Risk selection and detection. A critical appraisal of the Dutch obstetric system
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Chapter 11

Summary, conclusions and implications

The Dutch two-tier system of obstetric care is characterised by evidence-based risk management to the extent of the available information. Primary care is offered to low-risk women by midwives and general practitioners and secondary care to high-risk women by or under responsibility of obstetricians. The basic concept is that a potential hazardous risk factor amenable to detection, surveillance and (preferably) treatment should be timely recognised. Recognition should invoke surveillance by secondary care; if pathology shows up, therapy should be started either to cure or to prevent damage to mother and infant. The screening for risk factors is a continuing process starting at the booking visit, and continued until the last visit in puerperium, performed by both primary and secondary care.

With some exceptions, therapy is restricted to secondary care professionals. The aim of this risk management system is to achieve good obstetric results, while providing appropriate care for each group, restricting the use of expensive technology to those who will benefit, and preserving the appreciated low technology to primary care, which includes home delivery. Patient referral between the two care levels, when risk status changes, is an essential part of this system.

This system needs to satisfy some requirements:

1. Efficient cooperation between primary and secondary care professionals to facilitate referral when indicated.
2. The existence of validated (and accepted) guidelines for assessment, indicating risk status and ensuing secondary or primary care.
3. Permanent monitoring of the performance system.

Based on limited empirical evidence rather than permanent monitoring data the Dutch system of obstetric care has generally been regarded as providing good quality care, albeit other western countries regarded home delivery as a quaint ‘wooden shoe’ like relic. The system survived until now by acceptance in the population, its attractive philosophical merits, embedment in the insurance system, and professional strong-holds which overcame a recent (end 1990s) professional crisis (shortfall) among the midwives.

A recent publication on perinatal mortality put some question marks herewith, fitting in a long row of criticism on the outcome of the system. These doubts are welcomed as they force to reconsider the evidence; similarly this acts on behalf of the defence of the system.

The aim of this thesis, as outlined in Chapter 1, was to answer four questions.
(1) What is the quality of the risk selection system, and subsequently low-risk care by midwives and high-risk care by obstetricians?
   (1.1) Are all low-risk women recognised and do they receive primary care?
   (1.2) Do the referral rates increase?
(1.3) Are all high-risk women recognised and do they receive secondary care?
   (1.3.1) Is obstetric outcome consistent with the risk selection?
   (1.3.2) Are growth-retarded fetuses detected during antenatal care, and are the mothers referred to secondary care? How is the quality of Dutch obstetric care regarding the detection of intrauterine growth retardation?
(2) Which factors contribute to the relatively high perinatal mortality in the Netherlands?
(3) What is the value of various official 'medical indications', designating women as high risk and therefore requiring secondary care?
(4) What are the risk factors for postpartum haemorrhage and the recurrence risk?

Chapters 1 and 2 describe the basics of risk selection and risk management, and the study cohort.

Risk selection

As stated above, risk selection is a continuing process during antenatal and delivery care. The outcome of the selection process can result in:

- **Continuous low risk, exclusively primary care**: the midwife provides prenatal care, also delivery and childbed are under responsibility of the midwife. Delivery can either be at home or in hospital according the woman’s wish.
- **Initially high risk, exclusively secondary care**: risk factors from medical or obstetric history are present, or become apparent at the booking visit. Both prenatal care and the obligatory hospital delivery are under the responsibility of the obstetrician. In case of vaginal term delivery of a child with a normal birth weight, the childbed will take place at home under responsibility of the midwife.
- **Initially low risk, transition to high risk**:
  - **During pregnancy**: during pregnancy a risk factor arises, the women is referred to secondary care, and from that moment the patient is treated as high risk.
  - **During delivery**: pregnancy was uneventful, during delivery a risk factor (meconium-stained fluid) or a problem (dystocia) arises, the patient is referred to secondary care, and from that moment the obstetrician takes over.
  - **During third stage of labour**: pregnancy and delivery were uneventful, but problems arise in the third stage. The obstetrician takes over.
  - **During puerperium**: pregnancy, delivery and third stage were uneventful, but problems arise during puerperium. This regards predominantly pediatric problems like jaundice, but also maternal problems like thrombosis. When a child is ad-
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mitted to the hospital within 8 days after delivery, the mother is admitted also and for convenience reasons the obstetrician takes over.

