From the Division of Obstetrics and Gynecology,
Department of Clinical Sciences, Danderyd hospital,
Karolinska Institutet, Stockholm, Sweden

SHORT AND LONG TERM EFFECTS OF CAESAREAN SECTION AND VAGINAL DELIVERY

Christina Larsson

Stockholm 2010

Yesterday is history, tomorrow is a mystery, today is a GIFT!
That is why, we call it the present!

ABSTRACT

 The aim of this thesis was to study short and long term effects after caesarean section (CS) and vaginal delivery. We also studied the difficulty in estimating blood loss at delivery and birth experience estimated nine months after delivery.

In **Study I** blood loss during delivery was measured in two ways, visually, according to the routine of the hospital, and with a laboratory method, the alkaline hematin method. The visual estimation tended to over-estimate the bleeding. In vaginal deliveries there was no correlation between the two ways of measuring. Using blood loss after delivery as a quality indicator or for comparison in studies may lead to false conclusions, since visual estimation has low validity.

In **Study II** the Swedish Hospital Discharge Registry was used to identify women with a diagnosis of pelvic organ prolapse. The data were linked to the Swedish Medical Birth Registry (MBR). 16,605 women who were diagnosed with pelvic organ prolapse (ICD9: n = 618, ICD10: n = N81) and who had deliveries during 1973-2004 were identified. Stratification was made by the women's year of birth (2 year intervals), the year of the last delivery (1 year interval), and the parity at the last delivery. Among women who had only had vaginal deliveries, a strong and almost linear association between parity and the risk of surgery/in hospital care of pelvic organ prolapse was found. Women delivered by CS only, had a five-fold lower risk of being admitted to hospital for pelvic organ prolapse.

In **Study III** healthy primiparae with planned CS were investigated in a prospective cohort study. The indication for planned CS was breech presentation or maternal request. For every woman scheduled for a planned CS, one to two women from the same antenatal clinic planning a vaginal birth were asked to participate. Questionnaires were answered at inclusion (gestational week 37-39), two days, three and nine months after delivery. Details about the delivery were retrieved from the medical records. The outcome of delivery and complications were investigated and data were analysed as intended mode of delivery. In this group of healthy Swedish primiparae collected prospectively, we could not show any difference in short term medical complications like blood loss and infections. There was a longer in hospital stay in the planned CS group

Study IV: The Karolinska Scales of Personality (KSP), the Edinburgh Postnatal Depression Scale (EPDS), Wijma Delivery Expectancy Questionnaire (W-DEQ A), and Wijma Delivery Experience Questionnaire (W-DEQ B) were added to the data in Study III. The experience of delivery was measured with a Visual Analogue Scale (VAS) in order to get a global rating of the delivery. The logistic regression analysis yielded odds ratios for those variables that were independently related to the experience of delivery. There was no correlation to planned mode of delivery. Confidence in the midwife as well as adequate pain relief seems to be more important than mode of delivery for a positive birth experience. W-DEQ B was correlated to VAS at nine months after delivery, and even though the correlation was moderate, VAS could be a simple method to estimate birth experience.

These studies on healthy Swedish primiparae show that improving outcome in planned vaginal deliveries by support and coping with pain are important issues, but also that risks with one planned CS are few.

Key words: Caesarean section, maternal request, post partum haemorrhage, comparative study, repeatability of results, CS/adverse effects, cohort study, obstetric complications, pelvic organ prolapse, birth experience

LIST OF PUBLICATIONS

I   Larsson C, Saltvedt S, Wiklund I, Andolf E. Estimation of blood loss after caesarean section and vaginal delivery has low validity with a tendency to exaggeration. Acta Obstet Gynecol Scand 2006;85:1448-52

II   Larsson C, Källén K, Andolf E. Caesarean section and risk of pelvic organ prolapse – a nested case-control study. Am J Obstet Gynecol 2009;200(3):243.e1-4.

III   Larsson C, Saltvedt S, Wiklund I, Andolf E. Planned vaginal delivery versus planned caesarean section – short term medical outcome analysed according to intended mode of delivery. Presented as a poster at SMFM annual meeting in San Francisco, Febr. 5-10, 2007. Submitted to Journal of Obstet Gynecol Canada.

IV   Larsson C, Saltvedt S, Edman G, Wiklund I, Andolf E. Factors independently related to a negative birth experience in first-time mothers. Conditionally accepted. Sexual and Reproductive Healthcare.

CONTENTS

List of abbreviations

ACOG	American college of obstetricians and gynecologists
BMI	Body Mass Index
CI	Confidence interval
CS	Caesarean section
CTG	Cardiotocography
ICC	Intra-class correlation coefficient
IVF	In vitro fertilization
KSP	Karolinska scales of personality
NICU	Neonatal intensive care unit
NIH	National Institute of Health, Bethesda, Maryland, USA
OR	Odds ratio
PPH	Post partum haemorrhage
RCT	Randomized controlled trial
VAS	Visual analogue scale
VBAC	Vaginal birth after caesarean section
W-DEQ	Wijma delivery expectancy/experience questionnaire
WHO	World health organization

GRADING OF EVIDENCE

Level	Evidence
1a	Systematic review or meta-analysis of RCTs
1b	At least one RCT
2a	At least one well-designed controlled study without randomization
2b	At least one well-designed quasi-experimental study, such as a cohort study
3	Well-designed non-experimental descriptive studies, such as comparative studies, correlation studies, case-control studies, and case series
4	Expert committee reports, or opinions and/or clinical experience of respected authorities.

1 INTRODUCTION

1.1 HISTORY

The history of caesarean section illustrates the development of
obstetrics and humans´ struggle for a safe way of delivery.
It has been claimed that Julius Caesar was born by caesarean section (CS).
This is highly unlikely, since his mother survived the delivery (1).The word
caesarean section did probably not have its origin from Julius Caesar, but
from the verb caedere, which means "to cut" (2, 3). Post-mortem caesarean
section has been in use a long time. A Roman law was established (Lex
Regis de Inferendo Mortus) in 715 BC (before Christ). This law required
that the baby should be cut out of the mother in the occurrence/event of her
death. Under the Emperor`s rule, the name of the law was changed to Lex
Caesare (4) Out of religious reasons the practice with post-mortem
caesareans remained. It was not until the beginning of the 15th century that
a midwife in Germany claimed to have performed seven caesarean
sections, where both mother and child survived (1).

   In Sweden the first reported caesarean section was performed in 1758 by
an obstetrician. The mother died due to infection, but the daughter survived
(1). This story has been beautifully used in a recent novel by the Swedish
author, Agneta Pleijel (5).

   Before the 20th century, it was not certain that women would survive
pregnancy and delivery. This must, of course, have been a source of much
worry to women, even though not a big subject of discussion. Most
probably the women concealed their worry and asked a close relative or
friend to take care of the children, if they did not survive the delivery.
There were no thoughts of a caesarean section. In a Swedish midwifery
education textbook from 1873, the possibility of performing a caesarean
section was not even mentioned (6). When anaesthesia was introduced, in
the middle of the 19th century, the possibility of performing a caesarean
section increased (3).

   By that time, caesarean sections were made to save the life of the mother
in case of obstructed labour. Other methods such as dividing of the
symphysis pubis or destruction of the foetal skull were coming out of
practice. The introduction of the antiseptic technique around 1870, further
lowered the maternal mortality. It was still high in 1930 when one out of
ten women died after caesarean section in Sweden(7).

   Blood transfusions and antibiotics made the complications decrease and
in the sixties caesarean sections were even made on foetal indications (8).

1.2 INCREASING RATE OF CAESAREAN SECTIONS

Still in the sixties the rate of CS was low in most countries, less than five percent. The Swedish Medical Birth Registry was started in 1973 and from that year the rate can easily be followed. With the introduction of CTG (cardiotocography) in the seventies, the numbers of caesareans started to rise. The method of CTG is not very specific and in the beginning CTG-patterns of unclear importance often lead to emergency CS. The rate then stayed at the same level for some years due to efforts from leading Swedish obstetricians to keep the rate down (9). The last ten to fifteen years the rate has increased to around eighteen percent in Sweden.
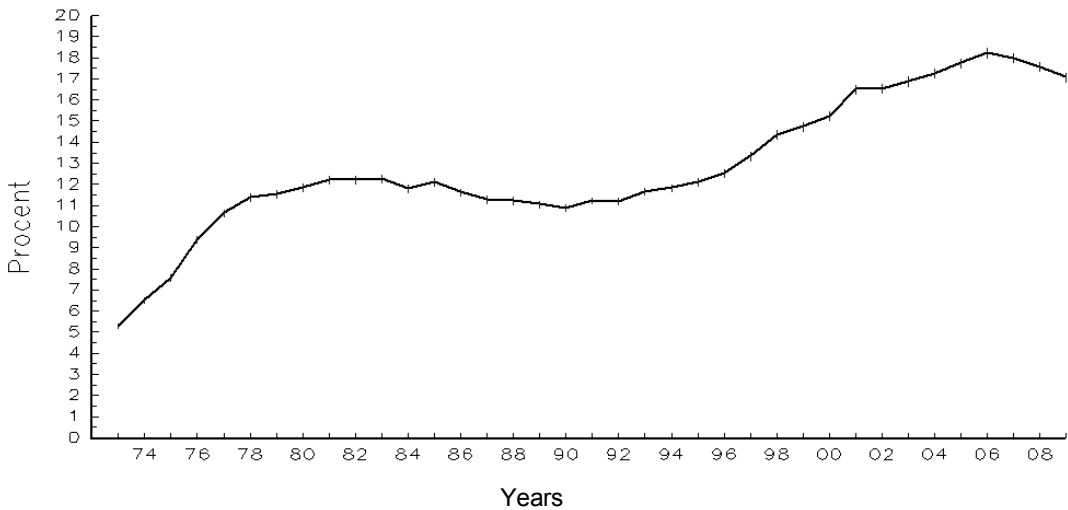
Figur 1 Rate of caesarean section in Sweden, 1973 – 2008.

(Figure from the Swedish Medical Birth Registry)

In 2006 the rate of CS was 18.1% in primiparae at Danderyd Hospital and in 2009 the rate was 28.9%. The total rate of CS was 21% in 2009 as estimated from all deliveries at the hospital (9 639). In Sweden he total rate was 17.2% in 2008 (10).

In many other countries the frequency is even higher. In the US the caesarean rate was around 31% in 2006 (11). In China, where only one child per family is recommended, the rate was 56% in 2006 in certain parts of the country and as many as 20% were CSs on maternal request (12).

2

In some parts of the world and in special clinics the rate can be as high as 80%. In Brazil the rate of CS is 72% in private clinics, compared to 31% in public clinics (13).

1.3   WHY HAS THE RATE OF CS INCREASED?

There are several reasons for the increase. In Sweden the main reasons are socio-demographic changes of the population. Women are older today when having their first child. Older women have a higher risk of diseases such as diabetes and hypertension. Also body mass index (BMI) has increased. If women are older when starting to give birth a larger proportion will have one child only. All these factors are related to a higher risk of being delivered by a CS (14).

Birth weight has increased until recently, but the two latest years it seems to decrease, possibly because of the increasing CS rate(10). The probability of obstructed labour and ensuing planned or emergency CS is higher if the birth weight is higher. Studies have demonstrated a decreased risk of morbidity for infants in breech position if delivered by CS compared to a vaginal delivery(15). Today close to 100% of all foetuses in breech position are delivered abdominally in Sweden (14). IVF, in vitro fertilization, being performed as a consequence of infertility, makes it more likely that the women are older when giving birth. This fact plus the increased risk for twins in IVF, increases the risk for a CS (16) (17).

The increased rate of CS in Sweden is to one third due to socio-demograhpic factors, to one third due to dystocia/disproportion and to one third due to a previous caesarean/CS on maternal request (14). These two diagnoses (previous caesarean/CS on maternal request) are not clearly defined and probably interrelated since vaginal birth after one caesarean delivery is possible. When the first delivery results in a CS, the risk of a CS in the next pregnancy is much higher. In the US today, the rate of CS after a previous CS, is as high as 91% (18). This fact could reflect the wish of the woman, but also be the suggestion of the obstetrician. It can be a difficult decision to determine which women would be suitable/adapted for a VBAC (vaginal birth after caesarean section).

In many situations it is also difficult to choose between an instrumental delivery and an emergency CS. It takes years to achieve experience as an obstetrician. A decision in an emergency situation about the best route of delivery can depend on the competence of the obstetrician in charge. Obstetric outcome has been shown to vary during the day possibly due to less experienced staff during the night (19). Today obstetricians may get insufficient training in vaginal deliveries (20). It has been demonstrated that obstetricians are more willing to plan for a CS today than twenty years ago, even though they would prefer a vaginal delivery for themselves or

their partner (21) (22) (23). Swedish male obstetricians seem to be more liberal than their female colleagues to plan for a CS (24). The increasing rate of CSs has been shown to be due to lower threshold for the decision and maternal preference in Sweden (25).

