

# Finding the right indicators for assessing quality midwifery care

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Accepted for publication 3 February 2012

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## Abstract

**Objective.** To identify a set of indicators for monitoring the quality of maternity care for low-risk women provided by primary care midwives and general practitioners (GPs) in the Netherlands.

**Design.** A Project Group (midwives, GPs, policymakers and researchers) defined a long list of potential indicators based on the literature, national guidelines and expert opinion. This list was assessed against the AIRE (Appraisal of Indicators through Research and Evaluation) instrument criteria, resulting in a short list of draft indicators. In a two-round Delphi survey, a multidisciplinary group of stakeholders reviewed the elaborated draft indicators, rating both the relationship between indicator and quality of care and the feasibility.

**Setting and Participants.** A multidisciplinary expert panel consisting of 28 midwives, 2 GPs, 3 obstetricians and 3 maternity assistants, randomly selected from different regions in the Netherlands.

**Intervention.** None.

**Main Outcome Measure.** Set of quality indicators for midwifery care.

**Results.** The Project Group generated a list of 115 potential indicators which was reduced to 35 using the AIRE criteria. The 35 draft indicators were discussed by a Delphi panel. In total, 26 indicators were recommended by the participants as relevant indicators of midwifery care, representing several levels of measurement. Eight structure indicators, 12 process indicators and 6 outcome indicators were addressing the various phases of midwifery care.

**Conclusions.** We identified a set of quality indicators concerning midwifery care provision in a low-risk population. Practicing maternity care providers adopted the large majority (83%) of the draft indicators proposed as a feasible set of indicators, describing the structure, process and outcome. The input from multidisciplinary experts in the process of identifying the right indicators showed to be essential in all phases of development.

**Keywords:** quality indicators (measurement of quality), outcome and process assessment (health care), maternity care, Delphi method

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## Introduction

The quality of clinical care can vary widely, both between and within countries. Hence, there is a growing interest in having objective quality and safety information [1, 2]. A valid quality monitoring system is essential to optimize the quality of healthcare effectively [3–6].

Indicators can be used for different purposes. Quality indicators provide the opportunity to measure the initial

situation in order to assess the needs, to set realistic goals and to provide a baseline for assessing changes to achieve the same or better outcomes. Continuous monitoring of quality indicators might reveal trends in practice and patient care and could lead to steps and initiatives to research and improve care [2–4]. Receiving a feedback report based on indicator data can trigger professionals and practices to improve their care [7, 8]. Indicators may produce benchmarking information on the level of professional,

practice, region or country and may be used in the increasing public demand for transparency and judging performance. Further, quality indicators are used to inform public or patients about services. Finally, indicators can be used for supervision by inspectorates of healthcare, assessing the standards of health-care services.

Indicators have already been applied to many branches of medicine. In maternity care, indicators for international comparison were developed in the so-called EURO-PERISTAT studies, resulting in benchmarks of maternity care provided in 1999 and 2004 in 15 and 25 European countries, respectively [9, 10]. Compared with other European countries, the Netherlands have an unexpected relatively high perinatal mortality rate [10]. Since the EURO-PERISTAT outcomes, discussion raised about the obstetric system in the Netherlands, which was positive a spin-off for a structured evaluation of Dutch maternity care [11].

The perinatal mortality rate is considered to be a valid outcome indicator for the quality of obstetric care [12]. However, perinatal mortality has a relatively low incidence and is a crude measure revealing little about the underlying processes of care, especially applied to the low-risk population attended by midwives [9, 13]. Around the world, large differences exist between the organizational model of maternity care [14]. One factor, however, seems to be consistent within all maternity care systems: the role of the midwife in attending and promoting normal pregnancy and birth [15]. The Dutch obstetric system has unique features. Pregnant women can consult a midwife or a general practitioner (GP) in primary care. Women with complicating pregnancies and/or deliveries are referred to midwives and gynaecologists in secondary care [16]. In the Dutch obstetric system, independently practicing midwives at the primary care level are responsible for maternity care as long as they assess the woman's pregnancy and labour normal. In the case of complications, the midwife refers the woman to the obstetrician [17]. In areas where no midwifery practice is established, the 'midwifery care' is provided by a GP in 3%. Due to this role division, the monitoring of the safety and quality of low-risk delivery (whether delivered by a GP or midwife) requires indicators tailored to the midwife's low-risk population. However, the relatively few existing international indicators on maternity care turn out to be applicable for low-risk populations only partially [9, 13].