- **Consultation:** in initially low-risk women a risk factor is suspected but after consultation at the obstetrician not sustained (e.g. suspected breech: vertex at ultrasound), resulting in referral back to primary care.

The study cohort

All pregnant women during a 4.5 years period from 1990 to 1994 in the Zaanstreek, a region north of Amsterdam around the city of Zaandam, who entered prenatal care either in one of the three independent midwifery practises or in the regional hospital, were entered in four subdatabases, together forming one obstetric database, called ZAVIS. From all pregnancies data were recorded about general and obstetric history, thus preexistent risk factors, data of each prenatal visit, data of the delivery, perinatal outcome and childbed. Moreover all traffic between primary and secondary care, inclusive reasons for referral, were recorded. Laborious data completion and quality control, employing record linkage techniques, provided a database which was unselected and complete regarding all major outcomes. A total of 8031 pregnancies could be analysed. The completeness of the cohort was further established by linking the ZAVIS data to the LVR (National Dutch Perinatal Database). The ZAVIS database was fairly complete, only 2.3% of women living in the described region received care outside the region. As stated in Chapter 1, the observational cohort analysis is second best to the theoretical RCT comparing obstetrical care with and without risk management.

Chapter 3 answers question (1) What is the quality of the Dutch obstetric system?

**Question (1.1) Are all low-risk women recognised and do they receive primary care?**

Of the nulliparous women recorded in the ZAVIS cohort 14% were initially high risk, of the multiparous women 28% were initially high risk. In at least 47% (nulliparous) and 26% (multiparous) the assigned indications for exclusively secondary care were not conform the guidelines of the obstetric manual. In ZAVIS we observed poor agreement between the guidelines in the obstetric manual, and the actual risk assignment, in initially high-risk women. As the ZAVIS data are quite comparable to the national LVR data, we assume that this phenomenon holds true nationwide. The system might be good, but its executants deliver suboptimal performance in this respect.

**Question (1.2) Do the referral rates increase?**

Of all 3280 initially low-risk nulliparous women 62% ended up in secondary care, of all 3050 initially low-risk multiparous women 27%. Referral rates during pregnancy and labour in nulliparous women were quite similar, 29 and 31%. Compared to national data (OBINT and LVR1 1993) the ZAVIS referral rate during pregnancy is higher, while referral rates during labour are in the same range. Time trend showed a
slight increase in referral rate during pregnancy, however referral rate during labour increased substantially from 10% in 1970 to 31% in 1993 in nulliparous women. In multiparous women referral rate during pregnancy was stable, however referral rate during labour increased from 5% to around 12%.

We ascribe the slight increase in referral rate during pregnancy mainly to the technical improvements of obstetrics (like fetal surveillance and ultrasound), and an increase of risk factor prevalence (given age) of those becoming pregnant, in particularly of hypertensive diseases, smoking, and perhaps diabetes.

In particular, data on referral during labour are a bit disturbing. As all initially high-risk women and all women referred during pregnancy are eliminated, one might expect an extremely low-risk residual population, with ensuing low referral rates during labour. The contrary is true: the referral rate during labour has risen from 10% to a staggering high 30%. Major determinants (or maybe better: ‘labels’) were failure to progress in first and second stage. Proposed reasons for this exploded referral rate may be a change in indications for referral (earlier referral for premature rupture of membranes and meconium-stained fluid – assigned officially as risk factor for fetal distress since 1987), an increased incidence of risk factors of dystocia and instrumental delivery (age), and a changed attitude towards essentially the same risk factors by both the client (impatience, wish to avoid assumed risks of expectant management, especially after infertility treatment and/or advanced age), and the professional (defensive obstetrics).

We hypothesise a change of women’s attitude over time. Women (couples) live in a society where everything is available on demand, health, included, seems enforceable, where uncertainty should be purchased. The context of pregnancy has been commercialised, multimedia information provision playing an ever-increasing role: internet, medical television programmes, instructive books on pregnancy and labour, and prenatal classes make them feel they are omniscient, although their grandparents to a certain extent were better informed that health is not granted nor enforceable.

Chapters 4 and 5 answer question (1.3) Are all high-risk women recognised and do they receive secondary care?

Chapter 4 in particular answers subquestion (1.3.1) Is obstetric outcome consistent with the risk selection?