In Brazil between 30-80% of all women are delivered by CS although 70-80% of the women preferred to be vaginally delivered, when asked during pregnancy. The conclusion from this study was that doctors had persuaded women (13). Fear of litigation may probably influence decisions about route of delivery as well (26) (27). High frequency of CSs can also be economically related, since financial incentives play a role in some places (28).

Cultural factors may also affect the rate of CS. In some countries, having a caesarean is a sign of wealth for some, while poor women do not have access to CS even when needed (29). In some developing countries on the other hand, women are afraid of having a CS, since the risks of complications are higher than being delivered vaginally (30).

Finally, fear of surgery has decreased. Today it is not uncommon to go through surgery for cosmetic reasons without any medical indication and therefore, worries about the surgery itself, do not seem very common.

1.4 CS ON MATERNAL REQUEST

Today, in developed countries, women do not worry about surviving pregnancy and delivery. Instead they worry about injuries to the infant during the delivery, lack of adequate pain relief and support by the midwife during the delivery (31) (32). Some women may request repeat CSs, because of fear of delivery, since they regard this route of delivery to be safer than vaginal delivery, both for themselves and their baby (33).

A CS on maternal request is a CS performed without any medical indication. To estimate the rate of CSs on this indication is difficult, because of unclear rules of definition. Changes in medical coding practice and changes in obstetricians´ judgement are other factors influencing and aggravating the estimation (34) (35). Internationally rates of 4-18% of all CS have been proposed by the National Institute of Health, Bethesda, Maryland, USA, (NIH), in comparison with Swedish figures of 7%. Thirteen percent of Canadian nulliparae and 5% of multiparae would like a planned CS, if they were given the opportunity to choose (36). Results from a Swedish study show that 8.2% of the women, both nulli- and multiparae, wanted a planned CS in early pregnancy (37) Fear of delivery and fear of injuries to the infant during delivery are two common motives for demanding a CS (38-40). Women having had a previous traumatic delivery, often want a planned CS the next time they get pregnant. One reason is that they do not want the same procedure to be repeated. Another

is that they find a planned CS safer than an emergency CS. (41) (33). Bettes demonstrated that 50% of American obstetricians believed women would have the right to a CS on request (21). Some women are also of the opinion that they should have the right to decide about route of delivery (36). Today the issue of women´s rights concerning mode of delivery is commonly debated in all kind of media.

1.5 SHORT TERM EFFECTS

Maternal medical short term effects are complications connected with the delivery. Complications after CS have to be compared with complications connected with vaginal deliveries. The term intended mode of delivery signifies that complications after an emergency CS in a delivery that started vaginally are referred to the vaginal group. Some of the effects are only relevant in vaginally delivered women (lacerations of the birth canal and instrumental delivery). Others can only affect women being delivered by CS (injury to intra-abdominal structures) and some can affect women in either group (excessive blood loss, peripartal hysterectomy, infections, thrombo-embolic events and maternal death).

Many studies have been published on this subject. When our studies were initiated in 2002 few data of high evidence were available. In published studies primi- and multiparae, planned CS and emergency CS as well as CS on different indications were often mixed. Most studies were retrospective and not analysed according to intended mode of delivery. Emergency CSs, connected with a higher complication rate, were then referred to the CS group regardless of how the delivery started.

Studies regarding complications in healthy women after CS with foetuses in vertex presentation were also not available since the practice of coding made it difficult to study these women separately. For ethical reasons, randomised control trials were absent with foetuses in vertex presentation. Breech presentation was therefore used as a proxy. Only one large multicenter randomised controlled trial (RCT) on breech presentation was available showing no difference in short term complications concerning the mothers (15).

In 2002 available studies indicated various results concerning blood loss and infection (42, 43). In 2004 and 2006, when our prospective study was finished, large metaanalyses were published (RCOG, NIH). The conclusion from RCOG was that there were higher risks for infections in caesareans (low to moderate evidence). The recommendation to use antibiotics was emphasized with high evidence(44) As for bleeding no difference was reported referring to the RCT on breech position(15)

In a "State of the Science"Conference in 2006 at NIH weak evidence was presented regarding a higher rate of infections in caesareans, whereas

moderate evidence was presented regarding higher blood loss and blood transfusions at vaginal deliveries compared to CS (45).

Infections occur after all deliveries, although it is more common after complicated deliveries and pre-rupture of membranes. The most common types of infection are endometritis, wound- and urinary tract infections. The most common causes for readmission after CS were infection and wound complications(46) Authors discuss the difficulty of diagnosing infection, a well-known issue for every clinically active obstetrician (47). Further, if women are released early from hospital after delivery, infections may go unnoticed.

Obstetric haemorrhage is still a leading cause of maternal death world wide. In Australia and the UK haemorrhage is ranked as the 3rd and 4th most common cause of maternal death (48). Anaemia also increases the risk of infection and interferes with recovery after delivery (49). Excessive blood loss can occur both during CSs and vaginal deliveries. From Australia was shown a rate of PPH (post partum haemorrhage) of 5.8% in the first pregnancy, although PPH was defined as blood loss of >500 mL in vaginal deliveries and >750 mL in CSs (50). A recent Norwegian study found that bleeding seems to increase, probably due to a higher rate of obstetric interventions (51).

It is well-known that it is difficult to estimate blood loss, especially in vaginal deliveries. Studies regarding blood loss during deliveries have come to divergent results, and most studies were old when we started our study. The common conclusions from many studies were that blood loss was often underestimated and that visual estimation, the routine method, was not reliable (52-58).

During pregnancy there is an increased risk of thrombo-embolism, to one in a thousand pregnancies, which indicates a ten-fold rise (59) (60). A doubled risk has been reported after CS with an OR of 2.2, compared to vaginal deliveries (CI 1.5-3.2) (61). Other conditions that lead to an increased risk of thrombo-embolism are high BMI, smoking, maternal age and different kind of intercurrent maternal disease such as diabetes and hypertension (62, 63). Since the BMI is increasing all over the world, there will probably be an increased rate of thrombo-embolism during pregnancy in the future (62) (64).

The maternal mortality is very low in developed countries and particularly in Sweden, where the rate is 3 in 100 000 live births (http://www.who.int). The close relation between the indication for CS and possible complications makes the figure unreliable.

1.6   LONG TERM EFFECTS

The evidence of long term effects after planned CS compared to vaginal deliveries is moderate to weak for most outcomes(45). RCTs are not feasible. Observational studies have flaws since controlling for confounding factors is difficult. Considering the long time period that is needed for follow up of many outcomes, retrospective data base studies are most common. The long follow up also creates other problems since management may have changed over time.

Women delivered by CS have fewer children than those delivered vaginally (65, 66) (67). For those delivering abdominally confounding factors may be at hand. Therefore it has been difficult to show that the infertility is voluntary (68).

Reported increased risks of tubal pregnancies, miscarriages and stillbirths after CS may further increase the risk for subsequent infertility, even when pregnancies do occur (66).

Placental problems, such as placenta praevia and placenta accreta, are known to be more frequent after CS (67) (45), which may increase the risk of a poor obstetric outcome. Placental implantation problems increase with the number of prior CSs and also with age and parity. The risk of a placenta praevia is 7:1 after 2 previous CSs, compared to after two vaginal deliveries (69).

Uterine rupture is another concern in subsequent deliveries after CS (45, 67). Meta-analyses have shown an increased risk of 0.4-0.6% with an attempted VBAC compared to a planned repeat CS (45) (14). The risk of a rupture is increased during induction and with administration of labour stimulating drugs (70, 71). Both abnormal placentation and uterine rupture are associated with an increased risk of excessive blood loss, hysterectomy and a higher maternal and neonatal morbidity (72).

Multiple CSs are also associated with a higher risk of other maternal complications, such as the formation of adhesions and ensuing surgical difficulties. This could lead to injuries on other occasions when the abdominal cavity is entered (73).

Post surgery adhesions can increase the risk of ileus and long term pain. Women with previous CS report more pelvic pain(74) but this, as well as the rate of dyspareunia, is not well investigated. The risk for ileus is regarded as less than after other abdominal surgery (67). A recent study on the Swedish Medical Birth Registry report a risk of 0.64% of being submitted to in-hospital care for adhesions or intestinal obstruction after CS. The risk after vaginal delivery was 0.32% (75).

Risk of perineal lacerations, sphincter injuries and complications that might follow after vaginal deliveries, such as pelvic organ prolapse, fecal- and urinary incontinence, are subjects being debated more often today.

Pelvic floor disorders have a high prevalence and cause much suffering in elderly women. A large part of gynaecological surgery is geared towards repair of the pelvic floor. Parity, damage to the birth canal during pregnancy and delivery, smoking, lung disease, obesitas, ageing, genetic factors and diabetes increase the risk for symptoms from the pelvic floor (76, 77) (78) (79).

Vaginally delivered women have a higher rate of urinary incontinence than women delivered by CS three months post partum (80). Vaginal delivery is independently associated with an increase of stress urinary incontinence symptoms (81). At long time follow-up this difference has disappeared (79, 82) (76). After menopause there is no difference in risk between nulliparae and women, who have given birth (83).

Cohort studies evaluating the risk for anal incontinence after vaginal delivery have come to different results. Rates between 1-23% have been reported (45, 67). In a randomized controlled trial there was no difference regardless of mode of delivery three months post partum (80). A recent Cochrane review could not show that CS offered protection from anal incontinence mostly due to the lack of RCT:s (84).

Several case control studies are available concerning the risk for pelvic organ prolapse after vaginal delivery and CS. Some show a protective effect of CS (76, 85-89) (90), others do not (91, 92). Study design varies, some use symptoms of pelvic prolapse in self reported questionnaires, others results of pelvic exam or surgery for pelvic prolapse as primary outcome. Small sample size and difficulties in controlling for confounding factors such as smoking, obesity, diabetes and family history may also explain the difference in results.

1.7   BIRTH EXPERIENCE

Estimation of birth experience is important with the aim to support and counsel women in subsequent pregnancies. Discussing birth experience has become common during the last ten to fifteen years, probably due to the fact that medical complications have been reduced. Today women have high expectations of their approaching delivery, and sometimes medical caregivers have difficulties fulfilling their expectations.

Birth experience is estimated after delivery and should be separated from the estimation of fear of delivery. One cause of fear of delivery is a previous negative birth experience. How an individual reacts to the delivery is very personal and influenced by many factors. Many Swedish researchers have investigated factors related to birth experience (32, 37, 93). There are different methods for the estimation of birth experience. A self rated Likert scale has been in use to measure pain and mood for several years. The scale can have five, seven or ten points and start from zero or

one (94, 95). Waldenström used a seven point scale which had been validated in a previous study. Women with low ratings of the birth experience (score 1-2) had fewer subsequent children than women scoring high on the scale (32, 96).

Wijma used a six point Likert scale with the end points "not at all" and "extremely" to rate the women´s personal feelings when thinking of the coming delivery, and afterwards to estimate the birth experience (97). These questionnaires, Wijma Delivery Expectancy Questionnaire and Experience Questionnaire, W-DEQ A and B respectively, have been in use since 1998. Lavender used open questions given to women post partum with the purpose of estimating birth experience (98). In her study on fear of childbirth before, during and after delivery, Alehagen used W-DEQ (both expectancy and experience) and a Likert scale from one to ten, measuring fear during delivery (99). Goodman et al. used a 5-point Likert scale to evaluate childbirth satisfaction (94).

Factors associated with a negative birth experience are socio-demographic factors like unemployment, smoking, a bad relation to the partner and low education (32, 100). Other factors influencing birth experience are factors related to the delivery, i.e. unexpected events, emergency situations, admission of newborns to NICU (32). Pain during and after delivery, being involved in decisions and the feeling of having control are other factors connected to the birth experience (98). The importance of support, both during pregnancy but also during delivery and post partum, is well documented (100, 101). Length of hospital stay, support regarding breast-feeding and post partum pain are other contributing factors (32, 100).

1.8   ETHICAL PERMISSION

All studies were approved by the Research Ethics Committee at Karolinska Institutet (Stockholm, Sweden). 02-301, 03-408, 04-737/4, 2005/89-31.

2 AIM

The overall aim of this thesis was to study short and long term medical effects after caesarean section and vaginal delivery. The specific aims of the studies were:

- to validate estimation of blood loss in delivery, both caesarean sections and vaginal delivery (Paper I)

- to investigate the association between caesarean section and pelvic organ prolapse in a nested case-control study (Paper II)

- to compare somatic maternal complications in healthy primiparae after planned vaginal delivery and planned caesarean section on maternal request or breech presentation in a prospective cohort study (Paper III)

- to investigate birth experience in a cohort of healthy primiparae by correlating the experience with a number of variables related to delivery, socio-demographic background and psychologic factors (Paper IV)

3 MATERIAL AND METHODS

3.1 STUDY I

Women undergoing elective or semi-acute CS or vaginal delivery were included. After caesarean delivery, blood loss was estimated by the obstetrician and the anaesthetist nurse together. The content of drainage bottles was measured and added. After vaginal delivery, the blood loss was visually estimated by the midwife according to the routine of the hospital. When there were difficulties in estimating the blood loss or when the loss visually exceeded 500 ml, pads, swabs and diapers were weighed. These estimations represent standard procedure.