This article describes the identification process of a set of indicators for midwifery care, using existing data as much as possible. This set of indicators is developed to research aspects of midwifery care (state-of-art), and improve quality gaps. During the consultative process, practitioners from the midwifery field were involved to select indicators. In addition, the Dutch Health Care Inspectorate (DHCI) can use the indicators for supervision.

## Methods

The set of quality indicators was developed in four steps: (i) the formation of a multidisciplinary Project Group; (ii) a

literature search to identify and select a long list of potential quality indicators; (iii) the selection of a short list of detailed draft indicators; and (iv) the assessment of the draft indicators by means of a two-round Delphi procedure.

### The formation of a multidisciplinary Project Group

The Project Group consisted of midwives ( $n = 1$ ), a GP ( $n = 1$ ), a neonatologist ( $n = 1$ ), policymakers ( $n = 3$ ), public health officers ( $n = 3$ ) and researchers ( $n = 2$ ). They represented the Royal Dutch Organization of Midwives (KNOV), the Association of General Practitioners (VVAH), the DHCI and the National Institute for Public Health and the Environment (RIVM). Six of the 11 members were practicing in maternity care or used to do so.

To capture all phases of (suboptimal) maternity care, the Project Group identified indicators along five domains of quality: patient safety, patient-centeredness, access to care, coordination of care and effectiveness.

### Potential quality indicators

In the next step, various sources were used to identify indicators. First, existing/potential quality indicators were identified by a review of the international scientific literature, searching Pubmed with the keywords: quality management, midwifery care, outcome indicator, process indicator and structure indicator (limits: publication date 1998–2008; language English and Dutch). Additionally, the Internet was searched for government and research reports. Secondly, the national guidelines, protocols and consensus statements of the professional groups involved were scrutinized. At last, the Project Group suggested additional indicators based on their expertise. In this way, a long list of potential indicators was generated.

### Draft indicators

The long list of potential indicators was revised by the Project Group to reduce the list to a manageable size, using the AIRE (Appraisal of Indicators through Research and Evaluation) instrument (Table 1). The AIRE instrument can be used as (i) a checklist to judge the quality of indicators and (ii) a manual to develop indicators [18]. In addition to that, the Project Group also considered the following criteria: (A) the plausibility of a relationship between process and outcome of care, (B) the perceived room for improvement as a result of efforts and interventions by the care providers, (C) the variability between midwifery practices, in order to enable comparison and (D) the feasibility of the data needed to build the indicator, i.e. whether the data can be collected accurately, reliably and with reasonable costs.

The indicators meeting the criteria remained on a short list and were expanded with definitions, numerator and denominator, background information and references to the literature.

Based on the theory of Donabedian [3], they were classified into the three categories that are generally distinguished in indicators: structure, process or outcome. *Structure indicators*

**Table 1** Criteria for assessment of the long list of potential indicators

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Criteria based on the Appraisal of Indicators through Research and Evaluation (AIRE instrument [18])

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1. The purpose of the indicator is described clearly
2. The criteria for selecting the topic of the indicator are described in detail
3. The organizational context of the indicator is described in detail
4. The quality domain the indicator addresses is described in detail
5. The health-care process covered by the indicator is described and defined in detail
6. The group developing the indicator includes individuals from all relevant professional groups
7. Considering the purpose of the indicator, all relevant stakeholders have been involved at some stage of the development process
8. The indicator has been formally endorsed<sup>a</sup>
9. Systematic methods were used to search for scientific evidence
10. The indicator is based on recommendations from an evidence-based guideline or studies published in peer-reviewed scientific journals
11. The supporting evidence has been critically appraised
12. The numerator and denominator are described in detail
13. The target patient population of the indicator is defined clearly
14. A strategy for risk adjustment has been considered and described<sup>a</sup>
15. The indicator measures what it is intended to measure (validity)<sup>a</sup>
16. The indicator measures accurately and consistently (reliability)<sup>a</sup>
17. The indicator has sufficient discriminative power<sup>a</sup>
18. The indicator has been piloted in practice<sup>a</sup>
19. The efforts needed for data collection have been considered
20. Specific instructions for presenting and interpreting results<sup>a</sup>