To answer this question we studied the obstetric outcome in singleton pregnancies in the three risk strata:

- Initially high risk.
- Secondary high risk after referral during pregnancy.
- Continued low risk at the start of labour.

The rationale behind this stratification was that all risk factors leading to preg-
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Obstetric outcome was defined as intervention rate, maternal outcome, perinatal mortality and neonatal outcome. In nulliparous women caesarean section (CS) rate was highest among the group secondary high risk, referred during pregnancy (nulliparous 18.6%, 6.1% planned and 12.5% emergency CS). In the initially high-risk group the CS rate was 12.8% (5.3% planned and 7.5% emergency). In multiparous women the highest CS rate was in the initially high-risk group, 13.2% (7.6 and 5.6%), in the secondary high-risk group, 9.8% (3.1 and 6.7%). The group low risk at start of labour had low CS rates, nulliparous 3.2%, and multiparous women 0.6%. Of the CS in this group, failure to progress was the dominant indication. In our view, this implies adequate risk selection.

Intervention rates are the results of the obstetric pathology and the intervention attitude of the hospital (OBINT). Intervention rate in ZAVIS was on average quite similar or slightly lower – for CS and forceps delivery – compared to LVR and OBINT. As the population of ZAVIS was comparable to the Dutch population, the slightly lower intervention rate in ZAVIS reflects probably the attitude of the regional hospital.

Maternal outcome was described by parity in term pregnancies. The induction rate differed widely per risk stratum, the highest induction rate being in the secondary high-risk group, as to be expected as this group contains the highest level of obstetric pathology. The median duration of the second stage was 34 min in nulliparous, and 18 min in multiparous women. This difference is not remarkable, but these basic obstetric data are not to be found easily in obstetric literature.

Comparison of perinatal mortality was not possible with LVR (or OBINT), as perinatal outcome, including perinatal mortality, is notoriously bad documented in LVR. Overall perinatal mortality was comparable to Wormerveer. Comparing the ZAVIS cohort with the WV study, perinatal mortality was overall lower in the ZAVIS cohort, 9.3 vs 10.1%. Although, the perinatal mortality rate in the secondary high-risk group was considerably lower in ZAVIS (19.5 vs 49.7%), while the perinatal mortality rate in...
the low-risk cohort at start of labour was higher in ZAVIS (6.6 vs 2.1%). Perinatal mortality in the primary care group is comparable in ZAVIS (6.6%) and Wormerveer (5.8%), if we locate fetal deaths during pregnancy as mortality under responsibility of primary care. We think it is of major importance to study the level of care at the moment of the diagnosis of fetal death, and NOT the level of care during the delivery of the demised infant, as all cases of fetal death are referred to and delivered by secondary care.

As to be expected, the neonatal outcome was best (by AS, seizures, admission) in the group low risk at the start of labour, higher in the group initially high risk, and highest in the group secondary high risk, and so reflects a good selection process.

Furthermore we described the obstetric outcomes related to known risk factors: high maternal age and ethnicity. High maternal age predisposed mainly for hypertension and obstetric interventions, ethnicity predisposed mainly for preterm birth. The scope of hypertensive disorders was described, and the incidence of preeclampsia (7.5% in nulliparous women), its risk factors and the relation to adverse obstetric outcome. Our incidence of preeclampsia was higher than in other Dutch cohorts, probably due to definitions and underreporting.

Ensuing we considered two obstetric entities, preeclampsia and preterm birth, and looked into two directions: risk factors predisposing for, and adverse outcome related to these obstetric phenomenons.

Chapter 5 regards subquestion (1.3.2) Are growth-retarded fetuses detected during antenatal care, and are the mothers referred to secondary care? How is the quality of Dutch obstetric care regarding the detection of intrauterine growth retardation?

Intrauterine growth retardation is a major cause of neonatal morbidity and perinatal mortality. Apart from the notorious difficult detection prior to birth, effective treatment is absent, but surveillance is of major importance to prevent fetal death and hypoxia.

In initially low-risk women the method to detect growth retardation is abdominal palpation. In case of suspected growth retardation the woman is referred to the obstetrician, where additional examination will be done, as ultrasound. If ultrasound reveals normal growth, the woman is referred back to primary care. If the suspicion growth retardation is sustained by ultrasound, the woman receives further secondary care. We examined the performance of abdominal palpation as screening test for intrauterine growth retardation. Outcome parameters were severe small for gestational age (small for gestational age (SGA) ≤2.3 percentile), SGA ≤10 percentile, operative delivery, neonatal morbidity and perinatal mortality.