Initially, to compare inter-individual variation of estimation of blood loss, two skilled midwives estimated the blood loss in 10 vaginal deliveries independent of one another. Blood loss was also estimated in 16 CSs simultaneously by two persons, independent of one another (the obstetrician and anaesthetist nurse on duty). As for the comparison of estimated and measured blood loss, results from another 29 women delivered by CS (s) and 26 women delivered vaginally (v) were analysed. In all, 20 midwives were involved in the vaginal deliveries and 7 obstetricians in estimating the blood loss of the CSs.

To study the validity of estimation, estimated blood loss was compared to the measured amount. Measurement of blood loss was performed using the alkaline hematin method (102). All the blood-stained pads, diapers and swabs and the content in the drainage bottle were collected, put in a plastic bag and blended with 5% NaOH solution. Haemoglobin was extracted in a Stomacher Lab Blender. A portion of the fluid was collected and diluted with 5% NaOH solution. The concentration of alkaline hematin was obtained by assay in a spectrophotometer at 546 nm. The blood loss was then calculated using the patient's haemoglobin at admittance as a reference.

3.2 STUDY II

The Swedish Hospital Discharge Registry (HDR), kept by the National Board of Health and Welfare (Stockholm, Sweden), was used to identify women with a diagnosis of pelvic organ prolapse. Using the personal identification number assigned to each resident in Sweden, the data were linked to the Swedish Medical Birth Registry (MBR), which is also kept by the National Board of Health.

In total, 16,605 women who were diagnosed with pelvic organ prolapse (ICD9: n = 618, ICD10: n = N81) and who had deliveries during 1973-2004 were identified. No data were excluded. For women who had been

diagnosed with pelvic organ prolapse more than once, only the first diagnosis was counted. Women also had to have had their first diagnosis of pelvic organ prolapse more than 365 days after the last labour because symptoms of pelvic organ prolapse may develop shortly after delivery but improve with time. Women with a diagnosis of pelvic organ prolapse made beyond the age of 60 years were excluded. We chose this cut off because women over this age probably would have given birth before 1973, when the MBR started. Therefore, information on their mode of delivery and parity was not available. Also, information on date of death was not available. The final study group consisted of 15,007 cases.

3.3   STUDY III

During the study period, January 2003 to June 2005, woman scheduled for planned CS were asked to participate if they fulfilled the following inclusion criteria: healthy Swedish-speaking primiparae, a normal pregnancy, a body mass index <30 and indication for planned CS due to breech presentation or maternal request. Women were included in gestational week 37-39. For every woman scheduled for a planned CS, one to two women from the same antenatal clinic planning a vaginal birth were asked to participate. The controls should fulfil the same inclusion- and exclusion criteria, with term estimated within 1-2 weeks of that of the study

A questionnaire on socio-demographic background and health was sent to all participants shortly after inclusion. Three months after delivery, the participants received questionnaires concerning their health and complications after delivery. If questionnaires were not returned within three weeks, a reminder was sent. Details about the delivery were retrieved from the medical records. If data were ambiguous the woman was contacted by telephone.

After vaginal delivery the blood loss was visually estimated by the midwife. When there were difficulties in estimating the blood loss or when the loss visually exceeded 500 ml pads, swabs and diapers were weighed.

After caesarean delivery blood loss was visually estimated by the obstetrician and the anaesthetist nurse together. These estimations represent standard procedures at the clinic.

Prophylactic antibiotics were given in case of CS in labour, according to the routines at the clinic. Anti-thrombotic prophylaxis was not given.

In order to make a power calculation the record of the hospital and the Swedish Medical Birth Registry (MBR)(10) were used to estimate blood loss and rate of infections after CS and vaginal delivery in presumed healthy primiparae. We estimated that there would be a 20% rate in complications after CS (10% blood loss over 1000 mL 10% rate of infection) whereas 10% would be reasonable in vaginally delivered (5%

large blood loss, 5% infections). Power analysis showed that 219 women would be needed in each group to detect a difference of 10% (power 80%, significance 5%).

3.4 STUDY IV

This study includes the same cohort as in study III and inclusion- and exclusion criteria did not differ. All data in study III were used. In addition two other questionnaires, i.e. the Edinburgh Postnatal Depression Scale (EPDS), and the Karolinska Scales of Personality (KSP) were given to the participants, the first at three months, and the second at inclusion and at nine months after delivery. The EPDS is a 10-item self-rating scale measuring postnatal depression, validated and broadly used (103-105).

Karolinska Scales of Personality consists of 135 items with 4-point Likert response scale (106, 107). The items are standardised with regard to age and sex on the basis of a control group randomly selected from the population. The KSP scales measure personality traits. The scale is validated and has been shown to be stable over a time period of 9-10 years (106, 108).

W-DEQ A was also used at inclusion to measure fear of delivery. W-DEQ B was sent at 3 months in order to estimate birth experience.

The experience of delivery was measured with a Visual Analogue Scale (VAS) two days after delivery, three and nine months post partum, in order to get a global rating of the delivery. One represented the most negative and ten the most positive experience.

In total 531 variables were collected. Sixty-three variables, assumed to be related to the experience of delivery were selected from the database of 531 variables.

4 STATISTICS

In study I an alternative approach according to Bland and Altman, was used to measure the correlation between blood loss in CSs and vaginal deliveries (109). Intra-class correlation coefficient [ICC] was calculated with the SSPS program to assess the inter-observer repeatability (110).

All other statistical analyses of the data were performed using JMP statistical package.

Blood loss was not normally distributed and, therefore, the Wilcoxon two-sample test was used. The co-variation between variables was assessed by bivariate linear regression.

Study II is a nested case-control study. The term nested refers to that both cases and controls were collected from a common cohort of people, in this study women giving birth between 1973 and 2004. Odds ratios (ORs) were obtained using the Mantel-Haenzsel procedure (111). Stratification was made by the women's year of birth (2 year intervals), the year of the last delivery (1 year interval), and the parity at the last delivery (previous deliveries plus 1) and 95% confidence intervals (CIs) were calculated using the method proposed by Miettinen (112).

As a complement to the Mantel-Haenzsel analyses, Cox analyses were performed to estimate hazard ratios for pelvic organ prolapse after the last labour. The time at risk for each woman was recorded by counting the number of days between the individual dates of study entrance and exit. For each woman, the time for the study entrance was set at Jan.1, 1987 (when the HDR started) or at the date of the last delivery (if after 1987). The time for the study exit was set at the date of the first diagnosis of pelvic organ prolapse, the date the women turned 60 years old, or on Dec. 31, 2004 (when the data set was retrieved), depending on which event happened first. The women's age at study entrance was entered in the Cox analyses as a continuous variable, whereas delivery mode (CS only or vaginal only) and parity were entered as class variables.

All data in studies III and IV were analysed according to intended mode of delivery. Sample size was based on an incidence of infections and post partum haemorrhage. Standard descriptive statistics (e.g. mean, standard deviation and range) were used to summarize the variables. Group differences in age and weight were analyzed with Student´s t-test. For categorical data chi-square was used, Fisher´s test or Mann-Whitney´s test if data were skewed. A significant level of 5% was used.

All statistical analyses of the data were performed using JMP statistical package (SAS Institute Inc., JMP Sales, SAS Campus Drive, Cary, NC 27513, USA).

In study IV we correlated 63 variables, presumed to be related to the birth experience, to the VAS estimation made at nine months using Kendall´s rank order correlation The stability or test-retest reliability of the rating of delivery experience was expressed as an intra class correlation according to the method of Bland and Altman (109). Those variables that were significantly correlated to the experience of delivery were dichotomised and entered in a logistic regression analysis (stepwise forward). The inclusion criterion was that the correlation coefficient, expressed as a chi^2-measure, should be significant at the five percent level. The logistic regression analysis yielded odds ratios for those variables that were independently related to the experience of delivery. The analysis was performed on the collapsed samples, since mode of delivery was not significantly correlated to birth experience in the first analysis.

The correlation between W-DEQ B and VAS, estimating birth experience at three months after delivery, was calculated according to Pearson's product-moment correlation.

5 RESULTS

5.1 STUDY I

When the blood loss was estimated simultaneously by two persons, the ICC was 0.92 (95% CI 0.70-0.98) in vaginal deliveries and 0.97 (95% CI 0.91-0.99) in CSs. Both correlations are significant with p-values <0.001.

The median blood loss in the vaginal group was 325 ml (200-1300 ml) according to estimation and 254 ml (102-715) according to the haemoglobin extraction method (p=0.07). The median blood loss in the caesarean group was 500 ml (200-1500 ml) according to estimation and 440 ml (135-1000) according to the haemoglobin extraction method (p=0.1). Estimated blood loss for the whole group (n=55) was 400 ml compared to the measured loss of 370 ml (p=0.05) (Figure 2).
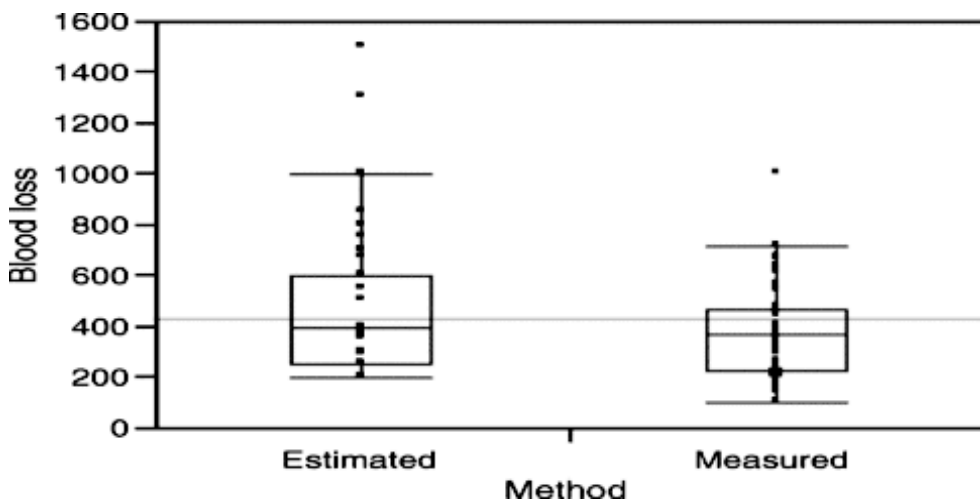
Figure 2. Estimated and measured blood loss in women delivered by caesarean section and vaginal delivery. Values are given as median and percentiles with the ends of the box as the 25th and 75th percentiles and the 10th and 90th percentiles indicated.

Regression showed a moderate correlation (r^2=0.55) between estimated and measured blood loss in the (s) group.
In the (v) group (r^2=0.13), there was no correlation.

Agreement between the methods, according to Bland and Altman (109), showed that estimation tended to over-estimate the bleeding by a mean of 114 ml (SD 228). This indicates that the true result of measured blood loss could be between -570 (-2 SD) and +342 (+2 SD) ml from the estimated (Figure 3).

16

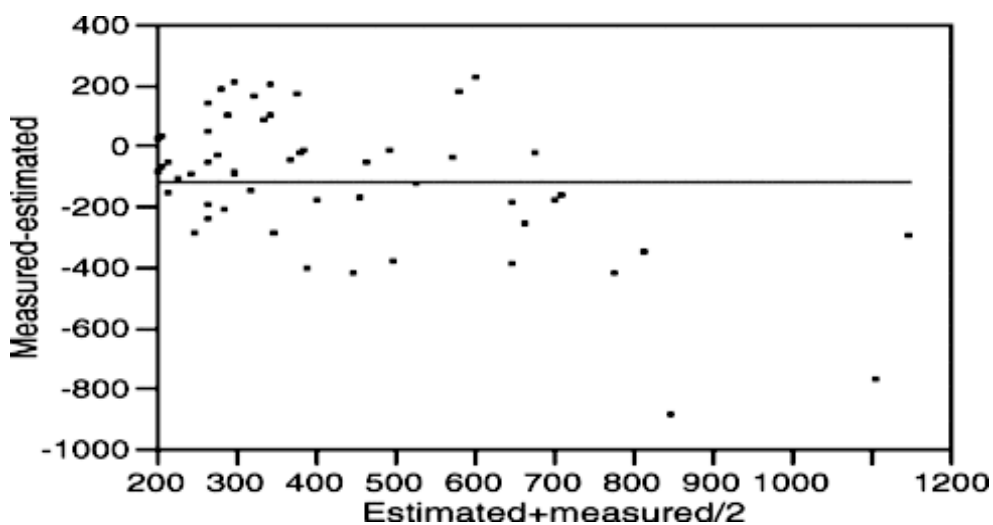Figure 3. Mean of difference between measured and estimated blood loss for all women is -114 (SD 228) indicating that the difference could vary between -570 (-2 SD) and +342 (+2 SD) ml.

For vaginally delivered only, mean would be -101 (SD 240) indicating a range from -581 to +379. For women delivered by CS, a mean of -26 (SD 220) was measured, indicating a range of -566 to +314.