Additional criteria used by the Project Group

- A. There is a plausible causal relationship between process and outcome of care
  - B. The indicator points to aspects of care with perceived room for improvement
  - C. Variability between midwifery practices is expected, in order to enable benchmarking
  - D. Preferably the data for building the indicator are already existing and easily accessible
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<sup>a</sup>Not applicable at this stage of the process of development.

include the human, physical and financial resources that are available to provide healthcare. A *process indicator* covers the set of activities that take place between the provider and the receiver of care. It refers to the actual transaction in which the provider of care makes use of the available structural elements to manage the technical and personal aspects of health [3]. *Outcome indicators* refer either to the direct impact on the current or future health of mother or newborn, or to the indirect impact on her satisfaction with the services offered [3].

### Delphi consultation

We used a modified Delphi process and the RAND/UCLA appropriateness method as a formal framework to elicit consensus on the importance of each indicator in relation to the quality of midwifery care. The Delphi technique is a method for systematically collecting informed judgements from a group of experts on specific questions or issues [19]. The RAND/UCLA appropriateness method is a systematic technique combining expert opinion and evidence [19].

Potential participants were recruited via the website of the Royal Dutch Organization of Midwives (KNOV). The refined list of indicators, designed as a postal questionnaire, was distributed along with a stamped return envelope.

In March 2008, the first questionnaire of the Delphi survey was sent out to a panel of 28 midwives, 5 GPs, 3 obstetricians and 2 maternity assistants (in total  $n = 38$ ). The participants were asked to judge the draft indicators in a continuous nine-point rating scale (ranging from 1, strongly disagree, to 9, strongly agree). The indicators were judged on the basis of two review criteria: (i) relevance to clinical practice and (ii) the feasibility to derive the necessary data from routinely collected data and the reporting burden for the professional. Panel members were invited to add additional indicators and were in the opportunity to provide written comments. An e-mail reminder was sent 2 weeks later.

The responses of the first round were entered into Excel, to calculate the median scores and summarize the comments. Analyses were based on the RAND/UCLA appropriateness method [19]. In the first round, indicators with a median score of  $\geq 8$  without disagreement were considered relevant and feasible to collect, and accepted instantly. Disagreement

**Table 2** The selected quality indicators for monitoring and evaluating midwifery care

|  | Level of measurement <sup>a</sup> | Indicator |
|--|-----------------------------------|-----------|
| <b>Patient safety</b>  |                                   |           |
| 1. Accreditation of the midwifery practice   | M/GP                              | S         |
| 2. Number of midwives (GPs) registered in the quality register of the professional group                                 | National + M/GP                   | S         |
| 3. Availability of a quality system in the midwifery practice (GP's practice)  | M/GP                              | S         |
| 4. Number of perinatal deaths reported to the multidisciplinary perinatal mortality audit                                | National + M/GP                   | P         |
| 5. Evaluation of midwifery care in the case of (near) accidents  | National + M/GP                   | P         |
| 6. Methods of complaint regulation   | M/GP                              | P         |
| 7. Number of perinatal deaths in women starting labour in primary care   | National + M/GP                   | O         |
| 8. Percentage of neonates small for gestational age  | National + M/GP                   | O         |
| <b>Patient centeredness</b>  |                                   |           |
| 9. A procedure for backup duty 7 × 24 h a week   | M/GP                              | S         |
| 10. Percentage of unassisted births in the case of too late arrival of the attending midwife or GP                       | M/GP                              | P         |
| 11. Percentage received filled-in questionnaires to explore client experiences of midwifery care                         | M/GP                              | P         |
| <b>Access to care</b>  |                                   |           |
| 12. Accessibility to midwifery advice and information for non-urgent matters   | M/GP                              | S         |
| 13. The percentage of women accessing midwifery care at 8–10 weeks of gestational age                                    | M/GP                              | P         |
| <b>Coordination of care</b>  |                                   |           |
| 14. Active participation in the regional organization of midwives  | Regional                          | S         |
| 15. Active participation in the regional Obstetric Collaboration Group of professionals involved in obstetrics (OCG)     | Regional                          | S         |
| 16. Availability of a protocol for referral to the Child Health Centre   | Regional                          | S         |
| 17. Percentage of referrals due to slow progress of labour or need for pain relief                                       | M/GP                              | P         |
| 18. Percentage of intrapartum referral   | M/GP                              | P         |
| 19. Percentage of home deliveries with attendance of a maternity assistant   | M/GP                              | P         |
| <b>Effectiveness</b>   |                                   |           |
| 20. Percentage of breech pregnancies with an attempt to external cephalic version (ECV)                                  | All levels                        | P         |
| 21. Percentage of deliveries in midwifery care, recorded by means of a partogram   | Regional + M/GP                   | P         |
| 22. Percentage of women receiving control 6 weeks postpartum   | National + M/GP                   | P         |
| 23. Percentage of pregnant women who smoked at start pregnancy and are still smoking in the third trimester of pregnancy | National + M/GP                   | O         |
| 24. Percentage of women with an episiotomy   | Regional + M/GP                   | O         |
| 25. Percentage of neonates with an Apgar score <7 at 5 min   | All levels                        | O         |
| 26. Percentage of breastfed babies at the end of the midwifery care  | National + M/GP                   | O         |