Abdominal palpation had a poor sensitivity of 28% for severe SGA and 21% for SGA. The sensitivity of the obstetric system as such (suspicion by midwife and referral to obstetrician, ultrasound performed) to select severe SGA was 53%, of SGA 37%. So half of the intrauterine growth retardation (IUGR) high-risk pregnancies were not detected. Of all cases of perinatal mortality 32% were SGA. Only six cases were not detected during prenatal care.

Literature data confirm the low sensitivity of abdominal palpation as screening test
for IUGR. Regrettably various stratagems as routine ultrasound do not improve detection rate, perinatal morbidity and mortality.

Chapter 6 answers question (2) Which factors contribute to the relatively high perinatal mortality rate in the Netherlands? Is the Dutch perinatal mortality too high?

Perinatal death rate in the ZAVIS database was 12.6 per 1000, slightly higher than the national Dutch rate of 11.4 per 1000 listed by the PERISTAT report (data 1999), the recently published comparison between various European countries. If we compare the ZAVIS data with the LVR data, the intrauterine death rate is comparable, the neonatal death rate higher. This is to be expected, as the LVR data (on which PERISTAT is based) are filled out in the form directly after delivery, while childbed and neonatal complications – all covered by ZAVIS – are usually not added later.

We investigated the influence of multiple versus singleton gestation, parity, maternal age, ethnicity and substandard care on perinatal mortality. Substandard care was investigated by subjecting 92 cases of perinatal mortality (singletons, ≥22 weeks of gestation) to an audit. In 31 cases substandard care factors were found, in seven cases probably related with the outcome.

The risk factors parity and multiple gestation had a strong influence on perinatal mortality, perinatal mortality being the lowest in singletons of multiparous women. Advanced age increased the risk for perinatal mortality, mainly in nulliparous women and multiple pregnancies. Effect of ethnicity was low (in ZAVIS the non-Europeans were predominantly Turkish).

Our conclusion is that all these factors (age, parity, multiple gestation, most likely ethnicity if main cities are included) should be taken into account when comparing perinatal mortality rates. A comparison without stratification for these factors is meaningless. Accepting differences caused by these factors implies that to explain remaining differences (both within the Netherlands and between the Netherlands and elsewhere), the clinical management strategy (antenatal screening, attitude on treatment of extremely preterm births) is at stake. The ZAVIS data lend support to such a role that, however, is modest relative to the factors age and parity. In absence of policy data of other countries, this does not provide an answer to the comparative question ‘Is perinatal mortality too high’, but at least it suggests room for improvement.

Chapters 7 and 8 answer question (3) What is the evidence on various accepted ‘medical indications’ in the guideline, defining women as high risk requiring secondary care?

Chapter 7 investigates the clinical outcome in women with a caesarean scar.

The overall caesarean section (CS) rate in our study cohort was 5.6%. We studied all 252 multiparous women of the ZAVIS cohort with a previous CS. Outcome parameters were trial of labour (TOL), success rate and vaginal delivery after caesarean
(VBAC) rate. Seventy-three percent had a trial of labour, of those 77% succeeded, resulting in a VBAC rate of 56%. The indication for the previous caesarean had an impact on success rate: high success rate was found if the previous caesarean was done for breech presentation (95%) or fetal distress (86%), low success rate if the previous caesarean was done for failure to progress in first (52%) or second (72%) stage of labour.

The complication rate was compared within three groups: elective repeat CS, emergency repeat CS and VBAC. The only difference was a higher incidence of haemorrhage ≥500 ml in the elective CS group versus the TOL group. We conclude that an increase of the number of VBAC can and should be achieved by increasing the number of women exposed to TOL. In populations where a history of CS is less often related to manifest pathology, one might expect an even higher success rate.

Chapter 8 studies the risk factors and the recurrence risk of spontaneous preterm birth.

Firstly we studied the risk factors for spontaneously preterm birth in nulliparous women. To analyse this problem, it is important to discern this entity from induced preterm birth for obstetric reasons as intrauterine growth retardation or preeclampsia. (In Chapter 4 we opposed risk factors for spontaneous preterm birth (SPB) against induced preterm birth (IPB) in nulliparous women.)