The decline of haemoglobin (difference between haemoglobin analysed at admittance to the delivery ward and haemoglobin 3-7 days post partum) did not correlate to the result of blood loss (r^2=0.05). Only 17 patients were available for this analysis.

5.2   STUDY II

Of the women with inpatient diagnosis of pelvic organ prolapse 78.2% had undergone surgery for pelvic organ prolapse.

During the study period, the rate of instrumental deliveries and ruptures of the anal sphincter were 7% and 3%, respectively, in vaginally delivered women. Instrumental delivery was not more frequent in women with prolapse.

Results of method of delivery in those with and without pelvic organ prolapse can be seen in Table 1. Only about 2% of the women with a diagnosis of pelvic organ prolapse had had no vaginal deliveries and one or more CSs, whereas in women with no pelvic organ prolapse, the corresponding figure was almost 9%. Thus, women with pelvic organ prolapse were significantly more likely to have had a vaginal delivery than those without.

Mode of delivery	Prolapse (n=15 007) n (%)	No prolapse (n=1 444 548) n (%)	Crude OR	Adjusted OR (95% CI)
Vaginal deliveries only	13.935 (92.9)	1.193.661 (83.5)	1.00	1.00
Vaginal and CS	791 (5.3)	108.212 (7.6)	0.63	0.75 (0.69 - 0.81)
CS only	281 (1.9)	127.668 (8.9)	0.19	0.18 (0.16 – 0.20)

Table 1 The relation between mode of delivery and risk of pelvic organ prolapse. The ORs were obtained after stratification for maternal year of birth, year of last delivery, and parity at last delivery.

The crude OR for pelvic organ prolapse (CS vs vaginal births) was significantly below 1. Even though heavy confounding from maternal year of birth, parity, and year of last delivery was suspected, the adjusted and crude ORs were almost identical. Thus, there appeared to be a significant reduction in the risk of pelvic organ prolapse in those who had undergone CS compared with vaginal delivery.

Cox analyses revealed that the overall hazard ratio, (CS only vs vaginal births only) controlling for women's age and parity was 0.20 (0.18-0.22), thus similar to the OR obtained from the Mantel-Haenzsel analysis. Among women who had only had vaginal deliveries, a strong and almost linear association between parity and the risk of pelvic organ prolapse was found (Figure 4).
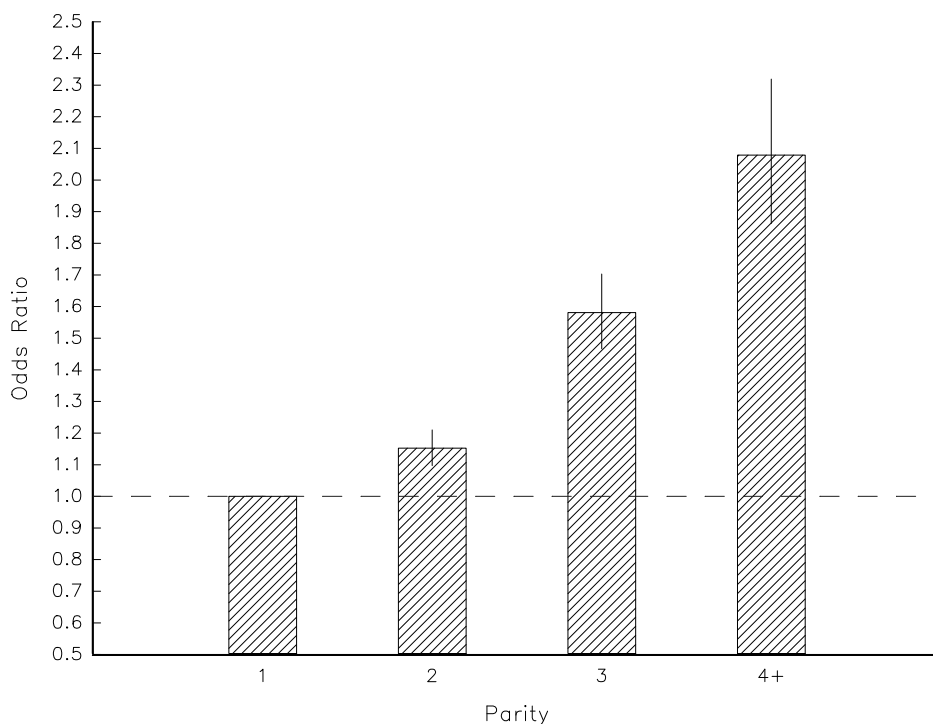
Figure 4. Risk of surgery for pelvic organ prolapse

Parity at last delivery as risk factor for pelvic organ prolapse among women with only vaginal deliveries. The odds ratios were obtained after stratification for maternal year of birth and year of last delivery. Vertical bars indicate 95% confidence intervals.

Among women who had had a CS but no vaginal births, no such association could be found. Thus, the protective effect of CS on pelvic organ prolapse was more pronounced among multiparous women than among primiparous (OR, 0.063; 95% CI, 0.05-0.081 and OR, 0.26; 95% CI, 0.23-0.29, respectively).

5.3   STUDY III

In total 541 women were included in the study, 247 were planning CS and 294 planned to have a vaginal delivery. The indications for planned CS were breech presentation (n=132) and maternal request (n=115).

Socio-demographic factors differed between the groups (Table 2).

19

	Planned CS n=247	Planned vaginal delivery n=294	p-value
Age, mean (range)	32.4 (17-43)	31.0 (21-42)	<0.001
University studies	137/247 55.5%	191/290* 65.9%	0.013
Non-native Swedes	69/247 27.9%	48/291* 16.5%	0.001
Smokers	36/245* 14.7%	20/286* 7.0%	0.008
IVF	18/247 7.3%	10/285* 3.5%	0.051
Weight, mean (kg)	63.2	64.5	0.17

* when denominator differs from the total number of included women, this depends on lack of data in the medical files.

Table 2: Socio-demographic factors

Delivery data and complications are presented in Table 3 and 4. Three women scheduled for planned CS on maternal request had vaginal deliveries, all normal. Due to early onset of labour, 25 planned caesareans had to be performed earlier than scheduled. One woman in the planned vaginal delivery group had a normal home delivery.

	Planned CS n=247	Planned vaginal delivery n=294	p-value
Gestational week at delivery	38	40	<0.001
Birth weight (mean, g)	3339	3617	<0.001
Blood loss (mean, ml)	580	625	0.32
Apgar score at 5 minutes (mean)	9.7	9.7	0.98
Admission to NICU (%)	5.3	5.1	0.90
Hospital stay (mean, days)	3.6	2.9	0.001

Table 3: Delivery data

	Planned CS n=247	Planned vaginal delivery n=294	p-value
Blood loss ≥1000mL	25 (10%)	41 (14%)	0.38
Blood transfusion	6 (2.4%)	10 (3.4%)	0.17
Endometritis*	8 (3.2%)	8 (2.7%)	0.12
Urinary infection *	7 (2.8%)	15 (5.1%)	0.13
Wound infection *	0	1	
DVT/pulmonary embolia*	0	1	
Intestinal obstruction *	1	0	
Prolonged vaginal bleeding*	1	0	
Urinary retention	0	1	
Anal sphincter injury, 3rd and 4th degree	0	7 (2%)	
Instrumental delivery	0	49 (17%)	
Emergency CS or performed before schedule**	25 (10%)	45 (15.4%)	0.09
Major complications*	**32 (13%)**	**53 (18%)**	**0.123**

* Follow up three months
** For indications, see text
*** Major complications = infection, blood loss≥1000mL/ blood transfusion, sphincter injuries (third degree, total and fourth degree). Number of women with at least one of these complications

Table 4: Complications

There was no significant difference in mean blood loss between the planned CS group and the planned vaginal delivery group, nor in the rate of blood transfusions (se Table 4).

In the group planning a vaginal delivery, 45/294 (15%) had CS in labour. Indications were suspected foetal distress (22), failure to progress in labour (19), preeclampsia/HELLP (2) and breech position (2). One woman suffered from pulmonary embolism after a CS in labour. There were 17% (49/294) instrumental deliveries, 2% (7/294) injuries of the sphincter and/or the rectum and one case of urinary retention. Fifty percent (143/294) had epidural analgesia and in 12% (34/294) of women in this group, labour was induced.

The mean hospital stay was significantly longer in the planned caesarean group as compared to the vaginal group, 3.6 versus 2.9 days (p<0.001).

Two days after delivery, analgesics (paracetamol 1g three times daily and dextropropoxifen 100 mg twice a day) was taken by 100% in the planned CS group compared to 67% in the planned vaginal delivery group (p<0.001). The planned CS group had significantly more pain in the region of the wound and the planned vaginal delivery group had more pain in the perineal area (p<0.001). There was no significant difference between the groups when asked about other kinds of pain (i.e. shoulder pain, headache). Three months after birth no differences were seen.

5.4   STUDY IV

Altogether, 25% (116/460) of the women had a negative experience of the delivery at two days post partum, i.e. they scored ≤5 at the VAS, compared to 20 % (92/460) at three and at nine months. This improvement was not significant (p=0.059). Forty-three percent (196/460) of the women chose the two highest scores (nine and ten) two days after delivery as compared to 51% (234/460) at three and 47 % (215/460) at nine months. Neither this improvement was significant (two days versus nine months, p =0.23).

Test-retest reliability of the rating was fairly high or r_{tt}= 0.67. Figure 5 shows the VAS estimation in groups of women with different delivery outcome.
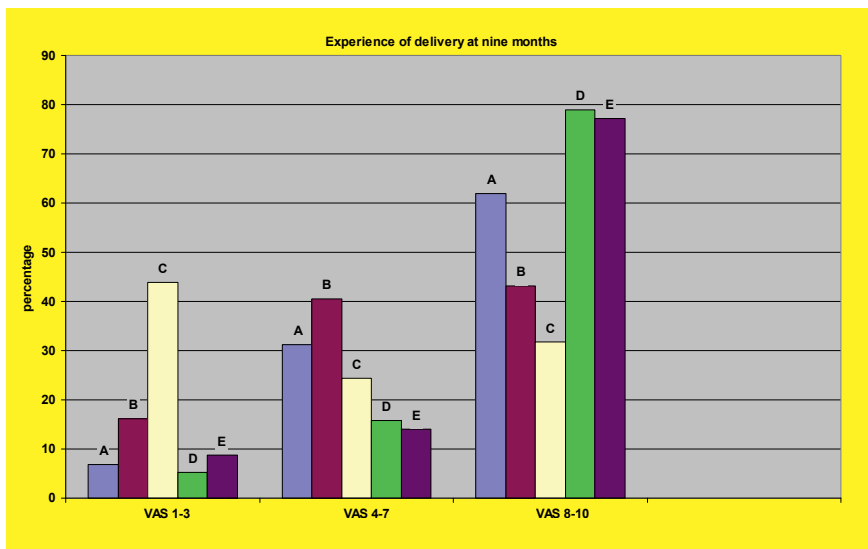

Figure 5. Percent of experience of delivery in different groups of women.

A= women with vaginal deliveries, B= women with instrumental deliveries, C= women delivered with emergency CS (from the group planning vaginal delivery), D= women planning a CS, delivered before schedule with a CS, E= women delivered with a planned CS

The correlations between the 63 variables (collected from the 531 variables) and the experience of delivery are presented in Table 5 in Appendix.

Nineteen variables were significantly correlated to the experience of delivery, eight of which were related to experience of pain. These 19 variables were entered in a logistic regression analysis to investigate the independent contribution of each variable (Table 6 in Appendix).

We only analysed women with a full variable set regarding all 19 items (355/460, 77%). Six variables were independently related to the experience of the delivery (Table 7 in Appendix).

Thus, higher ratings of pain during delivery, usage of analgesics post partum, longer hospital stay, worry in late pregnancy, and higher self-rated irritation were related to lower ratings of the experience, while higher confidence in the midwife was related to higher ratings of the experience.

The information on W-DEQ B was available in 372 cases only, since this questionnaire was added in November 2003. The correlation between experience of delivery at three months after delivery, rated by W-DEQ B and VAS was moderate, but clearly significant ($r_{xy}=0.52$, $p<0.001$).

A majority of the women in the cohort reported that they would prefer the same mode of delivery, if pregnant again. Of the women with a negative experience of birth, 45% (33/73) answered that they wanted to change the mode of delivery or did not know. Among the women who were more satisfied with their delivery, only 24% (70/289) wanted to change the mode of delivery. This was statistically significant ($p=0.01$). Planning another child was equally common in women with an unsatisfactory experience as with a satisfactory experience (74% (70/94) and 77% (280/363), respectively).

A subgroup analysis was also performed to evaluate the results on the two groups (planned CS and planned vaginal) separately, due to the known fact that these groups differ.

The subgroup analysis did not show any significant difference between the groups in the variables that were related to birth experience. Furthermore, only the variables that were independently related to experience of delivery after nine months in the analysis of the collapsed samples were included. Of course, there is a loss of power in the subgroup analyses.