O, outcome; P, process; S, structure indicator.

<sup>a</sup>National, regional or midwifery/general practice (M/GP) level.

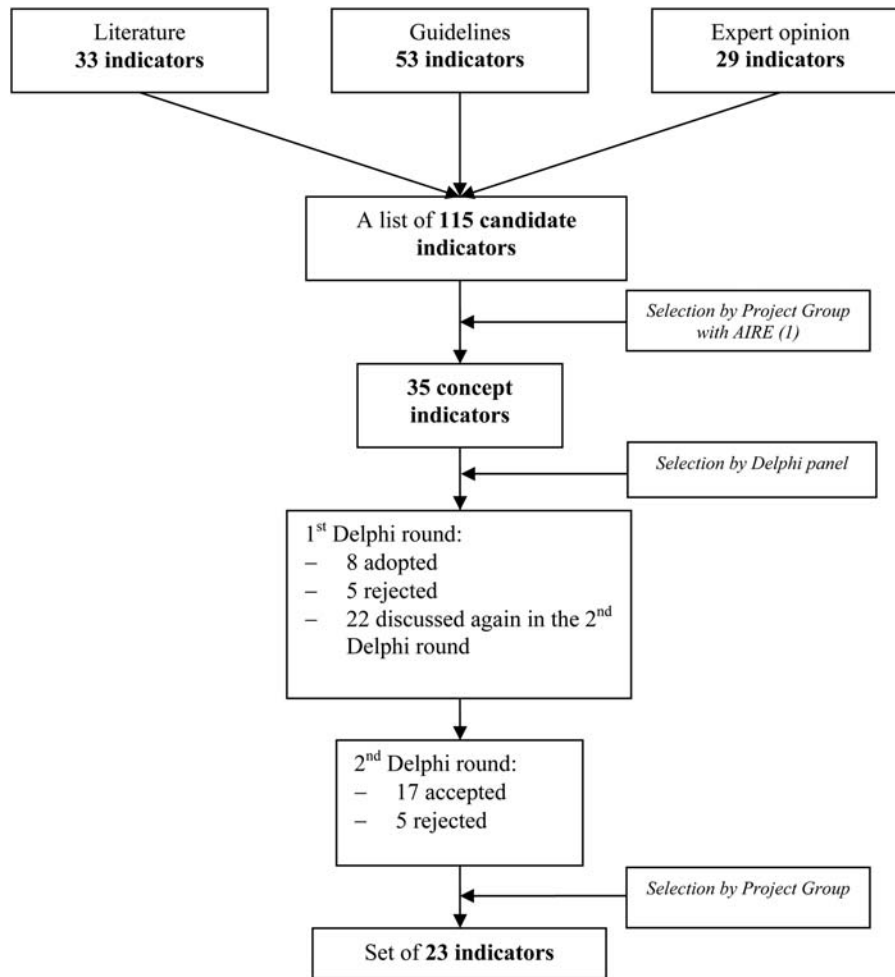
was defined when 30% or more of the ratings were in both the 1st–3rd tertile and the 7th–9th tertile. Indicators scored with a median of  $\leq 3$  without disagreement were rejected. Median scores of  $> 3$  and  $< 8$  regarded unclear consensus and were discussed again in the second Delphi round. In the second round, a median score of  $\geq 7$  without disagreement was needed for acceptance of the indicator.