We extracted all cases of spontaneous birth between 16 and 37 weeks of gestation. Cases with comorbidity causally related to preterm birth such as multiple pregnancies, major congenital malformations, fetal death, abruptio placentae and placenta praevia were excluded. We then studied the risk factors maternal age, ethnicity, education, marital status, previous infertility, previous miscarriage, intrauterine exposure to DES, previous cone biopsy, chronic hypertension, maternal diabetes, BMI, smoking, alcohol consumption, early pregnancy blood loss (< 20 weeks), pregnancy-induced hypertension. Also the fetal factors gender and growth retardation were taken into account.

The rate of preterm delivery was 7.8%, the rate of SPB 5.3% (N=200) vs 2.5% for IPB. 5% delivered late preterm (≥34 weeks). Of all studied factors, we found that younger age, non-European ethnicity, chronic hypertension, a low BMI, DES exposition and blood loss before 20 weeks were significant factors. In multiple regression analysis ethnicity (OR 1.7, CI 1.2–2.4), chronic hypertension (OR 2.5, CI 1.4–4.2), DES exposition (OR 4.1, CI 1.3–12.6), and early pregnancy blood loss (OR 2.5, CI 1.4–4.2) were independent risk factors.

Secondly, we studied the follow-up of the 200 women with a SPB in their first ongoing pregnancy. 138 had a consecutive pregnancy (69%). In this group the recurrence risk of SPB was studied. Two cases were excluded. Of the remaining 136 women, 25 had a recurrent spontaneous preterm birth: 18%, 95% CI 12–25%. Only four of those were before 34 weeks. We compared this with the group of women with a previous uncomplicated term birth. After exclusion of multiple pregnancies and other complications, we had 791 women with a consecutive birth in this group. SPB occurred in 16
cases, 2.0% (CI 1.9–2.1%). The unadjusted RR of women with a previous SPB on recurrent SPB was 9.1 (CI 5.0–16.6) compared to women with a previous term birth.

Obviously, the a priori risk of spontaneous preterm birth in low-risk nulliparous women with a singleton pregnancy on SPB is 5.3%. The increase from 5.3% SPB (first pregnancy) towards a recurrence risk of 18% in a subsequent pregnancy may justify secondary care surveillance, in particular if one accepts possible preventive screening and management options like cervical measurements by ultrasound, screening for vaginal infections or treatment with progesterone.

**Chapters 9 and 10 answer question (4) What are the risk factors for postpartum haemorrhage and the recurrence risk?**

Chapter 9 explores risk factors for PPH in nulliparous women, and analyses whether these are different for two frequently used cut-off levels of 500 and 1000 ml, after stratification for risk level. In the 3464 women with a vaginal delivery mean blood loss was 369 ml (estimated following daily practice methods). A normogram of blood loss is given, 81% had blood loss < 500 ml, and 4.2% had severe PPH (≥1000 ml). Retained placenta occurred in 1.8%, of which 80% was accompanied by PPH (≥500 ml) and 61% by severe PPH. Blood transfusion was administered in 2.7%.

The following risk factors were studied: age, multiple pregnancy, ethnicity, induction and augmentation of labour, instrumental vaginal delivery, short (< 30 min) or long (>1 h) second stage of labour, perineal tear, episiotomy, fetal macrosomia (>4 kg), and retained placenta. All factors except augmentation because of failure to progress during first stage were associated with PPH. The most important risk factors for severe PPH were retained placenta (OR 47.0) and duration of third stage >30 min (OR 11.9). All other risk factors had much lower odds. In multiple regression analysis for severe PPH retained placenta remained was the most important risk factor (OR 11.7, 95% CI 5.67–24.1), but also a prolonged third stage of labour (OR 4.9, 95% CI 2.89–8.32), macrosomia (OR 2.55, 95% CI 1.57–4.18), and perineal damage >first degree tear (OR 1.82, 95% CI 1.01–3.28).

Retained placenta and prolonged third stage gave a large mean difference in blood loss (971 and 372 ml), the most frequent risk factors (European ethnicity and second stage >30 vs ≤30 min) gave no clinically significant differences.

