of the index

An optimality index is not a static measurement tool. It requires close evaluation of its internal validity before it can be applied to specific situations in practice. The tool needs to be critically assessed and redesigned on a regular basis to accommodate different or changed insights into maternity care and to be appropriate for the available data and the purpose of the study.⁹

To develop the new Dutch version of the index, several steps were taken, all by 2 researchers (TW and MH). First, we collected and sorted all possible items already used in the existing optimality indexes: the Perinatal Background Index and Perinatal Outcome Index (PBI and POI, both elements of the previous Dutch OI, 36 items), the Optimality Index-US (OI-US, 94 items) and the Optimality Index-UK (OI-UK, 54 items).^{9,11,12}

Second, the current list of items as registered in the Netherlands Perinatal Registry was studied to find potential extra items for the OI-NL2015. The Netherlands Perinatal Registry is an electronically collected national database that contains individual demographics and risk factors, as well as prenatal, intrapartum, postpartum, and neonatal interventions and outcomes during the first 7 days after birth. It is a routine registry in which standard response categories are defined for each item. There are no open-ended questions. The respondent has to score multiple discrete choices per item. However completing each item is not required for all items.²⁰ All 4 professional obstetric disciplines (midwives, general practitioners, obstetricians, paediatricians) have their own professional registry. These separate registries are afterwards linked to each other into one combined file per woman with data obtained from all involved professionals. Not all items from the 4 registries are scored for all women as not all 4 professionals are involved in caring for each woman.²¹ Reliability of individual items of this database has been studied before but information about the inter-rater agreement of more than 1 item of the database is rare.^{22,23}

Third, all potential items retrieved from the first two steps were reviewed by the same 2 researchers and evaluated for their relevancy to the Dutch maternity care system and the availability of information on this item within the Netherlands Perinatal Registry.

Fourth, items were excluded if they did not identify women at low risk of complications at the onset of labor under care of a midwife according to criteria written in the *List of Obstetric Indications*.¹⁷

Fifth, the optimal evidence based value for an item was decided. This was based

on the evidence lists about the optimal value of the items of the 3 earlier versions of the optimality indexes as well as the recently updated guideline from the English National Institute for Health and Care Excellence (NICE) on the subject of intrapartum care.^{9,11,12,24} If no evidence was found in one of these before mentioned documents, a search was conducted in the Pubmed database. 'Clinical consensus' was defined as evidence if no scientific research with evidence for optimality was found, but national guidelines contained uniform endorsement of the desirability of an outcome. The term 'clinical consensus' was also used when the criteria for optimality were adapted from the existing categorical options in the Netherlands Perinatal Registry. For instance, in the Netherlands Perinatal Registry the item 'duration of first stage of labor' is categorically scored, with values <6, 6-12, >12 hours. An individual item was recorded in the OI-NL2015 if its criterion for optimality was agreed on by both experts (TW and MH).

These methods (a thorough comparison of earlier versions of the Optimality Index, deriving consensus about the inclusion of all items, and coming to agreement on the criteria for an optimal score) provided data to support the content validity of the index. This is consistent with the current recommendations for the construction of assessment instruments.²⁵

Reliability

To study the reliability of the data extracted from the Netherlands Perinatal Registry we asked 20 community midwives to assess all potential items of the OI-NL2015 as to their perceptions of the level of accuracy of these items in the registry. The midwives were randomly chosen from a group of 52 midwives all working in one area located around a hospital in the southern part of the Netherlands. They represented 12 different midwifery practices, all had worked over 5 years as a primary community midwife and had over 5 years of experience in filling out data in the registry. The midwives were asked to give their opinion on the reliability of the registry per item on a rating scale of 4 points: 1 (very unsure about the reliability) to 4 (very sure about the reliability). For example, would 'artificial rupture of membranes' be reliably recorded in the Netherlands Perinatal Registry? An item was assessed as unsure if more than 30% of the respondents answered unsure or very unsure.

In order to assess the reliability of these data, all unsure items were added to a case report form that was used to collect data for the Dutch Birth Centre study. This cohort consisted of 3455 low risk women who started labor under care of a community midwife.²⁶ The methodology for the Dutch Birth Centre study has been reported elsewhere.¹⁶ It was assumed that the remaining items were reliably registered within the registry. The same person filled out both datasets directly after birth, sometimes completed by a colleague if there was additional information on outcomes or interventions at a later stage.

All women in the Dutch Birth Centre Study were linked to their data in Netherlands Perinatal Registry. This resulted in a combined database in which all unsure items were recorded twice per woman: once in the Dutch Birth Centre Study and once in the national perinatal registry. Missing data were recoded when possible with extrapolated data; for example, if data about referral were missing but the woman had a cesarean birth, referral was assumed to have taken place and was therefore recoded from missing to referred.

For all items, and corresponding to other optimality indexes, each optimal item received a score of 1 and each nonoptimal item received a score of 0. To determine the reliability of the unsure items, we compared the percentage of women with an optimal score on an item between our study data and the data derived from national perinatal registry. Agreement was defined as the frequency in which 2 evaluators assigned the exact same rating.²⁷ Ninety percent absolute agreement was used as acceptable level of agreement.²⁸

The Netherlands Perinatal Registry gave approval for anonymous use of requested data for the analyses of this study. Design and planning of the study were presented to the Medical Ethics Committee of the University Medical Centre Utrecht. They confirmed that this study agrees with Dutch legal regulations for the methods used for this study. For this reason official ethical approval of this study was not required.²⁹

Results

In total, 94 possible OI items were described in the 3 earlier versions of the OI and 6 possible new items were derived from the Netherlands Perinatal Registry (Figure 1). From these 100 items, 46 items were not in the Netherlands Perinatal Registry and therefore excluded. Another 11 items were present in the registry but only for a subgroup of women, namely those under care of an obstetrician after referral during labor. Including these items would have led to missing values for nonreferred women, so exclusion was the only option. Nine items were not distinctive for women at low risk of complications starting labor under care of a community midwife, according to the *List of Obstetric Indications*.¹⁷ These items included women with problems like hypertension, diabetes, previous problems during childbirth (such as a previous cesarean) or an indication for induction of labor. If any of these events occur a woman is no longer considered as low risk and will be referred to secondary care before onset of labor. A list of the excluded items is in Appendix 1.

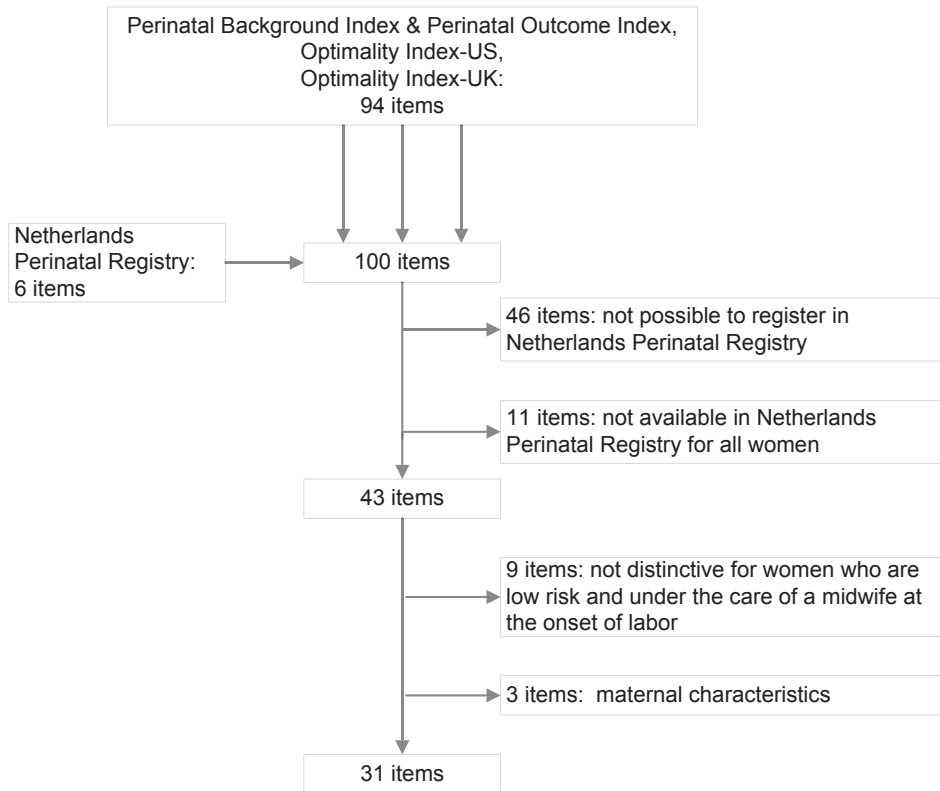


Figure 1 • Flowchart on selection of items for Optimality Index NL-2015

Table 1 shows the final selection of 31 items for the OI-NL2015 with the criteria for optimality and the maternal characteristics to adjust the sum score of the OI-NL-2015 for. As shown in this table, 4 items did not appear in earlier versions of the OI. These items are ‘serious maternal complications postpartum’, ‘manual placenta removal’, ‘urgent referral’ and ‘cephalic position at birth’.

Four maternal characteristics were used to adjust the sum score of the OI-NL2015 for potential selection bias. Three of them were used in earlier versions of the OI (maternal age, maternal ethnic background and social deprivation). The fourth item ‘social deprivation’ was indirectly measurable by linking the postal code as registered in the Netherlands Perinatal Registry to the database of The Netherlands Institute for Social Research.³⁰ The postal code also made it possible to extend the number of maternal characteristics to 4 by linking it to the database of Statistics Netherlands to gain information on the level of urbanization.³¹ Both procedures are often used in research with data obtained from the Netherlands Perinatal Registry.

Evidence for a criterion of optimality was found in earlier versions of optimality indexes in 25 items of the 31 potential items left. This was consistent with the evidence obtained in the recently updated NICE intrapartum guideline.²⁴ Evidence for the 4 new items (see Table 1) was found in this guideline as well, except for the criterion 'no urgent referral'. Criteria for this item were adapted as suggested in the referral categories by Amelink et al.³² For the criterion for the item 'time between rupture of membranes and birth' the *List of Obstetric Indications* was used as evidence.¹⁷ For the item 'duration of first stage' it was only possible to record 0-6 hours, 6-12 hours or 12+ hours in perinatal registry.¹⁵ Therefore a maximum of 12 hours was chosen to be the criterion for optimality. The criteria for 'congenital anomalies' were adapted from the European Registration of Congenital Anomalies (and Twins) that was used in earlier Dutch research on congenital anomalies.^{33,34}

The final Optimality Index NL2015 consists of a list of 31 items in 3 different components: 22 intrapartum, 7 neonatal and 2 postpartum.

All 31 items were presented to 20 randomly chosen community midwives and scored on expected reliability in Netherlands Perinatal Registry. Seven items scored were considered unsure or very unsure. These items were added to the case report form of the Dutch Birth Centre Study in order to study the inter-rater agreement on the optimality score between both registrations.

Table 1 • Optimality Index NL 2015 with the criteria for optimality

Optimality Index-NL-2015 ^{a,b}	Criterion for optimality
intrapartum component	
time between rupture of membranes and birth	≤ 24 hrs
duration first stage	≤ 12 hrs
duration second stage	≤ 120 min
color of amniotic fluid	clear
use of oxytocin for augmentation of labor	no
amniotomy	no
oral or injectable medication for pain relief during first or second stage of labor	no
epidural analgesia for labor and/or birth	no
birth occurred in the place originally intended at the onset of labor	planned place of birth is final place of birth
fetal presentation at birth	cephalic

Table 1 • Continued Optimality Index NL 2015 with the criteria for optimality

Optimality Index-NL-2015 ^{a,b}	Criterion for optimality
cephalic position at birth ^c	occipital
instrumental (vaginal) birth	no
cesarean section	no
episiotomy	no
1st or 2nd degree laceration of perineum or perineal tissue requiring sutures (including sulcus and cervical lacerations)	no
3rd or 4th degree extension of either an episiotomy or a 1 st or 2nd degree laceration	no
loss of blood during birth	< 1000mL
blood transfusion	no
other serious intrapartum complications (eclampsia, preeclampsia or HELLP syndrome present during intrapartum period, placental abruption, vasa previa, placenta previa discovered during intrapartum period, infected uterus before birth, other major serious obstetric complications)	no
referral during labor or within 2 hours postpartum	no
urgent referral ^c	no
manual placenta removal (after vaginal birth) ^c	no
neonatal component	
duration of gestation	37-42 weeks
birth weight	P10-P90
Apgar score at 5 minutes	>= 9
transfer to high risk neonatal care setting within 24 hours postpartum	no
congenital anomalies	no
birth trauma within 24 hours postpartum (Erb's palsy, clavicular fracture, cephalo-hematoma, other serious birth trauma)	no
perinatal death within 24 hours postpartum	no
postpartum component	
maternal mortality within 24 hours after birth	no
serious maternal postpartum complications (eclampsia, deep venous thrombosis, preeclampsia or HELLP syndrome present during postpartum period, pulmonary embolism postpartum) ^c	no

^a The sum score of the OI-NL2015 should be adjusted for the maternal characteristics ethnicity, social deprivation, maternal age and level of urbanization

^b All items are available within the Netherlands Perinatal Registry except for social deprivation, which is obtained from the linkage with the database of the Netherlands Institute for Social Research.³⁰

^c new item, not present in former versions of the Optimality Index

As shown in Table 2, 6 of the 7 OI-NL2015 unsure items scored more than 90% agreement within both databases. The agreement on the OI item "birth occurred in the place originally intended at the onset of labor" was the lowest; this was the case in 71.8%.

Table 2 • Inter-rater agreement on optimality between scores from the Dutch Birth Centre Study and the Netherlands Perinatal Registry (n=3655)

Optimality Index-NL2015 item with criterion for optimality	Optimal score in the Dutch Birth Centre Study (%)	Optimal score in Netherlands Perinatal Registry (%)	Absolute agreement between Dutch Birth Centre Study and the Netherlands Perinatal Registry (%) ^a
no use of oxytocin for augmentation of labor	75.4	74.4	94.5
no epidural analgesia for labor and/or birth	87.2	86.3	96.3
birth occurred in the place originally intended at the onset of labor	54.2	57.8	71.8
no blood transfusion	98.8	99.8	98.9
no referral during labor or within 2 hours postpartum	53.9	57.8	93.8
no urgent referral	96.1	97.5	97.7
no transfer to high risk neonatal care setting within 24 hours postpartum	99.7	99.9	99.7

^a equal score in both (both optimal or both nonoptimal)

Discussion

The OI-NL2015 is designed to assess aggregated outcomes in comparison to an evidence based standard and has its value in distinguishing processes of maternity care across various groups as has been demonstrated in other publications.^{1,14} To our knowledge this is the first outcome measurement tool that focuses on optimality and can be calculated with data from the Netherlands Perinatal Registry. As is true of other versions of the Optimality Index, it is intended as a research instrument, not a quality assessment tool.

The OI-NL2015 consists of 31 items in 3 different components: 22 intrapartum, 7 neonatal and 2 postpartum items. For 29 items of the OI-NL2015 scientific evidence was found for its criteria of optimality. For 2 items this criterion was based on consensus. Thirty out of all 31 items of the OI-NL2015 can reliably be used when calculating a sum score for the OI-NL2015 with data from Netherlands Perinatal Registry.

To use the OI-NL2015 all items need to be scored optimal (1) or nonoptimal (0) as is true of other forms of the optimality index. To use this index, inclusion criteria for the sample are women with a term pregnancy who are at low risk of complications who under care of a community midwife at the onset of labor. A mean sum optimality score should be calculated for each group being evaluated; this must be adjusted

for the baseline characteristics of maternal background, maternal age at the time of birth, socio-economic status and level of urbanization. Because of the large differences in frequencies of interventions and outcomes between nulliparous and multiparous women, groups should also be analyzed by parity.³⁵

More items are known to have an effect on optimal outcome than the items now included in the OI-NL2015. For the development of the OI-NL2015 we only had the items registered in the Netherlands Perinatal Registry available. Therefore, other items such as body mass index, smoking behavior, continuous support during labor and skin-to-skin contact between mother and her baby directly after birth could not be included although they are known to have evidence based effects on optimal outcomes. To use the OI-NL2015 in future studies all 31 items should be re-evaluated when major changes in maternity care have occurred or when there are changes in items included in the Netherlands Perinatal Registry.

Data in perinatal registries are routinely collected and often used in scientific research although little is known about their reliability and validity. The degree of underreporting and the percentage of incorrect data have an unknown effect.²⁰ We therefore assessed the reliability of all items to be used in de OI-NL2015. All, except one, scored over 90% agreement between the data from Netherlands Perinatal Registry and from the Dutch Birth Centre Study. The item that did not meet the 90% criterion was 'birth occurred on the planned place of birth'. The relatively high percentage of women with unknown planned place of birth in registry and the lack of definition of what birth location is called a birth centre could have contributed to that.^{16,36} When using the OI-NL2015 only with data derived from registry and not being able to assess the item 'birth occurred on the planned place of birth' in another way, one should be alert that the sum score of the OI-NL2015 will end up lower, implying a lower level of optimality.

Although the OI-NL2015 is a research instrument, it can be used in care to increase awareness of the effect of interventions that are used on a daily basis in some midwifery practices (for example, episiotomy): it can demonstrate differences in the process between comparable subgroups by showing that every (unnecessary) intervention interrupts the process of physiological childbirth and often starts a cascade of other interventions. Evaluation and adjustment of these processes can lead to more optimal outcomes. Awareness of differences between one subgroup and another can be the first step to change practice. Although the aggregated evaluation provides information on processes, the OI is not an alternative for the evaluation of care on case level. It is supplementary. Acquaintance with the OI-NL2015 can also lead to a more positive evidence based approach on childbirth by looking at sum scores of optimal items

instead of the percentage of rare adverse outcomes (for example, perinatal death).

For this study, the aim was to develop a new Dutch version of the Optimality Index that can be calculated with data from Netherlands Perinatal Registry and could be used as an outcome measurement tool for the Dutch Birth Centre Study.¹⁶ The perinatal registry includes over 95% of all births in the Netherlands and data are supplied by 3 different disciplines all involved in maternity care. Data are generated per hospital department (obstetrics and/or neonatology) and per independent community midwifery practice. With their own identification code midwifery practices are able to look at their own data on obstetric processes and outcomes in relation to anonymized national data online. In the near future it would be helpful if the OI-NL2015 could be included as an automatically generated outcome score within this web-based program to make it easier to reflect on the given care.³⁷ Although it is clear that in clinical use an optimality list should never replace the separate recordings of complications and was never intended to do so, a new version of the Optimality Index ensures a more comprehensive evaluation of potential differences between sub-groups of low risk women at the onset of labor under care of a community midwife, divided by planned place of birth (i.e. home, hospital, birth centre).⁸

Conclusion

We redeveloped and updated an outcome measurement tool that focuses on optimal outcomes instead of the presence of perinatal complications. All but one met the 90% criterion of reliability to use when calculating a sum score with data from the Netherlands Perinatal Registry. The Optimality Index NL-2015 will be used to distinguish variation between groups of low risk women by planned place of birth as studied in the Dutch Birth Centre study. An optimality index is not a standard measurement instrument but must be validated and adapted to local circumstances and available data.

Acknowledgements

This study received funding from ZonMW (the Netherlands Organisation for Health Research and Development) in the context of the research program Pregnancy and Childbirth, grant number 209020012. We thank all participating midwives for filling out the case report forms of the Dutch Birth Centre study. We also thank Paula van Dommelen and Nathalie Masurel for making linkage to other databases possible. Perined gave permission to use the registry data and assisted the researchers in dealing with data from the Netherlands Perinatal Registry.

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Appendix 1 • Items of other Optimality Indexes and reason for exclusion**not possible to register in Netherlands Perinatal Registry (n=46)**

marital status
took part of parenthood classes
use of any smoking since conception (during index pregnancy)
use of any alcohol since conception (during index pregnancy)
drugs or over the counter since conception
prepregnancy body mass index (weight [in kg] / height [in m ²]) (18.5 to 24.9)
access to services (woman speaks and understands Dutch)
previous preterm birth < 28 wks
previous preterm birth 28-36 wks
previous instrumental birth
previous low birth weight for gestation infant
previous infertility
uncertain date of last menstrual period
intrauterine fetal demise
history of domestic violence during the pregnancy
anemia (Hb < 6.8 mmol/L)
major psychiatric history (formal diagnosis or treated with drugs/inpatient therapy)
pyelonephritis
Rhesus sensitization
vaginal bleeding
prenatal care: initiation in first trimester (prior to 14 weeks) and minimum of 5 visits
amniocentesis
nonstress test/contraction stress test/biophysical profile
cardiotocography during pregnancy
drugs prescribed or taken during pregnancy
history of mental health issues
24 hours or less have elapsed between first digital examination following rupture of membranes and birth
fetal heart rate abnormalities
presence of a support person during labor (other than care provider)
pushing was nondirected
nonsupine position at birth
medication (other than oxytocin or local anesthetic for perineal repair) during the third stage of labor
skin-to-skin contact
placental retention (\geq 30 mins)
insufficient cervical dilatation
insufficient progress in second stage

fetal distress
any breastmilk taken by time of discharge (including partial)
problems in first 24 hour
problems in first week
fever while mother remains in the birth setting, or provider diagnosis of infectious process or major complication
hematoma
local infection of sutures
prescription medications for conditions newly identified in intrapartum or postpartum period (Exception: Analgesic medications at over the counter dosages (OTC), iron and vitamins, oral contraceptives, rubella vaccine)
other problems
active management of third stage of labor
not available for all cases in Netherlands Perinatal Registry (for example, only available for cases for which obstetricians supplied data) (n=11)
inter-pregnancy interval between index pregnancy and previous viable birth > 18 months and < 60 months
more than one previous abortion
previous intrauterine fetal death
previous pregnancy-induced hypertension
specialist advice required during pregnancy (not during parturition)
fetoscope, Doppler or intermittent electronic monitoring used during labor, rather than continuous electronic fetal monitoring
assisted birth (not instrumental)
cystitis
endometritis
mastitis
specialist advice required during labor or birth
not distinctive for low risk women at the start of labor under care of a community midwife (n=9)
evidence of any preexisting, major, chronic, disease (chronic renal disease, diabetes (nongestational), heart disease class II-IV, HIV antibody positive, hypertension, major psychiatric history (treated with drugs or inpatient therapy))
previous cesarean section
history of any other serious antepartum complications (diabetes, eclampsia, placenta previa, placenta abruption, preeclampsia (RR of 140/90 and proteinuria 1+ or use of this term by any provider, pyelonephritis, Rh sensitization))
placental abruption in pregnancy
diabetes diagnosed in pregnancy (including gestational diabetes)
multiple birth (twins or higher number of births anticipated)
placenta previa
preeclampsia
hypertension (RR > 90)

All items above were included in other optimality indexes [14,20,23]

05

Chapter

Differences in optimality index between planned place of birth in a birth centre and alternative planned places of birth, a nationwide prospective cohort study in the Netherlands

Results of the Dutch Birth Centre Study

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BMJ Open 2017;7:e016958

Abstract

Objectives To compare the optimality index of planned birth in a birth centre to planned birth in a hospital and planned home birth for low-risk term pregnant women who start labour under the responsibility of a community midwife.

Design Prospective cohort study.

Setting Low-risk pregnant women under care of a community midwife and living in a region with one of the 21 participating Dutch birth centres or in a region with the possibility for midwife-led hospital birth. Home birth was commonly available in all regions included in the study.

Participants 3455 low-risk term pregnant women (1686 nulliparous and 1769 multiparous) who gave birth between 1 July 2013 and 31 December 2013: 1668 planned birth centre births, 701 planned midwife-led hospital births and 1086 planned home births.

Main outcome measurements The Optimality Index-NL2015, a tool to measure 'maximum outcome with minimal intervention', was assessed by planned place of birth being a birth centre, a hospital setting or at home. Also, a composite maternal and perinatal adverse outcome score was calculated for the different planned places of birth.

Results There were no differences in Optimality Index-NL2015 for pregnant women who planned to give birth in a birth centre compared with women who planned to give birth in a hospital.

Although effect sizes were small, women who planned to give birth at home had a higher Optimality Index-NL2015 than women who planned to give birth in a birth centre. The differences were larger for multiparous than for nulliparous women.

Conclusion The Optimality Index NL-2015 for women with planned birth centre births was comparable to planned midwife-led hospital births. Women with planned home births had a higher Optimality Index NL-2015, that is, a higher sum score of evidence based items with an optimal value than women with planned birth centre births.

Introduction

In the Netherlands, low-risk pregnant women who start labour at or after 37 weeks gestation and are under care of a community midwife can choose whether they want to give birth at home, in a primary care level midwife-led birth centre or in the hospital. Most Dutch community midwives work in group practices with other midwives in their own premises. They are autonomous in their actions and decisions during prenatal, natal and postnatal care [1]. When a complication occurs or medical assistance for pharmacologic pain relief is requested, the woman will be referred to a secondary care obstetric hospital unit. Depending on the reason for referral, either the obstetrician or the neonatologist takes over responsibility of care from the community midwife. Reasons for referral are defined in the so called List of Obstetric Indications. This is a multidisciplinary guideline in which all professionals involved in perinatal care have reached agreement on the indications for consultation and referral during labour and birth [2].

For low-risk women who are planning to give birth out of home there are two options, that is, in a birth centre or in a hospital setting [3]. Birth centres are a relatively new development in most Dutch regions and the number of birth centres has increased in recent years [4,5]. Recently a Dutch birth centre was defined as: 'a midwifery-managed location that offers care to low-risk women during labour and birth. They have a homelike environment and provide facilities to support physiological birth. Community midwives take primary professional responsibility for care. In case of referral the obstetric caregiver takes over the professional responsibility of care'[5]. Birth centres can be freestanding (outside the hospital), alongside (in the hospital but not in the obstetric unit) or on-site of the hospital (within the obstetric unit). The other option for low-risk women is to give birth in a conventional labour setting in a hospital room under care of a community midwife (midwife-led hospital birth). These rooms are often located in the obstetric unit and differ from the rooms in the birth centre: at this location the community midwife does not participate in the organisation of the location, protocols and birth environment. Although the community midwife is the one responsible for the care during labour and birth, this room is otherwise managed by obstetricians. In case of referral, the secondary care giver will enter the birthing room and takes over the professional responsibility from the community midwife.

Although a woman is free to choose her preferred planned place of birth, in some occasions not all birth locations are available within her close neighbourhood, so some women have a birth centre in their neighbourhood, some a hospital and some both. In September 2013 there were 23 birth centres and 70 conventional hospital labour settings in the Netherlands[5]. It is unknown what percentage of women planned birth in a birth centre or in conventional hospital labour setting, because birth centres were

not yet as such identified nor included in the standard perinatal registration.

In the Netherlands, no research on the perinatal outcomes of planned birth centre births has been undertaken before. In other countries, studies on birth centre care have shown that low-risk women who planned to give birth in a birth centre experienced fewer interventions compared with women who planned birth in a conventional labour setting in a hospital. This included fewer intrapartum caesarean sections and lower use of obstetric analgesia and augmentation of labour [6–10]. The Birthplace study in England showed that adverse perinatal outcomes (intrapartum stillbirth, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, and specified birth related injuries including brachial plexus injury) were not significantly different for low-risk nulliparous women who planned birth in freestanding midwifery units and alongside midwifery units compared with planned birth in an obstetric unit. For multiparous women, birth in freestanding and alongside midwifery units significantly and substantially reduced the odds of experiencing an unplanned caesarean section, instrumental birth or episiotomy. No significant differences in adverse perinatal outcomes were found between planned home births or midwifery unit births and planned births in obstetric units for multiparous women [8]. Earlier research on the effect of planned place of birth in the Netherlands focused on the evaluation of planned birth in a conventional labour setting in a hospital and planned home birth [11,12]. The national effect of planned birth in a birth centre in the Netherlands is still unknown.

In 2009, a ministerial steering committee published a report that recommended – among other things – an investigation of the use of birth centres to improve perinatal outcomes. This was based on an assumption that birth centres might provide a higher quality of care because they offer a better opportunity for more integrated care [13,14]. The essence of integrated care is a continuum of care for service users, crossing the boundaries of public health, primary, secondary, and tertiary care [15–17]. The increase in the number of birth centres and its unknown effect in the Dutch maternity care system, as well as the assumption that birth centres might offer more integrated care, led in 2013 to a nationwide study: the Dutch Birth Centre Study (DBC study). The aim of that study was to evaluate birth centre care by investigating perinatal outcomes, experiences of clients and caregivers as well as economic outcomes [18]. The aim of the present study, part of the DBC study, is to assess the differences in Optimality Index-2015 between a planned birth in a birth centre planned birth in a hospital and at home for low-risk term women who start labour under the care of a community midwife. In addition, differences in the outcomes of a planned birth in different types of birth centres based on location and level of integration were studied.

Methods

A prospective cohort study was designed to compare the Optimality Index NL-2015 of planned birth in a birth centre compared with planned midwife-led hospital birth or planned home birth. Design and planning of the study were presented to the Medical Ethics Committee of the University Medical Centre Utrecht. They confirmed that this study agrees with Dutch legal regulations for the methods used. Because of this further formal ethical approval of this study was not required [19].

Setting and participants

Within the study period 1 July 2013 to 31 December 2013, community midwives were asked to record data for each birth that started under their care regardless of the planned place of birth. Recruitment of the midwives was done by three researchers (MHe, MHI and IB), two of whom are community midwives (one practising). In September 2013, there were 23 birth centres in the Netherlands according to the definition above [5]. Condition for participation in this study was that the birth centre was in service for more than half a year before the start of the study period, leading to the exclusion of two birth centres. A minimum of three midwifery practices working in the area of each birth centre in the Netherlands were randomly recruited to collect data for a minimum period of three months. After the midwifery practice agreed on participation, the number of expected births for the next three months was asked to calculate the number of expected planned birth centre births. If after the recruitment of three practices this was expected to be too low, a fourth or even fifth midwifery practice was approached to participate in the study. Midwifery practices in areas where there was the possibility for midwife-led hospital birth were randomly recruited based on their geographical location and level of urbanisation to collect data from planned midwife-led hospital births. Some midwifery practices had both options for an out-of-home birth as option for planned place of birth. Planned birth at home was an option for women in all participating midwifery practices. In total, data were obtained by 110 midwifery practices (127 were approached). In our study 21 birth centres out of the 23 birth centres that were present in the Netherlands at that time participated as well as 46 hospital locations where midwife-led birth was possible.