6 DISCUSSION

Many researchers, and also many caregivers, claim that the increasing rate of CS is a problem, concerning medical complications for the mother and the child, complications in subsequent pregnancies/deliveries for the woman and perhaps the obstetrician. Can we say at what level the rate of CSs is appropriate? (113). In progress and evolution in medicine and society we would probably have to adjust the level from time to time. The World Health Organization (WHO) claimed that the rate was too high, and that 15% should be the limit. This statement was made in 1992 and today efforts are laid on guidelines and improvement of clinical practice in order to reduce the CS rates (114). Not only maternal medical complications and consequences for the child should be taken into consideration, but also birth experience (115). In this thesis we have studies on two of these three outcomes, i.e. maternal health and birth experience.

6.1 STUDIES INVESTIGATING THE EFFECTS OF CAESAREAN SECTION

The ideal study to gain better knowledge of complications after planned CS compared to planned vaginal delivery would be a RCT. This is not feasible on vertex presentation, because of ethical reasons. The number of drop-outs would certainly be too large. RCT:s have been the demand from many researchers as well as the American National Institute of Health (NIH) (45).

There is only one RCT available using the proxy of breech presentation. The problems with that study were that many different countries, hospitals and routines were involved, and drop-outs were not even mentioned. There was no difference in maternal outcome (15).

Since RCT:s are not feasible, observation studies have been the choice and the difficulty with confounding factors, like indication, BMI, parity and whether the woman is healthy or not, remains both in retrospective studies and in prospective studies on databases. There are a few studies analysed as intended mode of delivery, but the same problem with confounding by indication remains.

Well controlled studies tend to be rather small. To be able to detect unusual outcomes like thromboembolic events or maternal death a large sample of women is needed. When studying long term complications routines and treatments may have changed during the analysed time period, why the results may not be applicable.

Yet another problem regarding the validation of studies is the difficulty in coding and terminology, especially concerning the diagnosis of maternal request (116).

In available studies the documentation is often scanty on how blood loss was measured or how the diagnosis of infection was confirmed. When evaluating studies reporting blood loss, it is of interest to analyse how the estimation was done. To weigh drapes and swabs will improve the estimation of blood loss, but is of course not possible in a daily routine (117). Divergent results and the lack of equal diagnosing regarding blood loss and infections makes it also difficult to compare studies.

An overview of some of the most important and recent studies on medical complications after CS and vaginal deliveries are listed in Table 8 in Appendix.

In 2007, after completion of our prospective cohort study, two large well controlled database studies were published. Liu demonstrated, in a study of more than 2.3 million women, a higher severe maternal morbidity after planned CS, 27 per1000 deliveries, compared to after planned vaginal delivery, nine per 1000. The study of Liu was analysed as intended mode of delivery. The indication for CS was breech presentation but parity was not controlled for (61). Villar showed in a prospective cohort study, analysed both as actual and as intended mode of delivery, including 100 000 women from countries in Latin America, that CS was associated with a higher maternal morbidity and mortality. Women undergoing caesarean delivery had an increased risk of severe maternal morbidity compared with women undergoing vaginal delivery, O.R. 2.0 (95% confidence interval 1.6 to 2.5) for intrapartum caesarean and O.R. 2.3 (1.7 to 3.1) for elective caesarean. (118). The intended mode of delivery analysis showed a still higher risk for maternal morbidity in the intended CS group compared to the intended vaginal group (OR 1.7, C.I. 1.3-2.2), as well as for antibiotic treatment (OR 2.8, C.I. 2.0-4.0).

6.2   COMMENTS ON THE RESULTS OF OUR STUDIES

Our study estimating blood loss shows that there was good agreement between estimations performed by various individuals at the same hospital. Visual estimation in comparison with measured blood loss resulted in an overestimation. Published studies have also shown that estimations are inaccurate (53, 54, 57) Using blood loss as a variable in studies and also to compare studies is therefore problematic. Some use the need for blood transfusion or hysterectomy as outcome but criteria for these two interventions are often not specified (15, 118, 119).

To overcome the shortcomings of previous studies mainly on short term complications our study was designed in 2002. Our prospective cohort

study on short term outcomes is unique as it is a well controlled study in that sense that only primiparae were included and that all diagnoses were checked. Files were controlled and patients were contacted if data were ambiguous. Results were not restricted to the information in databases. Thereby confounding by parity and indication was avoided.

The disadvantage with our study is that it is small. The information in 2002 when the study was planned, on rates of bleeding and infection in databases on presumably healthy women on which the power calculation was based, were different from the results we obtained in our study. The power calculation indicated a sample that turned out to be too small.

In our study there were no differences in excessive blood loss and infection between the two delivery groups. The results of the Hannah study, the only RCT available, came to the same conclusion(15).Also in a recent study on healthy primiparae analysed as intended mode of delivery, there was no difference(120)

We had few serious medical complications, partly because included women were healthy and had a normal BMI, partly due to the small size of the study and to lack of power. Compared to the study of Villar, which included women of different parity and with diseases as preeclampsia, our study group was more homogeneous. In a large study also unusual complications will be noticed. Therefore larger studies have shown a difference with a higher rate of complications in the CS group, although the absolute risk is low (61, 118).

There was a significantly longer in hospital stay for women in the CS group compared with the vaginal group in our study (15).

Of interest in our study is the high rate of complications in women with intended vaginal delivery. If studies are not analysed according to intended mode of delivery, this will not be evident. Women with emergency caesareans but with spontaneous start of labour will often be referred to the CS group. Perineal lacerations and sphincter injuries can only affect women being delivered vaginally and nulliparae are at a higher risk than multiparae. In our study there were 15% emergency CSs, 17% instrumental deliveries and 2% sphincter injuries in the planned vaginal group. In 2008 the total rate of perineal lacerations grade 3-4 in Sweden was 3.4% (primiparae 5.9%, multiparae 1.5%) (10).

The frequency of perineal lacerations differs from one country to another, a fact that is difficult to explain. Birth weight has been one explanation (121). Maternal age has also been discussed, but in a study from 2006 this could not be shown (122), although others have demonstrated higher risks with advanced maternal age (123). The difference in rates may also indicate a difference in coding. In a study from Burrows in 2004 the rate of third- and fourth degree lacerations in the US was 7.8% in women delivering vaginally compared to 22.3% after

instrumental deliveries (124). In a review from 2008 was demonstrated a frequency of anal sphincter muscle injury from childbirth of around 11% (125).

Other complications that can occur to the women being vaginally delivered are instrumental deliveries, also more common in the first delivery. The frequency in Sweden in 2008 was 14.4% in primiparae, 3.1% in multiparae, in total 8.2%. This is in accordance with our study.

Women being delivered by a CS are on the other hand exposed to complications related to the anaesthesia and the surgery. The complications related to anaesthesia have been reduced today, since CS is usually performed in regional anaesthesia. General anaesthesia is mostly used in emergency situations (61).

During surgery there is always a risk of injuries to other organs and the risk increases after several CSs (126). The most common injuries are on the bladder (0.1-1.0%) or ureter (0.002-0.05%) (67). Our study was too small to detect any of these complications.

As for long term complications we have studied the risks of being admitted to hospital for pelvic organ prolapse. Women delivered by CS only, had a much lower risk. This study is the largest study published so far on this subject. Pelvic organ prolapse is a multifactorial disease and we could not control for all confounding factors. A high BMI, hereditary factors, smoking and employment do contribute to the development (88, 127, 128). The results of our study are interesting but must be interpreted with care. The absolute risk of having a pelvic organ prolapse is also low in Sweden, and only about 1% of vaginally delivered women developed pelvic organ prolapse during the study period (i.e. before the age of 60 years).

Even if the risk of pelvic organ prolapse was increased after vaginal deliveries, the risks with a CS have to be weighed against the risk of developing pelvic organ prolapse. In certain cases though, it could be a factor of consideration. Women developing pelvic organ prolapse before menopause have been shown to have a lower concentration of collagen (129). In the future, studies of genetics or molecular biology may help identify women with a high risk for pelvic organ prolapse. In these cases CS may be a solution.

Many studies have been published on birth experience (32, 37, 41, 93, 96, 130, 131).Our study was performed on a collapsed sample, i.e. all women were analysed together regardless of mode of delivery. It is unique because of the large amount of variables and that only healthy primiparae were included.

We chose to analyse all women together to improve the power and since planned mode of delivery was not significantly related to birth experience in the univariate analysis, only actual mode. We found a high correlation

between high ratings of pain post partum and low ratings of the experience of delivery. We also found that women with higher rating of the personality trait measuring "self-rated irritation" rated their birth experience more negatively. Both are new findings. The post partum pain may be easy to deal with whereas coping with personality traits may be more difficult. It has previously been shown that certain personality traits are more frequent in women with fear of delivery, even though all results were within the normal range, i.e. within 1 SD from the mean. (132). The personality traits were within the normal range also in our study.

Confidence in the midwife had a very high correlation to a positive experience. One could expect that the support from the midwife would be of more importance during a vaginal delivery, than during a planned CS. This means that support of the midwife must be a very strong factor, since all women were analysed together.

In our study instrumental deliveries and excessive blood loss did not correlate to birth experience. Emergency caesareans were significantly related to a negative birth experience in the univariate, but not in the multivariate analysis. Previous studies have shown a relation, but multivariate statistics was not used. (68, 93, 104, 133, 134). In a study from Sweden, where multivariate statistics was used, risk factors for a negative birth experience were emergency CS, pain, lack of control and support. Instrumental delivery, augmentation of labour, and newborn transmitted to NICU also correlated when primiparae were analysed in one group (32). The reason why these results differ from ours could be due to the study design, inclusion of women (only primiparae in our study), or the rate of drop-outs.

In our study pain and psychologic factors turned out to be more important than complications.

A simple VAS scale has not been validated before, when estimating birth experience. Fear of delivery has been estimated with a VAS scale, which has been validated and shown to have a good correlation (135). Since VAS and W-DEQ B correlated significantly, our study shows that VAS could be used as a simple method for screening of birth experience. In the computer program `Obstetrics´ used by a majority of Swedish delivery wards today, birth experience can be estimated using a VAS-scale.

6.3 CLINICAL IMPLICATIONS OF OUR STUDIES

The estimation of blood loss after delivery varies little between persons working at the same hospital. When comparing visually estimated blood loss with the `true amount´ estimation, it is not accurate. Still, we have to continue estimating to be able to detect excessive blood loss, beside of clinical observation and judgement. If estimation varies between persons

working at different hospitals is not known. Using estimated blood loss as a variable in quality assurance when comparing results of different hospitals may not be correct. Also comparison of studies reporting blood loss should be done with caution.

Blood loss and rate of infection did not differ in our prospective study on planned mode of delivery. This probably shows a picture of the circumstances in Sweden today. It is also a fact that women are aware of..

Of concern in our study is the high rate of complications in women with planned vaginal delivery. Much of the morbidity is due to instrumental deliveries and emergency CSs, as noted by others (136). After instrumental delivery, sphincter lacerations, haemorrhage and infections may ensue. The rates of complications may seem high, but is in line with results of other studies on primiparae only (137-139). Results of primiparae and multiparae are often presented together why rates may seem lower. Rates of sphincter injuries have to be estimated on vaginal deliveries only, not on the total rate of deliveries. The definition of what should be diagnosed as a sphincter injury may also vary. Studies by ultrasound have shown damage to the sphincter in up to 35 % of vaginally delivered primiparae, when examined six weeks after delivery (140). All ruptures may not have been detected in studies with low rates.

Injuries of the birth canal may affect not only the well-being directly after delivery, but also the self-rated health for a long time (93). Many women suffer from perineal pain and refrain re-establishing sex-life for a long time post partum (141).

The most important conclusion from our prospective study is that we have to improve the outcome of vaginally delivered primiparae. What can we do to decrease the rate of operative deliveries? How can the obstetrician/midwife influence the rate of vaginal ruptures with different procedures? These questions must be of concern for improvement and further study.

One of the main results of our study on birth experience is that the midwife matters. Support has been shown to be crucial in several studies (32, 101). Non-professional women `doulas´ were of importance as a support during delivery by just being present (142, 143). Doulas gave the delivering women a better birth experience, decreased the use of analgesia and led to a shorter labour (143). The rate of sphincter injuries may also be influenced by the support of doulas (139).

By providing better support during labour we may improve both maternal outcome and birth experience of vaginal deliveries, thereby possibly reducing the rate of CS.

6.4   HOW TO COUNSEL WOMEN ON MODE OF DELIVERY?

Around 10 % of pregnant women seem to have fear of delivery (144). In a Finnish study, severe fear of childbirth was more common if the woman had had a previous CS or an instrumental delivery. It was also more common in nulliparous women and late in the pregnancy (135). Fear of delivery did not seem to be related with mode of delivery in one study (145), although Waldenström could show that fear of delivery led to an increased risk of a planned CS, even after counselling (144). On the other hand, women who were not offered counselling had a more negative birth experience.