We studied PPH within the two risk levels, high and low risk. In the low-risk group with an uneventful pregnancy, first and second stage of labour, labour was under responsibility of a midwife. In this low-risk group induction, augmentation, and instrumental delivery were not performed. If the placenta retained for 30 min the OR for severe PPH was 3.6 (95% CI 1.6–8.0), and in a quarter of these cases the placenta was removed manually and/or severe PPH occurred. Mean blood loss in this group of a retained placenta for more than 30 min was 1424 ml. Our conclusion is that a third stage of more than 30 min is abnormal.

Chapter 10 compares the risk factors in nulli- and primiparous women, who deliv-
ered vaginally, and studies the recurrence risk after a previous PPH and/or retained placenta (RP).

The incidence of both standard PPH ($\geq 500$ ml) and severe PPH ($\geq 1000$ ml) was higher in nulliparous women (standard 19 vs 12%, severe 4.2 and 3.2%). The risk factors for a significant difference in blood loss were shown. The impact of a risk factor could slightly differ: macrosomia had a higher incidence in primiparous women, but the effect on mean blood loss difference was 57 vs 127 ml in nulliparous women. The most clinical important risk factors in both parity groups were retained placenta (921 and 1121 mean differences in blood loss) and prolonged third stage (372 and 438 mean differences in blood loss). The lower on average prevalence for risk factors in primiparous women establishes a lower PPH incidence in this group. In fact these results quantify everyday obstetricians' experience of greater facility in subsequent deliveries, as testified by its shorter duration, the decreased incidence of instrumental delivery and the decreased prevalence of perineal damage.

The most relevant risk factors for standard and severe PPH in both groups were a retained placenta and a third stage of labour over 30 min. In primiparous women a history of severe PPH without a RP in the index delivery was a serious risk factor for a recurrent severe PPH (OR 5.5, 95% CI 2.6–11.7).

Of all nulliparous women with a RP during first pregnancy ($N=61$), 37 had subsequent vaginal delivery. In 43% a recurrent retained placenta was observed. In a control group of 898 women without a RP during first pregnancy, a RP during the subsequent vaginal delivery occurred in 1.8%. The relative risk of a recurrent retained placenta was 24.3 (95% CI 13.2–44.7), suggesting an intrinsic causative maternal mechanism.

**Recommendations**

This study shows that critical appraisal of the Dutch risk management system is possible on the basis of comprehensive and complete registry data, not unlike the data currently collected separately by midwives, gynaecologists and paediatricians. The contents of such a performance-evaluating registry partially goes beyond the data currently collected, apart from being more complete regarding participants and follow-up, being connected to dates of occurrence, and being more integrated into, ultimately, one record per woman combining the entire obstetric history across all specialist departments. Non-facultative data on the presence of risks and on the indications for (and execution of) specific interventions should be added, using terms and definitions which fit 1 to 1 to the guideline and to published evidence. This is a prerogative to end up with conclusions like ours on the presence (or absence) of appropriate referral.

To achieve such a registry participation in the LVR should be compulsory for all obstetric care workers, general practitioners included. A linkage of the data sets of primary care (LVR1) and secondary care (LVR2) is likewise mandatory. Further all efforts should be put to complete data on neonatal outcome, at least until 6 weeks follow-up, implying further linkage with the Dutch National Neonatal Database (LNR).
Summary, conclusions and implications

Recently (September 2003) the first steps towards such a registration have been made. Ongoing activities on the contents of the registry preferably adapt the variable set of risk factors and their operational measurement to achieve concordance with their anticipated use for evaluation. Given the rather simple changes this recommendation involves, we strongly advocate to change the current registry forms (LVR1 and LVR2 form) to cover both guideline-based referral indications and additional risks at the start of prenatal care.

Three important lessons from the observations on the appropriate use (if any) of the guidelines to establish risk are that

a. for many decisions the relevant evidence on risk is absent or not applicable,

b. even plausible guidelines based on solid evidence frequently are not applied, without information on the background of this deviation which could be deliberate or not,

c. some evidence-based guidelines need an update in view of current evidence and standards of care.

Ad a. To improve the evidence of Dutch guidelines, studies should be generated on questions of daily practice. These studies can only be performed when a Dutch registration system exists as described above.

Ad b. Apart from improved registry facilities the role of incentives should be explored. The interest of professional representatives and insurance companies in maintaining the risk system is limited. From the perspective of midwives this is surprising, as the Dutch system (and the survival of midwifery as a profession) is based on successful low-risk surveillance. The viewpoint of insurance companies is also surprising given the high potential for cost-saving measures.