Birth centres can be distinguished based on their location in relation to the obstetric unit and based on their level of integration of care. Based on location, there were three types: 1) *freestanding* (not on hospital grounds), 2) *alongside* (separate from an obstetric unit but in a hospital or on hospital grounds) or 3) *on-site* (within an obstetric unit of a hospital). In case of referral, physical transfer to secondary care is needed for the freestanding and alongside birth centres (resp. by car or ambulance, or by wheelchair

or bed). In case a referral is needed at the on-site birth centre, the secondary caregiver enters the birthing room of the birth centre. In the Netherlands in September 2013, there were three freestanding birth centres, fourteen alongside and six on-site birth centres [5].

Boesveld *et al* classified birth centres into different types with distinctive characteristics. This classification was done according to their integration profile of maternity care: 1) *monodisciplinary-oriented birth centres* (MOBCs). MOBCs are more focused on being a facility to give birth in than on improving collaboration between maternity care providers or realising integration of care. The MOBCs are mainly owned by primary care organisations. 2) *Multidisciplinary-oriented birth centres* (MUBCs). MUBCs can be regarded as facilities to give birth in with a focus on integrated (birth) care. They have governance structures consisting of both primary and secondary care organisations. The disciplines involved have formulated a joint vision on birth care. The community midwife is still the person who is responsible for the care of low-risk pregnant women. 3) *Birth centres with a mixed profile* (MIBCs). MIBCs are a mixed group. They differ more from each other in their organisation than birth centres in the other groups. Compared with MUBCs these centres had higher scores on clinical integration (the coordination of person-focused care in a single process across time, place and discipline) and lower scores on the other dimensions (professional, organisational, system, functional and normative integration). In September 2013, there were ten MOBCs, six MUBCs and seven MIBCs in the Netherlands [13].

Data collection

In the Netherlands, individual baseline and perinatal outcome data are electronically collected in one national database: The Netherlands Perinatal Registry (Perined) [20]. To collect additional and more detailed data about process indicators and outcomes, a case report form (CRF) was developed for this study [18]. For each pregnancy, the obtained data of the CRF were linked to data from the Netherlands Perinatal Registry by means of unique anonymous identifiers for the client and midwifery practice. Linkage between these data was obtained at the office of Perined, and the key with unique identifiers stayed there at that location, as it was proposed in the design of this study and accepted by the ethics committee. If linkage was not completed because of lacking data in Netherlands Perinatal Registry the missing information was manually obtained from the client record in the midwifery practice and linked. Cases in which linkage between data from the CRF and data from the Netherlands Perinatal Registry, was not established were excluded. Processes and outcomes were considered as non-existing if there was no registration of them in the Netherlands Perinatal Registry.

Data were collected for all term (≥ 37 weeks gestational age) women at the start

of labour under care of a community midwife, regardless their planned place of birth. Excluded were women with a medium-risk situation (D-indications according to the List of Obstetric Indications, i.e. an obstetric history of postpartum haemorrhage or manual removal of the placenta [2]. Also, women with no specific choice for planned place of birth at the onset of labour were excluded.

Our primary main outcome measure was the Optimality Index-2015 (OI-NL2015), a tool to measure 'maximum outcome with minimal intervention'[21]. It emphasizes that in general childbirth is a normal physiologic process with high numbers of optimal processes and outcomes rather than a pathological process of disease. The OI-NL2015 is specifically useful to measure quality of obstetric care for women with low-risk pregnancies in which cases adverse perinatal outcomes are rare [22]. The adoption of the 'optimality concept' avoids the problem of defining what is normal or abnormal in obstetrical care, and it shifts the focus from rare adverse events, i.e. perinatal mortality, to evidence-based optimal events. The optimality index is designed to yield a summary score reflective of processes of care and clinical outcomes in relation to the background risk [21,23,24]. The OI-NL2015 has 31 items distributed over three clinical perinatal domains: intrapartum, postpartum and neonatal; each item meeting the criteria for optimality is scored '1'. It includes conditions (e.g., pre-eclampsia) and interventions (e.g., amniotomy, episiotomy, referral and epidural analgesia). Its reliability is demonstrated in earlier research [21]. The OI-NL2015 is based on items that were included in the national perinatal database. The former version of a Dutch optimality index included a perinatal background index to adjust for differences in maternal background [22]. Because almost none of these items are included in the national perinatal database the new version of the Optimality Index has to be adjusted, after calculating the sum score, for ethnicity, maternal age, social economic status and urbanisation level [21].

Our secondary outcome measure was a description of a maternal and perinatal Composite Adverse Outcome score (CAO). Adverse maternal and neonatal outcomes were used to assess the effect of a planned birth in a birth centre compared to alternative settings on adverse outcomes. The CAO is a percentage based on the presence of at least one of the following adverse outcomes: maternal death (within 42 days of giving birth), third or fourth degree of perineal tear, postpartum haemorrhage (>1000 mL in 24 hours, stillbirth diagnosed after presentation in labour, early neonatal death (<7 days), Apgar score <7 after 5 min and admission to a neonatal unit within 48 hours after birth [25].

Data analysis

To determine whether there was a difference in optimality index between subgroups the sum scores of the 31 items of the OI-NL2015 were analysed. Both outcome measures

were adjusted for background variables (maternal age (mean), social economic status (SES) (high/medium/low), urbanisation (<500 addresses per km²/500-1500 addresses per km²/≥1500 addresses per km²) and ethnicity (Dutch/non-Dutch)) because other studies have shown that they may vary among women with different planned places of birth and not all birth locations were available within a women's close neighbourhood [21,26]. Urbanisation and SES were based on the characteristics of the four digital postal code area in which the participants live (level of income, educational level, position in the labour market) [27]. Because of the large differences in interventions and outcomes between nulliparous and multiparous women, analyses were performed separately [28].

To answer the research question, planned place of birth in a birth centre (reference group) was compared with planned place of birth in a hospital and home. To find out if location or level of integration of a birth centre would affect the outcome, we performed subgroup analyses between the different types of birth centres based on location and on integration level. Planned place of birth in an alongside birth centre (reference group) was compared with planned place of birth in a freestanding and an on-site birth centre [5]. Planned place of birth in multidisciplinary-oriented birth centres (MUBCs; reference group) was compared with planned place of birth in monodisciplinary-oriented birth centres (MOBCs) and with birth centres with a mixed integration profile (MIBCs) [13]. The sample size for this study was calculated to detect differences between the different type of birth centres on the OI-NL2015. A sample size of nine birth centres per level of integration with 66 women per centre would achieve 80% power to detect an effect size of 0.2 (ICC=0.005, alpha=0.05) for the OI-NL2015 between the three levels of integration [11]. Midwifery practises working with all eligible birth centres were asked to participate in this study to avoid clustering of birth centres. Based on this assumption, the power of this study would be enough to detect differences for our primary outcome measurement. All analyses were performed according to the intention-to-treat principle: data for women were analysed as belonging to the group of planned place of birth in which they were originally included.

Chi-square tests were conducted within the nulliparous and multiparous group to compare the general characteristics and frequencies of optimality between planned places of birth [19]. Logistic regression analyses were performed to adjust the frequencies of optimality and composite adverse outcome score for the general characteristics (maternal background, social economic status and urbanisation). Linear regression analyses were performed within the nulliparous and multiparous group to compare maternal age and the optimality index between all different planned places of birth. Effect sizes (Cohen's *d*) were calculated to examine the magnitude of the differences in OI-NL2015 between groups. It was interpreted as proposed by Cohen: small (0.2), medium (0.5) and large (0.8) [29].

Although we only performed statistical tests to answer the research questions, multiple tests were performed. To take this into account, it was decided to show three levels of significance (p-values: <0.05, <0.005, <0.001) for correct interpretation of the results.

All analyses were performed in the Statistical Package for Social Sciences (SPSS) version 22.0 (SPSS Inc., Chicago, IL, USA).

Women's involvement

Representatives of pregnant women, organized in "het Ouderschap" took place in the advisory committee of the Dutch Birth Centre Study to advise on the set-up, planning and interpretation of the results.

Women were involved by asking for their experiences at another study that was also part of the Dutch Birth Centre Study [30]. We are planning to disseminate the results of this study by means of infographics for use in the midwifery practices as a tool to inform women and their partners on the effect of planned place of birth. Results of this study will also be presented to midwives in structured peer-reviewed group sessions where the topic planned place of birth will be critically appraised.

Results

After applying our exclusion criteria, 3455 women were included in the study as shown in Figure 1: 1668 planned birth centre births, 701 planned hospital births and 1086 planned home births.

Table 1 shows the characteristics of the study population by planned place of birth. Nulliparous women who planned birth in a birth centre lived in more densely populated areas compared with nulliparous women who planned birth in a hospital (respectively, 45.0% and 30.8%; $p < 0.05$). Compared with women with a planned home birth, women with a planned birth centre birth were more often non-Dutch of origin, had a lower social economic status and lived in more densely populated areas.

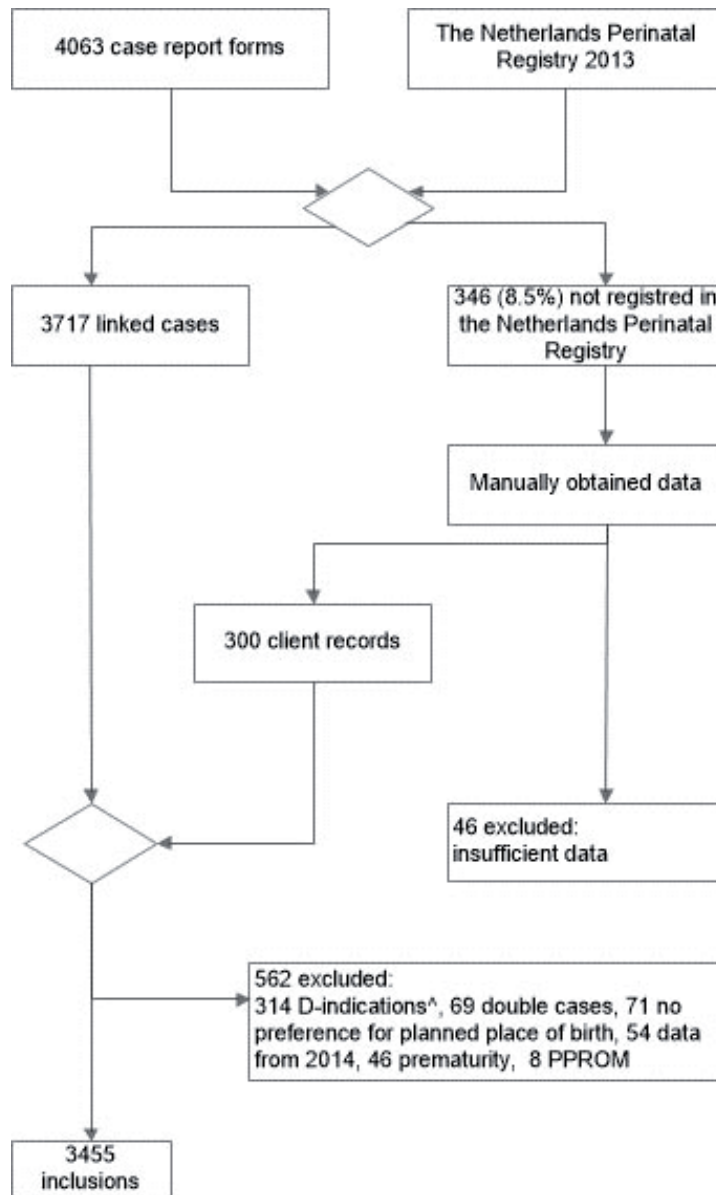


Figure 1 • Flow diagram of study selection for inclusion

^ D-indications according to the List of Obstetric Indications: due to medium-risk situation birth on obstetric unit [2]

PPROM = premature prelabour rupture of membranes

Table 1 • Characteristics of women with low-risk pregnancies by planned place of birth at start of labour

	NULLIPAROUS			MULTIPAROUS		
	birth centre (reference) n(%)	hospital ¹ n(%)	home n(%)	birth centre (reference) n(%)	hospital ¹ n(%)	home n(%)
Maternal background	939	348	399	729	353	687
Dutch	750 (79.9)	270 (77.6)	386 (96.7)***	524 (71.9)	261 (73.9)	649 (94.5)***
Non Dutch	189 (20.1)	78 (22.4)	13 (3.3)	205 (28.1)	92 (26.1)	38 (5.5)
Social Economic Status						
Low	123 (13.3)	36 (10.9)	25 (6.3)***	121 (17.0)	44 (12.9)	28 (4.1)***
Medium	637 (68.9)	243 (73.4)	330 (83.3)	476 (67.0)	239 (70.3)	558 (81.9)
High	165 (17.8)	52 (15.7)	41 (10.4)	113 (15.9)	57 (16.8)	95 (14.0)
Urbanization						
Densely populated areas (\geq 1500 / km ²)	412 (45.0)	101 (30.8)***	80 (20.4)***	293 (42.0)	127 (38.3)	132 (19.5)***
Intermediate density areas (500 - 1500 / km ²)	215 (23.5)	87 (26.5)	120 (30.5)	188 (26.9)	80 (24.1)	185 (27.4)
Thinly populated areas (<500 / km ²)	288 (31.5)	140 (42.7)	193 (49.1)	217 (31.1)	125 (37.7)	359 (53.1)
Maternal age (Mean in years) (SD)	29.6 (4.5)	28.9 (4.2)*	28.3 (4.2)	32.2 (4.3)	32.1 (4.0)	32.4 (4.6)
Gestation (Mean in days) (SD)	280 (7.4)	279 (7.3)	280 (7.6)	281 (6.4)	280 (6.6)	281 (6.8)

¹ = community midwife-led

SD = standard deviation

* p < 0.05

*** p < 0.001

Individual items of the Optimality Index-2015

Planned place of birth in a birth centre compared with alternative places

The frequency of optimality for the items of the Optimality Index-NL2015 are listed in Table 2 for the different planned places of birth. Interventions as epidural analgesia and episiotomy were less common in multiparous women, confirming the need to consider these women separately. For 31.8% nulliparous and 64.4% multiparous women who planned birth in a birth centre, the final place of birth was the same as the planned place of birth. Of the women who planned a midwife-led hospital or a home birth, respectively, 40.2% and 45.6% of nulliparous women and, respectively, 59.5% and 84.6% of the multiparous women succeeded in this intention.

For nulliparous women, the individual items of the OI-NL2015 demonstrated a few differences between planned place of birth in a birth centre and in a hospital, that is, 'no referral during labour or within 2 hours postpartum' and 'no use of oxytocin for augmentation of labour'.

For multiparous women, there were no differences in the proportion of any of the items of the OI-NL2015 between women who planned birth in a birth centre compared with women who planned to give birth in a hospital.

Higher proportions of optimal items were found for women who planned to give birth at home than for those who planned birth in a birth centre on the items 'no referral during labour or within 2 hours postpartum', 'no use of oxytocin for augmentation of labour', 'no injectable medication for pain relief during first or second stage of labour' and 'no epidural analgesia for labour and/or birth'.

Location of birth centre in relation to the obstetric unit

The final place of birth was less often in the planned place of birth for women who planned birth in an alongside birth centre (reference group) compared with women who planned birth in a freestanding birth centre (nulliparous: alongside 30.6%, freestanding 69.7%; multiparous: alongside 62.0%, freestanding 81.3%). Multiparous women who planned birth in an on-site birth centre were also more likely to give birth at their planned place (71.6%) compared with the reference group (62.0%).

For nulliparous women who planned to give birth in an alongside birth centre, 'no referral' occurred less often (29.3%) compared with nulliparous women who planned to give birth in a freestanding birth centre (57.6%). For multiparous women with planned birth in an alongside birth centre 'no referral' was less common (66.2%) compared with planned births in a freestanding birth centre (87.5%).

'No amniotomy' and 'no episiotomy' occurred more often in women who planned

to give birth in an on-site birth centre compared with women who planned to give birth in an alongside birth centre ('no amniotomy': nulliparous: on-site 64.3%, alongside 49.9%; multiparous: on-site 54.6%, alongside 35.0% ; 'No episiotomy': nulliparous: on-site 69.6%, alongside 57.7%; multiparous: on-site 92.8%, alongside 87.5%). In the comparison between these two locations, the item 'no manual placental removal' occurred more often for the women who planned to give birth in an alongside birth centre (nulliparous: alongside 97.7%, on-site 94.7%; multiparous: alongside 99.0%, on-site 96.9%).

No other differences were seen between the different planned locations of birth centres in relation to the obstetric unit on the items of the OI-NL2015.

Integration profiles of the birth centre

'No urgent referral' was more likely for nulliparous women who planned birth in MUBCs (the multidisciplinary oriented group) (95.9%) compared with MIBCs (the mixed group) (90.9%). Also 'blood loss < 1000 mL' was less likely for women planning birth in MIBCs (87.4%) compared with those planning birth in the other birth centres (MOBCs 94.4% (the monodisciplinary oriented group) and MUBCs 96.3%). 'Apgar score ≥ 9 after 5 minutes' was less likely in MUBCs (91.8%) compared with MOBCs (95.6%) for nulliparous women.

A higher proportion of women with planned birth in a birth centre within the group of multidisciplinary oriented birth centres had 'no amniotomy' compared with women with planned birth in a monodisciplinary oriented birth centre or a birth centre from the mixed group (nulliparous: MUBCs 63.9%, MOBCs 50.2% MIBCs 47.5%; multiparous: MUBCs 53.7%, MOBCs 34.2% MIBCs 38.4%).

Optimality Index NL-2015

Multiparous women had a higher mean sum score (28.3) (a more favourable outcome) on the OI-NL2015 than nulliparous women (26.0).

Birth centre compared with alternative places

As shown in Table 3a, nulliparous women who planned birth in a birth centre had a lower mean score on the OI-NL2015 (25.8) compared with nulliparous women who planned birth in a hospital (26.0, $p < 0.05$). The effect size of this difference was 0.07 (non-trivial). There was no significant difference between multiparous women who planned birth in a birth centre or in a hospital. Both nulliparous and multiparous women who planned birth in a birth centre had lower scores on the OI-NL2015 compared with women with the same parity that planned birth home (nulliparous: birth centre 25.8,

Table 2 • Frequency of optimality by planned place of birth

	NULLIPAROUS			MULTIPAROUS		
	birth centre (reference) n=939 (%)	hospital ² n=348 (%)	home n=399 (%)	birth centre (reference) n=729 (%)	hospital ² n=353 (%)	home n=687 (%)
time between rupture of membranes and birth <= 24u	861 (91.7)	321 (92.2)	367 (92.0)	706 (96.8)	345 (97.7)	669 (97.4)
duration first stage <= 120 hr	927 (98.7)	344 (98.9)	394 (98.7)	729 (100)	353 (100)	686 (99.9)
duration second stage <= 120 min	932 (99.3)	346 (99.4)	394 (98.7)	728 (99.9)	353 (100)	687 (100)
amniotic fluid is clear	766 (81.6)	286 (82.2)	337 (84.5)	607 (83.3)	293 (83.0)	597 (86.9)
no use of oxytocin for augmentation of labour	470 (50.1)	208 (59.8)**	248 (62.2)***	619 (84.9)	314 (89.0)	634 (92.3)***
no amniotomy	496 (52.8)	167 (48.0)	204 (51.1)	290 (39.8)	132 (37.4)	299 (43.5)
no injectable medication for pain relief during first or second stage of labour	563 (60.0)	215 (61.8)	281 (70.4)***	631 (86.6)	302 (85.6)	661 (96.2)***
no epidural analgesia for labour and/or birth	670 (71.4)	257 (73.9)	320 (80.2)**	685 (94.0)	327 (92.6)	677 (98.5)***
birth occurred in the place originally planned at the onset of labour	299 (31.8)	140 (40.2)**	182 (45.6)***	477 (65.4)	210 (59.5)	581 (84.6)***
fetal presentation at birth was cephalic	938 (99.9)	348 (100)	399 (100)	729 (100)	352 (99.7)	687 (100)
occipital foetal presentation	932 (99.3)	345 (99.1)	393 (98.5)	728 (99.9)	350 (99.2)	682 (99.3)
no instrumental (vaginal) birth	730 (77.7)	279 (80.2)	314 (78.7)	709 (97.3)	337 (95.5)	674 (98.1)
birth was vaginal not caesarean	864 (92.0)	330 (94.8)	377 (94.5)	722 (99.0)	347 (98.3)	684 (99.6)
no episiotomy	569 (60.6)	191 (54.9)	244 (61.2)	645 (88.5)	313 (88.7)	634 (92.3)*
no 1st or 2nd degree laceration of perineum or perineal tissue requiring sutures (including sulcus and cervical lacerations)	158 (16.8)	55 (15.8)	59 (14.8)	221 (30.3)	111 (31.4)	272 (39.6)***
no blood transfusion	925 (98.5)	343 (98.6)	390 (97.7)	725 (99.5)	347 (98.3)	682 (99.3)
no other serious intrapartum complications ²	939 (100)	348 (100)	399 (100)	729 (100)	353 (100)	687 (100)
no referral during labour or within 2 hours postpartum	281 (29.9)	127 (36.5)*	167 (41.9)***	497 (68.2)	233 (66.0)	558 (81.2)***
no urgent referral	893 (95.1)	332 (95.4)	381 (95.5)	709 (97.3)	336 (95.2)	668 (97.2)
no manual placental removal	912 (97.1)	341 (98.0)	393 (98.5)	718 (98.5)	350 (99.2)	681 (99.1)

Table 2 • Continued Frequency of optimality by planned place of birth

	NULLIPAROUS			MULTIPAROUS		
	birth centre (reference) n=939 (%)	hospital ² n=348 (%)	home n=399 (%)	birth centre (reference) n=729 (%)	hospital ² n=353 (%)	home n=687 (%)
duration of gestation 37-42 weeks	937 (99.8)	348 (100)	398 (99.7)	729 (100)	353 (100)	683 (99.4)
birth weight P10-P90	850 (90.5)	317 (91.1)	349 (87.5)	664 (91.1)	325 (92.1)	608 (88.5)
Apgar score at 5 minutes ≥ 9	925 (98.5)	342 (98.3)	396 (99.2)	726 (99.6)	351 (99.4)	687 (100)
no congenital anomalies	932 (99.3)	344 (98.9)	397 (99.5)	724 (99.3)	350 (99.2)	683 (99.4)
no birth trauma within 24 hours postpartum ³	939 (100)	348 (100)	398 (99.7)	729 (100)	352 (99.7)	686 (99.9)
no serious maternal postpartum complications ⁴	939 (100)	348 (100)	399 (100)	729 (100)	353 (100)	687 (100)
no 3rd or 4th degree extension of either an episiotomy or a 1 st - or 2nd degree laceration	901 (96.0)	345 (99.1)**	381 (95.5)	716 (98.2)	346 (98.0)	676 (98.4)
loss of blood < 1000 ml	877 (93.4)	322 (92.5)	371 (93.0)	706 (96.8)	339 (96.0)	666 (98.9)
no transfer to high risk neonatal care setting within 24 hours postpartum	934 (99.5)	346 (99.4)	396 (99.2)	725 (99.5)	353 (100)	687 (100)
no perinatal death within 24 hours postpartum	939 (100)	347 (99.7)	399 (100)	729 (100)	353 (100)	687 (100)
no maternal mortality within 24 hours after birth	939 (100)	348 (100)	399 (100)	729 (100)	353 (100)	687 (100)

¹ community midwife-led² this includes (pre-) eclampsia or HELLP syndrome present during intrapartum period, placental abruption, placenta praevia discovered during intrapartum period, infected uterus before birth, uterine rupture⁴ this includes Erb's palsy, clavicular fracture and cephalo hematoma³ this includes (eclampsia, deep venous thrombosis, pre-eclampsia or HELLP syndrome present during postpartum period, pulmonary embolism postpartum)

* after adjusted for maternal age, maternal background, urbanization and social economic status p < 0.05

** after adjusted for maternal age, maternal background, urbanization and social economic status p < 0.01

*** after adjusted for maternal age, maternal background, urbanization and social economic status p < 0.001

home 26.3; $p < 0.005$; multiparous: birth centre 28.1, home 28.8; $p < 0.001$). The effect size for this difference was 0.18 for nulliparous women (small) and 0.36 for multiparous women (small to medium).

Table 3a • Optimality Index NL-2015 for women with low-risk pregnancies by their planned place of birth at start of labour

Planned place of birth	NULLIPAROUS			MULTIPAROUS		
	n	Mean (SD)	Adj. B (95% CI)‡	n	Mean (SD)	Adj. B (95% CI)‡
Birth centre	939	25.8 (2.68)	reference	729	28.1 (2.17)	reference
Hospital (midwife-led)	348	26.0 (2.71)	0.40 (0.05, 0.74)*	353	28.0 (2.14)	-0.05 (-0.31, 0.21)
Home	399	26.3 (2.80)	0.53 (0.19, 0.86)**	687	28.8 (1.70)	0.85 (0.63, 1.07)***
Birth centre by location						
Free standing	33	27.4 (2.60)	1.69 (0.75, 2.62)**	32	28.6 (1.60)	0.75 (-0.05, 1.54)
Alongside	699	25.7 (2.66)	reference	503	27.9 (2.24)	reference
On-site	207	25.8 (2.67)	0.08 (-0.35, 0.52)	194	28.4 (2.03)	0.48 (0.10, 0.84)*
Birth centre by integration profile						
MOBC	522	25.7 (2.67)	-0.29 (-0.72, 0.15)	401	27.9 (2.30)	-0.55 (-0.95, -0.15)**
MIBC	198	25.7 (2.75)	-0.32 (-0.84, 0.20)	151	28.0 (2.08)	-0.09 (-0.57, 0.39)
MUBC	219	26.0 (2.64)	reference	177	28.5 (1.85)	reference

‡ = adjusted for maternal age, ethnicity, urbanization and social economic status SD = Standard Deviation

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

MOBC = monodisciplinary oriented birth centre; MIBC = the mixed group of birth centres; MUBC = the multidisciplinary oriented birth centre

Location of the birth centre in relation to the obstetric unit

Nulliparous women with planned place of birth in an alongside birth centre had a lower score on the OI-NL2015 than those with planned place of birth in a freestanding birth centre (25.7 vs. 27.4, $p < 0.005$). The effect size of this difference was 0.64 (medium to high). Multiparous women who planned birth in an on-site birth centre had a higher score on the OI-NL2015 compared with those who planned birth in an alongside birth centre (28.4 vs. 27.9, $p < 0.05$). The effect size of this difference was 0.24 (small).

Integration profiles of the birth centre

For nulliparous no differences were found between the different types of birth centres based on their integration profile. Multiparous women who planned birth in a MUBC (multidisciplinary oriented birth centre) had a higher mean score on the OI-NL2015 compared with the women who planned birth in a MOBC (monodisciplinary oriented birth centre (28.5 vs. 27.9, $p < 0.005$)). The effect size of this difference was 0.28 (small).

Composite Adverse Outcome score

Table 3b demonstrates the frequencies of the CAO between the different planned places of birth. Overall, an adverse perinatal outcome was rare. On average, multiparous women had an adverse outcome less frequent than nulliparous women.

Table 3b • Composite Adverse Outcome Score for women with low-risk pregnancies by their planned place of birth at start of labour

Planned place of birth	NULLIPAROUS		MULTIPAROUS	
	n	Mean (SD)	n	Mean (SD)
Birth centre	939	12.1	729	5.5
Hospital (midwife-led)	348	10.3	353	6.2
Home	399	11.8	687	4.5
Birth centre by location				
Free standing	33	9.1	32	3.1
Alongside	699	11.9	503	5.6
On-site	207	13.5	194	5.7
Birth centre by integration profile				
MOBC	522	10.7	401	5.2
MIBC	198	18.7	151	5.3
MUBC	219	9.6	177	6.2

SD = Standard Deviation

MOBC = monodisciplinary oriented birth centre; MIBC = the mixed group of birth centres; MUBC = the multidisciplinary oriented birth centre

Discussion

Summary of main findings

Our study demonstrated that clinically, there was no relevant difference in scores on the Optimality Index-NL2015 (OI-NL2015) for women who planned to give birth in a birth centre compared with women who planned to give birth in a hospital. Only the difference between planned birth centre birth and planned home birth had a small to medium effect size: a higher score on the OI-NL2015 for women with planned home birth compared with planned birth in a birth centre.

Strengths and limitations

This was the first prospective cohort study of perinatal outcomes of planned birth in a birth centre compared with a planned birth in a hospital or at home in the Netherlands. The OI-NL2015 focused on an evidence-based optimal approach of maternity care

instead of a focus on serious adverse outcomes. Comparing groups on OI-NL2015 may show differences in processes during labour, birth and the postpartum period. Improvement of these processes could directly lead to less interventions potentially leading to better perinatal care. Although the Optimality Index is not a commonly used outcome measure it has been shown to be valuable over a decade in distinguishing processes of maternity care across and within various groups [31]. The second approach for outcomes (CAO) is more commonly used and focused on serious adverse perinatal outcomes [32,33].

Data from the Netherlands Perinatal Registry are more often used for perinatal research in the Netherlands. It is unclear if not registered data in this database are not registered because they did not happen or that they are missing. In line with other research that uses these data we considered them as not happened. It is possible that this assumption has led to a higher sum score of the OI-NL2015 (more optimal result) and an underestimation of the composite adverse outcome score.

In our study there was an unexpected 8.5% missing of data from the Netherlands Perinatal Registry. Besides a random single missing case, complete periods with data were missing from some community midwife practices. The information on missings was shared with Perined in order to identify the cause and make it possible to solve this problem.

This study ensured comparability of the subgroups by adjusting for confounding baseline characteristics. However, women's choice for planned place of birth often reflects their underlying perception of pregnancy and childbirth. These differences have not exactly been quantified in previous studies [34,35]. Although we adjusted for common baseline characteristics, adjusting for attitude (e.g. anxiety towards birth) and lifestyle (e.g. smoking) was not possible in the current study. The differences in outcomes may therefore partly be a result of these confounders instead of the differences in planned location of birth.

We found that nulliparous women who planned birth in a freestanding birth centre had a higher mean score on the OI-NL2015 compared with those who planned birth in an alongside birth centre. The effect size of this difference was 0.64 (medium). Also, almost all inclusions of women with planned place of birth in a freestanding birth centre originated from one region in the Netherlands. This region is known for its conservative attitude towards health care in general, which may have its reflection on the perception of care of pregnant women as well as on the professional attitude of the community midwives working there. Therefore we want to be prudent to generalize our results of planned births in a freestanding birth centre to the rest of the Dutch population. Although all women who planned birth out of home are free to choose the specific location they plan to give birth in, regional circumstances may influence their final

choice e.g. facility nearest to their home available.