Counselling women requesting CS without a medical indication is a difficult task. Also deciding on route of delivery after a previous emergency CS requires thorough experience (100, 146). Women themselves also claim that they want individual counseling. To a great extent information regarding deliveries and CSs is found on the internet today, or in the lay press (147). In primiparae the underlying cause for the fear has to be found since possible complications may be avoided by planning the delivery and offering support. The degree of childbirth fear can also be graded by validated instruments (97, 135). Many women suffering from fear of childbirth are multiparae with a previous negative birth experience after a vaginal delivery or emergency CS (37, 41, 133). In this case also individual counselling is necessary. A planned vaginal delivery with induction of labor is sometimes possible. For some women a planned CS is better than an induction, especially with an unfavourable status of the cervix (71).

The risks of complications after CS especially multiple CS must be discussed. The absolute risks of placental problems, uterine rupture and thromboembolic events are not high, but may be life-threatening.

Studies have shown that many women are aware of possible complications after CSs (36). NIH and American College of Obstetricians and Gynecologists (ACOG) do not recommend women, who want to have several children, a planned CS (45, 148). It is of course, much easier to decide and plan for a CS regarding an older woman, who probably will not have more than one child. In cases of infertility or bad obstetric history this is also the case. Regarding younger women it is hard to predict the number of children they would like to have.

In this time of increasing rates of CSs and fear of childbirth we must not forget women who wish to have a normal vaginal delivery. Some women declare a resistance to medicalisation of the delivery and want a natural birth, emphasized also by investigators (149). Only 8% of Swedish women

wanted to be delivered by CS in early pregnancy (37). This is the main reason why we have to improve the outcome of vaginal deliveries.

To some women the experience of a vaginal delivery could be the greatest experience ever. To some it could become the worst thing that has happened to them, an experience of pain, loneliness and fear which will follow them for a long time. This could be the case, even though the vaginal delivery was objectively normal.

The main goal of our work as obstetricians and midwives should be to obtain the best outcome, first of all a healthy mother and a healthy infant. The birth experience is also not without importance. Many women write letters on how they would like their subsequent delivery and lists of wishes they would like to have fulfilled. When confronted with the reality of childbirth disappointment might follow. Realistic information ahead of delivery, support before and after remain important issues in helping to improve birth experience. Active participation of the pregnant woman in the process of labour and birth is surely a good help to many.

My own reflections are that the counselling during pregnancy is of great importance. Surely, caregivers are aware of this, but lack of time is one of the main causes for complaints. The flow of women is high, the time designed for each woman decreases and the demands from the women increase. Many caregivers find it stressful with the demand of exact documentation, often connected with computerized journals, and new methods being initiated. All this increases the fear of making mistakes. The same problem with lack of time could, at least in some hospitals in our country, also be valid regarding deliveries. The midwives often have two delivering women to take care of, sometimes even more. It is not unusual that a woman meets several midwifes during her stay at the delivery ward and also during the short hospital stay post partum, facts that are not in accordance with our findings in this thesis. To be able to follow ours, and others results, we do not need reduction of financial resources, which leads to a reduced number of beds at the post delivery ward and fewer midwives/caregivers. The hospital care today involves a lot of paper work and administration leading to insufficient time for the patients, i.e. the pregnant and delivering women. In order to improve the care of delivering women and thus possibly reducing the rate of caesareans, obstetricians and midwives have to devote more time to their primary task: assisting women before, during and after labour.

7 POPULÄRVETENSKAPLIG SAMMANFATTNING

Syftet med denna avhandling var att studera kort- och långtidskomplikationer efter kejsarsnitt och vaginal förlossning. Vi studerade också svårigheten med att skatta blodförlust i samband med förlossning samt faktorer som påverkar förlossningsupplevelse.

I Studie I uppmättes/skattades blodförlust visuellt i samband med vaginal förlossning och med kejsarsnitt på sedvanligt sätt, samt med en laboratoriemetod. Vi jämförde också om det fanns en inter-individuell variation, alltså om olika personer mätte olika, vilket de ej gjorde. Jämförelsen mellan två olika metoder att mäta blödningsmängd visade att vi generellt överskattar blödningsmängden samt att skattningen av blödning i samband med kejsarsnitt är mer tillförlitlig än vid vaginal förlossning. Visuell skattning av blödningsmängd är ej ett bra kvalitetsmått, då felmarginalerna är stora.

I Studie II användes Svenska slutenvårdsregistret, i vilket alla personer som blir inlagda på sjukhus registreras, för att identifiera kvinnor, som vårdats under diagnosen framfall. Dessa data jämfördes med Medicinska Födelse Registret, MFR, ur vilket uppgifter om förlossningar finnes sedan 1973. Totalt fann man16.605 kvinnor med diagnosen framfall och som hade fött barn under tidsperioden 1973 till 2004. I analyserna som gjordes för att skatta risken för att opereras och/eller vårdas under diagnosen framfall efter sista förlossningen, justerades för (=man tog hänsyn till) kvinnans födelseår (2 års intervall), år för sista förlossning (1 år intervall) samt paritet (hur många barn hon fött) vid sista förlossningen. De kvinnor som endast fött barn vaginalt hade en femfaldigt ökad risk att opereras och/eller vårdas under diagnosen framfall, även om många andra faktorer påverkar risken, såsom ärftlighet, fetma, rökning, lungsjukdomar/astma. Den absoluta risken att vårdas/opereras för framfall är dock liten.

I studie III undersöktes medicinska komplikationer efter förlossning. Kvinnor, som hade tid för ett planerat kejsarsnitt inkluderades. Indikation för det planerade kejsarsnittet var sätesbjudning eller psykosocial indikation, dvs utan medicinsk indikation. Kontrollgruppen utgjordes av kvinnor, som planerade vaginal förlossning, från samma MVC (Mödravårdscentral). Frågeformulär rörande sociodemografiska faktorer, upplevd hälsa och planering av förlossning skickades ut i sen graviditet. Frågeformulär angående smärta under och efter förlossningen samt komplikationer besvarades två dagar samt tre och nio månader efter

förlossningen. Förlossningsdata hämtades från kvinnans journal. Data analyserades enligt "intended mode of delivery", vilket betyder att om man är inkluderad i en grupp, t.ex vaginalgruppen, så tillhör man den hela tiden, även om förlossningen avslutas med ett akut kejsarsnitt. I många tidigare studier analyserades alla kejsarsnitt, både planerade och akuta, tillsammans, vilket ledde till en ökad komplikationsfrekvens i kejsarsnittsgruppen. Vissa sociodemografiska skillnader fanns mellan kejsarsnittsgruppen och vaginalgruppen, men vi kunde ej påvisa någon statistisk signifikant skillnad vad gällde blödningsmängd och infektioner.

Ett personlighetstest, Karolinska Scales of Personality (KSP), en skattningsskala för depression, Edinburgh Postnatal Depression Scale (EPDS) samt skattning av förlossningsrädsla och förlossningsupplevelse; Wijma Delivery Expectancy and Experience Questionnaire (W-DEQ A resp. B) användes tillsammans med de frågeformulär, som ingick i Studie III, i studien om förlossningsupplevelse, **studie IV**. Förlossningsupplevelsen mättes med en Visuell Analog Skala (VAS), två dagar, tre och nio månader efter förlossningen, för att få en subjektiv skattning.

Nitton variabler, som var signifikant korrelerade till förlossningsupplevelsen, dikotomiserades (delades på mitten) och analyserades i en logistisk regressionsanalys. De faktorer som var oberoende korrelerade till en negativ förlossningsupplevelse var smärta under förlossning, behov av smärtstillande två dagar närmast efter förlossningen, vårdtid, oro samt personlighetsfaktorn "irritation". Den enda variabel som var oberoende korrelerad till en positiv förlossningsupplevelse var förtroende för den barnmorska, som var med vid förlossningen.

Sammanfattningsvis visar studien på de svårigheter som är förknippade med skattning av blödning i samband med förlossning och att vår skattning är osäker. Vid jämförelse av medicinska komplikationer efter planerat kejsarsnitt resp. vaginal förlossning, visar vår undersökning att inga signifikanta skillnader föreligger vad gäller infektioner och blödning. Man ska dock hålla i minnet att de undersökta kvinnorna är friska, normalviktiga samt förstföderskor.
Vi noterade också en relativt hög frekvens av komplikationer för de kvinnor som planerat en vaginal förlossning, varför ett av budskapen är att vi, som sysslar med förlossningsvård, måste förbättra utfallet vid vaginala förlossningar.

8 ACKNOWLEDGEMENTS

Last, but not least, I would like to thank my family, first of all my parents, *mother Gunnel*, who used to work as a nurse. She is still going strong and here today. My *father Sven-Olof,* who was a teacher and actually was my teacher for two years in the school in the little village were I grew up. Without you I would never have been here today!

My husband and best friend in life *Christer,* we have spent 36 years together and I assure you that there is never a dull moment! You are the most positive person I know and I love you because of that and thousands of other reasons!

And our four children, *Sofia, Emma, Julia and Victor.* What would life be without you?

9 APPENDIX

Table 5. Variables with an assumed relationship to experience of delivery at nine months.

Variable	Experience of delivery		
	tau	p	n
Background characteristics			
Age	-0.02	0.594	460
University studies	-0.02	0.625	460
Born outside of Sweden	0.07	0.155	459
Planned pregnancy	0.04	0.368	423
Self-estimated health	-0.05	0.336	425
Smoking	-0.02	0.629	451
Status of child			
Apgar score	0.03	0.524	459
Neonatal care	-0.07	0.070	460
Contacted doctor for the newborn (3 months)	-0.02	0.706	446
Child hospital care (3 months)	0.07	0.151	448
Contacted doctor for the newborn (9 months)	-0.03	0.483	458
Delivery			
Vaginal delivery	0.06	0.221	460
Caesarean on medical indications	0.02	0.632	460
Caesarean on maternal request	0.05	0.252	460
Emergency caesarean section	-0.21	<0.001	460
Instrumental delivery	-0.03	0.464	460
Perineal lacerations	0.04	0.417	460
Bleeding in mL	-0.05	0.185	460
Hospital stay, number of days	-0.09	0.021	457
Infection postpartum	0.00	0.935	460
Mobility without difficulties (2 days postpartum)	-0.21	<0.001	428

36

Perineal wound healing (9 months)	-0.04	0.364	460
Caesarean wound healing (9 months)	-0.04	0.380	460
Urinary leakage (9 months)	-0.03	0.515	459
Confidence in midwife	0.215	<0.001	428

Breast feeding

Breast feeding (3 months)	0.07	0.148	447
Blocked ducts (3 months)	0.00	0.995	435
Breast feeding (9 months)	0.01	0.912	460
Blocked ducts (9 months)	0.01	0.834	429

Sex life

Mother´s perception of the question if sex life is important (before delivery)	0.03	0.671	182
Sex life re-established (3 months)	0.09	0.050	447
Mother´s perception of the question if sex life is important (3 months)	0.05	0.411	228
Sex life re-established (9 months)	0.15	<0.001	457
Quality of sex life (9 months)	0.06	0.272	312

Worry and pain

Worry, global rating in late pregnancy	-0.12	0.004	424
Epidural anesthesia	-0.17	<0.001	460
Analgesics 24-48 hrs after delivery	-0.12	0.011	425
Pain during delivery, VAS* (2 days after delivery)	-0.12	0.004	425
Perineal pain (3 months)	-0.13	0.006	443
Headache (3 months)	-0.10	0.031	441
Pain in shoulders/arms (3 months)	-0.12	0.006	445
Analgesics within last 24 hours (3 months)	0.04	0.417	444
Pain during delivery, VAS* (3 months)	-0.16	<0.001	445
Perineal pain (9 months)	0.03	0.522	455
Headache (9 months)	-0.07	0.135	456
Pain in shoulders/arms (9 months)	-0.06	0.154	454
Analgesics (9 months)	-0.06	0.240	460
Pain during delivery VAS* (9 months)	-0.16	<0.001	445

Continued!

Table 5. (Continued)

Variable	Experience of delivery		
	tau	p	n
Personality			
Somatic anxiety	-0.04	0.317	423
Muscular tension	-0.05	0.181	423
Psychic anxiety	-0.07	0.094	423
Psychasthenia	-0.06	0.152	423
Inhibition of aggression	0.06	0.155	423
Impulsivity	-0.01	0.728	423
Monotony avoidance	0.00	0.973	423
Detachment	0.00	0.951	423
Socialization	0.06	0.114	421
Social desirability	0.03	0.528	423
Indirect aggression	-0.09	0.029	423
Verbal aggression	-0.10	0.014	422
Irritation	-0.12	0.004	422
Suspicion	-0.03	0.550	423
Guilt	-0.09	0.040	423

VAS-scale 1-10 where 1=no pain at all and 10=worst imaginable pain
n= women with available information on the special subject

Table 6. Variables entered in the logistic regression analysis based on experience of delivery at nine months.