In June 2008, the second round was conducted. The participants received in the second Delphi round: (i) the anonymous median scores of the other respondents, (ii) the frequency distribution of scores (ranging from 1 to 9) and (iii) a summary of written comments gathered in the first

round. Table 2 shows an example of an indicator which was discussed twice. Again, the median scores were calculated, resulting in a final list of indicators.

## Results

Figure 1 shows the processes that led to the selection of the quality indicators, and the numbers of indicators 'on the list' at each step. The Project Group aimed to capture the whole midwifery care field, ranging from early pregnancy care to



**Figure 1** Flow chart of the selection process of quality indicators for midwifery care.

the accessibility, continuity and evaluation of midwifery (post partum) care.

Within the scope of these domains, 33 potential indicators were derived from the literature, 53 from practice guidelines and another 29 were suggested by the Project Group. By means of the AIRE-criteria (Table 1), the Project Group selected 35 draft indicators out of this long list, which were proposed to the Delphi panel.

The first Delphi round was completed by 32 participants (response rate of 84%); of whom, 27 completed the second round (response rate 84%). During the first round, nine indicators were adopted unanimously and three were rejected. As a result of the responders' comments, one indicator was incorporated into another indicator which addressed a similar issue, and five indicators were reworded. The remaining 22 draft indicators were discussed again in the second Delphi round, which resulted in the acceptance of 17 indicators and the rejection of another three indicators. Considering the responders' comments, two draft indicators were combined with another indicator which addressed a similar issue [e.g. at first, the indicator concerning intrapartum referrals (number 14) was split up into two separate indicators for nulliparous and multiparous women]. The

reasons for the rejection of the six draft indicators were an unsatisfactory rate for relation to quality ( $n = 1$ ) or for feasibility ( $n = 2$ ) or for both quality and feasibility ( $n = 3$ ). In total, 26 out of the 35 proposed draft indicators were adopted (Table 2). Since three draft indicators were incorporated into a single indicator, the number of rejected indicators was six (17%).

In total, 26 indicators were prioritized by the participants as relevant indicators of midwifery care, representing several levels of measurement (national, regional and provider level).

Eight selected indicators can be defined as *structure indicators*. Examples are the accessibility for urgent and non-urgent matters (indicators 4 and 5) and the compliance to the minimum standards of quality, set by the professional groups and the national laws (indicators 1 and 2). Twelve selected indicators may be considered a *process indicator*. For example, indicator 12 concerns the monitoring and recording of parameters during the process of labour in a partogram. The significance of using a partogram is emphasized by the World Health Organisation as well as in the guidelines of the Dutch professional groups [20, 21]. So, the rate of indicator 12 reveals both the percentage of deliveries in which the monitoring has been recorded adequately and the adherence to



| <b>Indicator 11: Percentage of unassisted births by too late arrival of the attending midwife or GP*</b>  |          |          |          |          |          |          |          |          |             |          |          |          |          |          |          |          |          | <b>Median</b>              |                    |
|---|----------|----------|----------|----------|----------|----------|----------|----------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------------------------|--------------------|
|   |          |          |          |          |          |          |          |          |             |          |          |          |          |          |          |          |          | <b>Relation to quality</b> | <b>Feasibility</b> |
| Relation to quality   |          |          |          |          |          |          |          |          | Feasibility |          |          |          |          |          |          |          |          | <b>6,5</b>                 | <b>8</b>           |
| 0   | 2        | 2        | 1        | 4        | 5        | 6        | 5        | 7        | 0           | 2        | 2        | 0        | 3        | 1        | 5        | 13       | 6        |                            |                    |
| <b>1</b>  | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b> | <b>9</b> | <b>1</b>    | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b> | <b>9</b> |                            |                    |
| disagreement  |          |          |          |          |          |          |          |          |             |          |          |          |          |          |          |          |          | no                         | no                 |
| <p><i>Summary of comments of responders first round:</i></p> <ul style="list-style-type: none"> <li>- Partially depending on factors beyond the care provider's influence (very fast multiparous birth, very late telephone call from mother-to-be, large distances)</li> <li>- The reasons behind are most important</li> <li>- May be an indication of a (dis)functioning back up procedure for 24 /7 accessibility</li> <li>- May be an indication of how patients are counseled and instructed about calling the midwife</li> </ul> <p><i>Comments of Project Group:</i></p> <ul style="list-style-type: none"> <li>- The Project Group is aware that an unintended unassisted birth can happen incidentally.</li> <li>- An indicator is a signal. In spite of the relatively limited influence of the care provider, a more than incidental number of unassisted births may be a signal of substandard (organization of) care.</li> <li>- A deviating result may prompt examination of the underlying factors</li> </ul> |          |          |          |          |          |          |          |          |             |          |          |          |          |          |          |          |          |                            |                    |