The enthusiastic participation of the community midwives showed the involvement and interest in this research. Their high participation rate reduced the selection bias on variation in practice among community midwives. With regard to participation of the birth centres: all eligible Dutch birth centres participated in this prospective national cohort study. The number of inclusions of planned births in the freestanding birth centres were low but in line with their annually reported low numbers of births and the number of freestanding birth centres (three) in the Netherlands.

Interpretation of the results

The difference in OI-NL2015 for women who planned birth in a birth centre compared with home was mostly due to a lower proportions of 'non referrals'. Referral had a direct effect on the score of the individual items of the OI-NL2015, as referral often leads to the start of a cascade of interventions [36]. Further analyses showed that the most important reason for this difference in number of referrals was found in referrals for failure to progress in first stage and a need for pain relief. This result was also demonstrated in earlier research on this subject [37]. In July 2014 the Dutch Minister of Health, Welfare and Sports included the use of nitrous oxide as an alternative analgesia for use during labour on the list of medications to be used in primary midwife-led care. Nitrous oxide is allowed under strict requirements for ventilation of the environment and source extraction [38,39]. It is shown to be beneficial as analgesia during labour and can be used in primary midwifery-led care in case all conditions for safety are fulfilled [40]. Although it is not possible to fulfil these conditions in case of home births, birth centres can be a suitable place to offer this method for pain relief [29]. Reduction of the number of referrals to secondary care could be the result.

Comparisons between birth centres distinguished by location or integration profile demonstrated that in cases of a difference in the OI-NL2015, this was only a (very) small effect size. This effect was not homogenous across the different parities, and therefore no conclusions can be made between the different types of birth centres. A significant difference in the numbers of 'no amniotomy' was found between women with planned birth in an alongside birth centre and planned birth in an on-site birth centre. In case of meconium stained liquor women in an alongside birth centre need to be transferred to another room in the same hospital after referral, in contrast to women in an on-site birth centre. As it did not contribute to more referral for meconium stained liquor, the need for amniotomy in this group should be studied in further research.

Birth centres offer facilities that may improve the chances on physiological childbirth like a birthing chair, a bath and continuous one to one support from a maternity care assistant [5]. The actual use of these facilities and the choice of birthing position depends

among other things on the perception of childbirth and the acquaintance of these facilities by the expecting woman and her partner. Also the preferences and attitude of the attending community midwife are factors that co-influence these choices [41]. Evidence-based information about factors that make a physiological birth more or less likely, should be presented antenatally to all women. The effect of the different options for planned place of birth should be included.

A clear comparison of the findings from this study to those of other birth centre studies is hard to make because the primary outcome measurement tool (OI-NL 2015) was not used before in this type of research. Other studies often focus on the prevalence of adverse outcomes and interventions instead of optimal outcomes [6-9]. The Birth Place study in England found that women who planned birth in a midwifery unit (alongside or freestanding) had significantly fewer interventions, including substantially fewer intrapartum caesarean sections, and more spontaneous vaginal births than women who planned birth in an obstetric unit [6]. That difference was not found in this study. The Birth Place study as well as this study showed that home birth is a good option for low-risk women to give birth under the care of a midwife. For women who do not want to give birth at home, birth centres are an alternative option to give birth in a homelike environment.

Personal preferences and attitude toward defining the boundaries of physiological birth may also play an important role in the use of facilities by the attending midwife to support physiological birth. In general there is a considerable variation among this [42]. Offerhaus *et al* showed two contrasting attitudes: 1) community midwives who 'emphasize physiology', focused on expectant management and tailor made decisions and 2) community midwives 'operating on the safe side', characterised by early anticipation on risks and adherence to protocols, leading to higher referral rates. As this attitude influences the whole process of care, planned place of birth is potentially coinfluenced by this. Awareness of a community midwife's personal attitude and monitoring personal referral behaviour can help to maintain high quality midwifery care. Being aware of a high referral rate can stimulate community midwives to reflect critically on what circumstances effects this rate and whether they personally can improve their care in supporting and promoting physiological childbirth, as described in the recent *Lancet* series [36,43]. A birth centre, with its homelike atmosphere and facilities to promote physiological childbirth, could be a suitable place for women who do not want to give birth at home.

Conclusion

This study showed that birth centres are a good alternative to give birth for the increasing number of women who do not want to give birth at home. Perinatal outcomes of planned birth centre births are comparable to planned midwife-led hospital births. Women with planned home birth had a higher OI-NL2015 compared with women with planned births in a birth centre. The pros and cons of the different places of birth should be clearly explained to women and their partners to make an informed choice on their planned place of birth.

Acknowledgements

The authors would like to thank the participating women and community midwives for their time and effort in this research. We also would like to thank Joyce Dijs and Chantal Hukkelhoven for their support with the data of the Netherlands Perinatal Registry. Special thanks to Roger Heydanus for his expertise in scientific writing in English. This study was supported by grants from the Netherlands Organisation for Health Research and Development (ZonMw) [Grant no. 209020012].

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Cost-effectiveness of a planned
birth in a birth centre compared
with alternative planned places
of birth

Results of the Dutch Birth Centre Study

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Abstract

Objectives To estimate the cost-effectiveness of a planned birth in a birth centre compared with alternative planned places of birth for low-risk women. In addition, a distinction has been made between different types of locations and integration profiles of birth centres.

Design Economic evaluation based on a prospective cohort study.

Setting 21 Dutch birth centres, 46 hospital locations where midwife-led birth was possible and 110 midwifery practices where home birth was possible.

Participants 3455 low-risk women under the care of a community midwife at the start of labour in the Netherlands within the study period 1 July 2013 - 31 December 2013.

Main outcome measures Costs and health outcomes of birth for different planned places of birth. Health care costs were measured from start of labour until 7 days after birth. The health outcomes were assessed by the Optimality Index-NL2015 (OI) and a composite adverse outcome score.

Results The total adjusted mean costs for births planned in a birth centre, in a hospital and at home under the care of a community midwife were €3.327, €3.330 and €2.998, respectively. There was no difference between the score on the OI for women who planned to give birth in a birth centre and that of women who planned to give birth in a hospital. Women who planned to give birth at home had better outcomes on the OI (higher score on the OI).

Conclusions We found no differences in costs and health outcomes for low-risk women under the care of a community midwife with a planned birth in a birth centre and in a hospital. For nulliparous and multiparous low-risk women, planned birth at home was the most cost-effective option compared with planned birth in a birth centre.

Introduction

The Dutch maternity care system is based on risk attribution: independent community midwives providing care for low-risk pregnant women (primary care) and obstetricians providing in-hospital care for high-risk women (secondary care). The risk attribution with reasons for consultation and referral are set out in a multidisciplinary guideline: the List of Obstetric Indications (1). Low-risk pregnant women can choose where they want to give birth: at home, in a hospital or in a birth centre. The community midwife assists them during natal care, pregnancy and the postpartum period. Most midwives work in group practices in the community and they are autonomous as regards their actions and decisions (2). If a pregnant woman's risk status changes during her pregnancy or labour or she requests pharmacological pain relief, she will be referred from primary care to secondary care.

Over the past decade fewer women planned to give birth at home. In 2004, around 48% of all low-risk births in the Netherlands were planned at home; in 2014 this number fell to 24% (3). As most low-risk women in the Netherlands are now planning to give birth outside their home, it is necessary to offer these women a good alternative. Birth centres are a relatively new phenomenon in the Netherlands and most of them have been established in the last decade. Birth centres are regarded as settings where women with low-risk pregnancies can give birth in a homelike environment, supervised by a community midwife. When complications arise or pharmacological pain relief is requested, referral to an obstetrician/paediatrician is needed (4-6). During birth the community midwife is assisted by a maternity care assistant. This assistant provides care and support for the mother and her baby for up to eight days after birth, in a birth centre or at home.

The costs and health outcomes of the different birth settings in the Netherlands (i.e., hospital and home) for low-risk women have been widely discussed in recent years (7-11), especially since the national perinatal mortality rate was shown to be one of the highest in Europe (12). The results of the studies were linked directly to the operational set-up of the Dutch maternity care system, with its clear segmentation of primary (community midwife-led) and secondary care (obstetrician-led) and lack of collaboration. It is, however, assumed that birth centres provide a better quality of care when compared to the existing system of primary and secondary care. One reason for this may be that colocation of birth centres and obstetric units is an enabler for better collaboration (13). At present, there is no evidence for this assumption.

A Dutch study found that the total costs associated with pregnancy, childbirth and postpartum care are comparable for home birth and hospital birth under the care of a community midwife (14). Evidence relating to costs and health outcomes of all Dutch

low-risk birth settings, including birth centres, is still lacking. The costs and health outcomes of birth-centre care have been studied internationally. In England, planned birth at home is the most cost-effective option compared with planned birth in an alongside or freestanding midwifery unit and an obstetric unit (15). The results of other studies on costs and health outcomes of midwifery-attended births in England, the United States of America and Australia were comparable to the British study (16-21).

However, the outcomes of these studies cannot easily be generalised to the Netherlands, since the Dutch system is different, with a relatively high rate of home births and a low rate of medical interventions compared to other high-income countries (7). We therefore studied the costs and health outcomes of Dutch birth centre care as part of the Dutch Birth Centre Study, a national project evaluating the outcomes of Dutch birth centres on aspects such as client and professional experiences, effectiveness and costs (4). The aim of this study is to estimate the cost-effectiveness of planned birth in a birth centre compared with alternative planned places of birth for low-risk women who start labour under the care of a community midwife. In addition, a distinction has been made between different types of locations and integration profiles of birth centres.

Methods

The cohort study included 3455 term low-risk women under the care of a community midwife at the start of labour. The characteristics of these women, the exclusion criteria and the analyses on the health outcomes have been reported in detail elsewhere (22). A minimum of three midwifery practices located near a birth centre ($n=23$) were randomly recruited to collect data. A condition for participation was that the birth centre had been operating for over six months before the study period, leading to the exclusion of two birth centres. Midwifery practices in regions where there was the possibility of a midwifery-led hospital birth were recruited to collect data relating to planned midwife-led hospital births. Planned birth at home was an option for women in all participating midwifery practices. The women were recruited from 110 midwifery practices (127 were approached) within the study period 1 July 2013 - 31 December 2013. Twenty-one birth centres and 46 hospital locations where midwife-led birth was possible participated in this study (22).

The cohort study compared perinatal and maternal outcomes, according to the intention-to-treat method, by planned place of birth: in a birth centre, in a hospital or at home. The intention-to-treat method is used to prevent distortion in outcomes resulting from selective drop-out in the groups to be investigated. In maternity care research the place of birth is a variable where selective drop-out occurs as a result of referrals

to secondary care during childbirth. By analysing the outcomes based on the planned place of birth, the groups remain comparable (23). Separate analyses were performed for different types of birth centres, based on location and based on integration profile. Three types of birth centre locations can be distinguished: 1) freestanding from a hospital, 2) alongside an obstetric unit and 3) on-site at an obstetric unit (24).

We also distinguished three integration profiles: monodisciplinary-oriented birth centres (MOBC), multidisciplinary-oriented birth centres (MUBC) and a mixed group of birth centres (MIBC). Integrated care is increasingly encouraged in maternity care systems (25). The essence of integrated care is a continuum of care for service users, crossing the boundaries of public health, primary, secondary, and tertiary care (25-27). The focus of MOBCs is to act as a facility for giving birth rather than to improve collaboration between care providers or to realise integration of care, and MOBCs are mainly owned by primary care organisations. MUBCs can be regarded as facilities for giving birth with a focus on integrated birth care. They have governance structures consisting of both primary and secondary care organisations. The disciplines involved have formulated a joint vision on birth care. The community midwife is still the person who takes care of low-risk pregnant women. MIBCs are a mixed group. They differ more from each other in their organisation than centres in the other groups. Compared with MUBCs these centres had higher scores on clinical integration (the coordination of person-focused care in a single process across time, place and discipline) and lower scores on the other dimensions (professional, organisational, system, functional and normative integration) (28).

The primary clinical outcomes were measured by the Optimality Index-NL2015 (OI) (29) and a composite adverse outcome score (CAO) was used as a secondary outcome measure (30). The OI is a tool used to measure 'maximum outcome with minimal intervention', based on the principle of optimality. It contains both process and outcome items and background characteristics are taken into account. The tool is used to compare the extent to which different low-risk groups, with few adverse outcomes, achieve an optimal situation. An optimal situation is a situation that every woman would wish for: a spontaneous, uncomplicated birth after a full-term pregnancy, without interventions, resulting in a healthy mother and baby (31-33). The tool was revised for use in Dutch obstetric research (29). It contains 31 process and outcome items with evidence-based criteria relating to optimality (e.g., duration of first and second stage, instrumental (vaginal) birth, loss of blood during birth, referral during labour or within 2 hours postpartum and birth weight). Each item meeting the criteria for optimality was scored as '1'. Those considered non-optimal were scored as '0'. In this way a sum score of all 31 items per woman was calculated (31-33). In addition, the composite adverse outcome score (CAO), a combined measure of six distinct adverse outcomes (maternal mortality within 42 days of birth, (sub) total rupture, blood loss of more than one litre,

perinatal mortality within 7 days of birth, Apgar score below 7 at 5 minutes after birth, admission to the neonatal intensive care unit within 48 hours of birth), was used. This measure is based on the occurrence of at least one of these six adverse outcomes and is thereby a dichotomous variable with the value 0 or 1 (29).

Type of economic evaluation, study perspective, and time horizon

The economic evaluation took the form of a cost-effectiveness analysis in which we estimated the costs and health outcomes for a planned birth in a birth centre, in a hospital or at home. The economic evaluation was performed from a health care perspective. The time horizon of the economic evaluation was from the start of labour until seven days after birth (end of maternity care period). Because of this short time frame no discounting took place. Costs were in 2015 euro; cost prices from earlier years were converted to 2015 euro using the consumer price index (34).

Measurement of resource use

Volume of health care resource use was collected prospectively by the attending community midwives using a case record form which was designed to complement the data from the Netherlands Perinatal Registry (3). The case record form included additional process indicators and volumes such as the time of the first physical contact between the client and the community midwife after a call at the start of labour, the planned place of birth at the start of labour, time of arrival at the birth centre or hospital, referral to the hospital, use of pain relief, use of transport during referral and maternity care assistance. Information on health outcomes and the use of other medications than pain relief was extracted from the Netherlands Perinatal Registry.

Unit cost estimation

All birth centres (n=23) were asked to send their financial details, including overheads, materials and staff costs, and 16 birth centres sent useable information. These total costs were divided by the total number of births and the total number of postpartum days to calculate unit costs (35). Dutch reference prices were used for consultation costs, blood transfusion and ambulance transport (36, 37). These reference prices include personnel costs, material costs, costs of medical equipment and supporting departments, accommodation, and overhead costs. For additional costs of interventions after referral and interventions in the third stage (delivery of the placenta) unit costs estimates were obtained from the Dutch Healthcare Authority (NZA) (38). These costs are based on the unit cost of an intervention in a representative selection of Dutch hospitals, weighted by the number of this particular intervention performed in the different hospitals. Unit costs of a birth at a hospital and maternity care assistance were also obtained from the

NZA (39). Twenty community midwives were asked about the duration of home-visits between the start of labour and birth and the duration of consultations during and after birth by a gynaecologist and paediatrician. Their mean estimates (respectively 50, 15 and 12 minutes) were converted into cost prices of consultation using gross salaries. The duration of postpartum consultations by a community midwife and the gross salaries of community midwives were provided by the Royal Dutch Organisation of Midwives (KNOV) (40, 41), and Dutch reference prices were used for the gross salaries of gynaecologists and paediatricians. Admission costs were based on a Dutch obstetric study (42). Medication costs were obtained from the website of the National Health Care Institute, which calculates costs for the Dutch situation based on doses and amounts of drugs (43). The cost of medication - which included not only the drugs but also the materials and/or equipment needed for their administration - was based on other studies (44-46). The values obtained as described above were used for the base case analysis (the model with the values that are assumed most likely). Additionally, sensitivity analyses were undertaken on variables with a great diversity in cost prices across the sources, including: epidural, general anaesthesia, birth at hospital with referral, additional costs after referral (spontaneous birth, vacuum extraction, forceps extraction and caesarean section), repair of perineal tear in operating theatre and manual placenta removal. By repeating our analysis with different cost estimates for variables with a great diversity in cost prices among sources, the implications of uncertainty in costs were explored. These sensitivity analyses included an analysis in which the maximum cost found in literature was used and a bottom-up calculation (assigning a value to each of the resources used during an intervention and summing these values) based on resource use estimates of five hospitals (two teaching hospitals and three general hospitals), see Table 1.

Analytical methods

Total costs per birth were calculated after multiplying resource use per woman and unit costs.

A decision rule was used for missing values that were needed to calculate the outcome scores (OI and CAO): not registered was considered as not happened (since some items did not need to be filled in). Multiple imputation (20 datasets) was used to correct for other missing data. Missing values that were imputed for the cost analysis were: ambulance use (missing 0.2%), place of admission of the child (missing 1.7%), duration of admission of the child (missing 11.0%), duration of post-partum stay at the birth centre (missing 3.7%) and maternity care assistance during birth (missing 5.0%). The variables of the OI, age, parity and maternal background were used as predictors. An iterative Markov chain Monte Carlo method was used in which, for each iteration and for each variable, the fully conditional specification method is in keeping with a univariate

Table 1 • Unit cost (2015, €) in base case analysis, and sensitivity analysis using maximum cost prices and cost prices resulting from bottom up calculation

		Unit	Base case analysis	Sensitivity analysis		
				Maximum cost in literature	Bottom up calculation	
Consultation and medication during first and second stage	Home-visit by a midwife	visit	49 ⁴⁷			
	Gynaecological consultation	visit	20 ³⁷			
	Oxytocin	dose	0.60 ⁴³			
	Epidural	procedure	185 ⁴⁴	526 ³⁸	252	
	Remifentanil	procedure	86 ⁴⁶			
	Morphine	procedure	0.60 ⁴³			
	Pethidine	procedure	0.62 ⁴³			
	Nalbuphine	procedure	3.25 ⁴³			
	Nitrous Oxide	procedure	422 ⁴⁵			
	General anaesthesia	procedure	391 ³⁹	713 ³⁹	713	
Cardiotocography	procedure	151 ³⁸				
Birth (staffing, overhead and referral) and intervention during second stage	Birth at birth centre	procedure	980			
	Birth at birth centre with referral	procedure	725			
	Birth at home	procedure	604 ⁴⁷			
	Birth at home with referral	procedure	598 ⁴⁷			
	Birth at hospital	procedure	1136 ³⁹			
	Birth at hospital with referral	procedure	1130 ³⁹	1130 ³⁹	916	
	Additional costs after referral					
	spontaneous birth	procedure	677 ³⁸	1223 ⁴²	209	
	vacuum extraction	procedure	637 ³⁸	1445 ⁴⁸	418	
	forceps extraction	procedure	637 ³⁸	1445 ⁴⁸	516	
caesarean section	procedure	868 ³⁸	2157 ⁴⁸	1403		
Intervention and consultation during third stage	Blood transfusion	procedure	446 ³⁷	578	578	
	Oxytocin	dose	0.60 ⁴³			
	Repair perineal tear	procedure	15 ⁴³			
	Repair perineal tear in operating theatre	procedure	678 ³⁸	1057	957	
	Manual removal of placenta	procedure	746 ³⁸	746 ³⁸	1059	
	Paediatric consultation	visit	16 ³⁷			
	Gynaecological consultation	visit	20 ³⁷			

Table 1 - Continued Unit cost (2015, €) in base case analysis, and sensitivity analysis using maximum cost prices and cost prices resulting from bottom up calculation

	Unit	Base case analysis	Sensitivity analysis	
			Maximum cost in literature	Bottom up calculation
Admission and transport	Admission mother and child			
	hospital stay - ward	day	398 ⁴²	
	hospital stay - medium care	day	605 ⁴²	
	NICU-stay	day	1679 ⁴²	
	Ambulance transport - urgent	procedure	559 ³⁷	
	Ambulance transport - non urgent	procedure	270 ³⁷	
Postnatal care	Postpartum consultation by a midwife			
	Birth centre stay	day	372	
	Maternity care assistance	hour	45 ³⁹	
	Maternity care assistance	once	84 ³⁹	

model using the other variables as predictors; this then imputes missing values for the relevant variable. Rubin's rules were used for combining the 20 imputed datasets (49).

We estimated differences in costs using the one-way analysis of variance (ANOVA). Although the cost data were skewed, the arithmetic mean is the informative measure for cost data in cost-effective analysis. Analyses other than the arithmetic mean can produce misleading conclusions. Therefore, ANOVA is appropriate for costs where untransformed data are concerned (50, 51). Multiple regression was used to estimate the differences in total cost and to adjust for potential confounders including parity (nulliparous/multiparous), mean maternal age, maternal background (Dutch/non-Dutch), urbanisation and socio-economic status (SES). Urbanisation (<500 addresses per km²/500-1500 addresses per km²/≥1500 addresses per km²) and SES (high/medium/low) were based on the characteristics of the four-digit postal code area in which the participants live (level of income, educational level, labour market situation) (52).

Non-parametric bootstrapping was used, involving 1,000 replications, to calculate uncertainty around all cost and health outcomes estimates. The net benefit regression framework was used to construct the cost-effectiveness acceptability curve (CEAC) comparing a planned birth in a hospital or at home to a planned birth in a birth centre (53). Net benefit regression uses net benefit, defined as $nb = \lambda \cdot effect - cost$ for each individual patient as dependent variable, where λ is the maximum willingness to pay for a point improvement on the OI. Using the regression equation $nb = a + \beta BC + \gamma X + \epsilon$

with BC the indicator variable for a planned birth in a birth centre, e.g. BC= 1 if the planned birth was in a birth centre and BC = 0 if the planned place of birth was in a hospital or at home respectively, and X the potentially confounding variable (parity, maternal age, maternal background, urbanisation and socioeconomic status) results in estimation of β and its p-value, with the latter being used to construct the CEAC. The CEAC for comparing the different types of birth centres was based on bootstrapping the adjusted costs and health outcomes and plotting the proportion of births with the highest net benefit for the different types of birth centres (with respect to location and integration profile) for a range of values relating to the willingness to pay for a point improvement on the OI.

Since it is known that parity highly influences the progress and outcomes of childbirth (54), all analyses were repeated by parity subgroup (nulliparous vs. multiparous women). Analyses were performed using SPSS version 21 (SPSS, Chicago, IL) and Microsoft Excel (Microsoft, Seattle, WA) 2010 software.

Results

Health outcomes

The characteristics of the participating women and the analyses of the health outcomes are reported in detail elsewhere (22). Overall, no differences on the OI were found in the cohort study between a planned birth in a birth centre (nulliparous OI=25.8 and multiparous OI=28.1) and a planned birth in a hospital (nulliparous OI=26.0 and multiparous OI=28.0). Women who planned to give birth at home had better outcomes (higher score on the OI) on the OI (nulliparous OI=26.3 and multiparous OI=28.8) compared with a planned birth in a birth centre; the effect size is small for nulliparous and medium for multiparous. Within the three types of birth centres based on location only the OI score of nulliparous women with a planned birth in a freestanding birth centre (27.4) was better ($p<0.001$) compared with a planned birth in an alongside birth centre (OI=25.7). No statistical differences in the OI were found for the three different integration profiles, either for nulliparous (MOBC OI=25.7, MIBC OI=25.7 and MUBC OI=26.0) or for multiparous women (MOBC OI=27.9, MIBC OI=28.0 and MUBC OI=28.5).

Overall, an adverse perinatal outcome was rare. No differences were found in the total number of women with one or more adverse outcomes (CAO) between planned births in a birth centre, in a hospital or at home (22).

Unadjusted costs in categories

The total unadjusted mean costs per low-risk woman for births planned in a birth centre

(€3.361) are almost the same as those in a hospital (€3.354) and significantly ($p < 0.001$) higher than those at home (€2.942). The significant difference in total costs between a planned birth in a birth centre and a planned birth at home is mainly due to: 1) the fact that more women with a planned birth in a birth centre received an epidural and a cardiotocography, 2) the higher overhead costs of the birth centre itself and 3) more mothers and children with a planned birth in a birth centre being admitted to a clinical ward. With regard to the different types of birth centres (based on location and integration profile) there were no differences in unadjusted mean costs, see Table 2.

Adjusted total costs

The general linear model on costs showed that, after adjustment for confounders, the costs of a planned birth in a birth centre (€3.327) remained the same as in a hospital (€3.330) and were significantly ($p < 0.001$) higher than a planned birth at home (€2.998). With regard to the different types of birth centres (based on location and integration profile) the adjusted mean costs did not vary significantly either.

Restriction of the analyses to nulliparous women showed overall higher mean costs per woman. The costs of a planned birth in a birth centre (€3.653) and at home (€3.397) differed significantly ($p < 0.001$). With regard to the different types of birth centres (based on location and integration profile) there were no differences in adjusted mean costs.

Restriction of the analyses to multiparous women showed overall lower mean costs per woman and significantly ($p < 0.001$) lower costs for women with a planned place of birth at home (€2.639), compared with a birth planned in a birth centre (€3.018). The adjusted mean costs of a planned birth in a freestanding birth centre (€3.278) were significantly ($p < 0.05$) higher than in an alongside birth centre (€3.003). The adjusted mean costs of a planned birth in a birth centre in MIBC (€2.839) were significantly ($p < 0.01$) lower than MUBC (€3.098), see Table 3.

Mean costs and health outcomes (OI)

Uncertainty around costs and health outcomes (OI) obtained by bootstrapping are plotted in Figure 1a (total group) and Figure 1b (nulliparous and multiparous women).

Mean costs and health outcomes (CAO)

The total adjusted composite adverse outcome score (CAO) and the adjusted total mean costs per woman were similar for women with a planned birth in a birth centre and in a hospital. The CAO was also similar for women with a planned birth in a birth centre and at home, but a planned birth at home resulted in lower costs, see Figure 2a. With regard to the parity subgroups, multiparous women had more favourable health outcomes and lower adjusted total mean costs than nulliparous women, see Figure 2b.