Variable	Cut point	Frequency of subjects above cut point %
Delivery		
Emergency caesarean section	No/Yes	12.8
Hospital stay, number of days	≤3 days/>3 days	33.7
Mobility without difficulties	Moderate/Severe	12.1
Confidence in midwife	Yes, on the whole/Yes, absolutely	84.8
Sex life		
Sex life re-established (3 months)	No/Yes	65.3
Sex life re-established (9 months)	No/Yes	88.2
Worry and pain		
Worry, global rating in late pregnancy	Some/Rather much	37.0
Epidural anesthesia (EDA)	No/Yes	26.3
Analgesics 24-48 hrs after delivery	No/Yes	82.4
Pain during delivery, VAS (2 days)*	≤5/>5	50.6
Perineal pain (3 months)	Not at all/Some or more	13.8
Headache (3 months)	Not at all/Some or more	37.0
Pain in shoulders/arms (3 months)	Not at all/Some or more	58.9
Pain during delivery, VAS (3 months)*	≤5/>5	51.0
Pain during delivery, VAS (9 months)*	≤5/>5	49.4
Personality		
Indirect aggression	≤50/>50	52.0
Verbal aggression	≤50/>50	29.6
Irritation	≤50/>50	34.1
Guilt	≤50/>50	22.0

*VAS scored 1-10, where 1=no pain at all and 10=worst imaginable pain.

Table 7. Odds ratios (OR) for variables predicting experience of delivery after nine months.

	b	SE	OR	95 % CI for OR	
				Lower	Upper
Pain during delivery (2 days after delivery)	-1.71	0.334	0.18	0.09	0.35
Confidence in midwife	1.18	0.344	3.27	1.67	6.41
Analgesics, last 24 hours (2 days after delivery)	-1.13	0.460	0.32	0.13	0.80
Hospital stay, days	-1.08	0.307	0.34	0.19	0.62
Worry	-0.81	0.299	0.45	0.25	0.80
Irritation (KSP)	-0.67	0.292	0.52	0.29	0.91
Constant	3.44	0.653			

In this table the variables are rank ordered from the strongest OR to the weakest. The sign of the b coefficient indicate a correlation with experience of delivery after nine months, e.g. pain during delivery is negatively correlated with the experience while confidence in the midwife is positively correlated. NB! The relationships are expressed as an OR, which means that an OR below 1.00 indicates as negative correlation, while an OR≥ 1.00 indicates a positive correlation. In order to make the ORs comparable those ORs below 1.00 should be inverted.

	Planned CS group	Total rate	Planned vaginal group	W-DEQ B
	541 women included			
Questionnaire 1 Before delivery	82% (203/247)	86% (467/541)	90% (264/294)	
Questionnaire 2 Two days after delivery	89% 219/247)	85% (463/541)	83% (244/294)	
Questionnaire 3 Three months after	86% (213/247)	88% (477/541)	90% (264/294)	75% (280/372)
Questionnaire 4 Nine months after	82% (203/247)	85% (460/541)	87% (257/294)	
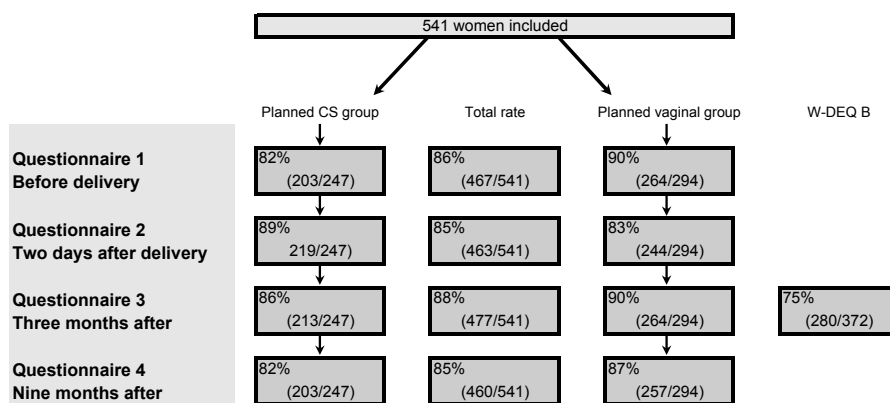
Article IV
Flow chart. The questionnaires contained information about sociodemographic factors, health and birth experience.
W-DEQ was added to the study later and sent to 372 women only

Studies on maternal morbidity after caesarean section and vaginal delivery

Author	Type of study	No of women	Comment	Morbidity	Mortality
Liu 2007 (Canadian database 1991-2005)	Retrospective cohort study. Analysed as intended mode of delivery	2.3 milj vaginal versus 46 000 CS (breech), low risk	Different parity	27/1000 in CS group, 9/1000 in vaginal group	41 in vaginal group None in the CS group
Villar 2008 (Latin Am. Countries)	Prospective cohort study. Analysed as actual mode of delivery	97 000	Adjusted for demographic, pregnancy, institutional characteristics	OR 2.0/2.3 vaginal vs CS, intrapartum/ Elective resp.	Vag. del 7/62 000 Elective CS 5/13 000 Intrapart CS 11/18 000
Villar 2008, same study as above	Analysed as intended mode of delivery	97 000	Same as above	OR 1.7-4.0 Risk of maternal morbidity-antibiotic treatment	
Hannah 2000	Randomised multicentre (26 countries)	1 043 planned CS 1 043 planned vaginal	Different parity	The same in both groups	1 in the vaginal group
Allen 2003 (Nova Scotia Database 1988-2001)	Retrospective cohort, analysed as intended mode of delivery	721 planned CS 17.714 planned vaginal	Nulliparae	RR 2.2 for febrile morbidity in CS group, but decreased risk of PPH (0.6)	None
Dahlgren 2009 (Database study Canada 1994-2002)	Retrospective cohort, analysed as intended mode of delivery	1046 planned CS 38 000 planned vaginal	Healthy nulliparae	No difference	None
Declercq 2007 (Database USA 1998-2003)	Cohort study, analysed as intended mode of delivery	3334 planned CS 240 000 planned vaginal		Rehospitalization more common after CS (OR 2.3)	
Schindl 2003	Prospective observational study	147 planned CS 903 planned vaginal	Different parity	Adverse effects CS: 4.8% Vag: 19.3%	None

Table 8

41

10 REFERENCES

1.   Trolle, D., *The History of Caesarean Section.* Reitzel Bookseller. Copenhagen, 1980.
2.   Lurie, S., *The changing motives of cesarean section: from the ancient world to the twenty-first century.* Arch Gynecol Obstet, 2005. **271**(4): p. 281-5.
3.   Todman, D., *A history of caesarean section: from ancient world to the modern era.* Aust N Z J Obstet Gynaecol, 2007. **47**(5): p. 357-61.
4.   Warraich, Q. and U. Esen, *Perimortem caesarean section.* J Obstet Gynaecol, 2009. **29**(8): p. 690-3.
5.   Pleijel, A., ***Drottningens** chirurg.* 2006, Stockholm: Nordstedts Förlag.
6.   Cederschiöld, F., *Lärobok för barnmorskor.* 1873.
7.   Hogberg, U., *Maternal deaths related to cesarean section in Sweden, 1951-1980.* Acta Obstet Gynecol Scand, 1989. **68**(4): p. 351-7.
8.   Högberg, U., *Barnet och badvattnet - från bekämpande av mödradöd till familje-BB och tidig hemgång. Från Jubileumsskrift "Svensk kvinnosjukvård under ett sekel" 1904-2004.* 2004: p. 109-115.
9.   Nielsen, T.F., P.O. Olausson, and I. Ingemarsson, *The cesarean section rate in Sweden: the end of the rise.* Birth, 1994. **21**(1): p. 34-8.
10.   Socialstyrelsen. *The Swedish Medical Birth Register.*   [cited 2009 20090506]; Available from: www.sos.se.
11.   MacDorman, M.F., F. Menacker, and E. Declercq, *Cesarean birth in the United States: epidemiology, trends, and outcomes.* Clin Perinatol, 2008. **35**(2): p. 293-307, v.
12.   Zhang, J., et al., *Cesarean delivery on maternal request in southeast China.* Obstet Gynecol, 2008. **111**(5): p. 1077-82.
13.   Potter, J.E., et al., *Women's autonomy and scheduled cesarean sections in Brazil: a cautionary tale.* Birth, 2008. **35**(1): p. 33-40.
14.   Socialstyrelsen, *Kejsarsnitt i Sverige.* 2005.
15.   Hannah, M.E., et al., *Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. Term Breech Trial Collaborative Group.* Lancet, 2000. **356**(9239): p. 1375-83.
16.   Adler-Levy, Y., E. Lunenfeld, and A. Levy, *Obstetric outcome of twin pregnancies conceived by in vitro fertilization and ovulation induction compared with those conceived spontaneously.* Eur J Obstet Gynecol Reprod Biol, 2007. **133**(2): p. 173-8.

17.   Pinborg, A., A. Loft, and A. Nyboe Andersen, *Neonatal outcome in a Danish national cohort of 8602 children born after in vitro fertilization or intracytoplasmic sperm injection: the role of twin pregnancy.* Acta Obstet Gynecol Scand, 2004. **83**(11): p. 1071-8.

18.   Menacker, F., E. Declercq, and M.F. Macdorman, *Cesarean delivery: background, trends, and epidemiology.* Semin Perinatol, 2006. **30**(5): p. 235-41.

19.   Lee, S.K., et al., *Higher mortality rates among inborn infants admitted to neonatal intensive care units at night.* J Pediatr, 2003. **143**(5): p. 592-7.

20.   Ebulue, V., et al., *Fear of failure: are we doing too many trials of instrumental delivery in theatre?* Acta Obstet Gynecol Scand, 2008. **87**(11): p. 1234-8.

21.   Bettes, B.A., et al., *Cesarean delivery on maternal request: obstetrician-gynecologists' knowledge, perception, and practice patterns.* Obstet Gynecol, 2007. **109**(1): p. 57-66.

22.   Wax, J.R., et al., *Patient choice cesarean--the Maine experience.* Birth, 2005. **32**(3): p. 203-6.

23.   Bergholt, T., et al., *Danish obstetricians' personal preference and general attitude to elective cesarean section on maternal request: a nation-wide postal survey.* Acta Obstet Gynecol Scand, 2004. **83**(3): p. 262-6.

24.   Gunnervik, C., et al., *Attitudes towards cesarean section in a nationwide sample of obstetricians and gynecologists.* Acta Obstet Gynecol Scand, 2008. **87**(4): p. 438-44.

25.   Florica, M., O. Stephansson, and L. Nordstrom, *Indications associated with increased cesarean section rates in a Swedish hospital.* Int J Gynaecol Obstet, 2006. **92**(2): p. 181-5.

26.   Fuglenes, D., P. Oian, and I.S. Kristiansen, *Obstetricians' choice of cesarean delivery in ambiguous cases: is it influenced by risk attitude or fear of complaints and litigation?* Am J Obstet Gynecol, 2009. **200**(1): p. 48 e1-8.

27.   Hickson, G.B. and S.S. Entman, *Physician practice behavior and litigation risk: evidence and opportunity.* Clin Obstet Gynecol, 2008. **51**(4): p. 688-99.

28.   Rebelo, F., et al., *High cesarean prevalence in a national population-based study in Brazil: the role of private practice.* Acta Obstet Gynecol Scand. **89**(7): p. 903-8.

29.   Ronsmans, C., S. Holtz, and C. Stanton, *Socioeconomic differentials in caesarean rates in developing countries: a retrospective analysis.* Lancet, 2006. **368**(9546): p. 1516-23.

30.   Essen, B., et al., *Qualitative study of pregnancy and childbirth experiences in Somalian women resident in Sweden.* BJOG, 2000. **107**(12): p. 1507-12.

31. Ryding, E.L., *Investigation of 33 women who demanded a cesarean section for personal reasons.* Acta Obstet Gynecol Scand, 1993. **72**(4): p. 280-5.

32. Waldenstrom, U., et al., *A negative birth experience: prevalence and risk factors in a national sample.* Birth, 2004. **31**(1): p. 17-27.

33. Fenwick, J., J. Gamble, and Y. Hauck, *Reframing birth: a consequence of cesarean section.* J Adv Nurs, 2006. **56**(2): p. 121-30; discussion 131-2.

34. Gossman, G.L., J.M. Joesch, and K. Tanfer, *Trends in maternal request cesarean delivery from 1991 to 2004.* Obstet Gynecol, 2006. **108**(6): p. 1506-16.

35. Lydon-Rochelle, M.T., et al., *Repeat cesarean delivery: what indications are recorded in the medical chart?* Birth, 2006. **33**(1): p. 4-11.

36. Pakenham, S., S.M. Chamberlain, and G.N. Smith, *Women's views on elective primary caesarean section.* J Obstet Gynaecol Can, 2006. **28**(12): p. 1089-94.

37. Hildingsson, I., et al., *Few women wish to be delivered by caesarean section.* BJOG, 2002. **109**(6): p. 618-23.

38. Robson, S., et al., *Elective caesarean delivery at maternal request: a preliminary study of motivations influencing women's decision-making.* Aust N Z J Obstet Gynaecol, 2008. **48**(4): p. 415-20.

39. Wax, J.R., et al., *Patient choice cesarean: an evidence-based review.* Obstet Gynecol Surv, 2004. **59**(8): p. 601-16.