**Figure 2** The format of indicators presented to the Delphi panel members ( $n = 27$ ) in the second round's questionnaire. \*The indicator has been adopted in the second round.

the guideline of the own professional group. The same principle can be applied to indicator 10. To reduce the chance of non-cephalic births and Caesarean sections, an attempt should be made at external cephalic version (ECV) in the case of breech presentation [22]. Concomitantly, the percentage breech deliveries in which ECV has been attempted reflect the performance in the care process as well as the degree to which the protocol has been adhered to (Fig. 2).

Six selected indicators may be defined as an *outcome indicator*. For example, a high rate of neonates with a low birth weight (indicator 25) may be an indication that intra-uterine growth retardation (IUGR) either is not diagnosed or that timely referral has not taken place. The detection of IUGR is difficult, even with ultrasound examination [23]. Benchmarking will point out whether the rate of small-for-date neonates in a certain practice exceeds the average.

Table 3 shows the specifications of some selected indicators (one example per critical domain), including their background information and rationale.

## Discussion

Our study provided a framework for developing face valid and feasible indicators capturing all aspects of midwifery care in a low-risk population. A set of indicators was developed and subsequently adopted by care providers practicing in primary maternity care.

Valid, accepted indicators provide insight into the state of the quality of care and enable comparison of the results of individual practices with regional or national results. In addition, the indicators provide insight into best practice and can

be used for reflection and benchmarking. An indicator may act as a stimulus to improve care at the individual, regional and national level.

In the development of the set of indicators for midwifery care, we attempted to exploit these various characteristics of an indicator. We concluded that the input from multidisciplinary experts (care providers, policymakers and researchers) is essential in all phases of the development of indicators, but especially in the phase of preparation.

We are aware that the presented set of indicators has its limitations. First, the core element of midwifery care (literally: 'being with women') is hard to define and therefore hard to catch in indicator data. Secondly, some considered important issues appeared to be difficult to translate into feasible indicators (such as communication, or the prevalence of domestic violence). These issues should be explored in future research. Thirdly, the set we developed did not include indicators of women's perceptions of care, since its development is addressed by a separate study [24]. In the future, these issues have to be incorporated as it has been demonstrated that provider's and women's perceptions may differ [25]. Finally, the set is defined for internal use (by the care providers themselves) and for supervision by health-care inspectors. When the set of indicators is extended to external users (i.e. pregnant women, or health insurance companies), a further consideration of the indicators would be required.

Maternity care is an explicit example of outcome-oriented clinical care, given its ultimate purposes of a healthy mother and a healthy neonate. Therefore, outcome indicators might be considered more significant than structure or process indicators. From this point of view, the relatively small number of outcome indicators (6 out of 26) may at first