Table 2 • Unadjusted mean (SD) costs (2015, €) in categories per woman according to planned place of birth

Planned place of birth	Consultation and medication during first and second stage ^a	Birth and intervention during second stage ^b	Intervention and consultation during third stage ^c	Admission and transport ^d	Postnatal care ^e	Total
Birth centre (n=1668) REF	155 (140)	1074 (321)	55 (179)	254 (858)	1823 (311)	3361 (1015)
Hospital [^] (n=701)	148 (134)	1015 (327)***	39 (145)*	288 (1013)	1863 (269)**	3354 (1143)
Home (n=1086)	105 (106)***	696 (286)***	43 (157)	201 (845)*	1898 (215)***	2942 (892)***
Birth centre - location						
Freestanding (n=65)	98 (109)***	1280 (260)***	32 (116)	193 (558)	1884 (288)	3487 (641)
Alongside (n=1202) REF	163 (143)	1061 (307)	51 (172)	260 (860)	1827 (304)	3362 (976)
On-site (n=401)	141 (132)**	1078 (358)	71 (205)	245 (947)	1804 (331)	3338 (1164)
Birth centre - integration profile						
MOBC ¹ (n=923)	163 (136)*	1112 (290)	48 (162)	231 (770)	1841 (289)	3394 (867)
MIBC ² (n=349)	147 (138)	961 (332)***	70 (220)	327 (1046)	1763 (348)**	3268 (1225)
MUBC ³ (n=396) REF	144 (149)	1085 (356)	57 (176)	244 (929)	1835 (318)	3366 (1118)

[^] community midwife led

* p < 0.05, ** p < 0.01, *** p < 0.001

¹ Monodisciplinary-oriented, ² Mixed group of birth centres, ³ Multidisciplinary-oriented

^a Consultation and medication includes: home-visit by a midwife, gynaecological consultation, pain relief and cardiotocography during first and second stage

^b Birth and intervention includes: community midwife, maternity care assistance, overhead costs and additional costs after referral during second stage

^c Intervention and consultation includes: blood transfusion, oxytocin, repair perineal tear, manual removal of placenta, consultation by paediatrician/gynaecologist during third stage

^d Admission and transport includes: admission mother and/or child to hospital and ambulance transport

^e Postnatal care includes: consultation by a midwife, birth centre stay, maternity care assistance

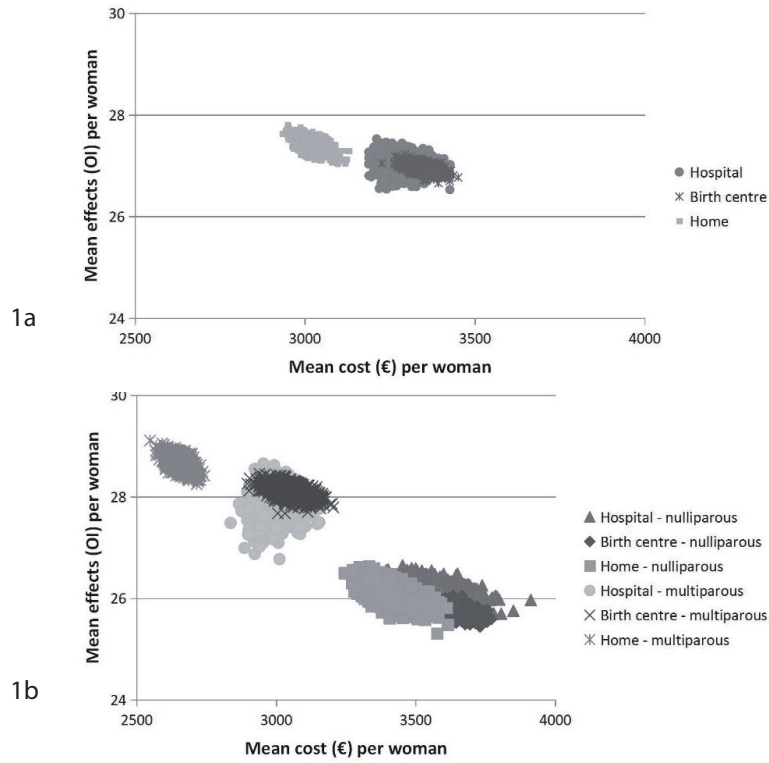


Figure 1a and b • Mean cost (2015, €) and health outcomes (optimality index) of planned birth at a birth centre, hospital and at home under the supervision of a community midwife

Table 3 • (Adjusted) Mean (SD) of total costs (2015, €) per woman according to planned place of birth

	Total costs			Total costs		
	n	Mean (SD)	B (95% CI)	n	Mean (SD)	B (95% CI)
	Unadjusted		ref	Adjusted#		ref
ALL LOW RISK WOMEN						
Birth centre	1668	3361 (1015)	ref	1610	3327 (6194)	ref
Hospital [∧]	701	3354 (1143)	-7.4 (-99.4 - 84.6)	659	3330 (1158)	3.9 (-84.5 - 92.3)
Home	1086	2942 (892)	-418.8 (-501.0 - -336.7)***	1067	2998 (1414)	-328.6 (-413.6 - -243.7) ***
Birth centre - location						
Freestanding	65	3487 (641)	124.6 (-139.3 - 388.5)	65	3469 (1026)	162.7 (-86.8 - 412.2)
Alongside	1202	3362 (976)	ref	1158	3306 (5215)	ref
On-site	401	3338 (1164)	-23.6 (-142.7 - 95.6)	387	3364 (1142)	57.6 (-56.1 - 171.4)
Birth centre - integration profile						
MOBC ¹	923	3394 (867)	28.5 (-94.4 - 151.3)	889	3342 (1783)	-14.8 (-132.0 - 102.5)
MIBC ²	349	3268 (1225)	-97.6 (-250.9 - 55.8)	338	3250 (1377)	-107.3 (-254.2 - 39.6)
MUBC ³	396	3366 (1118)	ref	383	3357 (3094)	ref
NULLIPAROUS		Unadjusted			Adjusted#	
Birth centre	939	3655 (1114)	ref	913	3653 (7276)	ref
Hospital [∧]	348	3644 (1356)	-11.5 (-160.3 - 137.3)	328	3607 (1397)	-45.8 (-196.9 - 105.4)
Home	399	3390 (1084)	-265.7 (-415.6 - -115.9)***	392	3397 (1584)	-255.6 (-412.7 - -98.5)***
Birth centre - location						
Freestanding	33	3691 (673)	56.1 (-361.7 - 474.0)	33	3680 (1262)	51.2 (-379.8 - 482.2)
Alongside	699	3635 (1061)	ref	680	3629 (6317)	ref
On-site	207	3720 (1319)	84.7 (-97.0 - 266.5)	200	3730 (1378)	100.8 (-90.2 - 291.9)

Table 3 - Continued (Adjusted) Mean (SD) of total costs (2015, €) per woman according to planned place of birth

	Total costs			Total costs		
	n	Mean (SD)	B (95% CI)	n	Mean (SD)	B (95% CI)
Birth centre - integration profile						
MOBC ¹	522	3666 (954)	19.9 (-162.9 - 202.7)	507	3657 (2199)	10.8 (-180.6 - 202.2)
MIBC ²	198	3636 (1243)	-10.4 (-238.0 - 217.1)	193	3649 (1694)	3.4 (-235.8 - 242.6)
MUBC ³	219	3647 (1319)	ref	213	3646 (3664)	ref
MULTIPAROUS						
		Unadjusted		Adjusted##		
Birth centre	729	2982 (709)	ref	697	3018 (3977)	ref
Hospital [^]	353	3068 (788)	85.6 (-6.3 - 177.5)	331	3074 (860)	56.2 (-36.4 - 148.9)
Home	687	2683 (623)	-299.7 (-374.0 - -225.4)***	675	2638 (1040)	-379.5 (-457.9 - -301.1)***
Birth centre - location						
Freestanding	32	3276 (526)	293.0 (37.8 - 548.3)*	32	3278 (726)	275.8 (24.2 - 527.5)
Alongside	503	2983 (681)	ref	478	3003 (3323)	ref
On-site	194	2932 (792)	-51.0 (-171.0 - 69.0)	187	3012 (838)	9.3 (-110.8 - 129.4)
Birth centre - integration profile						
MOBC ¹	401	3040 (565)	21.6 (-107.8 - 151.0)	382	3049 (1302)	-48.5 (-179.1 - 82.0)
MIBC ²	151	2786 (1017)	-232.6 (-388.4 - -76.8)**	145	2839 (955)	-259.2 (-414.7 - -103.7) **
MUBC ³	177	3019 (654)	ref	170	3098 (2082)	ref

[^] community midwife led

adjusted for parity, maternal age, maternal background, urbanisation and social economic status

adjusted for maternal age, maternal background, urbanisation and social economic status

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

¹ Monodisciplinary-oriented, ² Mixed group of birth centres, ³ Multidisciplinary-oriented

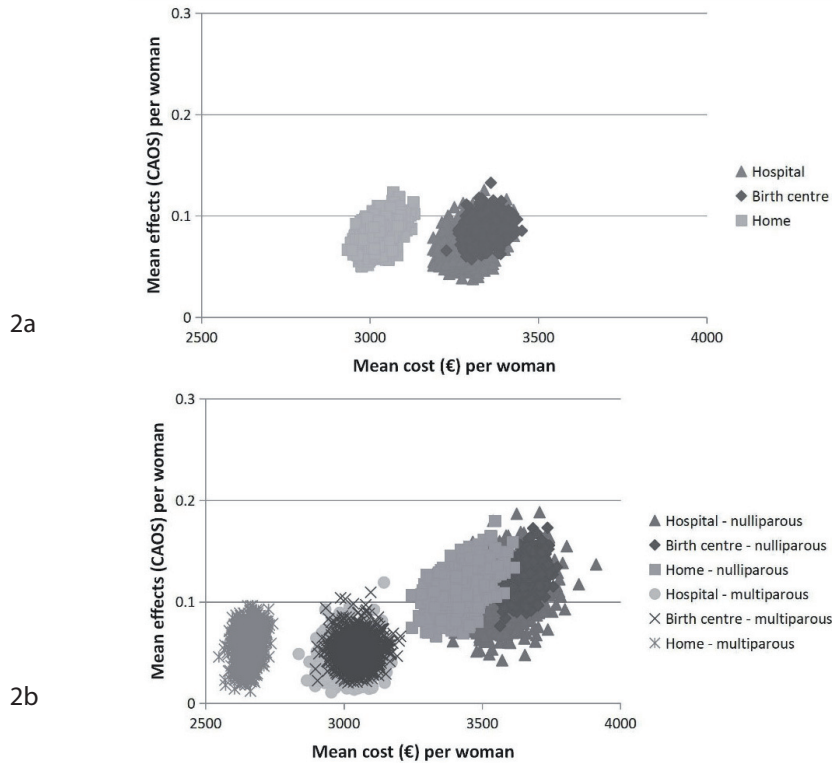


Figure 2a and b • Mean cost (2015, €) and health outcomes (composite adverse outcome score) of planned birth in a birth centre, hospital and at home under the supervision of a community midwife

Cost-effectiveness acceptability curves

Figure 3 shows the probability that a planned birth in a hospital or at home is cost-effective, compared with a planned birth in a birth centre, for different willingness-to-pay values (€ 0 - € 2,000) for an improvement of one point on the OI. Regardless of the level of willingness to pay, a planned birth at home was likely to be cost-effective compared with a planned birth in a birth centre. A planned birth at home had more favourable health outcomes (higher score on the OI) and lower costs compared with a planned birth in a birth centre. The probability that a birth planned in a hospital is cost-effective increased with a higher willingness to pay, compared with a planned birth in a birth centre. A planned birth in a hospital had more favourable health outcomes (higher score on the OI) but also higher costs compared with a planned birth in a birth centre.

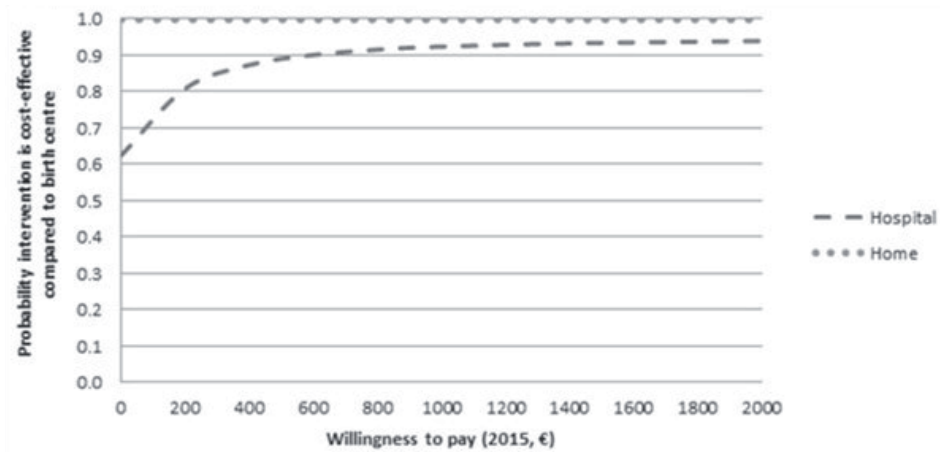


Figure 3 • Cost-effectiveness acceptability curves, graphing the probability to be cost-effective for planned birth at the hospital and at home compared with the birth centre, for different values of the willingness to pay for an additional point on the Optimality Index

Cost-effectiveness acceptability curves- type of birth centre based on location

Figure 4 shows the probability that a planned birth in a particular type of birth centre based on location is cost-effective, compared with a planned birth in the two other location types, for different willingness-to-pay values (€ 0 - € 1.000). If the willingness to pay for an extra point on the OI (health benefits) is € 0, the probability that a planned birth in an alongside birth centre is cost-effective is highest. The higher the willingness to pay, the higher the probability that a planned birth in a freestanding birth centre is cost-effective, compared with the two other types (alongside and on-site). A planned birth in a freestanding birth centre had more favourable health outcomes (higher score on the OI), but higher costs, compared with the two other types.

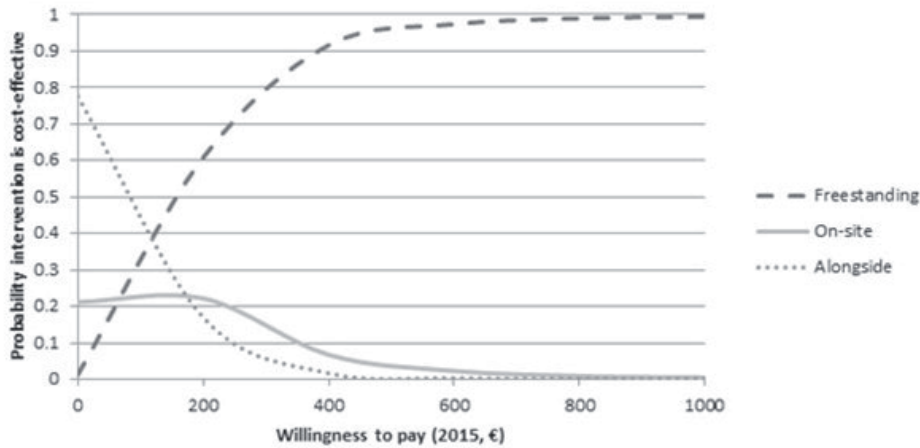


Figure 4 • Cost-effectiveness acceptability curves, graphing the probability to be cost-effective for planned birth in a freestanding, alongside and on-site birth centre, for different values of the willingness to pay for an additional point on the optimality index

Cost-effectiveness acceptability curves - integration profile of birth centre

Figure 5 shows the probability that a planned birth in a particular type of birth centre based on integration profiles is cost-effective, compared with a planned birth in the two other types, for different willingness-to pay-values (€ 0 - € 1,000). If the willingness to pay for an extra point on the OI (health benefits) is € 0, the probability that a planned birth in a MIBC is cost-effective is highest. The higher the willingness to pay, the higher the probability that a planned birth in an MUBC is cost-effective, compared with the two other types (MOBC and MIBC). A planned birth in an MUBC has more favourable health outcomes (higher score on the OI), but higher costs, compared with the two other types.

Adjusted total mean costs with varying costs prices

Finally, sensitivity analyses produced similar results as the original generalised linear model on costs: no cost differences between planned birth in a birth centre and in a hospital; planned birth at home had significantly ($p < 0.001$) lower costs than planned birth in a birth centre; and no cost differences between the different types (based on location and integration profiles) of birth centres, see Table 4.

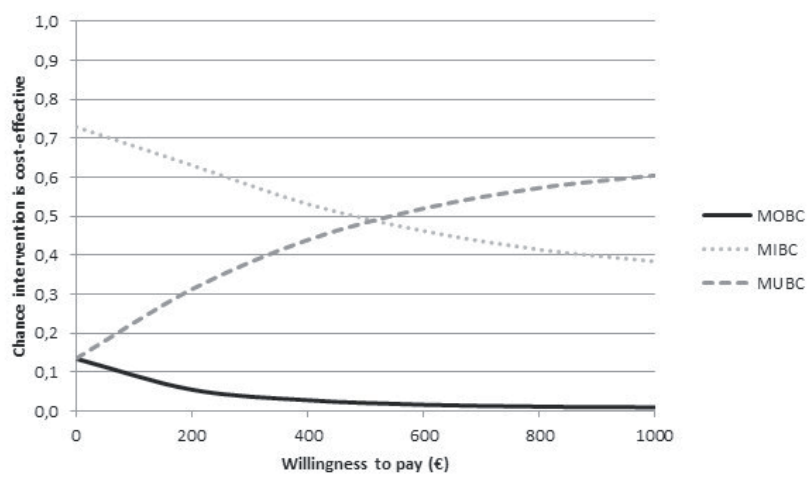


Figure 5 • Cost-effectiveness acceptability curves, graphing the probability to be cost-effective for planned birth in a MOBC, MIBC and MUBC, for different values of the willingness to pay for an additional point on the optimality index

Table 4 • Adjusted mean (SD) of total cost (2015, €) per woman according to planned place of birth in sensitivity analyses using maximum cost prices and cost prices resulting from a bottom up calculation with five hospitals.

	Maximum cost		Bottom-up calculation	
	Adjusted#		Adjusted#	
ALL LOW RISK WOMEN	Mean (SD)	B (95% CI)	Mean (SD)	B (95% CI)
Birth centre (n=1610)	3696 (7601)	ref	3206 (6103)	ref
Hospital [^] (n=659)	3643 (1456)	-53.5 (-164.7 - 57.7)	3182 (1157)	-24.3 (-112.6 - 64.1)
Home (n=1067)	3271 (1742)	-425.4 (-530.0 - -320.8)***	2919 (1413)	-287.1 (-372.0 - -202.2)***
Birth centre - location				
Freestanding (n=65)	3638 (1281)	-50.5 (-362.0 - 261.0)	3397 (1025)	219.4 (-29.9 - 468.7)
Alongside (n=1158)	3689 (6490)	ref	3178 (5211)	ref
On-site (n=387)	3729 (1433)	39.9 (-102.9 - 182.7)	3260 (1141)	82.4 (-31.3 - 196.1)
Birth Centre - integration profile				
MOBC ¹ (n=889)	3730 (2246)	36.0 (-111.7 - 183.7)	3201 (1783)	-54.9 (-172.1 - 62.4)
MIBC ² (n=338)	3604 (1712)	-89.9 (-272.4 - 92.7)	3165 (1376)	-90.3 (-237.1 - 56.5)
MUBC ³ (n=383)	3694 (3866)	ref	3256 (3093)	ref

[^] community midwife led

adjusted for parity, maternal age, maternal background, urbanisation and social economic status

*** $p < 0.001$

¹ Monodisciplinary-oriented, ² Mixed group of birth centres, ³ Multidisciplinary-oriented

Discussion

Summary of main findings

No differences were found in costs for birth if planned either in a birth centre or in a hospital. The costs of a planned birth at home are significantly lower compared with a planned birth in a birth centre. The total adjusted mean costs for births planned in a birth centre, in a hospital and at home were €3.327, €3.330 and €2.998 respectively. There was no difference in the score on the OI for women who planned to give birth in a birth centre compared with women who planned to give birth in a hospital. Women who planned to give birth at home had better outcomes on the OI (higher score on the OI). No differences were found for the CAO by planned place of birth. For nulliparous and multiparous low-risk women, a planned birth at home was the most cost-effective option compared with a planned birth in a birth centre.

No differences were found in the total adjusted mean costs for planned births for the different types of birth centres (based on location and integration profiles). The respective total adjusted mean costs for a birth planned in a freestanding, alongside and on-site birth centre were €3.469, €3.306 and €3.364. The respective total adjusted mean costs for births planned in a birth centre were €3.342, €3.250 and €3.357, when divided by the integration profile a) monodisciplinary-oriented, b) mixed group of birth centres and c) multidisciplinary-oriented). Within the three types of birth centres based on location the OI score for nulliparous women with a planned birth in a freestanding birth centre was significantly higher compared with a planned birth in an alongside birth centre. No big differences on the OI were found for the three different integration profiles. The CAO of nulliparous women with a planned birth in an MIMC was significantly more unfavourable than a planned birth in an MUBC.

Strengths and weaknesses

This study is an initial attempt to expand the net benefit regression framework from two to three treatments. In the literature on cost-effectiveness analyses, only two treatments have to date been compared using the net benefit regression approach. This study has a high participation rate as regards midwifery practices (110 of the 127 approached) and birth centres (21 out of 23), which reduces the chance of bias. Sensitivity analyses, using different prices, produced similar results and conclusions to those of the original generalised linear model on costs, in other words: the impact of systematic errors (bias) was low.

The limited time horizon of the study meant that the registration of outcomes for mother and child did not extend beyond one week postpartum. Perinatal events (such as a low Apgar score) can result in associated longer-term costs, which are not covered

in this study. As serious perinatal events were rare in this low-risk group, this would not have changed the results (22). As usual in economic evaluations we had to deal with missing data. However, the magnitude of missing data was limited and multiple imputation (20 datasets) was used to impute the missing data.

A problem of all (Dutch) studies comparing places of birth is that women in these places are all different. Although this is taken into account in the statistical analyses by adjusting for SES, maternal background, parity, age and urbanisation, it is not possible to adjust completely. For example, women who planned to give birth in a birth centre or hospital may have a different view on childbirth and are perhaps more anxious than women who planned to give birth at home (55-58). In addition, there may be differences between the groups as regards lifestyle, such as smoking, and obstetric history, including the number of miscarriages. Therefore, the minor differences found in this study may be the result of differences between the women rather than between the settings.

Interpretation of the results

This study is part of the Dutch Birth Centre study (30). The motive for this national study was the strong increase in the number of birth centres in the Netherlands over the last few decades and the unknown effect on outcomes such as costs, medical outcomes and client experiences.

We found comparable costs for a planned birth supervised by a community midwife in a birth centre and in a hospital and significantly lower costs for a planned birth at home. Another Dutch study found that the total costs associated with pregnancy, childbirth, and postpartum care are comparable for home birth and hospital birth. That study found lower costs during childbirth and postpartum care for maternity care assistance, admission and travelling costs for the home birth group compared with the hospital group (14). Our study showed lower costs for maternity care assistance for the birth centre group compared with the hospital and home birth group. In line with that study the admission and transport costs were lower for the home birth group. The other study was based on actual births and not, as in our study, on planned place of birth (intention to treat) and did not include the birth centre setting. We did not include pregnancy costs since this is not part of birth centre care in the Netherlands. Our results are in line with a study in England where a planned birth at home is cost-effective compared with a planned birth in alongside or freestanding midwifery units and obstetric units. However, we did not find increased adverse perinatal outcomes for nulliparous women planning to give birth at home (15).

One of the aims of this study is to provide objective, reliable and valid information to support decision-making and policy-making in healthcare. As most low-risk women

in the Netherlands are now planning to give birth outside their home, it is necessary to offer these women a good alternative. Birth centres offer a more homelike environment and are based on the philosophy of physiological birth. To know whether birth centres are a good alternative, policy makers, health insurers and managers want information on the cost-effectiveness of birth centres versus alternative places of birth. We conclude that for nulliparous and multiparous low-risk women a planned birth at home was the most cost-effective option compared with a planned birth in a birth centre. Planned births in birth centres have similar health outcomes and costs as hospital births for low-risk women.

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Chapter

07

Transfer to the birth centre
A secondary analysis of the
Dutch Birth Centre study

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*Published (in Dutch) as: Verplaatsen naar het geboortecentrum –
Tijdschr voor Verlos. (2018);42(1):44-7*

Introduction

The KNOV practical guidance 'Continuous support during childbirth in primary care' recommends an early face-to-face assessment during labour to determine the woman's current stage of childbirth [1]. Apart from the external examination and auscultation of the fetal heart, a digital vaginal examination (VE) should be offered during this assessment unless contractions are absent and spontaneous rupture of membranes is suspected or an immediate reason to refer the woman to secondary care is apparent. The findings of the examination, including the VE should be discussed with the woman and her birth companion(-s). The overall assessment of the situation, the findings of the VE and the needs and wishes of the woman in labour, determine the subsequent management of labour until the next assessment. For those women who do not plan to give birth at home, the possible moment of transfer to the planned birth location (the birth centre or the hospital) will be discussed at this point as well. If the medical need for referral has already arisen, the woman will be transferred directly from home to the obstetric unit (secondary care).

The number of birth centres in the Netherlands have been rising since the beginning of this century [3,4]. The Dutch Birth Centre Study (DBCS) developed a new definition for these centres (see box 1) [5]. The aim of this sub-study, is to describe the transfer process for nulliparous women who plan to give birth in a birth centre. Where do these women finally give birth, how many women have a VE at home before they are transferred to the birth centre, and is there any connection between the performance of a VE at home and the chance of referral to secondary care during labour?

Box 1 • Definition of a birth centre:

Birth centres are midwifery-managed locations that offer care to low risk women during labour and birth. They have a homelike environment and provide facilities to support physiological birth. Independent community midwives take primary professional responsibility for care. In case of referral the secondary caregiver (obstetrician or paediatrician) takes over the professional responsibility of care [5].

Methods

For this sub-study, existing data from the DBCS were used, which were collected from 1 July 2013 to 31 December 2013[6]. During the study period, community midwives were asked to record data for each birth that started in their care and for which they were responsible. In particular, data were collected on all VEs carried out both at home and in the birth centre, and the progress of labour. If applicable, in addition to the planned and final place of birth, the location of the woman at the moment of referral was recorded, as well as the corresponding medical reason for referral. The full description of the data collection can be found elsewhere [6]. For this sub-study, only the data of nulliparous women who planned to give birth in a birth centre were used. Because of the very small number of inclusions, the data collected from women who gave birth in free-standing birth centres (n=33) have not been used.

Only data of women who actually transferred to a birth centre, were used for the second part of this study. Women who had missing data of the examinations carried out at home before transfer, were excluded. We carried out a logistical regression analysis to determine the differences in risk of transfer to the secondary care. All data were analyzed in SPSS version 22.0 (SPSS Inc., Chicago, IL, USA.).

Results

We included 906 term nulliparous women who planned to give birth in a birth centre. The women had a mean age of 29.6 years (SD 4.5) and 79.9% were of Dutch descent. In total 45% of included women lived in an urban area (defined as ≥ 1500 people/km²) and 68.9% had an average socio-economic position (income, profession and education) based on the four digits of the postal code [7]. Mean gestational age at the time of birth was 280 days (SD 7.4).

Transfers of all nulliparous women who planned to give birth in a birth centre are presented in figure 1. During labour 69% (n=621) of the women were transferred to a birth centre, 23% (n=204) of women were transferred directly to secondary care and 9% (n=81) remained at home, chose a hospital birth under responsibility of the primary care midwife, or became medium-risk during labour¹. Of all women included in this sub-study, 29% (n=267) gave birth in a birth centre, 3% gave birth at home and 2% of

¹ When a medium-risk situation arises during labour, the community midwife advises the woman -due to a potential increase in risk during birth- to give birth on the obstetric unit, but under the responsibility of a community midwife. There is no referral, but the community midwife is assisted by an obstetric nurse instead of a maternity care assistant (who is the usual assistant for a community midwife, regardless the place of birth). (NB this footnote is supplementary to the original publication)

women gave birth in hospital under responsibility of a primary care midwife. Reasons for transfer and place at the time of transfer, are presented in Table 1. Almost a third of all women were transferred during labour because of a request for pharmacological pain relief or because of failure to progress in the first stage (32.8%, n=297).

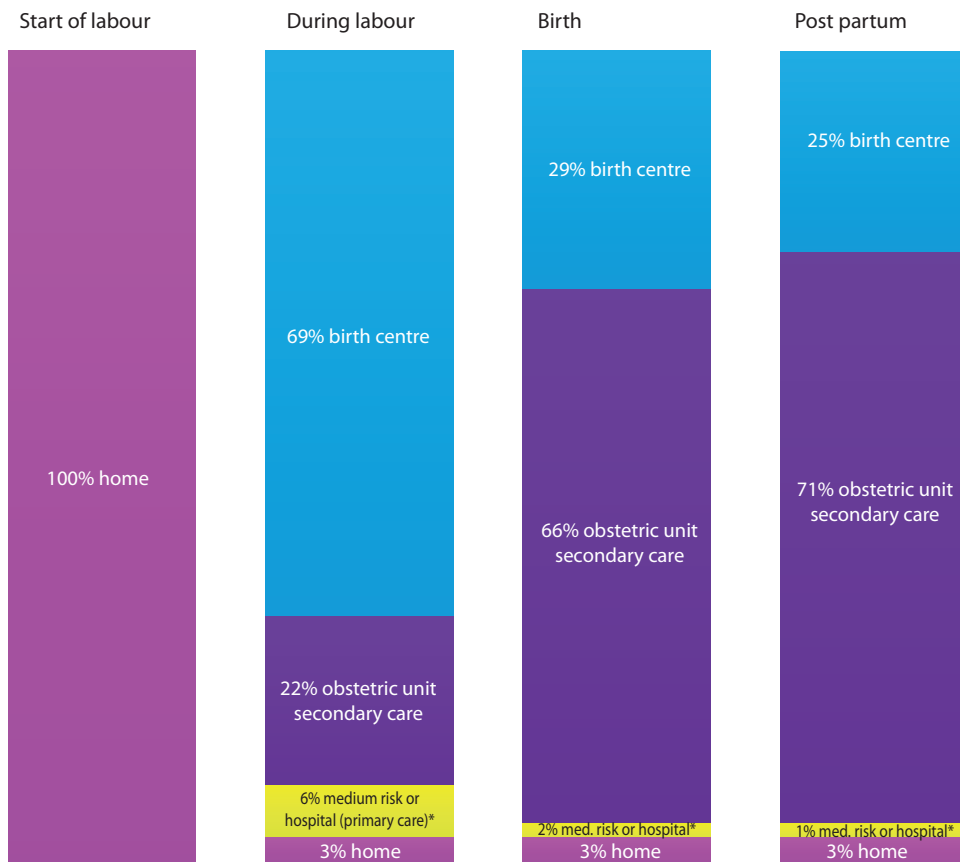


Figure 1 • Location during the different stages of childbirth, for nulliparous women who planned to give birth in a birth centre (n=906)

* = birth under responsibility of a community midwife

Table 1 • Place of from where referral took place and reason for referral for nulliparous women who planned to give birth in a birth centre (n=906)

	Referred from home (n)	Referred from the birth centre	Referred from hospital	TOTAL n=906(100%)
Referred during first or second stage	204	354	37	595 (65.7%)
Failure to progress in first stage or request for pharmacological pain relief	97	180	20	297 (32.8%)
Meconium-stained amniotic fluid	48	60	7	115 (12.7%)
PROM > 24u	39	5	2	46 (5.1%)
Failure to progress second stage	5	79	4	88 (9.7%)
Fetal distress	1	25	2	28 (3.1%)
other	14	5	2	21 (2.3%)
Referred during third or fourth stage	3	45	1	49 (5.4%)
Hemorrhagia post partum	1	15	0	16 (2.1%)
Complicated rupture	1	20	0	21 (2.3%)
Retentio placentae	1	10	1	12 (1.3%)
Total of referred women	207	399	38	644 (71.1%)
Total of non-referred women				262 (28.9%)

To determine the relationship between a VE carried out at home and outcomes after arrival in the birth centre, only data of those women who actually had been present in a birth centre were used (69%). After exclusion of women with missing data on the first VE (2.1%, n=19), the data of 600 women were analyzed. Before transfer to the birth centre, 73.8% (n=443) of the women were given a VE (at home). Mean cervical dilation at the last VE at home was 4.5 cm (figure 2). The women who were not vaginally examined at home prior to transfer, had a mean cervical dilation of 3.9 cm at the first VE in the birth centre.

The group of women who were not vaginally examined at home prior to transfer (26.1%, n=157) had a non-significant higher chance of being transferred to secondary care compared to the women who were given a VE at home (68.8% vs 61.2%, p=0.090, 95% CI 0.49 – 1.05).

Discussion

This small sub-study is the first investigation that enables some insight into the process of transfers during labour for nulliparous women who plan to give birth in a birth centre. Almost 29% of women gave birth at their chosen location. During labour 66% of women were transferred to secondary care. The main reason for transfer to secondary care was failure to progress in the first stage of labour or a request for pharmacological pain relief

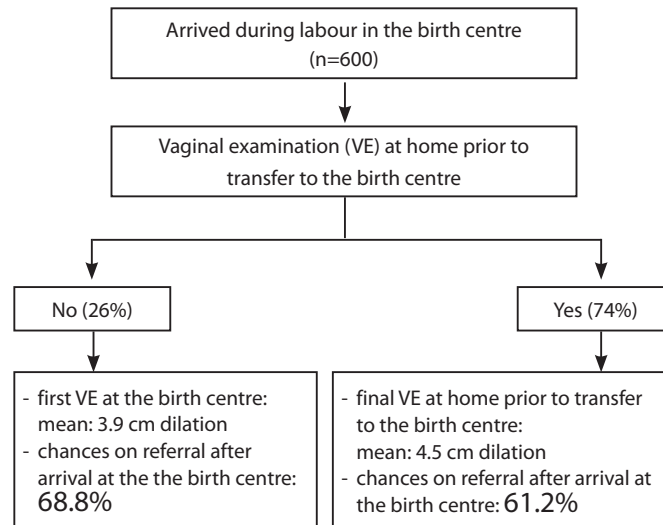


Figure 2 • Outcomes for nulliparous women who planned to give birth in a birth centre (n=906) and actual arrived in the birth centre during birth (n=600)

(32.8%). Women who were given a VE at home prior to transfer to the birth centre, had a smaller non-significant chance of being transferred from the birth centre to secondary care in the hospital during labour or the postpartum period.

Most birth centres present data about the number of women being transferred from the birth centre. These data only give information about those women who spent actual time in the birth centre. Our sub-study shows that more than 30% of nulliparous women who plan to give birth in a birth centre, never visit this location during labour. These women are transferred to medium or secondary care before ever reaching a birth centre or they choose a different place of birth during labour. This means that this group of women is never seen in the data of birth centres which may lead to different results than those presented in existing research into the effect of the planned place of birth [8–12]. Most of these studies analyse participants according to the intention-to-treat principle to enable an accurate comparison between birth places. Although at present it is not possible to carry out these analyses with the available Dutch Perined data, it should become a regular feature of the Dutch perinatal data base in the future [13].