Ad c. Some guidelines need a change or refinement: Repeat CS represent roughly 21% (ZAVIS) of all CS, and may be regarded as a genuine long-term disadvantage of a first CS. To reduce the number of repeat caesarean sections, trial of labour is to be advised in cases were contraindications are absent. Even after risk stratification, in the group with the lowest predicted success rate half of the trials of labour do succeed without obvious complications. Our study can be used two-fold. Firstly to inform women with a caesarean scar on their (on average good) chances to give birth vaginally. Secondly to refine the current risk management. Until recently a previous caesarean scar was stated in the guideline as an unconditional high risk requiring secondary care. Our data support the present advise in the guideline to have one secondary care visit of the women early in pregnancy, followed by regular antenatal visits in primary care (to the extent pregnancy is uneventful), with a final return to secondary care near term or in labour.

The most recent guideline of 2003 assigns a previous ventouse as primary care, and the professional should be informed about previous labour. However, a previous ventouse is not the most important risk factor, but the complication shoulder dystocia
with or without previous ventouse. Risk management and counseling in these cases is complex and the guideline should be refined with this risk factor.

Even a perfect registry and perfect data entry of professionals cannot cover the data requirements to judge the causes and their unavoidability in adverse outcomes. Of such outcomes, perinatal mortality is the best known. Perinatal mortality can follow a series of unfavourable events none of which is a sufficient cause, and the subtleties of the symptoms and signs of the case and their interpretation usually escape the recording potential of a registry. For that purpose the routine institution of audits is recommended.

In our Zaanstreek region, the various obstetric professionals had a good professional relationship in a well-established collaboration, and they volunteered in the participation in a monthly perinatal meeting on all cases of obstetric pathology. Currently national projects were recently started focussing on perinatal mortality audits, following pilot experiences in Den Bosch and Amsterdam.

Such audits require a set of tools and a direct measurable effect may not always be expected. Nevertheless we recommend this complement to routine data collection and their analysis. Hopefully the Dutch government will fund the national perinatal audit development in the near future.

We recommend a targeted approach to contain the exploding referral rate of nulliparous women during labour. Data suggest a non-biological set of causes. Popular information on delivery tends to be too unrealistic, focussing on the second stage while neglecting the long and tedious first stage. A standard television delivery does not exceed 10 min duration although eye-casting selection of images and sounds suggests a real-time registration.

Furthermore, it is remarkable that midwives and obstetricians take no responsibility for antenatal classes in which lots of information, education and guidance on pregnancy and delivery are given. All over the Netherlands these classes are given by physiotherapists, yoga teachers and other professionals, without any formal obstetric education.

We believe (so far evidence is failing) guidance and support during this first stage are of critical importance. The opportunity for referral from low to high risk during labour, a unique concept in the Netherlands, is a perfect setting for investigation of such support and if this will result in a lower referral rate a broad-scale program can be advocated.

The recurrence risk of retained placenta is high. In view of our data on postpartum haemorrhage (PPH) a third stage of more than 30 min is abnormal. In women who delivered under primary care this occurred in 7%, and in a quarter of these women the placenta was removed manually and/or severe PPH occurred. Especially in home deliveries referral to secondary care should be performed after 30 min, in contrast to the current guideline of 60 min.
General conclusion

The ZAVIS database used for this thesis was developed to study the interaction between primary and secondary care, as a continuation of the research tradition initiated by van Alten and Eskes in the Wormerveer study. Since those pioneering studies three registry facilities have been developed (LVR1, LVR2, LNR), so far profession focused, and not 1 to 1 compatible and unable to combine pregnancies of one woman. Recent work of the LinKID study group has created an integrated perinatal database of the 2001 data, although the missing data percentage through non-participation (general practitioners (GPs)) and technicalities still is amenable to improvement. The final touch should be adaptation of the information contained to achieve a dynamic process of quality control.

In a medical and economic environment requiring evidence by numbers rather than by belief, it is not enough to be proud on the two-tier risk approach of obstetric care. The results of the ZAVIS study show there is no place for complacency, neither by midwives nor by obstetricians. That GPs are left unmentioned is acceptable in ZAVIS (no GP care), but unacceptable for the Dutch data. Assuming current strategies for improvement to succeed, we believe the combined information of registries and audit provide ample opportunities to provide evidence that a two-tier system based on risk management can be maintained as a concept.