**Table 3** Specifications of the selected indicators<sup>a</sup>

| Critical domain                                       | NR of indicator | Indicator  | Numerator   | Denominator   | Background   | Rationale   |
|---|-----------------|--|---|---|--|---|
| Accreditation   | 2               | Number of midwives (GPs) registered in the quality register of the professional group                            | Number of midwives (GPs) working in the practice concerned and registered in the quality register           | Number of midwives (GPs) working in the practice concerned                                | The professional groups of midwives and GPs, respectively, keep a register containing minimum requirements to the individual care provider (concerning adherence to guidelines, education and continuing education, affiliation with complaints committee, etc.). The register is accessible for consumers on the Internet | Registration implies that the quality requirements of the own professional group are met. In the absence of registration, the quality of the individual provider may be questionable to consumer and supervisor |
| Accessibility and continuity of care                  | 5               | Accessibility of midwifery advice and information for non-urgent matters   | Number of hours per week accessible on the phone for non-urgent matters                                     | 7 × 24 h  | For urgent matters, a midwifery practice should be accessible and available 7 × 24 h a week. For continuity of care, easy accessibility in the case of non-urgent matters is necessary   | Easy accessibility is a signal of quality since prevention, counselling and advice are important issues in primary (midwifery) care   |
| Intra- and inter-disciplinary collaboration           | 7               | Active participation in the regional Obstetric Collaboration Group of professionals involved in obstetrics (OCG) | Yes/no (frequency of attendance)  | Not applicable  | An OCG, organized around a hospital, consists of midwives, GPs, obstetricians and neonatologists. They make agreements about organization, obstetric collaboration, evaluation and regional aspects of maternity care [16]   | The Dutch obstetric system requires intensive collaboration of professionals involved, in order to provide optimal care for the individual woman. Absence of agreements and participation may be a sign of risk |
| Data transmission between the care providers involved | 8               | Availability of a protocol for referral to the Child Health Centre   | Yes/no (if yes, the date of the protocol)   | Not applicable  | At the end of the postpartum period, the care for the newborn will be taken over by a Child Health Physician. Risk signals or 'gut feelings' received during midwifery care may be important input for Child Health care providers for prevention of medical or psychosocial problems                                      | Stimulating indicator: questioning the issue is a signal of its importance from the point of view of the professional groups and of the supervisory health-care inspection                                      |
| The woman's freedom of choice                         | 11              | Percentage of home births with attendance of a maternity assistant   | The number of home deliveries under the supervision of a midwife or a GP, attended by a maternity assistant | Total number of home deliveries under the supervision of the midwifery practice concerned | After an uncomplicated pregnancy, a woman can make the choice of a home or a hospital delivery, both under the supervision of her own midwife or GP. In the case of a home birth, the support of a maternity assistant is needed, especially in the last phases of labour  | Indicator for cooperation between midwifery practice and the regional organization of maternity care assistants   |

(continued)

Table 3 Continued

| Critical domain  | NR of indicator | Indicator   | Numerator  | Denominator  | Background  | Rationale  |
|------------------|-----------------|---|--|--|---|--|
| Antepartum care  | 9               | The percentage of women accessing midwifery care at 8–10 weeks of gestational age | The number of women accessing midwifery care at 8–10 weeks of gestational age  | The total number of women who had a first consultation in this pregnancy in the midwifery practice concerned | For an efficient and effective risk assessment, counselling and prenatal screening, it is preferable to access maternity care in an early stage so that antenatal care can be performed optimally   | Reflects both public health issues such as awareness of the benefits of antenatal care (especially for vulnerable groups), as well as the accessibility of the midwifery practice (correct information and no ‘waiting lists’) |
| Intrapartum care | 13              | Percentage of referrals due to slow progress of labour or need for pain relief    | The number of women giving birth under the supervision of a midwife or a GP who were referred to the obstetrician due to slow progress of labour or need for pain relief | Total number of women under the supervision of the midwifery practice concerned, at the start of labour      | The need for pain relief increasingly is an indication for referral intrapartum and often together with a slow progress of labour [17]. Continuous support for women during childbirth is an evidence based intervention resulting in a shorter labour and less intrapartum analgesia [30]  | A high percentage of referrals due to need for pain relief or to slow progress of labour may indicate inadequate support in supporting women during labour, whereas a low percentage may indicate a best practice              |
| Neonatal outcome | 25              | Percentage of neonates small for gestational age                                  | The number of neonates with birth weight <P 2.3 or <P 10 born under the supervision of a midwife or a GP   | Total number of babies born under the supervision of the midwifery practice concerned                        | Intrauterine growth restriction (IUGR) and small for gestational age (SGA) are associated with increased morbidity and mortality of the foetus and newborn [11]. When IUGR is suspected, timely referral to secondary care is recommended for further diagnostic evaluation. The detection of IUGR is difficult, even with ultrasound examination [23, 31]. Benchmarking will point out whether the rate of small-for-date neonates in a certain practice exceeds the average | An unusually high number of neonates with a birth weight low for gestational age may indicate that intra-uterine growth restriction either is not diagnosed or that timely action has not taken place                          |
| Postpartum care  | 26              | Percentage of neonates breastfed  | The number of women breast feeding at the end of the midwifery care period   | The number of women intending to breastfeeding   | There is a large body of evidence of the beneficial effects of breast feeding for the health of both neonate and mother [32]  | A low percentage of breastfeeding may indicate inadequate support, whereas a high percentage may indicate a best practice in supporting women during start and continuation of breastfeeding                                   |