The data used in this study are part of a larger study called the Dutch Birth Centre study [4]. A secondary analysis was carried out on prospectively collected data. This may mean that not having had a VE at home prior to transfer does not necessarily equal not having had a home visit prior transfer to the birth centre. We assume that this difference is negligible. This sub-study has its limitations due to the small number of data included

and is therefore only an exploration. The study does show that the effect of the moment at which a woman is transferred, should be investigated further.

On average nulliparous women who have had a VE at home are transferred at a later stage during labour when compared to women who did not have a VE prior to transfer in labour. These results are comparable to international trials which investigated the effect of a home visit versus triage by telephone on the progress in labour measured by cervical dilation [14,15]. A Cochrane review investigating the effects of labour assessment programs, found that women in labour assessment programs, which aim to delay hospital admission until active labour, experienced less interventions during labour [16]. The review indicated that a larger RCT was required in order to confirm these conclusions. International cohort studies which compare the mean cervical dilation in centimeters on arrival on the labour ward to outcomes such as the risk of interventions and the chance of a vaginal birth, suggest better outcomes for women who are not admitted to the labour ward until they are at least 4 cm dilated [17–21].

A home visit during labour is also associated with a more positive birth experience compared to women who were only given support by telephone during this labour phase [22]. Three quarters of the women in our study experienced a VE at home prior to transfer. We did not investigate the reasons behind the decision to carry out a VE at home or not. Possibly practice management, the vision of the birth centre or the woman's wishes may have influenced this decision. It is important to gain insight into the reasons why not all nulliparous women had a VE at home prior to transfer to the planned birth location and the possible effect of this VE on the birth process. The guideline of the Dutch midwives organization (KNOV) does not give any guidance on where the first contact in labour should take place [2]. We believe this should be at home, especially for nulliparous women.

A home visit during labour ensures adequate reflexion on the most appropriate moment of transfer to the planned birth location for each individual woman thereby truly putting her at the centre of care. Apart from informing women on the advantages and disadvantages of the available birth locations, they need to be informed about the reasons behind the moment of transfer. A home visit during labour should be part of the standard of care for all nulliparous women.

Conclusion

A considerable group of women who plan to give birth in a birth centre never arrive at the planned location. Nulliparous women who have a VE at home prior to transfer to

the birth centre, possibly have a smaller risk of needing a transfer to secondary care. Moreover performing a VE at home enables the midwife to give early support in labour.

Further research is needed into the effect of a home visit prior to transfer to the planned birth location on the experience of labour, the moment of transfer and outcomes such as the percentage of referrals.

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08

Chapter

Experiences of women who planned birth in a birth centre compared to alternative planned places of birth.
Results of the Dutch Birth Centre Study

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Abstract

Objective To assess the experiences with maternity care of women who planned birth in a birth centre and to compare them to alternative planned places of birth, by using the responsiveness concept of the World Health Organization.

Design This study is a cross-sectional study using the ReproQ questionnaire filled out eight to ten weeks after birth. The primary outcome was responsiveness of birth care. Secondary outcomes included overall grades for birth care and experiences with the birth centre services. Regression analyses were performed to compare experiences among the planned places of birth. The study is part of the Dutch Birth Centre Study.

Setting The women were recruited by 82 midwifery practices in the Netherlands, within the study period 1 August 2013 and 31 December 2013.

Participants A total of 2162 women gave written consent to receive the questionnaire and 1181 (54.6%) women completed the questionnaire.

Measurements and findings Women who planned to give birth in a birth centre:

- 1) had similar experiences as the women who planned to give birth in a hospital receiving care of a community midwife.
- 2) had significantly less favourable experiences than the women who planned to give birth at home. Differences during birth were seen on the domains dignity (OR=1.58, 95% CI=1.09-2.27) and autonomy (OR=1.77, 95% CI=1.25-2.51), during the postpartum period on the domains social considerations (OR=1.54, 95% CI=1.06-2.25) and choice and continuity (OR=1.43, 95% CI=1.00-2.03).
- 3) had significantly better experiences than the women who planned to give birth in a hospital under supervision of an obstetrician. Differences during birth were seen on the domains dignity (OR=0.51, 95% CI=0.31-0.81), autonomy (OR=0.59, 95% CI=0.35-1.00), confidentiality (OR=0.57, 95% CI=0.36-0.92) and social considerations (OR=0.47, 95% CI=0.28-0.79). During the postpartum period differences were seen on the domains dignity (OR=0.61, 95% CI=0.38-0.98), autonomy (OR=0.52, 95% CI=0.31-0.85) and basic amenities (OR=0.52, 95% CI=0.30-0.88). More than 80% of the women who received care in a birth centre rated the facilities, the moment of arrival/departure and the continuity in the birth centre as good.

Key conclusions and implications for practice In the last decades, many birth centres have been established in different countries, including the United Kingdom, Australia, Sweden and the Netherlands. For women who do not want to give birth at home a birth centre is a good choice: it leads to similar experiences as a planned hospital birth. Emphasis should be placed on ways to improve autonomy and prompt attention for women who plan to give birth in a birth centre as well as on the improvement of care in case of a referral.

Introduction

Traditionally, the quality of maternity care is described in terms of perinatal morbidity and mortality outcomes. Currently, other aspects of health care, such as client experiences, are important as well, also in terms of their potential to affect clinical outcomes (1-4). The Dutch maternity care system is often set as an example to learn from, because of its high home birth rate, its low number of obstetric interventions and a consequence, low cost and yet high assumed health outcomes (5-9). In the Netherlands, the quality of care experienced by women during the maternity care process in general is high (10).

The Dutch maternity care system is based on primary care provided by independent community midwives caring for women with a 'normal', uncomplicated, or low-risk pregnancy. Obstetricians provide in-hospital secondary care for women with a complicated, or high-risk pregnancy or birth. When a complication occurs or the risk of a complication increases substantially during pregnancy or during labour, or when pharmacological pain relief is requested, a woman will be referred from primary to secondary care. For women who were referred to secondary care before the 36th week of pregnancy, their planned place of birth will by necessity be in a hospital, under supervision of an obstetrician. Low-risk women can choose where they want to give birth: in a birth centre, in hospital or at home, all receiving care from a community midwife. Dutch birth centres have been established in the last decade to accommodate the growing number of low-risk women who do not want to give birth at home. A birth centre is a setting where women with uncomplicated pregnancies can give birth in a home-like environment (11).

Several international studies have explored the influences of the birth settings on the experience of women. A randomized, controlled trial in Sweden showed that low-risk women giving birth in a birth centre expressed greater satisfaction with care than women who gave birth in a hospital (12). A study in Australia showed that a birth centre setting ensured that women received personalised, genuine care that transcended the entire childbearing continuum (13). Differences in philosophy between hospital and birth centre settings is seen as an important component of care experiences (14). It is also known that women who have given birth in a specific birth centre were less satisfied than those who have given birth at home (15). In Australia, women giving birth at home rated their midwives higher than women giving birth at a hospital, with women giving birth in a birth centre generally scoring between the other two groups (16).

Currently we know very little of how women who planned to give birth in a birth centre experienced their care in the Netherlands. There is no study available that compares the experiences in birth centres with other birth settings in the Netherlands. Therefore, the aim of this study was to assess the experiences with maternity care of women who

planned birth in a birth centre and to compare them to alternative planned places of birth, by using the responsiveness concept of the World Health Organization. The World Health Organization introduced the concept of responsiveness as one of the available approaches to address service quality in an internationally comparable way (17). The concept offers the opportunity to capture client's experiences on eight predefined domains. Responsiveness is defined as aspects of the way individuals are treated and the environment in which they are treated during health system interactions (18, 19). The concept has been applied in the Dutch maternity care a few times before (20, 21).

This research is part of the Dutch Birth Centre Study (22). This national project evaluates the effect of Dutch birth centres on aspects such as client and partner experiences, process and outcome variables, costs and professional experiences.

Methods

Setting

The study was designed as a cross-sectional study. A minimum of three midwifery practices working in the area of each of the 23 birth centres included in the Dutch Birth Centre Study, were randomly recruited. This resulted in the participation of 82 midwifery practices. During the study period from 1 August to 31 December 2013 these 82 midwifery practices recruited women for participation. The midwifery practices varied in size and were located all over the country.

Data collection

Almost all women in the Netherlands, including women who gave birth under responsibility of an obstetrician, receive postpartum care from community midwives. During the data collection period, the community midwives of the 82 practices asked the women who received postpartum care for permission to send them a questionnaire. In this way, data were obtained from women with different planned places of birth: in a birth centre, in a hospital, or at home and under care of a midwife or an obstetrician. Excluded were women who could not read or speak Dutch and women with no specific preference for a place of birth. A total of 2162 women gave written consent either to receive the questionnaire through e-mail, as a hard-copy or to have an interview by phone. We explicitly tried to include women from different backgrounds, by giving the choice of an interview by phone. The women completed the questionnaire around eight to ten weeks after birth. A reminder was sent two weeks later, when needed.

Questionnaire

The ReproQ is a two-part questionnaire (part 1 prenatal, part 2 postnatal) and was developed to assess the responsiveness of the maternity care system in the Netherlands by evaluating client experiences. Responsiveness is defined as 'aspects of the way individuals are treated and the environment in which they are treated during health system interactions' (21). The postnatal part of the ReproQ was used in this study and includes two reference periods: the event of labour and birth and the subsequent postpartum week. The questionnaire consists of the following components: 1) questions about the process of care, including referral or emergency situations, 2) a question about the grade of overall experience during birth and the postpartum period, 3) questions about the eight domains of the WHO concept of responsiveness, 4) questions including experienced health outcomes, 5) the individual ranking of the various domains of responsiveness according to their importance and 6) the respondent's socio-demographic characteristics. For this study, questions about facilities (e.g. homelike environment, hotel service and bath) and transfers (e.g. change of caregiver and change of room) were included for women who received care in a birth centre.

The responsiveness concept is described to consist of eight domains: 1) dignity, 2) autonomy, 3) confidentiality, 4) communication, 5) prompt attention, 6) social consideration, 7) basic amenities and 8) choice and continuity. Each domain consists of several items, see Table 1.

The questions could be answered on a four-point scale with the values: always (4), mostly (3), sometimes (2) and never (1) (17). An average score per domain was computed this way. The questionnaire avoids any implicit or explicit preference towards the providers or the organizational structures, leaving room to compare different organizational structures and different levels of care (21).

Data handling

Questionnaires were excluded if more than 50% of the answers were missing in two or more domains. The client experiences were compared according to the women's planned place of birth. The information was based on the place of birth as it was planned one month before the birth, as recorded in the questionnaire. Subgroup analyses were performed for women referred to secondary care during birth and women who were not referred.

Data analysis

The basic characteristics of our respondents were compared with the characteristics of all the women receiving postpartum care of a participating midwife, the reference group. Therefore, data of all births occurring in the midwifery practices that participated in our study between August 2013 and December 2013 were derived from the

Table 1 • Items covered by the eight responsiveness domains

Domain	Item
Dignity	Respecting privacy
	Treating with respect
	Giving personal attention
	Treating with kindness
	Considering personal wishes regarding birth
	Trustworthy as health professional
Autonomy	Involving client in decision-making
	Acceptance of treatment refusal
	Involving client in decision-making on pain relief
	Involving client in decision-making on setting of birth
Confidentiality	Provision of medical information to family members after consent
	Discussing the medical situation without others hearing it
	Secured provision of medical information to others
Communication	Responsive to client questions
	Consistency of advice across professionals
	Comprehensibility of explanation
	Provision of information while treated
Prompt attention	Access for contact in urgent situations
	Access for contact without urgency
	Waiting time for service
	Availability of maternity care assistance
	Physical accessibility of setting
	Prompt phone response of health professional
Social consideration	Involvement of the partner or family in care provision
	Attention for family and household
	Support from partner or family
Basic amenities	Comfort of setting
	Hygiene of setting
	Physical accessibility of places (e.g. room and bathroom)
Choice and continuity	Continuity of care provision when change of individual professional (same discipline)
	Continuity of care provision when change professional (across disciplines)
	Allowance for selecting a preferred type of health professional
	Being explicit on which health professional is actual in charge

Netherlands Perinatal Registry (PRN-foundation). This PRN-foundation is a joint effort of four professions (midwives, general practitioners, obstetricians and paediatricians) that provide perinatal care in the Netherlands. All these professions have their own volunteer-based medical registries, which are linked to one combined PRN-registry (23).

Univariate analyses were carried out using the chi-square test and the Fisher's exact test for categorical factors and a one-way analysis of variance was carried out for continuous-characteristics. The mean and median grade (on a 10-point scale), including the 25th and 75th percentile, of the experience of overall care were calculated according to the planned place of birth.

Logistic regression analyses were performed with the responsiveness outcomes as dependent variables (optimal=4 and non-optimal<4) and with the planned place of birth as independent variable. We adjusted for the basic characteristics that differed among the groups: parity, education and ethnicity. The birth centre group was used as reference. P values less than 0.05 (two-sided) were considered statistically significant.

Descriptive analyses were performed on the additional questions about the birth centre services. The questions were filled out only by women who received care in a birth centre. The analyses were performed with SPSS 21.0 (24).

Ethical considerations

The design and planning of the study were presented to the Medical Ethics Committee of the University Medical Centre Utrecht. They confirmed that this study agrees with the Dutch legal regulations in terms of the methods used in this study and, therefore, an official ethical approval is not required (25). To invite the clients for participation in this study, permission from the midwifery practices was obtained. Informative letters to the clients were given by the midwifery practices directly. The letter clearly explained that if a client did not want to participate, she was not obligated to do so and this would not affect her care process. By signing the letter, clients consented either to receive the questionnaire digitally, as a hard-copy or to have an interview by phone.

Results

Study population

A total of 2162 women gave permission to receive the questionnaire; 1654 (76.5%) by e-mail, 464 (21.5%) by post and 44 (2.0%) women wanted to be interviewed by phone. We received 1181 completed questionnaires (including interviews by phone), with a total response rate of 54.6%. Forty-seven questionnaires were excluded, leading to 1134 questionnaires available for the analysis: 263 with a planned birth centre birth, 350 with

a planned home birth, 262 with a planned hospital birth under care of a community midwife and 115 with a planned hospital birth under supervision of an obstetrician.

Table 2 shows the characteristics of the participants and the reference group. No differences were found in parity and referral during birth between the respondents and the total group of women who gave birth in one of the participating midwifery practices. However, the respondents were significantly older, had a higher SES score, were more often of Dutch origin, were more often under supervision of the midwife at the start of labour and the respondents received less often an intervention during birth, compared to the reference group.

Table 2 • Characteristics of the respondents and the reference group

Characteristics	Participants (n = 1081) No. (%)	Reference group (n = 61169) No. (%)
Age*		
≤ 25	56 (5.6)	9204 (15.1)
26 - 35	736 (73.2)	42516 (69.6)
≥ 36	213 (21.2)	9322 (15.3)
Parity		
primiparous	490 (47.9)	28160 (46.1)
multiparous	532 (52.1)	32971 (53.9)
SES*		
low	70 (6.5)	10342 (16.9)
middle	807 (74.7)	41395 (67.7)
high	204 (18.9)	9432 (15.4)
Ethnicity*		
Dutch	921 (91.7)	46280 (78.1)
non-Dutch	83 (8.3)	12981 (21.9)
Start birth*		
midwife supervision	880 (82.1)	35288 (57.7)
obstetrician supervision	192 (17.9)	25881 (42.3)
Referral during birth		
no	815 (76.6)	46258 (75.6)
yes	249 (23.4)	14903 (24.4)
Interventions*		
no vacuum/forceps or section caesarean	928 (86.0)	47144 (77.1)
vacuum extraction/forceps	98 (9.1)	4852 (7.9)
section caesarean	53 (4.9)	9173 (15.0)

* p-value <0.05 (chi-square test)

Table 3 • Respondent's characteristics according to planned place of birth

	Community midwife			Obstetrician		Total (n = 990)‡ No. (%)
	Birth centre (n = 263)‡ No. (%)	Hospital (n = 262)‡ No. (%)	Home (n = 350)‡ No. (%)	Hospital (n = 115)‡ No. (%)	Home (n = 99)‡ No. (%)	
Age						
≤ 25	12 (4.6)	14 (5.8)	21 (6.5)	3 (2.7)		50 (5.3)
26 - 35	195 (75.0)	174 (72.5)	238 (73.2)	76 (69.1)		683 (73.1)
≥ 36	53 (20.4)	52 (21.7)	66 (20.3)	31 (28.2)		202 (21.6)
Parity*						
primiparous	154 (58.8)	113 (46.5)	126 (38.0)	47 (42.3)		440 (46.4)
multiparous	108 (41.2)	130 (53.5)	206 (62.0)	64 (57.7)		508 (53.6)
Education*						
low	16 (6.1)	14 (6.0)	26 (8.0)	10 (9.4)		66 (7.1)
middle	64 (24.4)	72 (30.9)	120 (36.9)	35 (33.0)		291 (31.4)
high	182 (69.5)	147 (63.1)	179 (55.1)	61 (57.5)		569 (61.4)
Ethnicity*						
Dutch	247 (93.9)	203 (84.6)	312 (96.3)	93 (85.3)		855 (91.3)
non-Dutch	16 (6.1)	37 (15.4)	12 (3.7)	16 (14.7)		81 (8.7)
Actual place of birth**						
birth centre	128 (48.7)	6 (2.3)	4 (1.1)	0 (0.0)		138 (13.9)
home	18 (6.8)	26 (9.9)	232 (66.3)	0 (0.0)		276 (27.9)
hospital, under care of a midwife	7 (2.7)	137 (52.3)	20 (5.7)	0 (0.0)		164 (16.6)
hospital, under supervision of an obstetrician	107 (40.7)	91 (34.7)	90 (25.7)	114 (99.1)		402 (40.7)
unknown	3 (1.1)	2 (0.8)	4 (1.1)	1 (0.9)		10 (1.0)

Table 3 • Continued Respondent's characteristics according to planned place of birth

	Community midwife			Obstetrician		Total (n = 990)‡ No. (%)
	Birth centre (n = 263)‡ No. (%)	Hospital (n = 262)‡ No. (%)	Home (n = 350)‡ No. (%)	Hospital (n = 115)‡ No. (%)	Home (n = 115)‡ No. (%)	
Experienced health mother in general						
poor/moderate	9 (3.4)	6 (2.5)	6 (1.8)	8 (7.2)	8 (7.2)	29 (3.1)
good	76 (28.9)	67 (27.5)	84 (25.5)	42 (37.8)	42 (37.8)	269 (28.4)
very good	100 (38.0)	101 (41.4)	138 (41.8)	35 (31.5)	35 (31.5)	374 (39.5)
excellent	78 (29.7)	70 (28.7)	102 (30.9)	26 (23.4)	26 (23.4)	276 (29.1)
Experienced health mother after birth						
healthy	172 (65.4)	182 (69.7)	254 (72.8)	67 (58.3)	67 (58.3)	675 (68.3)
small problems	77 (29.3)	67 (25.7)	82 (23.5)	39 (33.9)	39 (33.9)	265 (26.8)
big problems/problems, impact unclear	14 (5.3)	12 (4.5)	13 (3.8)	9 (7.8)	9 (7.8)	48 (4.9)
Experienced health baby after birth						
healthy	229 (87.4)	229 (87.4)	318 (91.4)	93 (80.9)	93 (80.9)	869 (88.0)
small problems	29 (11.1)	25 (9.5)	22 (6.3)	20 (17.4)	20 (17.4)	96 (9.7)
big problems/problems, impact unclear	4 (1.6)	8 (3.1)	8 (2.3)	2 (1.8)	2 (1.8)	22 (2.2)
Hospital admission of the child after birth*						
no	188 (72.3)	196 (74.8)	304 (87.4)	58 (50.9)	58 (50.9)	746 (75.8)
yes, at the maternity ward	63 (24.2)	58 (22.1)	38 (10.9)	41 (36.0)	41 (36.0)	200 (20.3)
yes, high care	9 (3.5)	8 (3.1)	6 (1.7)	15 (13.2)	15 (13.2)	38 (3.9)

* p-value <0.05 (chi-square test/Fisher's test)

** p-value <0.05 (statistical test are performed on expected place is equal to the final place of birth; hospital births under supervision of an obstetrician and unknown groups are excluded)

‡ numbers are varying between characteristics due to missing data

Table 3 shows the characteristics of the respondents according to their planned place of birth. The women who planned to give birth in a birth centre were more often primiparous and highly educated compared to the women who planned to give birth under care of a community midwife in a hospital, at home or under supervision of an obstetrician in a hospital. The women who planned to give birth in a birth centre or at home were more often of Dutch origin compared to the women who planned to give birth in a hospital (under care of a community midwife or of an obstetrician).

Grades for experiences during birth and the postpartum period

In general, the mean and median grades of experiences during birth and the postpartum period (adjusted for parity, education and ethnicity) were quite similar within each planned places of birth. The mean grades for the planned place of birth were 8.4 (SD=1.3) in a birth centre, 8.4 (SD=1.3) in a hospital under care of a community midwife, 8.7 (SD=1.3) at home and 8.0 (SD=1.6) in a hospital under supervision of an obstetrician. The mean grade for the planned place of birth in a birth centre was significantly ($p<0.05$) higher than the mean grade for the planned place of birth in a hospital under supervision of an obstetrician. The median grades were respectively 9, 8, 9 and 8.

Responsiveness outcomes

Table 4 shows the crude and adjusted odds ratios (ORs) for each domain of responsiveness during birth and the postpartum period, according to the planned place of birth. We adjusted for parity, education and ethnicity, with the birth centre group as reference.

Among all the domains, the domains 'social considerations' and 'basic amenities' performed the best, followed by the domains 'dignity', 'confidentiality' and 'choice and continuity'. The last domains were the domains 'autonomy', 'communication' and 'prompt attention'.

No significant differences were found between the birth centre group and the hospital group under care of a community midwife.

The women who planned to give birth in a birth centre scored significantly lower on responsiveness than the women who planned to give birth at home.

A significantly higher score on the domains 'dignity' ($p<0.05$) and 'autonomy' ($p<0.001$) during birth was found for the women who planned to give birth at home. They also reported a significantly higher score on the domains 'social consideration' ($p<0.05$) and 'choice and continuity' ($p<0.05$) during the postpartum period, compared to the birth centre group.

The women who planned to give birth in a birth centre reported a significantly higher score on 'dignity' ($p<0.01$), 'autonomy' ($p<0.05$), 'confidentiality' ($p<0.05$) and 'social considerations' ($p<0.01$) during birth compared to the hospital group under

supervision of an obstetrician. They also reported a significantly higher score on 'dignity' ($p < 0.05$), 'autonomy' ($p < 0.01$) and 'basic amenities' ($p < 0.05$) in the postpartum period.

Referrals

Table 5 shows the adjusted odds ratios of the referred and non-referred group for each domain of responsiveness during birth and the postpartum period. The reported scores were higher for the women who were not referred. The women who planned to give birth in a birth centre and who were not referred reported a significantly higher score during birth on all the domains except for 'confidentiality', compared to the referred women in this group. The non-referred women reported also a significantly higher score on 'dignity' ($p < 0.05$), 'prompt attention' ($p < 0.001$) and 'basic amenities' ($p < 0.05$) in the postpartum period.

The women who planned to give birth under care of a community midwife in a hospital and were not referred reported a significantly higher score on all domains during birth except 'basic amenities', compared to the referred women in this group. Their score during the postpartum period was also significantly higher on the domains 'autonomy' ($p < 0.01$) and 'basic amenities' ($p < 0.05$) compared to the referred women in this group. The women who planned to give birth at home and were not referred reported a significantly higher score on all the domains except 'basic amenities' during birth and only on 'dignity' ($p < 0.05$) in the postpartum period, compared to the referred women.

For the women who planned to give birth in a hospital under supervision of an obstetrician no distinction between referred or not referred can be made, because they all have been referred during pregnancy

Birth centre services

Table 6 shows the experiences of the respondents with the birth centre services. Most of the women who received care in a birth centre assessed the homelike environment (81.3%), hotel service (84.2%) and bath (94.8%) as good. More than 40% of the women reported that they did not use wireless internet although it was available.

Almost all the women (93.0%) reported that the birth centre experiences met their expectations. 84.9% of the women arrived and 84.7% of the women left the birth centre on their preferred time. However, 13.6% of the women preferred to arrive earlier. Most of the women who were referred from a birth centre to the obstetric unit did not evaluate the change of room (81.5%) or caregiver (81.8%) as a problem. None of the women who stayed postpartum in the same room as during birth found it a problem. As few as 8.6% of the women evaluated the postpartum stay in a different room as a small problem.

Table 4 • Responsiveness outcomes according to planned place of birth

	Under care of a community midwife						
	Birth centre (REF) (n = 263) No. (%)		Hospital (n = 262) No. (%)				
	optimal	non-optimal	optimal	non-optimal	CRUDE OR	Adj OR	95% CI
Responsiveness during birth							
Dignity	163 (62.0)	100 (38.0)	165 (63.0)	97 (37.0)	1.04	0.94	0.65-1.37
Autonomy	92 (36.2)	162 (63.8)	104 (41.3)	148 (58.7)	1.24	1.11	0.76-1.61
Confidentiality	180 (69.8)	78 (30.2)	170 (67.7)	81 (32.3)	0.91	0.84	0.57-1.25
Communication	145 (55.3)	117 (44.7)	131 (52.0)	121 (48.0)	0.87	0.79	0.55-1.14
Prompt attention	145 (55.1)	118 (44.9)	139 (55.4)	112 (44.6)	1.01	0.99	0.69-1.42
Social considerations	212 (80.6)	51 (19.4)	187 (74.8)	63 (25.2)	0.71	0.70	0.45-1.08
Basic Amenities	215 (82.1)	47 (17.9)	189 (76.2)	59 (23.8)	0.70	0.68	0.44-1.07
Choice and Continuity	159 (60.7)	103 (39.3)	157 (64.1)	88 (35.9)	1.16	1.08	0.74-1.57
Responsiveness postpartum							
Dignity	169 (64.3)	94 (35.7)	165 (63.0)	97 (37.0)	0.95	0.93	0.64-1.35
Autonomy	196 (76.6)	60 (23.4)	176 (70.4)	74 (29.6)	0.73	0.71	0.47-1.07
Confidentiality	174 (67.4)	84 (32.6)	154 (61.1)	98 (38.9)	0.76	0.76	0.53-1.11
Communication	96 (36.6)	166 (63.4)	108 (42.9)	144 (57.1)	1.30	1.19	0.83-1.73
Prompt attention	158 (60.1)	105 (39.9)	137 (54.6)	114 (45.4)	0.80	0.81	0.56-1.16
Social considerations	179 (68.1)	84 (31.9)	162 (65.1)	87 (34.9)	0.87	0.83	0.57-1.22
Basic Amenities	208 (80.6)	50 (19.4)	197 (81.1)	46 (18.9)	1.03	1.02	0.65-1.63
Choice and Continuity	156 (59.5)	106 (40.5)	156 (63.7)	89 (36.3)	1.19	1.19	0.82-1.72

Birth centre as reference and adjusted for parity, education and ethnicity

* p < 0.05, ** p < 0.01, *** p < 0.001

Under care of a community midwife					Under supervision of an obstetrician				
Home (n = 350) No. (%)					Hospital (n = 115) No. (%)				
optimal	non-optimal	CRUDE OR	Adj OR	95% CI	optimal	non-optimal	CRUDE OR	Adj OR	95% CI
265 (75.7)	85 (24.3)	1.91	1.58*	1.09-2.27	56 (48.7)	59 (51.3)	0.58	0.51**	0.32-0.81
182 (53.5)	158 (46.5)	2.03	1.77***	1.25-2.51	30 (28.6)	75 (71.4)	0.70	0.59*	0.35-1.00
244 (71.3)	98 (28.7)	1.08	1.08	0.75-1.57	65 (58.6)	46 (41.4)	0.61	0.57*	0.36-0.92
200 (58.8)	140 (41.2)	1.15	1.05	0.75-1.48	55 (49.1)	57 (50.9)	0.78	0.71	0.45-1.13
218 (65.1)	117 (34.9)	1.52	1.37	0.97-1.93	55 (49.1)	57 (50.9)	0.79	0.70	0.44-1.11
276 (82.9)	57 (17.1)	1.17	1.16	0.76-1.79	76 (67.3)	37 (32.7)	0.49	0.47**	0.28-0.79
278 (84.5)	51 (15.5)	1.19	1.21	0.77-1.90	83 (73.5)	30 (26.5)	0.61	0.60	0.35-1.04
221 (67.8)	105 (32.2)	1.36	1.16	0.81-1.64	59 (52.7)	53 (47.3)	0.72	0.65	0.41-1.04
optimal	non-optimal	CRUDE OR	Adj OR	95% CI	optimal	non-optimal	CRUDE OR	Adj OR	95% CI
254 (73.0)	94 (27.0)	1.50	1.37	0.95-1.97	61 (53.0)	54 (47.0)	0.63	0.61*	0.38-0.98
270 (80.6)	65 (19.4)	1.27	1.20	0.80-1.82	72 (64.3)	40 (35.7)	0.55	0.52**	0.31-0.85
239 (69.3)	106 (30.7)	1.09	1.09	0.76-1.56	71 (63.4)	41 (36.6)	0.84	0.82	0.51-1.32
155 (45.5)	186 (54.5)	1.44	1.28	0.91-1.80	49 (43.4)	64 (56.6)	1.32	1.24	0.78-1.98
223 (66.6)	112 (33.4)	1.32	1.22	0.86-1.73	57 (50.4)	56 (49.6)	0.68	0.65	0.41-1.03
253 (76.0)	80 (24.0)	1.48	1.54*	1.06-2.25	73 (64.6)	40 (35.4)	0.86	0.88	0.54-1.43
267 (81.9)	59 (18.1)	1.09	1.02	0.66-1.58	78 (69.6)	34 (30.4)	0.55	0.52*	0.30-0.88
226 (69.3)	100 (30.7)	1.54	1.43*	1.00-2.03	57 (50.9)	55 (49.1)	0.70	0.72	0.46-1.15

Table 5 • Responsiveness outcomes according to planned place of birth for referred and non-referred women

Responsiveness during birth	Under care of a community midwife Birth centre					
	non-referral (REF) (n = 177) No. (%)		referral (n = 83) No. (%)		Adj OR	95% CI
	optimal	non-optimal	optimal	non-optimal		
Dignity	125 (70.6)	52 (29.4)	132 (67.3)	64 (32.7)	0.33***	0.19-0.58
Autonomy	74 (43.8)	95 (56.2)	86 (45.7)	102 (54.3)	0.38**	0.20-0.71
Confidentiality	126 (72.8)	47 (27.2)	138 (73.4)	50 (26.6)	0.66	0.37-1.17
Communication	108 (61.4)	68 (38.6)	108 (56.8)	82 (43.2)	0.52*	0.30-0.91
Prompt attention	108 (61.0)	69 (39.0)	117 (61.9)	72 (38.1)	0.51*	0.29-0.88
Social considerations	151 (85.3)	26 (14.7)	145 (77.1)	43 (22.9)	0.39**	0.20-0.75
Basic Amenities	152 (86.4)	24 (13.6)	142 (76.3)	44 (23.7)	0.44*	0.22-0.86
Choice and Continuity	125 (71.0)	51 (29.0)	132 (71.7)	52 (28.3)	0.26***	0.15-0.45
Responsiveness postpartum	optimal	non-optimal	optimal	non-optimal	Adj OR	95% CI
Dignity	122 (68.9)	55 (31.1)	131 (66.8)	65 (33.2)	0.48*	0.28-0.84
Autonomy	133 (78.2)	37 (21.8)	141 (75.0)	47 (25.0)	0.78	0.42-1.46
Confidentiality	119 (68.8)	54 (31.2)	121 (64.0)	68 (36.0)	0.80	0.45-1.41
Communication	70 (39.8)	106 (60.2)	82 (43.2)	108 (56.8)	0.73	0.41-1.30
Prompt attention	118 (66.7)	59 (33.3)	111 (58.7)	78 (41.3)	0.39***	0.22-0.68
Social considerations	119 (67.2)	58 (32.8)	123 (65.8)	64 (34.2)	0.88	0.49-1.58
Basic Amenities	144 (83.7)	28 (16.3)	154 (84.2)	29 (15.8)	0.49*	0.25-0.95
Choice and Continuity	108 (61.4)	68 (38.6)	123 (66.8)	61 (33.2)	0.80	0.46-1.39

Non-referral as reference and adjusted for parity, education and ethnicity

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 5 • Continued Responsiveness outcomes according to planned place of birth for referred and non-referred women

	Under care of a community midwife						
	non-referral (REF) (n = 196) No. (%)		Hospital			Adj OR	95% CI
	optimal	non-optimal	optimal	non-optimal	referral (n = 60) No. (%)		
Responsiveness during birth	optimal	non-optimal	optimal	non-optimal			
Dignity	132 (67.3)	64 (32.7)	29 (48.3)	31 (51.7)	0.51*	0.27-0.97	
Autonomy	86 (45.7)	102 (54.3)	15 (25.9)	43 (74.1)	0.45*	0.22-0.94	
Confidentiality	138 (73.4)	50 (26.6)	28 (49.1)	29 (50.9)	0.41**	0.21-0.78	
Communication	108 (56.8)	82 (43.2)	19 (33.9)	37 (66.1)	0.48*	0.25-0.93	
Prompt attention	117 (61.9)	72 (38.1)	19 (33.9)	37 (66.1)	0.32***	0.16-0.62	
Social considerations	145 (77.1)	43 (22.9)	36 (64.3)	20 (35.7)	0.49*	0.25-0.97	
Basic Amenities	142 (76.3)	44 (23.7)	43 (76.8)	13 (23.2)	0.90	0.43-1.87	
Choice and Continuity	132 (71.7)	52 (28.3)	21 (38.2)	34 (61.8)	0.25***	0.13-0.48	
Responsiveness postpartum	optimal	non-optimal	optimal	non-optimal	Adj OR	95% CI	
Dignity	131 (66.8)	65 (33.2)	32 (53.3)	28 (46.7)	0.71	0.37-1.35	
Autonomy	141 (75.0)	47 (25.0)	31 (55.4)	25 (44.6)	0.40**	0.20-0.80	
Confidentiality	121 (64.0)	68 (36.0)	28 (49.1)	29 (50.9)	0.56	0.29-1.06	
Communication	82 (43.2)	108 (56.8)	22 (39.3)	34 (60.7)	0.92	0.48-1.77	
Prompt attention	111 (58.7)	78 (41.3)	23 (41.1)	33 (58.9)	0.54	0.28-1.02	
Social considerations	123 (65.8)	64 (34.2)	35 (62.5)	21 (37.5)	0.83	0.43-1.60	
Basic Amenities	154 (84.2)	29 (15.8)	39 (72.2)	15 (27.8)	0.42*	0.20-0.90	
Choice and Continuity	123 (66.8)	61 (33.2)	29 (52.7)	26 (47.3)	0.56	0.30-1.07	

Non-referral as reference and adjusted for parity, education and ethnicity

* p < 0.05, ** p < 0.01, *** p < 0.001

Table 5 • Continued Responsiveness outcomes according to planned place of birth and (non-)referral

	Under care of a community midwife					
	Home					
	non-referral (REF) (n = 196) No. (%)		referral (n = 60) No. (%)		Adj OR	95% CI
optimal	non-optimal	optimal	non-optimal			
Responsiveness during birth						
Dignity	230 (81.6)	52 (18.4)	31 (49.2)	32 (50.8)	0.20***	0.11-0.38
Autonomy	158 (57.2)	118 (42.8)	22 (36.7)	38 (63.3)	0.48*	0.26-0.90
Confidentiality	207 (74.5)	71 (25.5)	35 (57.4)	26 (42.6)	0.43**	0.23-0.79
Communication	176 (63.8)	100 (36.2)	22 (36.1)	39 (63.9)	0.34***	0.19-0.63
Prompt attention	189 (69.7)	82 (30.3)	26 (43.3)	34 (56.7)	0.32***	0.17-0.58
Social considerations	232 (85.9)	38 (14.1)	40 (67.8)	19 (32.2)	0.30***	0.15-0.58
Basic Amenities	229 (86.4)	36 (13.6)	46 (78.0)	13 (22.0)	0.55	0.26-1.16
Choice and Continuity	195 (73.9)	69 (26.1)	23 (39.0)	36 (61.0)	0.23***	0.12-0.42
Responsiveness postpartum						
Dignity	212 (75.4)	69 (24.6)	38 (61.3)	24 (38.7)	0.51*	0.28-0.95
Autonomy	220 (81.2)	51 (18.8)	47 (79.7)	12 (20.3)	0.97	0.46-2.06
Confidentiality	200 (71.7)	79 (28.3)	36 (59.0)	25 (41.0)	0.59	0.32-1.08
Communication	132 (47.8)	144 (52.2)	22 (36.7)	38 (63.3)	0.79	0.43-1.45
Prompt attention	186 (68.6)	85 (31.4)	34 (57.6)	25 (42.4)	0.63	0.34-1.15
Social considerations	207 (76.7)	63 (23.3)	42 (72.4)	16 (27.6)	0.62	0.32-1.20
Basic Amenities	214 (81.4)	49 (18.6)	49 (84.5)	9 (15.5)	1.29	0.56-2.96
Choice and Continuity	186 (70.7)	77 (29.3)	35 (60.3)	23 (39.7)	0.70	0.38-1.28

Non-referral as reference and adjusted for parity, education and ethnicity

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6 • Experiences with birth centre services

Facilities	good	sufficient	insufficient
Homelike environment	156 (81.3)	32 (16.7)	4 (2.1)
Hotel service	123 (84.2)	20 (13.7)	3 (2.1)
Bath	91 (94.8)	4 (4.2)	1 (1.0)
Expectations	good	sufficient	insufficient
Met	185 (93.0)	13 (6.5)	1 (0.5)
Moment	on time	too late	too early
Arrival	169 (84.9)	27 (13.6)	3 (1.5)
Departure	166 (84.7)	13 (8.7)	17 (6.6)
Continuity	no problem	small problem	big problem
Change of room in case of referral	44 (81.5)	9 (16.7)	1 (1.9)
Change of caregiver in case of referral	18 (81.8)	4 (18.2)	0 (0.0)
Postpartum stay in the same room as birth	32 (100.0)	0 (0.0)	0 (0.0)
Postpartum stay in different room as birth	32 (91.4)	3 (8.6)	0 (0.0)

Discussion

The aim of this study was to assess the experiences with maternity care of the women who planned birth in a birth centre compared to alternative planned places for child-birth, by using the responsiveness concept of the World Health Organization.

The women had, in general, good experiences during birth and the postpartum period. Women who planned to give birth in a birth centre reported similar experiences as those who planned to give birth at a hospital under care of a community midwife. Women who planned to give birth at home were most positive about their experiences and scored highest on the domains autonomy and prompt attention. A referral to secondary care had a negative effect on the experiences of women in all settings. Women who received care in a birth centre highly valued the facilities, moment of arrival/departure and continuity in a birth centre. In case of referral, the physical travel from the birth centre to the obstetric unit was not a problem for most of the women.

Strengths and limitations

This is the first study comparing the experiences of women who planned to give birth in a birth centre with that of women who planned to give birth in the three other settings in the Netherlands: under care of a community midwife in a hospital, at home and under supervision of an obstetrician in a hospital. The used questionnaire avoids any implicit

or explicit preference towards the providers or organizational structures, captures the client's actual experience and is unique in the coverage of the eight responsiveness domains. Therefore, we were able to evaluate the maternity care as a whole, with its different services, professionals and time windows. The experiences (positive and negative) are allocated to the entire maternity chain and not to a specific profession or person. In addition, the present study includes a nationwide approach and high coverage of Dutch birth centres.

The analyses were performed according to the women's planned place of birth. Our information was based on the place of birth which was planned one month before the birth. For women who were referred to secondary care before the 36th week of pregnancy, their planned place of birth will by necessity be in a hospital, under supervision of an obstetrician. In general, around 15% of the women are referred during pregnancy to the second echelon after the 36th week (23). In addition, some women are referred immediately at the onset of labour from home to the second echelon. Therefore, some of the women who planned to give birth under care of a community midwife in a birth centre or in a hospital have not actually been in these places or experienced these conditions. According to the 'intention to treat'-principle however, they should not be excluded from the analyses.

The women were asked to participate in the study by their own community midwife. Although we asked the midwife to invite every woman receiving postpartum care for participation, we have no information if this was done. Our response rate was 54.6%, which is a good response in itself but a selection bias might have occurred. We, therefore, compared the characteristics of the respondents with those of all the women who received postpartum care from the included midwifery practices. It appeared that the respondents have characteristics (older, higher educated, more often of Dutch origin and having less interventions during birth) that are associated with a more optimal birth experience, which may have positively influenced the results (20, 26, 27).

Interpreting the results

The women have, in general, good experiences during birth and the postpartum period. Another Dutch study showed that the quality of care experienced by low-risk women during the entire maternity care process is high (10). The few significant differences between the settings during birth are especially associated with the personal related domains (dignity, autonomy and confidentiality). In the postpartum period, the differences are more related to the setting related domains (social consideration, basic amenities and choice and continuity). Although most differences were not significant, the women in the birth centre group have on most of the domains slightly better experiences compared to the women in the hospital group under care of a community midwife. More than 80%

of the women who received care in a birth centre highly valued the facilities, the moment (on time) of arrival and departure and the continuity in the birth centre. This is in line with what several other international studies have found (12-14).

The women who planned to give birth at home have significantly better experiences than the group of women who planned to give birth in a birth centre. This is in line with what other international studies have found and can possibly be explained by the positive influence of the familiar environment at home (16, 28). Another study which compared the experiences of women giving birth in a birth centre and at home, did not find differences on overall satisfaction (15). That study included only one specific birth centre. We found that the women in the birth centre group have significantly better experiences than the group of women who planned to give birth under supervision of an obstetrician in a hospital. This is not surprising, since it is known that women who perceive no health problems for themselves or their baby have better experiences. The women giving birth in a hospital under supervision of an obstetrician are high-risk women and, therefore, probably more anxious or worried about their own or their baby's health (21).

Being referred during labour/birth has a negative influence on the experiences. This is in line with a study that found a significantly negative association between referral and the birth experience 10 days postpartum (29). Another study found referral as a significant risk factor for a negative recall of birth experience in women 3 years postpartum (30). And a cross-national study showed the negative influence of a referral as well (31). However, there is also a Dutch study which found no association between the referral and the experience of birth three weeks postpartum (32). Moreover, a physical transfer from the birth centre to the obstetric unit has shown not to be a problem for most of the women in this study.

Implications for practice

In the last decades, many birth centres have been established in different countries, including the United Kingdom, Australia, Sweden and the Netherlands. Although no significant differences were found between the experiences of women in the birth centre group and those in the hospital group under care of a community midwife, the following trend can be seen: the women in the birth centre group have on some domains slightly better experiences. Additionally, women highly valued the birth centre services. This should be considered in the further development of birth centres in the different countries. Given the result that the women who planned to give birth at home have better experiences than the women who planned to give birth in a birth centre, more emphasis may be put on the homelike environment in the birth centres. Being referred to secondary care has a negative effect on the experiences in all settings. Referrals cannot

always be prevented, but one possible solution might be that the community midwife or her colleague, who are familiar with the woman, continues accompanying the client. In general, priority must be given to 1) autonomy (more specific: including the client in decision-making on pain-relief/setting of birth, acceptance of treatment refusal) and 2) prompt attention (more specific: access for contact in all situations, waiting time for service, physical accessibility of the setting, prompt phone response).

Conclusions

The women had, in general, good experiences during birth and the postpartum period. The domains 'social considerations' and 'basic amenities' performed the best. The domains 'autonomy', 'communication' and 'prompt attention' scored relatively lower. So, one should focus more on the latter domains.

Although no significant differences were found between the birth centre group and the hospital group under care of a community midwife, the following trend can be seen: the birth centre group report on some domains slightly better experiences. The women who planned to give birth in a birth centre reported less positive experiences than the women who planned to give birth at home. Most of the women who received care in a birth centre highly valued the services. For women who do not want to give birth at home a birth centre is a good choice, it leads to slightly better, but not significantly, experiences as a planned hospital birth.

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09

Chapter

Job satisfaction of maternity care providers Does working in or with a birth centre influence job satisfaction?

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Abstract

Introduction In the Netherlands women with uncomplicated pregnancies long had two options where to give birth, at home or in hospital, assisted by their community midwife. Recently, birth centres have become an alternative option. This article focusses on the job satisfaction of three groups of maternity care providers working in or with a birth centre compared to those working only in a hospital or at home: community midwives, clinical care providers and maternity care assistants.

Methods An existing questionnaire was adapted and distributed to community midwives, clinical midwives, obstetricians, paediatricians, maternity care assistants and obstetric nurses. With factor analyses two composite measures were constructed, a Composite Job Satisfaction scale and an Assessment-of-Working-in-or-with-a-Birth-Centre scale.

Results The overall score on the Composite Job Satisfaction scale did not differ between community midwives or clinical care providers working in or with a birth centre and those working in a different setting. For maternity care assistants there was a small but significantly higher score for those not working in a birth centre. Maternity care assistants' overall job satisfaction score was higher than that of both other groups. In a linear regression analysis working or not working in or with a birth centre was related to the overall job satisfaction score, but repeated for the three professional groups separately, this relation was only found for maternity care assistants.

Conclusion Job satisfaction is generally high, but, except for maternity care assistants, not related to the setting: working or not working in or with a birth centre.

Introduction

In the Netherlands three groups of medical professionals are responsible for providing maternity care, midwives, obstetricians, and some general practitioners. In addition to that, maternity care assistants (MCAs) and nurses assist the responsible medical professional during labour and birth and provide care and advise during the postpartum period. In case of complications with the new-born immediately after birth paediatricians are called in. Most midwives are community midwives, they are independently practicing care providers in primary care. They provide the full range of maternity care, that is: antenatal, natal and postnatal care, to healthy women with uncomplicated pregnancies and births. In case of pathology, threatening complications or a request for pharmacological pain relief, a woman will be referred to an obstetrician in a hospital. Only a few general practitioners still provide the full range of maternity care. An increasing number of midwives are employed by hospitals, working as clinical midwives under supervision of obstetricians, to provide care to women with an increased risk of complications. Women with uncomplicated pregnancies long had two options to choose where to give birth, at home or in a hospital, both assisted by their own community midwife. Recently, birth centres have become an alternative option in a number of regions in the Netherlands. Most birth centres do not employ a full staff of care providers, but have agreements with community midwives to bring their clients to give birth in the birth centre, and with hospitals to refer clients in need of specialist care. A birth centre in the Netherlands is primarily an alternative location, not an alternative form of care. The majority of birth centres are located in a hospital, but separated from the obstetric department. During births at home, in birth centres, and in some hospitals, midwives are assisted by maternity care assistants who also provide post-partum support to families, sometimes in the birth centre but mostly in the family's own home up to eight days following childbirth.

Job satisfaction of care providers is one of the aspects to be considered in measuring the success of organisational changes, like the introduction of birth centres, but recent studies about job satisfaction among maternity care providers are scarce. A qualitative study by Warmelink et al, 2015,[1] showed that direct client contact, positive support and teamwork as well as the ability to work independently and autonomously led to higher levels of satisfaction among Dutch primary-care midwives. No studies are available about job satisfaction among other professions in maternity care in the Netherlands.

In the last few decades the number of home births in the Netherlands has decreased rapidly, from about 25% in 2000 to 13% in 2015.[2,3] One of the reasons is the increased

number of referrals to secondary care before and during labour (from about 46% in 2000 to 58% in 2015).[2,3] Another reason could be the renewed discussions about the safety of home birth, following the EURO-Peristat publications about perinatal mortality.[4] Because of this, fewer women choose to give birth at home, leading to an increased number of births in the hospital, assisted by a community midwife (from about 12% in 2000 to 16% in 2015).[2,3] Responding to the Peristat publications a strategic review of maternity services[5] was performed, leading to a changing maternity service provision in the Netherlands, with the emphasis shifting towards more integrated care.[6]

The growing number of birth centres parallels the decrease in home births and the discussions about integrated care. Before 2000 only a few birth centres, called maternity clinics, existed in the Netherlands, but in the last ten to fifteen years their number increased rapidly.[7] Because birth centres are relatively new and there is discussion about their role in the changing maternity care system in the Netherlands, a study project, the Dutch Birth Centre Study, was initiated to evaluate the effects of birth centre care on quality of care, experiences of clients and caregivers, economic outcomes and implications for future implementation of birth centre care.[8] After formulating a definition for a birth centre in the Netherlands[7] the study identified 23 birth centres that were operational in September 2013. A sub-study of this project, focussing on the experience of caregivers, is presented in this article.

The research question for this sub-study is: Is there a difference in job satisfaction of care providers working regularly or occasionally in or with a birth centre, compared to care providers working only in other settings and how do care providers working in or with a birth centre assess that workplace?

Methods

Questionnaire

In cooperation with two other maternity care related studies in the Netherlands an existing questionnaire was adapted for use among care providers in maternity care. The questionnaire is based on a validated instrument[9] and consists of 10 themes with a total of 81 questions: 1) general background; 2) staffing and organisation; 3) job demands and tasks; 4) social support in the workplace and closeness; 5) cooperation; 6) arrangements and handover; 7) autonomy; 8) development opportunities; 9) financial assessment and satisfaction; 10) influence of the job on the private life. Except for theme 1, answers were on a four-point-scale ranging from 'totally disagree' to 'totally agree'. The questions were irregularly positively and negatively formulated but all answers were

coded with '1' the most negative and '4' the most positive response with regard to job satisfaction, resulting in a neutral value of '2.5'.

Two of the three studies added questions to the questionnaire, specific for their own research topic. For the Dutch Birth Centre study 21 questions related to working in or with a birth centre were added. All care providers were asked whether or not they worked in or with a birth centre, regardless of the intensity of that work relation: on a regular basis or occasionally.

Experiences of working in or with a birth centre were measured on four themes with a total of 14 questions also with answers on a four-point-scale ranging from 'totally disagree' to 'totally agree'. These themes were: organisation, cooperation, location and working conditions. Again, the questions were irregularly positively and negatively formulated but all answers were coded with '1' the most negative and '4' the most positive response with regard to work experiences. Nine of these questions also provided the option to answer 'I don't know' or 'not applicable'. Finally, care providers were asked to indicate on a four-point-scale, ranging from 'not at all' to 'very much', how much the local birth centre had a positive influence on their job satisfaction.

Data collection and analysis

Early in 2015 the questionnaire was online distributed through professional organisations of all professionals in maternity care and through hospitals to community midwives, clinical midwives, gynaecologists/obstetricians, paediatricians, maternity care assistants and obstetric nurses. No selection was made, everyone was invited to respond. The questionnaire was available from February until April. In the third week of March a reminder email was sent to all midwifery practices and other contact persons, and further reminders were placed on the KNOV-website (KNOV= Royal Dutch Organization of Midwives) and forums such as the hospital midwives group within the KNOV.

Factor analyses were used to construct two composite measures, a Composite Job Satisfaction scale for all maternity care providers and an Assessment-of-Working-in-or-with-a-Birth-Centre scale for care providers working regularly or occasionally in or with a birth centre.

Three groups of care providers: maternity care assistants (MCA), community midwives (CoM) and clinical care providers (CCP) (clinical midwives, obstetricians, paediatricians and obstetric nurses), working regularly or occasionally in or with a birth centre were compared to those working only in other settings. The clinical care providers, although of different professional background (40.3% obstetrician, 17.4% clinical midwife, 21.1% obstetric nurse, 16.2% paediatrician, 5% other), are combined into one group, because working in a clinical setting is what differentiates them from

both other groups: community midwives and maternity care assistants, who may assist a woman giving birth in a hospital, but are not part of the clinical setting.

Within the group of care providers working in or with a birth centre comparisons were made between the three groups. SPSS was used for the analyses. Differences between groups were tested with Student's t-test and MANOVA with PostHoc test. A linear regression analysis was conducted for the total group of professionals and for the three groups separately with the Composite Job Satisfaction scale as dependent variable. A p-value < 0.05 was considered to be statistically significant.

Design and planning of the study were presented to the Medical Ethics Committee of the UMCU (University Medical Centre Utrecht) who confirmed that an official ethical approval of this study is not required.

Results

4073 respondents completed the questionnaire. In total 224 respondents were excluded from the analyses : 49 not working as a maternity care provider, 56 with a profession other than community midwife (CoM), clinical care provider (CCP) or maternity care assistant (MCA) and 119 who did not fill in their profession. This resulted in a total of 3849 respondents of whom 1038 (27%) were regularly or occasionally working in or with one of the birth centres included in the Birth Centre Study. See table 1 for an overview of the respondents. Responding community midwives were more often working in or with a birth centre than average and responding clinical care providers less often. A response rate could not be calculated because it is unknown how many professionals received the invitation to fill out the questionnaire. However, the total study population, eligible for this study, consists of about 9,000 MCA,[10] 2,000 CoM[10] and 4,600 CCP (\pm 800 clinical midwives,[11] \pm 800 Gyn/Obs,[12] \pm 2800 O&G nurses.[13]) It is therefore no surprise that the majority of the respondents are maternity care assistants.

Table 1 • Respondents by profession

	Total number	Working in/with birth centre (BC)	Not working in/with birth centre (not BC)
Community midwives (CoM)	406	154 (37.9%)	252 (62.1%)
Clinical care providers (CCP)	598	142 (23.7%)	456 (76.3%)
Maternity care assistants (MCA)	2845	742 (26.1%)	2103 (73.9%)
Total number	3849	1038 (27.0%)	2811 (73.0%)

We did ask the care providers working in or with one of the birth centres what percentage of their clients received birth centre care, in order to have an idea of their involvement with birth centres. For only a few in each group (2.3% MCA, 1.3% CoM, 2.9% CCP) all clients receive (some of their) care in a birth centre. For the majority (68% MCA, 61% CoM, 84% CCP) 50 percent or less of their clients receive care in a birth centre.

Average age differs between professions, with community midwives being younger than other care providers (see Table 2). Men are clearly the exception among community midwives and maternity care assistants, and in a less extreme way also among clinical care providers. A large majority of community midwives and about one in four clinical care providers are self-employed. Clinical care providers are the most experienced in maternity care as well as in their current jobs and community midwives work on average the most hours per week, about twice as many as maternity care assistants.

Table 2 • Background of respondents

	Community midwives (CoM)		Clinical care providers (CCP)		Maternity care assistants (MCA)	
	BC (n=154)	Not BC (n=252)	BC (n=142)	Not BC (n=456)	BC (n=742)	Not BC (n=2103)
Average age (years)	39.2	37.3	46.5	46.4	47.4	47.1
Percentage female	99.4	98.7	83.1	77.8	99.7	99.3
Employment status (%)						
Employed	9.7	7.6	69.7	73.0	90.8	87.4
Self-employed	79.2	80.6	28.2	24.9	6.9	8.7
Locum	9.7	11.0	1.4	0.7	0.4	0.6
Other	1.3	0.8	0.7	1.4	1.9	3.3
Total work experience in maternity care (years)	13.8	12.3	18.2	17.2	14.9	16.1
Work experience in current job (years)	10.4	9.4	12.2	11.7	10.0	11.2
Working hours per week	42.9	44.0	37.8	39.2	22.7	22.3

Comparison of job satisfaction between different groups of care providers

For the Composite Job Satisfaction scale initially thirteen factors were identified, with Cronbach's alpha ranging from 0.71 to 0.99. One factor: 'social support from supervisor' was excluded from the Composite Job Satisfaction scale because it was not applicable to the majority of community midwives and more than a quarter of the clinical care providers, because they are self-employed.

Figure 1 shows the scores on the factors included in the Composite Job Satisfaction scale for the three different groups of care providers, regardless of their work setting. In

general maternity care assistants show higher levels of job satisfaction than the other care providers. Maternity care assistants score significantly different than both other groups on ten of the twelve factors and on the Composite Job Satisfaction scale. Only on the factor 'social support from colleagues' the difference with clinical care providers is not significant and on the factor 'trust' the difference with community midwives is not significant. Significant differences between community midwives and clinical care providers are found on the factors 'staffing', 'social support other professions', 'influence work on private life', and 'expectations'.

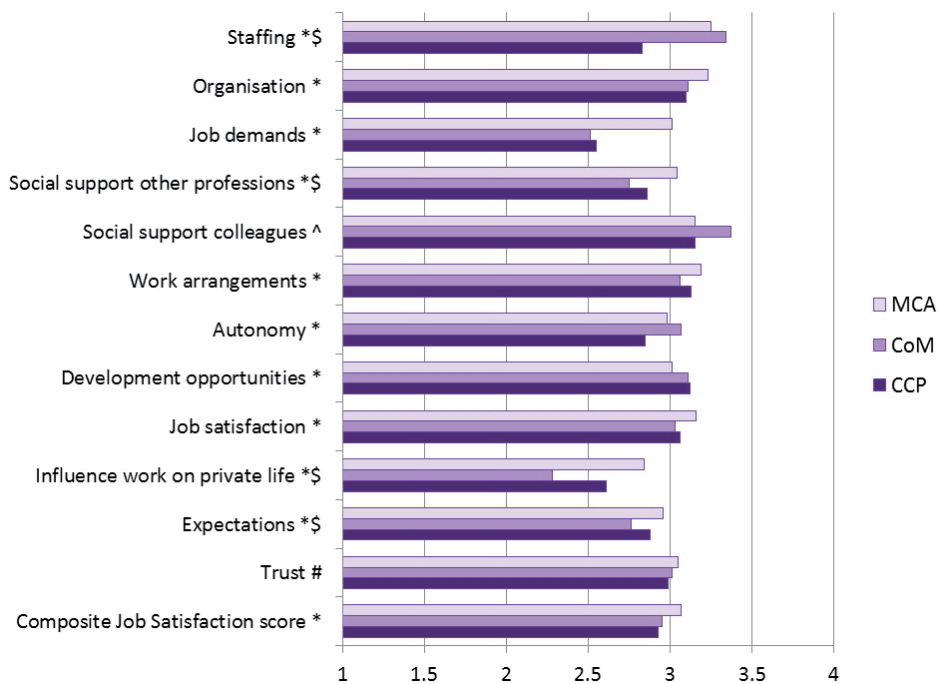


Figure 1 • Factors included in the Composite Job Satisfaction scale (range 1 – 4) for the three groups of care providers: maternity care assistants (MCA), community midwives (CoM) and clinical care providers (CCP). The neutral value is 2.5.

Comparison of job satisfaction between care providers working regularly or occasionally in or with a birth centre and care providers working only in other settings

Figure 2 shows the score on the Composite Job Satisfaction scale of different groups of care providers working regularly or occasionally in or with a birth centre and care

providers working only in other settings. The average score for the three groups of care providers working in or with a birth centre is 3.01, for the care providers working only in other settings the average score is 3.05. This difference is statistically significant ($t=4.14$, $p<0.05$), but looking at the different groups, this difference is only found among maternity care assistants. For community midwives and for clinical care providers there is no difference in the score on the Composite Job Satisfaction scale between both groups, but for maternity care assistants the score on the Composite Job Satisfaction scale is slightly higher for those not working in or with a birth centre (not BC) (3.09 versus 3.04, $t=4.35$, $p<0.05$).

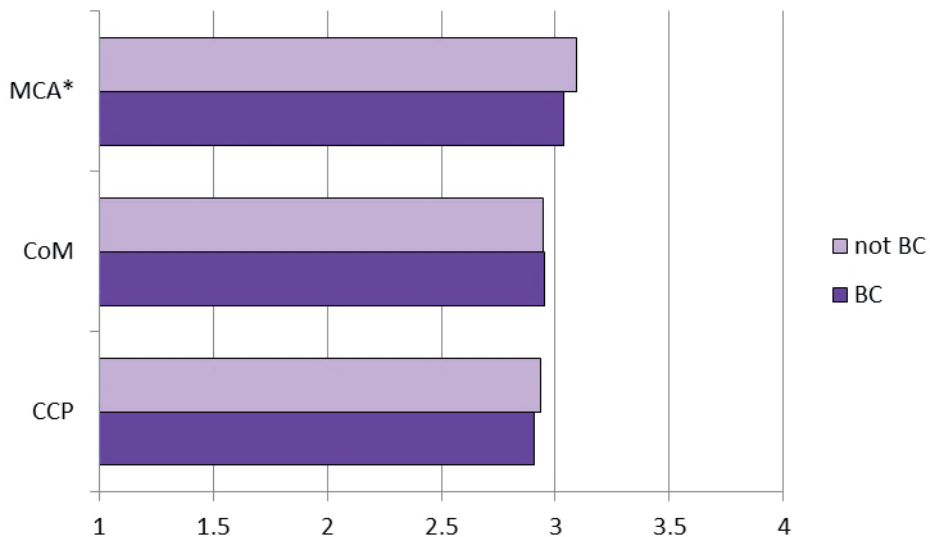


Figure 2 • Composite Job Satisfaction scores of different groups of care providers: maternity care assistants (MCA), community midwives (CoM) and clinical care providers (CCP) regularly or occasionally working in or with a birth centre (BC) and care providers working only in other settings (not BC). Range is 1 – 4. The neutral value is 2.5.