|                    |    |  |                                   |                                  |   |   |
|--------------------|----|--|-----------------------------------|----------------------------------|---|---|
| Evaluation of care | 18 | Evaluation of midwifery care in the case of (near) accidents | The number of evaluated incidents | Total number of (near) incidents | Evaluation of care in the case of (near) accidents and complaints is an important instrument to improve the quality of care and to prevent recurrence | Stimulating indicator: questioning the issue is a signal of its importance from the point of view of the professional groups as well as of the supervisory health-care inspection |
|--------------------|----|--|-----------------------------------|----------------------------------|---|---|

<sup>a</sup>The specifications of the total set of indicators can be obtained from the authors.

sight seem disappointing. However, good outcomes can only be achieved when the care provision is embedded in a sound structure within a quality system, and when it is performed in accordance with (evidence or practice based) processes and protocols agreed on. For example, the Apgar score is a well-established measure of neonatal outcome. In a range from 0 to 10, a score below 7 (5 min after birth) is considered an adverse outcome, possibly related to substandard care [26]. Therefore, the Apgar score was selected as one of the outcome indicators (indicator 23). To prevent this adverse outcome, the pregnant woman needs to access maternity care in an early stage of pregnancy, so that antenatal care can be performed optimally (process indicator 9). To deliver high-quality midwifery care, it is important that midwives are qualified (structure indicator 2) and organize continuity of care 24 h 7 days a week (structure indicator 4), in order to prevent unassisted births (process indicator 15). In the case of need for referral (process indicator 14), a solid system of collaboration is essential (structure indicators 6 and 7). Thus, in our opinion, there is not necessarily a hierarchical difference between the categories of indicators, provided that these are well chosen.

Our study was focussing on Dutch midwifery care. Nevertheless, we expect that the defined set will at least partially be applicable for international use in midwifery care as well, in view of the internationally shared professional values and competencies [27, 28].

In addition, the validity and reliability of the set should be evaluated in a pilot study in midwifery practices in the Netherlands with specific attention to case mix and the small volume of some midwifery practices. Further, indicators are part of an ongoing cycle of quality improvement, so an indicator set would never be static. Changes in evidence or clinical relevance, a consistently high performance or a low variation in achievement, may be criteria for removing selected indicators in the future [29].

## Acknowledgements

The authors gratefully acknowledge the members of the Project Group ‘Quality indicators for primary maternity care’ for their input in the project: A.J.M. Waelput [The National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands], A.L. den Ouden [The Dutch Health Care Inspectorate (DHCI), Utrecht, The Netherlands], M. van der Kolk [The Dutch Health Care Inspectorate (DHCI), Utrecht, The Netherlands], J. de Boer [The Royal Dutch Organization of Midwives (KNOV), Utrecht, The Netherlands], W. van Driel [The Royal Dutch Organization of Midwives (KNOV), Utrecht, The Netherlands], P. Offerhaus [The Royal Dutch Organization of Midwives (KNOV), Utrecht, The Netherlands], J. Blaauw [The Association of Physicians practicing maternity care (VVAH), Utrecht, The Netherlands], N.D. Hamaker-Ketel (Independent practicing midwife, Gouda, The Netherlands), W.C. Graafmans (World Health Organization Patient Safety Programme, Geneva, Switzerland). They would like to thank the members of the Delphi panel for their

indispensable cooperation and A.L. den Ouden for her useful comments on a draft version of this article.

## Funding

This study was funded by the Dutch Health Care Inspectorate.

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