*significantly different

Table 3 shows the scores on the factors included in the Composite Job Satisfaction scale for different groups of care providers by work setting. On individual factors some differences are found between the settings, but they are not tested, because of the many tests involved, with the risk of chance significances. However, one finding deserves mentioning: community midwives are the only ones to score lower than neutral: a score of 2.22 (BC) and 2.32 (not BC) on the factor 'influence work on private life' and a score of 2.46 for those working regularly or occasionally in or with a birth centre on the factor

'job demands'. All other scores for all three groups of professionals are on the positive side of the scale, that is: at or above 2.5.

Table 3 • Job satisfaction of respondents working regularly or occasionally in or with a birth centre (BC) or working only in other settings (not BC)(range 1 – 4, The neutral value is 2.5)

	Community midwives (CoM)			Clinical care providers (CCP)			Maternity care assistants (MCA)		
	Total	BC	Not BC	Total	BC	Not BC	Total	BC	Not BC
Staffing (3*)	3.34	3.35	3.32	2.83	2.81	2.84	3.25	3.19	3.26
Organisation (4)	3.11	3.08	3.12	3.10	3.12	3.09	3.23	3.21	3.24
Job demands (6)	2.51	2.46	2.54	2.55	2.50	2.57	3.01	2.97	3.02
Social support other professions (5)	2.75	2.76	2.73	2.86	2.90	2.85	3.04	3.00	3.05
Social support colleagues (5)	3.37	3.37	3.38	3.15	3.12	3.16	3.15	3.12	3.17
Work arrangements (4)	3.06	3.09	3.04	3.13	3.09	3.14	3.19	3.14	3.22
Autonomy (5)	3.07	3.09	3.05	2.85	2.80	2.87	2.98	2.96	2.99
Development opportunities (5)	3.11	3.17	3.06	3.12	3.09	3.13	3.01	3.00	3.02
Job satisfaction (7)	3.03	3.02	3.03	3.06	2.99	3.08	3.16	3.12	3.18
Influence work on private life (3)	2.28	2.22	2.32	2.61	2.58	2.62	2.84	2.82	2.86
Expectations (8)	2.76	2.76	2.76	2.88	2.87	2.88	2.96	2.93	2.98
Trust (6)	3.01	3.02	3.01	2.99	3.00	2.98	3.05	3.01	3.06
Composite Job Satisfaction score	2.95	2.95	2.95	2.93	2.91	2.94	3.07	3.04	3.09

*number of questions in the factor

Linear regression analysis was performed for the total group of professionals with the Composite Job Satisfaction scale as dependent variable and average age, profession, years of experience in their profession, years of experience in their current work setting, number of working hours per week, and working or not working in or with a birth centre as independent variables, using the backward method.

Three of these six variables showed being related to the job satisfaction score: number of working hours per week ($\beta = -0.038$, 95% CI= -0.002 – 0.000), profession ($\beta = -0.193$, 95% CI= -0.088 – -0.057), and working or not working in or with a birth centre ($\beta = -0.076$, 95% CI= -0.066 – -0.024). When repeated for the three professional groups separately, for maternity care assistants only the variable working or not working in or with a birth centre was related to the job satisfaction score ($\beta = -0.092$, 95% CI= -0.079 – -0.029), with higher job satisfaction among maternity care assistants not regularly or occasionally working in or with a birth centre. For community midwives the only variable remaining was the years of experience in their profession, with higher job satisfaction related to fewer years of experience ($\beta = -0.117$, 95% CI= -0.007 – 0.000). For clinical care

providers no single variable remained in the analysis. This confirms the results shown in Table 3.

Assessment of working in or with a birth centre

For the Assessment-of-Working-in-or-with-a-Birth-Centre scale four factors were identified, with Cronbach's alpha ranging from 0.63 to 0.88, but the number of valid responses for the composite scale was low, due to the large number of respondents, especially maternity care assistants (63%) and clinical care providers (70%), who indicated they did not know the answer to one or more of the questions.

Figure 3 shows the care providers' assessment of working in or with a birth centre. All scores are on the positive side of the scale. In contrast to the scores on the Composite Job Satisfaction scale, maternity care assistants score on all four factors lower than both other groups of care providers. On the factor 'organisation' maternity care assistants score significantly lower than clinical care providers, on the factor 'cooperation' maternity care assistants score significantly lower than both community midwives and clinical care providers, and on 'working conditions' clinical care providers score significantly lower than both maternity care assistants and community midwives. On the factor 'location' and on the total score there are no differences between the groups.

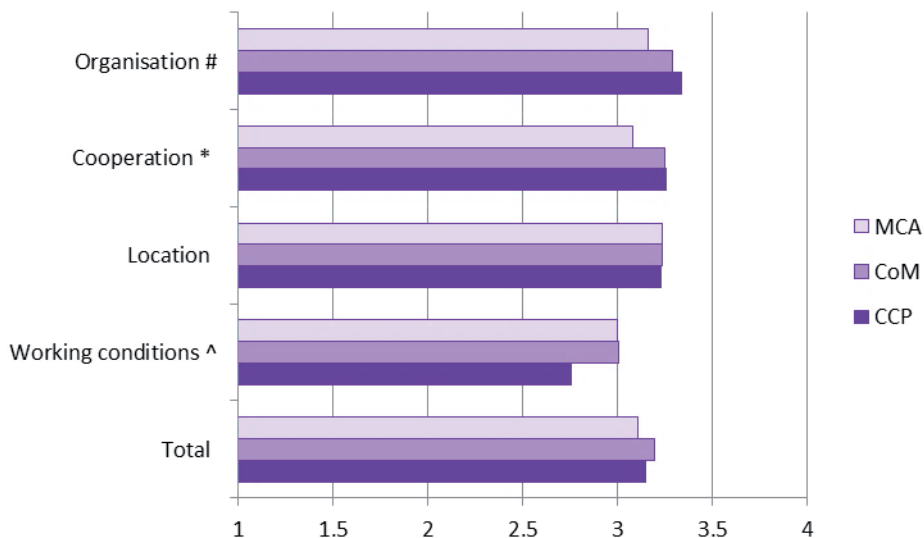


Figure 3 • Assessment of working in or with a birth centre by maternity care assistants (MCA), community midwives (CM) and clinical care providers (CCP). Range is 1 – 4. The neutral value is 2.5.

significant difference between MCA and CCP

* significant difference between MCA and both other groups

^ significant difference between CCP and both other groups

Figure 4 shows that for 5 to 8% of care providers the birth centre has a large influence on their job satisfaction, while a minority in all three groups think there is no influence. Whether this experienced influence is positive or negative is unclear, however. We expected it to be positive, but we have seen that job satisfaction of maternity care assistants is higher for those not regularly or occasionally working in or with a birth centre.

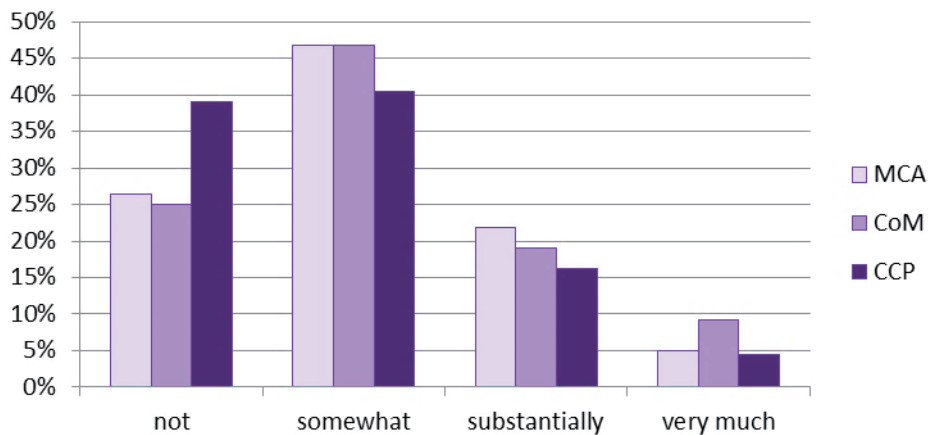


Figure 4 - Answers of maternity care assistants (MCA), community midwives (CoM) and clinical care providers (CCP) to the question: how much does the birth centre in your area influence your job satisfaction?

Comparison of job satisfaction between different birth centres

In the Dutch Birth Centre study 23 birth centres are included, clustered according to their location: freestanding, alongside, or on-site, and to their integration profile: low, intermediate and high.[14] The above presented data have also been checked for meaningful differences between these clusters, but there were none.

Discussion

Birth centres are a relatively new phenomenon in the Dutch maternity care system. For women with an uncomplicated pregnancy who do not want to give birth at home, birth centres provide an alternative for a hospital birth, with a home-like atmosphere, all kinds of conveniences, and their own midwife and a maternity care assistant to support them during labour and birth. In the Dutch Birth Centre Study several aspects of birth centre care have been studied,[4] including client experiences.[15]

In this sub-study the focus was on the care providers with the research question: Is there a difference in job satisfaction of care providers working regularly or occasionally in or with a birth centre, compared to care providers working only in other settings and how do care providers working regularly or occasionally in or with a birth centre assess that workplace?

We found that the overall score on the Composite Job Satisfaction scale is not different for community midwives and clinical care providers working regularly or occasionally in or with a birth centre compared to those working only in a different setting, while for maternity care assistants there was a small but significantly higher score for those not working in a birth centre. However, the maternity care assistants' overall job satisfaction score was higher than the scores of both other groups.

The overall conclusion is that for community midwives and clinical care providers the setting (the birth centre) does not significantly influence their job satisfaction but we can only guess why. Maybe there is not enough distinction between the birth centre and the maternity ward of the hospital, where low-risk women can give birth assisted by their own midwife and where high-risk women receive specialist care. After all, most birth centres are located inside the hospital, on a different floor or even next to the obstetric ward.

We did find significant differences between community midwives and clinical care providers as groups, with higher scores for community midwives on the factor 'staffing', and lower scores on the factors 'social support other professions', 'influence work on private life', and 'expectations'. We also found that community midwives score negative on the factor 'influence of work on their private life'. This last finding has been found in other studies among midwives as well,^[1] which is confirmed by the fact that it is found for both groups of midwives, those working regularly or occasionally in or with a birth centre and those working only in other settings.

Regarding the care providers' assessment of working in or with a birth centre, we found that maternity care assistants were less positive than both other groups. The reason for this difference is not immediately clear but may be related to their limited experience with birth centres. Most maternity care assistants only work occasionally in a birth centre. Maternity care assistants work most of their time in private homes, providing care and support to families in the first week after the baby is born. Moreover, their involvement with childbirth, at home or in a hospital or birth centre, is only part of their job. Therefore it could be that they are or feel less involved in the organisation of a birth centre and the cooperation with other care providers.

Among the care providers working regularly or occasionally in or with a birth centre

clinical care providers are less positive about 'working conditions' than both community midwives and maternity care assistants. We have no explanation for this result, other than the fact that most clinical care providers are only indirectly involved with birth centres. Only when clients are referred to clinical care there will be contact between care providers in the birth centre and clinical care providers. Most of the time the referred clients will have to be transferred from the birth centre to the clinical department. Only in a few cases the clinical care providers will enter the birth centre to take over the care from the community midwife.

We found that maternity care providers are generally satisfied with the place they have chosen to work in. However, the different birth settings may be of more significance to the choices and experiences of couples having their baby than to the care providers assisting with childbirth. In addition, further research needs to address the job demands of midwives, as well as the influence of work on their private life.

This study has a number of limitations. First of all, there is no way of telling how selective our study population is, because we do not know how many and which professionals did not receive the invitation to fill out the questionnaire and who declined to respond. Secondly, it is possible that our questionnaire was not specific enough to discern a difference between care providers working in or with a birth centre and those working only in other settings. Every respondent who answered that they worked in or with a birth centre was included in that sub-group, regardless the intensity of that work relation. That means that, for instance, a community midwife who assisted only one client in the local birth centre, was included in the same group as a maternity care assistant who worked predominantly or solely in a birth centre. However, birth centres are still not common in the Netherlands. So, most midwives working in the vicinity of a birth centre, will have had clients choosing to give birth there and will have experience with the birth centre. Thirdly, we did not differentiate between clinical care providers and included obstetricians, paediatricians, clinical midwives and nurses, because they all work in a clinical environment and within a clinical hierarchy, which is fundamentally different from the setting in a birth centre, where community midwives are independent care providers.

Conclusion

Job satisfaction among maternity care providers is generally high, with only two of twelve factors resulting in a less than positive score among community midwives: 'influence of work on their private life' for both groups and 'job demands' for community midwives

working in or with a birth centre. On the Composite Job Satisfaction scale no differences were found between community midwives and clinical care providers, while maternity care assistants score on average higher than both other groups. Only for maternity care assistants a difference is found between those working regularly or occasionally in or with a birth centre and those working only in other settings, with higher job satisfaction for the latter group. All three groups of care providers are positive about working in or with a birth centre and indicate that it influences their job satisfaction, but that influence is not visible in the overall Composite Job Satisfaction score.

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Chapter

10

Summary and General discussion

Background

This thesis contributes to a broad evaluation of birth centre care in the Netherlands. It is one of three theses based on data from the Dutch Birth Centre Study. The aim of this national study was to provide evidence based recommendations for birth centre care in the Netherlands. To make these recommendations all sub-studies of the Dutch Birth Centre Study must be considered.

This thesis focuses on the effect of a birth planned in a birth centre on perinatal outcomes, cost-effectiveness, transfer and referral and experiences. Studying an effect is not possible without a clear definition of the study subject or without a reliable outcome tool that is suitable for the Dutch maternity care system. Part I describes the study protocol, the formulation of a definition for 'birth centre' in the Netherlands and the description and validation of the outcome measurement tool. Part II focuses on the effect of a planned birth in a birth centre and Part III addresses job satisfaction amongst maternity care-providers with reference to working in a birth centre.

This final chapter represents an overview of the main findings of the thesis and a reflection on its findings. It also describes implications for practice and research.

Main findings

Part I

Chapter 2: Study protocol of the Dutch Birth Centre Study

This chapter describes the study protocol for the Dutch Birth Centre Study. The aims of this national study were 1) identification of birth centres and measuring integration of their organization and care; 2) measuring the quality of birth centre care; 3) effects of birth centre care on the quality and provision of birth care; 4) cost-effectiveness analysis; and 5) an in depth longitudinal analysis of the organization and processes in birth centres. The inclusion criteria, different methods, instruments and expected outcomes were described per sub-study. Results will enable users of maternity care, professionals, policy makers and health care financiers to make an informed choice about the kind of birth location that is appropriate for their needs and wishes.

Chapter 3: The identification of Dutch birth centres

In the Netherlands a standard **definition** for a birth centre was lacking. Without a clear definition it was not possible to identify birth centres in a consistent way. With a mixed-methods research design a Dutch definition for birth centres was formulated: birth

centres are defined as midwifery-managed locations that offer care to women with low-risk pregnancies during labour and birth. They have a home-like environment and provide facilities to support physiological birth. Independent community midwives take primary professional responsibility for care. In case of referral the secondary care-provider (obstetrician or paediatrician) takes over the professional responsibility of care. Three types of birth centre were identified based on their location to the nearest obstetric unit in a hospital: freestanding, alongside and on-site birth centres. Forty-six locations were considered as presumed birth centres and in September 2013, **twenty-three birth centres were identified** in the Netherlands: three freestanding, fourteen alongside and six on-site. The reason for their establishment, their characteristics and their view on the importance of different philosophies were described.

The definition and classification described above was used to study the effects of birth centre care on many different aspects such as perinatal outcomes, costs and client and healthcare provider satisfaction.

Chapter 4: Development of a new Dutch Optimality Index (OI-NL2015)

Adverse outcomes are a rare condition for women at low risk of perinatal complications and with full-term pregnancies. To evaluate the outcome of maternity care for these women it is therefore preferable not to focus on perinatal complications only. The optimality index (OI) is a composite outcome tool based on the concept of optimality that focuses on the presence of optimal outcomes. Although an individual OI is calculated for each woman, it is designed to compare groups of women. The OI can highlight differences in the combined processes and outcomes by comparing sum scores after adjustment for baseline characteristics of the women. The previous Dutch version of the OI dates from two decades ago. **A new version of the Optimality Index based exclusively on items of Perined was developed:** the OI-NL2015. It consists of 31 items in 3 different components: 22 intrapartum, 7 neonatal and 2 postpartum items. All but 2 items have an evidence based criterion for optimality. For the remaining 2 items the criterion was based on consensus. Every item that scores optimal adds 1 point to the score with a total sum-score of 31. The sum-score of a group needs to be adjusted for baseline characteristics of the women (age, ethnicity, social economic status and level of urbanisation).

Next, the reliability of the registration of these 31 items within Perined was examined. This was done by calculating the inter-rater agreement on optimality between scores from two different data-sets: data collected as part of the Dutch Birth Centre study were compared with data from Perined. All but one met the 90% criterion of reliability.

Part II

Chapter 5: Effect of planned birth in a birth centre on perinatal outcomes

The new Dutch version of the Optimality Index (the OI-NL2015) was used to evaluate the effect of planned place of birth in a birth centre. The sum scores of the OI-NL2015 of women who planned to give birth in a birth centre were compared to women who planned to give birth in a hospital (under the care of a community midwife) and to women who planned to give birth at home. In total 3455 women with low-risk, full-term pregnancies (1686 nulliparous and 1769 multiparous) participated in this study. There were **no differences in OI-NL2015 for women who planned to give birth in a birth centre compared to women who planned to give birth in a hospital**: the sum scores of both groups were equal. In contrast, **women who planned to give birth at home had a higher OI-NL2015 (scored more optimal items) than women who planned to give birth in a birth centre**. These differences were larger for multiparous women than for nulliparous women.

Chapter 6: Effect of planned birth in a birth centre on cost-effectiveness

The **economic evaluation** took the form of a cost-effectiveness analysis in which we estimated the costs and effects attributable to planned birth in a birth centre, in a hospital or at home. The time-frame of this evaluation was from the start of labour until seven days after birth. Volumes of health care resource use were collected prospectively and unit costs were calculated as obtained by different sources. Sensitivity analyses were undertaken when unit costs showed great variation. **The total adjusted mean costs and effects (OI-NL2015) per woman planning birth in a birth centre and in a hospital were similar. Planned birth at home led to significantly lower adjusted mean costs and significantly better effects compared to planned birth in a birth centre.** Looking at the parity sub-groups, nulliparous women had higher adjusted total mean costs and less optimal outcomes than multiparous women. Sensitivity analyses led to the same results as the original generalized linear model on costs.

Chapter 7: Transfer to the birth centre

In our study **69% of the nulliparous women who planned birth in a birth centre arrived during labour in a birth centre**, 22% of these women were referred directly from home to the obstetric unit and 9% chose another place to give birth (ie. remained at home, or went to a hospital (without referral)).

In total 74% of the nulliparous women who arrived at the birth centre during

labour had a vaginal examination at home before they transferred to the birth centre. Outcomes of these women were compared with those nulliparous women who arrived during labour at the birth centre but did not have a vaginal examination at home prior to their transfer to the birth centre. **The group who had a vaginal examination at home had more progress in dilatation** at arrival in the birth centre and had a lower chance of referral to secondary care. These last differences were not significant.

Chapter 8: The effect of planned birth in a birth centre on women's experiences

Experiences of maternity care were compared between women who planned birth in a birth centre and women who planned birth in a hospital, at home (all under care of a community midwife) or in a hospital under care of an obstetrician. The Repro-Q questionnaire was used to measure the responsiveness of birth care in a group of 1181 women. **Women who planned birth in a birth centre had similar experiences as women who planned birth in a hospital under care of a community midwife. Women who planned birth at home had significantly more favourable experiences on the domains of dignity and autonomy during birth and on the domains of social considerations, choice and continuity postpartum**, compared to women who planned birth in a birth centre. More than 80% of the women who received care in a birth centre rated the facilities, the moment of arrival/departure and the continuity of care in the birth centre as good.

Part III

Chapter 9: Job satisfaction among maternity care providers

Job satisfaction among maternity care-providers working in or with a birth centre was compared to job satisfaction of maternity care-providers working only in other settings. The questionnaire used was based on "the Leiden Quality of Work Questionnaire". Data from 3849 health care providers were analysed by profession (maternity care assistants, community midwives and clinical care providers) and by work setting: working with or in a birth centre and working in other settings. **Job satisfaction among maternity care providers is generally high. All three groups of care providers are positive about working in or with a birth centre.**

Reflections on findings

The number of birth centres in the Netherlands has increased rapidly over the last decade. The most important reason for this increase was the wish for a more home-like environment for the growing number of women who did not want to give birth at home [1]. Identification of these birth centres was challenging as a definition was lacking and the term itself was used loosely: not all locations that call themselves birth centre in the Netherlands are places where women can actually give birth. The term birth centre was also used for locations that house, for example, community midwifery practices, maternity care assistance organisations and ultrasound facilities [2–4].

To study the effect of birth centre care in the Netherlands in a structured way, the formulation of a definition was required [1]. This definition was developed as part of the Dutch Birth Centre Study [5]. It is important to use uniform terms for birth locations in order for women to make a well-informed choice for their birth location. Furthermore, research on outcomes of birth locations is only possible when these are well defined. The gap in agreement on the items planned and final place of birth between the Dutch Birth Centre Study and Perined data showed the need for more clarity on these items [6,7]. **Therefore the consistent use of the term birth centre should be pursued** and the differences between a birth centre and the obstetric unit of a conventional hospital should be made more well-known and more widely publicised.

Because of the enthusiastic participation by all professionals we were able to gain even more data than at first, during the power calculations, shown needed. However, most findings presented in this thesis are based on data collected in 2013. At that time more than 50% of all birth centres in this study had been open for less than two years and working in a birth centre was, for most midwives, a new experience. **The situation regarding birth centres has changed over the years:** new birth centres have opened and existing birth centres have **adapted their care** gradually [8–10]. These developments will influence the outcomes of future birth centre care in the Netherlands.

Implications for practice and research

Every pregnant woman has the right to an environment that promotes the optimal conditions for a safe and satisfying birth, regardless of her risk status during labour and birth, be it under the care of a midwife (low risk) or under the care of an obstetrician (increased or high risk). Different aspects of care affect these chances of an optimal outcome even before labour starts: to optimize the chances, women

should be well informed about the physiological process of birth, about what to expect from her care provider and of what to expect from her planned place of birth [7,8]. In the past few years, the number of women who plan to give birth outside of home is increasing rapidly [11]. Our research showed no differences in effects on the Optimality IndexNL-2015, nor in costs or birth-experience for women with low-risk pregnancies who planned birth in a birth centre compared with women with low-risk pregnancies who planned birth in a conventional hospital setting. The birth environment, number of interventions and care provided differed per planned place of birth. **A planned home birth gave better results on all outcomes** mentioned. But as the planned birth location showed to be of importance on outcomes for women with low-risk pregnancies, we should ask: **which aspects of a home-birth situation could be implemented in an alternative, out-of-home birth location, such as a birth centre or an obstetric unit, to support physiological birth for all women regardless of their risk status?** Effective practices for childbearing women regarding the birth location will be discussed to answer that question.

Birth environment

Oxytocin is the most important hormone that affects the process of childbirth: understanding the oxytocin system is a key to optimizing the process of physiological birth. One important factor that affects the release of oxytocin is **the woman's perception of the physical environment**: a place perceived as calm, warm, friendly and supportive facilitates oxytocin release whereas a place experienced as stressful, threatening or demanding triggers release of catecholamines which prepare the body for fight or flight [12–14]. For most people, home is a peaceful and restful place, where they feel more in control of environment and events. A home-like environment can contribute to reduced stress and encourage a comfortable feeling, which can help to support the physiological process of birth [15]: low levels of stress hormones during labour and birth promote uterine blood-flow and support neonatal well-being, whereas greater levels of stress hormones can lengthen labour and impede neonatal transition [16]. Earlier research linking architecture and neuroscience has revealed that many conventional hospital rooms may actually impair rather than improve health outcomes by increasing patient and staff stress [17–19]. A home-like birth environment is associated with lower rates of analgesia, augmentation and operative birth, as well as greater satisfaction with care and a positive effect on care-providers [20–22]. It is characterized by comfortable non-institutional furniture, ambient lighting, the use of warm colours, no medical equipment in direct sight (including emergency protocols, breath masks, etc), opportunities to benefit from warm water, quietness, and a bed that does not look institutional and is not centrally located in the room [12,16,17,23–25]. **All**

Dutch birth centres facilitate a home-like environment and more and more hospitals try to create this [1]. When refurbishing a birthing room with the purpose of optimising the ambient environment for giving birth, one should think of the reason behind the adjustment of this environment, instead of only introducing some of the individual items. For example, the benefit of a home-like wallpaper in a room where medical equipment and emergency protocols are still in sight will most likely not have the optimal intended effect. It is the coherence of various elements that helps to create a place that feels safe and a little bit like home.

Effect of a home-like birth environment on birth attendants

Several studies have examined the impact of different birth environments on the communication behaviour of birth attendants, including midwives. These studies revealed that different environments (e.g. home, birth centre or hospital) exert a powerful and unintended pressure on midwives **to conform to unwritten rules of conduct and styles of communication** depending on the location in which they find themselves, even if it is with the same woman. The less home-like the birth environment was, the greater this effect was experienced [26,27].

Also known is the impact of the **experience of alienation by the midwife** on stress: stress can be experienced when a midwife attends a birth with for example other equipment than her own trusted equipment (in contrast to the safe feeling that she experiences when she knows exactly where to find supplies and how to use them). Awareness of this potential form of stress can help in the creation of solutions for this type of problem, for example that a midwife brings her own equipment, or finds a way to become more familiar with the supplied equipment. Birth attendants should be aware of the impact a birth environment can have on their communication behaviour and experienced stress: it influences the way midwives and other care-givers practise [12,15,17,21,25,28–32]. **The impact of a supporting birth environment should be explored more thoroughly and outcomes should be implemented in all Dutch birth locations.**

Birthing facilities/Equipment

Home is for most women the place where they feel most in control: they feel free to move and deal with the contractions in a way that is at that moment the most comfortable and effective. Different facilities can affect the progress and experience of labour and childbirth. Some of these are facilitated by the maternity-care provider and can be used at any setting (such as one-to-one and continuous support) and some of them can only be used when the birth location provides this facility. Walking and upright positions in the first stage of labour reduces the duration of labour, the risk of

caesarean birth and the need for epidural administration. Also, these positions do not seem to be associated with increased interventions or negative effects on mothers' and babies' wellbeing [33]. **The availability of equipment such as birthing-pools, showers and birthing-balls** can encourage women to get out of the bed and to deal better with the first stage of labour. On the obstetric unit the availability of a **wireless (mobile or telemetry) continuous foetal monitoring** unit can be helpful to facilitate moving and upright positions for women who need continuous foetal monitoring [34]. An upright posture can also stimulate the physiological process of birth during the second stage: it reduces the number of assisted births and increases comfort. However, there is also an increased risk to blood loss greater than 500 mL [24,35,36]. A birthing chair or cushion can be useful to facilitate an upright position, although squatting is also effective [37]. In any birth setting, midwifery care providers can encourage the use of these facilities and equipment that support physiological birth, if these are available. Most community midwives have access to a birthing chair or cushion for use at any location. In addition, most obstetric beds on an obstetric unit can be transformed to a birthing chair position as well. All Dutch birth centres except one offer pools and the number of obstetric units with a pool is increasing [1,38]. Unfortunately, the evidence based effect of these facilities on health outcomes and learning how to use them is currently not included in the general educational program of any of the maternity care providers in the Netherlands. Initiatives for multidisciplinary courses on the subject of physiology have started recently [39]. Also, midwifery colleges offer courses on birthing positions and the Royal Dutch Organisation of Midwives (KNOV) wrote a practical guidance and developed a leaflet for pregnant women on the subject [40–42]. The development of more integrated maternity care in the Netherlands may enhance more respect of vision and expertise among maternity care providers of all echelons. It can break boundaries and promote a willingness to share skills and knowledge during work but also during inter professional education [43]. Apart from making these facilities available, maternity care-providers' lack of knowledge and willingness to use such facilities needs to be tackled in order that they feel confident in using them, encourage their use and thus support the process of physiological birth.

Culture and management

Another important factor that differs between home and other birth locations is the local culture; the birth location is not just a physical structure. **The philosophies on physiological birth of the individual care provider and its management influences the birth-culture of the location.** Education is an important factor affecting views on physiological birth: Midwives are trained to observe, identify and encourage the physiological process of pregnancy and childbirth, and to be attentive to any

abnormalities. **Low risk women who receive midwife-led continuity models of care are less likely to experience intervention and more likely to be satisfied with their care** with at least comparable adverse outcomes for women or their infants than women who received other models of care [44,45]. Obstetricians are trained to manage medium and high-risk pregnancies and abnormalities during childbirth and tend to focus on the pathologic potential of pregnancy and birth. It is important that midwifery care-providers examine their personal philosophy, because the care they provide to women during labour depends on their own beliefs about birth. Some may view birth as a high-risk event likely to need intervention; others believe birth is a normal physiological process in need only of support to progress naturally [24,46]. Even amongst a group of people within the same profession there is a variance in this philosophical concept [21]. In every location where maternity care-providers work they are influenced by the culture of that birth location. This culture differs significantly from location to location, as would be confirmed by any professional or mother (-to-be) [47]. A midwife managed ward (like a birth centre) will have a philosophical culture far more greatly influenced by a midwifery mindset than any obstetric managed one, with its focus on a more pathogenetic side of birth. There should be an awareness of this important cultural aspect of a birth location: it affects outcomes.

Possibilities for birth centres

Awareness and implementation of the subjects mentioned can contribute to a more home-like approach in out-of-home birth locations and **to support the physiological process of childbirth for all women, regardless of their risk status or planned place of birth**. In the Netherlands, women who are under the care of a community midwife, and who are full-term and at low risk when labour starts can choose where they want to give birth: at home, in a birth centre or in a conventional birthing room at the obstetric unit of a hospital. **Birth centres facilitate all aspects that are important for a birth location to stimulate the process of physiological birth**. In addition, suggestions can be made to birth-centres that can further enhance an even more natural process of birth, fewer referrals in the case of a prolonged first stage or the wish for pharmacological pain relief and the need of fewer interventions finally culminating in better perinatal outcomes.

Home visit prior to transfer

Our research showed that more than 25% of all nulliparous women who arrived at the birth centre did not have a vaginal examination prior to the transfer to the birth centre [chapter 8]. These women arrived at the birth centre on average earlier during dilatation and this possibly increased their chances for referral to an obstetrician. A home visit prior to this voluntary transfer makes it possible to make **an individual approach on**

the woman's wishes and need for support during labour, according to what is optimal for each individual woman. **Especially for nulliparous women; with no experiences of childbearing, a home visit should be standard procedure in order to decide on the optimal time of transfer to the birth centre.**

Admission to the birthing room

Dutch Birth centres varied in September 2013 with regards to admittance policy with 'as indicated by the woman' (52% of birth centres) versus 'as indicated by the midwife' (48% of birth centres)[chapter 3] [1]. For nulliparous women who wanted to give birth in a conventional labour room on an obstetric unit it was an unwritten rule that they transferred to the hospital together with their midwife when active labour started and dilatation progressed over 6 centimetres [48]. International research shows that labour assessment programmes to delay admission to the labour ward until labour is in active phase may benefit women with full-term pregnancies [49]. **The moment of admission to the birthing room should be critically appraised for every individual woman in order that her personal preferences will be considered with respect to the aim for the best possible outcomes. A home visit prior to this transfer is needed to make this possible.** Continuous support can be beneficial to support women during the first hours of contractions. In more and more regions in the Netherlands early continuous support is an option to receive at home, even when the woman plans to give birth elsewhere. Further Dutch research on the subject of intrapartum home assessments and the moment of admission to the birthing room is needed to gain further insight into the effect on perinatal outcomes, such as referrals and women's experiences.

Possibility to use inhaled analgesia

Preparation for how to deal with labour and effective support during the latent phase is needed in order to help women deal with this period. When the active phase continues and non-pharmacological methods for pain relief are not sufficient enough, an **inhaled analgesia should be an option** to use in primary care [50]. Since September 2014 Dutch midwives are legally allowed to prescribe and offer Relivopan® in a primary care setting. Strict rules for regulation and specialist education is needed to maintain safety for mother, child, partner and attending care-providers [51–53]. The effect of Relivopan® on the number of referrals has not yet been studied in the Netherlands, but it can contribute to lower the relatively high number of intrapartum non-urgent referrals and thus lower the total intervention-rate. At the time of our research Relivopan® was only an option for pain relief in only three out of 23 birth centres. **Birth centres are the only places to provide this approach to pain relief in a midwife managed birth location that can fulfill the legal conditions for use.**

Quality assessment

With the identification of birth centres in the Netherlands it was made possible to study the effect on outcomes of birth centre care in the Netherlands. For example, a discussion on birth centre outcomes was held during a structured peer review meeting (intercollegiale toetsing) with collaborating midwives. Motivation for this discussion was local feedback on the results of the Dutch Birth Centre study. These results showed a significant lower sum score of the OI-NL2015, for women who planned birth in their local birth centre compared to the national outcomes on OI-NL2015 for planned birth centre birth. This led to a critical appraisal of the individual items of the OI-NL2015. Their relatively high number of prolonged first stages and women with a need for pain relief led to an enthusiastic discussion of possible causes for this finding [54]. Arrival in the birth centre at the first signs of labour was replaced with a more individual approach per woman, after providing information on the effect of transfer in an early stage of labour on experiences and outcomes prenatally. Finally this critical appraisal and personal reflection led to an adaptation of the previously formulated vision about the preferred timing of admission to the birth centre [54,55].

A tool such as **the Optimality Index NL-2015 can help care providers to be more aware of the effect of every intervention and outcome** [6,56,57]. Implementing the Optimality Index in Perined Insight (a web based tool that makes it possible to make analysis with perinatal data) can make it easier to reflect on local differences between planned birth locations compared to other regions or to national data [7]. Before implementing the Optimality Index one should be aware of the importance of the correct values of Perined items 'planned' and 'final place of birth' as our research showed that it was not reliable to use current Perined data on those items. Clear information on the different types of birth locations can be helpful in raising the level of agreement.

Concluding remarks

The key factors in providing effective, safe and satisfying birth care is not the birth location in itself. Personal attention, continuous support, a well-defined birth plan and service provision to optimize the physiological process of birth are, in coherence with each other, all important [17,58–60]. However, the birth location affects a lot of aspects that can be supportive to facilitate and encourage the physiological process of birth. Women should be well informed prenatally on the differences between birth locations to make their own decisions based on evidence based information on all available possibilities. Several suggestions can contribute to support the physiological process of birth, such as the birth environment, availability of facilities and the philosophical culture of the

birth location. For women with low-risk pregnancies who do not wish to give birth at home, the home-like midwifery managed birth centre is the most logical place where these aspects can be realised. Possibilities to improve outcomes in birth centres, such as a standard home visit prior to the voluntary transfer and a transfer in active instead of latent phase of birth, should be studied and implemented. The conclusions drawn from the Dutch Birth Centre study demonstrates that outcomes on effect, costs and experiences are identical for women with low-risk pregnancies who plan birth in a birth centre as compared with a hospital. Opportunities to easily optimize the outcomes for women who do not want to give birth at home, have been identified. Birth centres have the best potential to easily implement these opportunities. After this implementation, and with the fact that more and more obstetric units in the Netherlands are dealing with capacity problems, birth centres are an added value as birth location for women who don't plan to give birth at home [61].

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11

Chapter

Samenvatting
List of publications
Curriculum vitae
Dankwoord

Samenvatting

Dit proefschrift draagt bij aan een brede evaluatie van de zorg rondom geboortecentra in Nederland. Het is één van de drie proefschriften die zijn gebaseerd op gegevens van het Geboortecentrum Onderzoek. Het doel van deze nationale studie was om evidence-based aanbevelingen te doen voor geboortecentra in Nederland. Voor het doen van aanbevelingen rondom dit onderwerp dienen alle resultaten van deelonderzoeken van het Geboortecentrum Onderzoek in overweging te worden genomen.

Dit proefschrift richt zich op het effect van een bevalling die gepland was in een geboortecentrum op perinatale uitkomsten, kosteneffectiviteit, verplaatsing, overdracht en ervaringen. Het bestuderen van een effect is niet mogelijk zonder een duidelijke definitie van het onderzoeksobject of zonder een uitkomstinstrument dat geschikt is voor het Nederlandse verloskundig systeem. Deel I beschrijft het onderzoeksprotocol, de formulering van een definitie voor 'geboortecentrum' in Nederland en de beschrijving en validatie van de primaire uitkomstmaat. Deel II richt zich op het effect van een geplande geboorte in een geboortecentrum en deel III beschrijft de arbeidssatisfactie van verschillende verloskundige zorgverleners met betrekking tot werken in een geboortecentrum.

Deel I

Hoofdstuk 2 beschrijft het onderzoeksprotocol voor het Geboortecentrum Onderzoek. De doelstellingen van deze nationale studie waren 1) de identificatie van geboortecentra en het meten van integratie van hun organisatie en zorg; 2) het meten van de kwaliteit van geboortecentra; 3) de effecten van geboortecentra op perinatale uitkomsten; 4) een kosten-batenanalyse; en 5) een diepgaande longitudinale analyse van de organisatie en processen in geboortecentra. De inclusiecriteria, verschillende methoden, instrumenten en verwachte resultaten werden per deelonderzoek beschreven. De resultaten zullen zorgprofessionals en beleidsmakers in staat stellen de verschillen in effect tussen bevallocaties te benoemen en zullen zwangeren en hun partner ondersteunen in het maken van een geïnformeerde keuze voor het type bevallocatie.

In **hoofdstuk 3** is de definitie voor een geboortecentrum geformuleerd. In Nederland ontbrak tot dan toe een standaard definitie en zonder een duidelijke definitie was het niet mogelijk om geboortecentra op een consistente manier te identificeren. Met een mixed-methods design werd een Nederlandse definitie voor een geboortecentrum

geformuleerd: een geboortecentrum is een midwifery managed bevallocatie, anders dan thuis, waar laag risico vrouwen kunnen bevallen onder verantwoordelijkheid van een eerstelijns verloskundig professional. Het geboortecentrum heeft een huiselijke sfeer en inrichting met daarbij faciliteiten die het fysiologische verloop van de baring kunnen ondersteunen. Wanneer er reden is voor overdracht neemt de tweede lijn (gynaecoloog of kinderarts) de verantwoordelijkheid van de zorg over van de eerste lijn (verloskundige of huisarts).

Drie typen geboortecentra werden geïdentificeerd op basis van hun locatie tot het dichtstbijzijnde ziekenhuis waarin klinische verloskamers aanwezig zijn: vrijstaande geboortecentra (fysiek los van het ziekenhuis), aanpalende geboortecentra (in het ziekenhuis met klinische verloskamers, maar op een andere afdeling of gang) en interne geboortecentra (in het ziekenhuis op de afdeling met de klinische verloskamers, echter voldoet wel aan de definitie waar een geboortecentrum aan hoort te voldoen).

Zesenvertig locaties werden beschouwd als mogelijke geboortecentra en in september 2013 werden daarvan drieëntwintig als geboortecentra geïdentificeerd: drie vrijstaand, veertien aanpalend en zes intern. De reden voor hun oprichting, hun kenmerken en hun verschillende filosofieën werden beschreven.

Hoofdstuk 4 beschrijft de ontwikkeling van de nieuwe Nederlandse versie van de Optimality Index. Negatieve zwangerschapsuitkomsten zoals perinatale sterfte komen relatief weinig voor in de groep vrouwen met een laag risico die a terme in de eerste lijn bevalt. Om de uitkomst van verloskundige zorg voor deze vrouwen te evalueren, is het daarom wenselijk om niet alleen te focussen op perinatale complicaties. De Optimality Index (OI) is een samengesteld uitkomstinstrument dat zich richt op de aanwezigheid van optimale resultaten. Hoewel voor elke vrouw een individuele OI wordt berekend, is het instrument bedoeld om groepen vrouwen te vergelijken. De OI kan verschillen in de processen en uitkomsten benadrukken door somscores van groepen vrouwen met elkaar te vergelijken.

De vorige Nederlandse versie van de OI dateert van twee decennia geleden. In dit onderzoek is een nieuwe versie van de Optimality Index ontwikkeld, uitsluitend gebaseerd op items van Perined: de OI-NL2015. Deze bestaat uit 31 items die verdeeld zijn over verschillende momenten van zorg. Het betreft 22 intrapartum, 7 neonatale en 2 postpartum items. Op twee items na hebben alle items een evidence based criterium voor de optimale uitkomst. Voor de resterende 2 items was het criterium gebaseerd op consensus. Elk item dat optimaal scoort, telt 1 punt op bij de score met een totale somscore van 31. De somscore van een groep moet worden gecorrigeerd voor de achtergrondkenmerken van de vrouwen (leeftijd, etniciteit, sociaal-economische status en urbanisatiegraad). De somscores maken het vervolgens mogelijk om te onderzoeken

of er verschillen zijn tussen deze groepen vrouwen.

Vervolgens is de betrouwbaarheid van de registratie van deze 31 items binnen de registratie van Perined onderzocht. Dit werd gedaan door de interbeoordelaars-overeenkomst tussen het aantal optimale scores uit twee verschillende datasets te berekenen: gegevens verzameld als onderdeel van het Geboortecentrum Onderzoek werden vergeleken met gegevens van Perined. Op één na voldeden ze aan het 90% betrouwbaarheids criterium.

Deel II

In **hoofdstuk 5** is het effect van een geplande geboorte in een geboortecentrum op perinatale uitkomsten bestudeerd. De nieuwe Nederlandse versie van de Optimality Index (de OI-NL2015) werd hiervoor als uitkomstmaat gebruikt. De somscores van de OI-NL2015 van vrouwen die van plan waren in een geboortecentrum te bevallen, werden vergeleken met vrouwen die van plan waren poliklinisch te bevallen in een ziekenhuis (onder verantwoordelijkheid van hun eerstelijns verloskundige) en vrouwen die van plan waren thuis te bevallen. In totaal namen 3455 vrouwen, die a terme in partu kwamen en onder controle waren van een eerstelijns verloskundige deel, aan deze studie (1686 nulliparae en 1769 multiparae). Er waren geen verschillen in OI-NL2015 voor vrouwen die van plan waren om in een geboortecentrum te bevallen in vergelijking met vrouwen die van plan waren poliklinisch in een ziekenhuis te bevallen: de somscores van beide groepen waren gelijk. Daarentegen hadden vrouwen die van plan waren thuis te bevallen een hogere OI-NL2015 (scoorden meer optimale items) dan vrouwen die van plan waren te bevallen in een geboortecentrum. Deze verschillen waren voor multiparae groter dan voor nulliparae.

Hoofdstuk 6 laat het effect van een geplande geboorte in een geboortecentrum op kosteneffectiviteit zien. De economische evaluatie heeft de vorm van een kosteneffectiviteitsanalyse. De kosten en effecten die toerekenbaar waren aan de geplande geboorte in een geboortecentrum, in een ziekenhuis of thuis, werden daarbij met elkaar vergeleken. Als uitkomstmaat voor de effecten werd gebruik gemaakt van de Optimality Index (OI-NL2015, zie hoofdstuk 4). Het tijdsbestek van deze evaluatie betrof het begin van de bevalling tot en met zeven dagen na de geboorte. Volumes van het zorggebruik werden prospectief verzameld en eenheidskosten werden berekend uit verschillende bronnen. Sensitiviteitsanalyses werden uitgevoerd wanneer de kosten per eenheid grote variatie vertoonden. De totale gecorrigeerde gemiddelde kosten en effecten (OI-NL2015) per geplande geboorte in een geboortecentrum

en in een ziekenhuis waren vergelijkbaar. Een geplande bevalling thuis leidde tot aanzienlijk lagere gecorrigeerde gemiddelde kosten en significant betere effecten in vergelijking met een geplande geboorte in een geboortecentrum. Nulliparae hadden hogere gecorrigeerde totale gemiddelde kosten en minder optimale uitkomsten dan multiparae. Sensitiviteitsanalyses leidden tot dezelfde resultaten als het oorspronkelijke gegeneraliseerde lineaire model.

Hoofdstuk 7 beschrijft het proces van verplaatsen naar het geboortecentrum bij nulliparae. In onze studie arriveerde 69% van de nulliparae die planden om in een geboortecentrum te bevallen daadwerkelijk tijdens de bevalling in een geboortecentrum, 22% werd rechtstreeks van thuis naar de tweede lijn verwezen en 9% besloot alsnog om op een andere plek te bevallen (dat wil zeggen bleef thuis, besloot op poliklinisch te gaan bevallen, of kreeg durante partu een plaatsindicatie). Van de vrouwen die planden om in het geboortecentrum te gaan bevallen en er durante partu aankwamen werd 74% vooraf aan de verplaatsing naar het geboortecentrum thuis getouchéerd. De kans op verwijzing naar de tweede lijn van deze vrouwen werd vergeleken met de nulliparae die tijdens de bevalling aankwamen in het geboortecentrum, maar die thuis geen vaginaal onderzoek hadden ondergaan voordat ze naar het geboortecentrum verplaatsten. De groep die thuis getouchéerd werd, had bij aankomst in het geboortecentrum meer ontsluiting en had een kleinere kans op doorverwijzing naar de tweede lijn. Deze laatste verschillen waren niet significant. Verder onderzoek naar het effect van een vaginaal onderzoek thuis in relatie tot het moment van verplaatsen en kans op verwijzing durante partu, dient uitgevoerd te worden.

In **hoofdstuk 8** wordt het effect van de geplande geboorte in een geboortecentrum op de ervaringen van vrouwen geëvalueerd. Ervaringen van vrouwen met een geplande bevalling in een geboortecentrum werden vergeleken met vrouwen die hun bevalling gepland hadden in een ziekenhuis (poliklinisch), thuis (alle drie onder zorg van een eerstelijns verloskundige) of in een ziekenhuis onder verantwoordelijkheid van een gynaecoloog. De ervaringen van de vrouwen met zorg tijdens de bevalling zijn gemeten met behulp van de Repro-Q-vragenlijst in een groep van 1181 vrouwen. Vrouwen die hun bevalling in een geboortecentrum hadden gepland, hadden vergelijkbare ervaringen als vrouwen die hun bevalling in een ziekenhuis hadden gepland onder de zorg van een eerstelijns verloskundige. Vrouwen die planden om thuis te bevallen, hadden significant gunstiger ervaringen met betrekking tot de domeinen van waardigheid en autonomie tijdens de bevalling, en op het gebied van sociale overwegingen, keuze en continuïteit postpartum, vergeleken met vrouwen die hun bevalling in een geboortecentrum hadden gepland. Meer dan 80% van de vrouwen die zorg kregen

in een geboortecentrum beoordeelde de voorzieningen, het moment van aankomst / vertrek en de continuïteit van de zorg in het geboortecentrum als goed.

Deel III

In **hoofdstuk 9** vergeleken we de ervaringen van verloskundige zorgverleners die in of met een geboortecentrum werken, met de tevredenheid van verloskundige zorgverleners die alleen in of met andere bevallocaties werken. De gebruikte vragenlijst was gebaseerd op "the Leiden Quality of Work Questionnaire". Gegevens van 3849 zorgaanbieders werden geanalyseerd per type zorgverlener (kraamverzorgenden, eerstelijns verloskundigen of klinische/tweedelijns zorgverleners). Werkplezier bij kraamzorgverzorgenden is over het algemeen hoog. Alle drie de groepen zorgverleners zijn positief over het werken in of met een geboortecentrum.

In **hoofdstuk 10** wordt gereflecteerd op bovenstaande studies en worden aanbevelingen gedaan voor verder onderzoek. Het is belangrijk om te realiseren dat de sleutelfactoren voor goede, veilige en als prettig ervaren geboortezorg niet alleen samenhangen met de geplande bevallocatie. Persoonlijke aandacht, continue ondersteuning en een weloverwogen en realistisch geboorteplan zijn naast de bevallocatie ook zeker van belang. De bevallocatie beïnvloedt echter veel aspecten die kunnen helpen het fysiologische bevalproces te vergemakkelijken en te bevorderen, zoals oa. de sfeer van de kamer, de aanwezige werkcultuur en de beschikbare faciliteiten. Vrouwen dienen prenataal goed geïnformeerd worden over de verschillen tussen bevallocaties, om hun eigen beslissingen te nemen op basis van evidence-based informatie over alle beschikbare mogelijkheden. Voor vrouwen met een laag risico zwangerschap die niet thuis willen bevallen, is het 'home-like' verloskundig geboortecentrum de meest logische plaats waar deze aspecten kunnen worden gerealiseerd. Mogelijkheden om de resultaten in geboortecentra te verbeteren, zoals een standaard huisbezoek (met eventueel een vaginaal onderzoek) voorafgaand aan de verplaatsing en verplaatsing in actieve in plaats van latente fase van de bevalling, moeten verder worden bestudeerd en geïmplementeerd.

De conclusies uit de studie van het Geboortecentrum onderzoek tonen aan dat de uitkomsten met betrekking tot het effect, de kosten en de ervaringen gelijk zijn voor vrouwen met een laag risico op complicaties tijdens de bevalling die van plan zijn te bevallen in een geboortecentrum, in vergelijking met dezelfde groep vrouwen die van plan zijn te bevallen in een ziekenhuis. Mogelijkheden om de resultaten te verbeteren voor vrouwen die niet thuis willen bevallen, zijn geïdentificeerd: de belangrijkste

aspecten daarbij zijn aandacht voor de invloed van een huiselijke bevalomgeving, de cultuur op een verlosafdeling, de mogelijkheid van het gebruik van lachgas in de eerste lijn, het huisbezoek voorafgaand aan verplaatsing naar de gekozen bevallocatie, en het moment van verplaatsen. Geboortecentra bieden een optimale mogelijkheid om deze aandachtspunten te implementeren. Na deze implementatie, en daarbij meegenomen dat steeds meer klinische verloskamers in Nederland te maken hebben met capaciteitsproblemen, zijn geboortecentra een toegevoegde waarde als bevallocatie voor laag-risico vrouwen die niet van plan zijn thuis te bevallen.

List of Publications

In this thesis:

1. Hermus MAA, Wiegers TA, Hitzert MF, Boesveld IC, van den Akker-van Marle ME, Akkermans HA, et al. The Dutch Birth Centre Study: Study design of a programmatic evaluation of the effect of birth centre care in the Netherlands. *BMC Pregnancy Childbirth*. 2015;15(1).
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Curriculum Vitae

Marieke Klapwijk-Hermus is op 13 maart 1977 gepland thuis in Oosterhout (N-Br) geboren na een zwangerschap van ruim 42 weken. Ze behaalde haar gymnasium diploma aan het Newmancollege in Breda en startte de opleiding tot verloskundige in 1997 aan de Vroedvrouwenschool in Kerkrade. Tijdens haar opleiding was zij lid van de studentenraad en tijdens het laatste jaar van haar opleiding was zij voorzitter van het LOVIO (Landelijk Overlegorgaan Verloskundigen in Opleiding). Na het afronden van haar studie in 2001 werkte ze als verloskundige bij verloskundigenpraktijk ISIS in Tilburg, waar ze in 2002 maatschapslid werd. Van 2004 tot 2006 nam zij deel aan de protocollencommissie in Verloskundig Samenwerkings Verband (VSV) Tilburg. In 2005 verhuisde Marieke van Tilburg naar Oosterhout en in 2007 verruilde zij Verloskundigenpraktijk ISIS voor Verloskundigen Praktijk Trivia in Oosterhout (inmiddels Verloskundigen Oosterhout).

In 2007 voltooide Marieke haar Master of Science opleiding aan de AMC/UVA met de uitstroomrichting wetenschappelijk onderzoek. Haar afstudeeronderzoek betrof een matched cohort study naar verschillen tussen beleid bij serotiniteit: inleiden bij 42 weken of nog afwachten, een onderwerp waar Marieke destijds als eerstelijns verloskundige in een stad met twee ziekenhuizen met verschillend beleid omtrend dit onderwerp, heel concreet mee te maken had.

Ook in regio Breda raakte Marieke actief betrokken bij de verloskundige organisatie in de regio. Vanaf 2007 tot 2015 was zij lid van de regionale refereeravond-commissie en in 2009 trad zij aan in de protocollencommissie van het VSV Breda e.o., die in 2017 omgevormd werd tot de protocollencommissie van intergrale geboortezorg organisatie Annature. Naast haar werk als eerstelijns verloskundige, werkte Marieke in 2008 en 2009 ook voor de KNOV, alwaar zij medewerker was van het team richtlijn-ontwikkeling. Als chronologisch verslagmaker, rapporteur en lid van het petit comite zette Marieke in 2010 de lokale perinatale audit op poten in de regio Breda. Zij nam van 2009 tot 2014 als eerstelijns verloskundige deel aan het landelijke werkgroep doodsoorzaken-classificatie van de Perinatal Audit en was lid van de redactiecommissie van de landelijke audit-rapportage in 2013 en 2014.

Voor de komst van geboortecentrum Origine (2010) motiveerde Marieke de kring Verloskundigen Breda e.o. voor het verzamelen van data rondom uitkomsten van het geboortecentrum. Dit leidde er uiteindelijk toe dat Marieke aanklopte bij TNO voor ondersteuning van haar onderzoek. Naast haar werk als eerstelijns verloskundige werkte Marieke vanaf eind 2011 bij TNO als junior verloskundig onderzoeker bij team Child Health en in 2013 begon zij daar (gedetacheerd vanuit het LUMC en onder supervisie van Prof. dr. Jan van Lith) haar promotietraject bij het Geboortecentrumonderzoek.

Vanaf januari 2018 is Marieke lid van de Annature commissie Onderwijs en Onderzoek en Annature commissie Nieuwbouw Amphia.

Marieke is getrouwd met Floris en samen hebben zij vier kinderen: Koen (9), Thijs (8), Bram (5) en Sara (3).

Dankwoord

En dan is het ineens zo ver dat je je dankwoord mag gaan schrijven omdat je proefschrift dan zowaar eindelijk af is. Nog erg onwaarschijnlijk maar waar. Zoveel mensen om te bedanken. Allemaal mensen die het mij mogelijk hebben gemaakt om dit traject, vol ups en downs en vol bijzondere momenten in mijn leven, te doorlopen:

Allereerst wil ik mijn promotor professor Jan van Lith bedanken. Dank voor je ondersteuning, verbredende blik en positieve woorden. Onze gesprekken over oa. die plaats van bevallen voor eerstelijns zwangeren gaven me vaak een interessant kijkje vanuit een ander perspectief, dank!

Lieve Karin, wat hebben we samen veel meegemaakt de afgelopen jaren, en steeds was je er voor me, om me te begeleiden, te prikkelen en uit te dagen. Ik realiseer me meer en meer dat het echt heel belangrijk is wie je naast je hebt staan in een traject zoals een promotie en was erg blij dat jij dat was. Dank voor je oprechte betrokkenheid en motivatie.

Lieve Trees, jij liet me kennismaken met 'jouw' Optimality Index en deelde je kennis en kunde met me, zodat ik de 2.0 versie weer verder de wereld in mocht helpen. Onze gesprekken zorgden er regelmatig voor dat ik weer 10 nieuwe onderzoeksvragen had bedacht die ik nog wel een keer zou gaan oppakken. Dank voor alles.

Ook de overige leden van de projectgroep wil ik bedanken voor hun kritische blik en inzet bij het hele geboortecentrumonderzoek.

En Inge en Marit, wat waren we een trio, wat hebben we veel meegemaakt samen... en wat voelden en vulden we elkaar goed aan. Onze hechte samenwerking heeft ons tot 3 promoties geleid, ik vind het nog steeds ongelooflijk. Snoepotten, haargroei en komkommers... wat zal ik er van zeggen. Heel fijn om de terugkerende verbazing van de wondere wereld van onderzoek en promoveren met jullie te kunnen delen. Dank voor alle gezelligheid en energie.

Ook wil ik natuurlijk alle mensen van TNO waar ik de afgelopen jaren mee gewerkt heb bedanken. Het warme bad dat ik kreeg vanaf dag 1 is altijd warm gebleven. In het bijzonder wil ik toch zeker Paula, Kathy, Symone, Joris, Diny, Suze, Jolanda, Helga, en natuurlijk Marlies bedanken.

Lieve lieve lieve Li, Loes en Mo: dank voor de mogelijkheid die ik in onze eerstelijns verloskundige maatschap gekregen heb om dit promotie-traject te kunnen aan gaan. Tijdens dit hele proces van promoveren besepte ik nog meer hoe bijzonder ons vak toch steeds weer is. Het is een voorrecht om in onze maatschap, -hoe verschillend we ook allemaal mogen zijn- te mogen werken: we zijn een superteam. De liefde voor ons vak blijft ons verbinden. Dank voor het aanhoren van al mijn vele promotie-prikkelen.

En Mo, wat fijn dat je straks mijn paranimf wilt zijn. En Carine en AssiMo uiteraard ook superbedankt!

Madres, madres, madres, wat een bizar clubje dames zijn we bij elkaar! Lieve Nan, Juudt, Buuv, Mjon, Netje, Klaas, Mjan, Smee, Ridge, Mie, Jen, San: lief een leed en af en toe een balletje gooien deelden we de afgelopen meer dan 20 jaar al samen. Vele geboortes vertrouwden jullie met me toe, hoe bijzonder! Het af en toe kunnen spuien van mijn promotie-gedoetjes was zo fijn. Guus blijven we herhalen. Dank voor alles!

VVS-ladies HK, Fem, Bieb, Roosje en Belle, dank voor alle lieve kaartjes en steun van jullie de afgelopen jaren. Onze vriendschap is onvoorwaardelijk. Wat heerlijk om met jullie over mijn onderzoek, en alle vernieuwing en veranderingen in de verloskunde te kunnen filosoferen (naast alle personal things). Dank voor al jullie vriendschap en medeleven. Yes, we can!

Niet te vergeten om te bedanken zijn ook zeker Wilma en Ria. Jullie ondersteuning aan ons gezin heeft er zeer zeker voor gezorgd dat ik samen met Floris de boel thuis geregeld en op orde kon houden, zodat ik weer aan 'mijn boekje' kon werken. Fantastisch!

En ook Ivanka wil ik niet vergeten te noemen. Je heerlijk relativerende reacties per mail zorgden meerdere malen voor een grote lach van herkenning op mijn gezicht. Dank!

Lieve pap, Antony en Jeroen, wat ben ik gezegend met zo'n warm gezin als het onze. En wat mis ik ons mam vandaag, maar eigenlijk nog elke dag. De basis die vroeger bij ons thuis gelegd is, heeft ons allen op prachtige plekken de wereld in gestuurd, elk op onze eigen manier, met deze promotie nu voor mij. Wat ben ik daar dankbaar voor. En lieve Karin, ook jij kent de combi werk, studie en jong gezin... en we deelden deze perikelen keer op keer. Ik had me geen fijner schoonzusje kunnen wensen. En natuurlijk ook Mieke, fijn dat je er bij bent!

Toon, na een gesprekje met jou kon ik telkens de wereld weer aan. Jouw woorden waren keer op keer goud waard, jij was mijn personal coach. De deur van je Amsterdamse huisje stond meerdere malen voor me open wanneer ik die rust voor dit boekje soms echt even nodig had. Geweldig. Wat ben ik er trots op dat je naast me staat bij mijn promotie.

Lieve Moeders, dank voor alle liefde voor ons gezin. U was en bent onmisbaar!

Dit zo schrijvend besef ik hoe gezegend ik ben met al deze lieve mensen om me heen. Wat ben ik daar dankbaar voor... En er zijn vast nog mensen die ik vergeet om te noemen... deze 'dank je wel' is voor jullie.

Tenslotte wil ik mijn grote steun en toeverlaat uiteraard nog bedanken. Lieve Floris, zonder jou had ik dit proces nooit, maar dan ook nooit kunnen voltooien. Jouw rust en vooral ook je relativeringsvermogen zorgden ervoor dat ik de balans bleef vinden

tussen gezin, promotie en praktijk, ondanks alle hobbels (en bobbelen ☺). Dank voor alles....

Lieve Koen, Thijs, Bram en Sara... mama's boekje is nu eindelijk klaar. In het Engels en zonder leuke plaatjes, sorry... Maar wat ben ik blij dat ik deze woorden mag schrijven. Ik ben supertrots op jullie!