40. Wiklund, I., G. Edman, and E. Andolf, *Cesarean section on maternal request: reasons for the request, self-estimated health, expectations, experience of birth and signs of depression among first-time mothers.* Acta Obstet Gynecol Scand, 2007. **86**(4): p. 451-6.

41. Pang, M.W., et al., *Impact of first childbirth on changes in women's preference for mode of delivery: follow-up of a longitudinal observational study.* Birth, 2008. **35**(2): p. 121-8.

42. Nielsen, T.F. and K.H. Hokegard, *Postoperative cesarean section morbidity: a prospective study.* Am J Obstet Gynecol, 1983. **146**(8): p. 911-6.

43. Smaill, F. and G.J. Hofmeyr, *Antibiotic prophylaxis for cesarean section.* Cochrane Database Syst Rev, 2002(3): p. CD000933.

44. www.rcog.org.uk, ed. *Caesarean section.* 2004.

45. *NIH State-of-the-Science Conference Statement on cesarean delivery on maternal request.* NIH Consens State Sci Statements, 2006. **23**(1): p. 1-29.

46. Declercq, E., et al., *Maternal outcomes associated with planned primary cesarean births compared with planned vaginal births.* Obstet Gynecol, 2007. **109**(3): p. 669-77.

47. Tharpe, N., *Postpregnancy genital tract and wound infections.* J Midwifery Womens Health, 2008. **53**(3): p. 236-46.

48.   Homer, C., et al., *Maternal mortality: What can we learn from stories of postpartum haemorrhage?* Women Birth, 2009.

49.   Chaim, W., et al., *Prevalence and clinical significance of postpartum endometritis and wound infection.* Infect Dis Obstet Gynecol, 2000. **8**(2): p. 77-82.

50.   Ford, J.B., et al., *Postpartum haemorrhage occurrence and recurrence: a population-based study.* Med J Aust, 2007. **187**(7): p. 391-3.

51.   Rossen, J., et al., *Is there an increase of postpartum hemorrhage, and is severe hemorrhage associated with more frequent use of obstetric interventions?* Acta Obstet Gynecol Scand. **89**(10): p. 1248-55.

52.   Brant, H.A., *Precise estimation of postpartum haemorrhage: difficulties and importance.* Br Med J, 1967. **1**(5537): p. 398-400.

53.   Duthie, S.J., et al., *Intra-operative blood loss during elective lower segment caesarean section.* Br J Obstet Gynaecol, 1992. **99**(5): p. 364-7.

54.   Duthie, S.J., et al., *Discrepancy between laboratory determination and visual estimation of blood loss during normal delivery.* Eur J Obstet Gynecol Reprod Biol, 1991. **38**(2): p. 119-24.

55.   Glover, P., *Blood loss at delivery: how accurate is your estimation?* Aust J Midwifery, 2003. **16**(2): p. 21-4.

56.   Quinlivan, W.L. and J.A. Brock, *Blood volume changes and blood loss associated with labor. I. Correlation of changes in blood volume measured by I-131 albumin and Evans blue dye, with measured blood loss.* Am J Obstet Gynecol, 1970. **106**(6): p. 843-9.

57.   Razvi, K., et al., *A comparison between visual estimation and laboratory determination of blood loss during the third stage of labour.* Aust N Z J Obstet Gynaecol, 1996. **36**(2): p. 152-4.

58.   Wilcox, C., A. Hunt, and C. Owen, *The measurement of blood lost during cesarean section.* Am J Obstet Gynecol, 1959. **77**: p. 772-9.

59.   Lindqvist, P., B. Dahlback, and K. Marsal, *Thrombotic risk during pregnancy: a population study.* Obstet Gynecol, 1999. **94**(4): p. 595-9.

60.   Walker, I.D., *Venous and arterial thrombosis during pregnancy: epidemiology.* Semin Vasc Med, 2003. **3**(1): p. 25-32.

61.   Liu, S., et al., *Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term.* CMAJ, 2007. **176**(4): p. 455-60.

62.   Jacobsen, A.F., F.E. Skjeldestad, and P.M. Sandset, *Ante- and postnatal risk factors of venous thrombosis: a hospital-based case-control study.* J Thromb Haemost, 2008. **6**(6): p. 905-12.

63.   Lindqvist, P.G., et al., *Postpartum thromboembolism: severe events might be preventable using a new risk score model.* Vasc Health Risk Manag, 2008. **4**(5): p. 1081-7.

64. Larsen, T.B., et al., *Maternal smoking, obesity, and risk of venous thromboembolism during pregnancy and the puerperium: a population-based nested case-control study.* Thromb Res, 2007. **120**(4): p. 505-9.

65. Hemminki, E., *Impact of caesarean section on future pregnancy--a review of cohort studies.* Paediatr Perinat Epidemiol, 1996. **10**(4): p. 366-79.

66. Hemminki, E. and J. Merilainen, *Long-term effects of cesarean sections: ectopic pregnancies and placental problems.* Am J Obstet Gynecol, 1996. **174**(5): p. 1569-74.

67. National Collaborating Centre for Womens and Childrens Health. Royal College of Obstetrics and Gynecology, R., *Cesarean section. Clinical Guideline.* 2004.

68. Bhattacharya, S., et al., *Absence of conception after caesarean section: voluntary or involuntary?* BJOG, 2006. **113**(3): p. 268-75.

69. Getahun, D., et al., *Previous cesarean delivery and risks of placenta previa and placental abruption.* Obstet Gynecol, 2006. **107**(4): p. 771-8.

70. Lydon-Rochelle, M., et al., *Risk of uterine rupture during labor among women with a prior cesarean delivery.* N Engl J Med, 2001. **345**(1): p. 3-8.

71. Taylor, D.R., et al., *Uterine rupture with the use of PGE2 vaginal inserts for labor induction in women with previous cesarean sections.* J Reprod Med, 2002. **47**(7): p. 549-54.

72. Ofir, K., et al., *Uterine rupture: risk factors and pregnancy outcome.* Am J Obstet Gynecol, 2003. **189**(4): p. 1042-6.

73. Nisenblat, V., et al., *Maternal complications associated with multiple cesarean deliveries.* Obstet Gynecol, 2006. **108**(1): p. 21-6.

74. Latthe, P., et al., *Factors predisposing women to chronic pelvic pain: systematic review.* BMJ, 2006. **332**(7544): p. 749-55.

75. Andolf, E., M. Thorsell, and K. Kallen, *Cesarean delivery and risk for postoperative adhesions and intestinal obstruction: a nested case-control study of the Swedish Medical Birth Registry.* Am J Obstet Gynecol. **203**(4): p. 406 e1-6.

76. MacLennan, A.H., et al., *The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery.* BJOG, 2000. **107**(12): p. 1460-70.

77. Samuelsson, E.C., et al., *Signs of genital prolapse in a Swedish population of women 20 to 59 years of age and possible related factors.* Am J Obstet Gynecol, 1999. **180**(2 Pt 1): p. 299-305.

78. Buchsbaum, G.M., et al., *Pelvic organ prolapse in nulliparous women and their parous sisters.* Obstet Gynecol, 2006. **108**(6): p. 1388-93.

79.   Rortveit, G., et al., *Vaginal delivery parameters and urinary incontinence: the Norwegian EPINCONT study.* Am J Obstet Gynecol, 2003. **189**(5): p. 1268-74.

80.   Hannah, M.E., et al., *Outcomes at 3 months after planned cesarean vs planned vaginal delivery for breech presentation at term: the international randomized Term Breech Trial.* JAMA, 2002. **287**(14): p. 1822-31.

81.   Ekstrom, A., et al., *Planned cesarean section versus planned vaginal delivery: comparison of lower urinary tract symptoms.* Int Urogynecol J Pelvic Floor Dysfunct, 2008. **19**(4): p. 459-65.

82.   Hannah, M.E., et al., *Maternal outcomes at 2 years after planned cesarean section versus planned vaginal birth for breech presentation at term: the international randomized Term Breech Trial.* Am J Obstet Gynecol, 2004. **191**(3): p. 917-27.

83.   Buchsbaum, G.M., et al., *Prevalence of urinary incontinence and associated risk factors in a cohort of nuns.* Obstet Gynecol, 2002. **100**(2): p. 226-9.

84.   Nelson, R.L., et al., *Cesarean delivery for the prevention of anal incontinence.* Cochrane Database Syst Rev. **2**: p. CD006756.

85.   Carley, M.E., et al., *Obstetric history in women with surgically corrected adult urinary incontinence or pelvic organ prolapse.* J Am Assoc Gynecol Laparosc, 1999. **6**(1): p. 85-9.

86.   Chiaffarino, F., et al., *Reproductive factors, family history, occupation and risk of urogenital prolapse.* Eur J Obstet Gynecol Reprod Biol, 1999. **82**(1): p. 63-7.

87.   Lukacz, E.S., et al., *Parity, mode of delivery, and pelvic floor disorders.* Obstet Gynecol, 2006. **107**(6): p. 1253-60.

88.   Moalli, P.A., et al., *Risk factors associated with pelvic floor disorders in women undergoing surgical repair.* Obstet Gynecol, 2003. **101**(5 Pt 1): p. 869-74.

89.   Tegerstedt, G., et al., *Obstetric risk factors for symptomatic prolapse: a population-based approach.* Am J Obstet Gynecol, 2006. **194**(1): p. 75-81.

90.   Uma, R., G. Libby, and D.J. Murphy, *Obstetric management of a woman's first delivery and the implications for pelvic floor surgery in later life.* BJOG, 2005. **112**(8): p. 1043-6.

91.   Gurel, H. and S.A. Gurel, *Pelvic relaxation and associated risk factors: the results of logistic regression analysis.* Acta Obstet Gynecol Scand, 1999. **78**(4): p. 290-3.

92.   Krebs, L. and J. Langhoff-Roos, *Elective cesarean delivery for term breech.* Obstet Gynecol, 2003. **101**(4): p. 690-6.

93.   Schytt, E. and U. Waldenstrom, *Risk factors for poor self-rated health in women at 2 months and 1 year after childbirth.* J Womens Health (Larchmt), 2007. **16**(3): p. 390-405.

94.   Goodman, P., M.C. Mackey, and A.S. Tavakoli, *Factors related to childbirth satisfaction.* J Adv Nurs, 2004. **46**(2): p. 212-9.

95. Schindl, M., et al., *Elective cesarean section vs. spontaneous delivery: a comparative study of birth experience.* Acta Obstet Gynecol Scand, 2003. **82**(9): p. 834-40.

96. Gottvall, K. and U. Waldenstrom, *Does a traumatic birth experience have an impact on future reproduction?* BJOG, 2002. **109**(3): p. 254-60.

97. Wijma, K., B. Wijma, and M. Zar, *Psychometric aspects of the W-DEQ; a new questionnaire for the measurement of fear of childbirth.* J Psychosom Obstet Gynaecol, 1998. **19**(2): p. 84-97.

98. Lavender, T., S.A. Walkinshaw, and I. Walton, *A prospective study of women's views of factors contributing to a positive birth experience.* Midwifery, 1999. **15**(1): p. 40-6.

99. Alehagen, S., B. Wijma, and K. Wijma, *Fear of childbirth before, during, and after childbirth.* Acta Obstet Gynecol Scand, 2006. **85**(1): p. 56-62.

100. Waldenstrom, U., A. Rudman, and I. Hildingsson, *Intrapartum and postpartum care in Sweden: women's opinions and risk factors for not being satisfied.* Acta Obstet Gynecol Scand, 2006. **85**(5): p. 551-60.

101. Hodnett, E.D., et al., *Continuous support for women during childbirth.* Cochrane Database Syst Rev, 2007(3): p. CD003766.

102. Newton, J., G. Barnard, and W. Collins, *A rapid method for measuring menstrual blood loss using automatic extraction.* Contraception, 1977. **16**: p. 269-80.

103. Rubertsson, C., et al., *Depressive symptoms in early pregnancy, two months and one year postpartum-prevalence and psychosocial risk factors in a national Swedish sample.* Arch Womens Ment Health, 2005. **8**(2): p. 97-104.

104. Ryding, E.L., K. Wijma, and B. Wijma, *Psychological impact of emergency cesarean section in comparison with elective cesarean section, instrumental and normal vaginal delivery.* J Psychosom Obstet Gynaecol, 1998. **19**(3): p. 135-44.

105. Wickberg, B. and C.P. Hwang, *The Edinburgh Postnatal Depression Scale: validation on a Swedish community sample.* Acta Psychiatr Scand, 1996. **94**(3): p. 181-4.

106. Gustavsson, J., et al., *Stability and predictive ability of personality traits across 9 years.* Personality and individual differences, 1997. **22**(6): p. 783-791.

107. Schalling, D., et al., *Markers for vulnerability to psychopathology: temperament traits associated with platelet MAO activity.* Acta Psychiatr Scand, 1987. **76**(2): p. 172-82.

108. Kampe, T., G. Edman, and H. Hannerz, *Ten-year follow-up study of personality traits in adults with intact and restored dentitions.* J Oral Rehabil, 1996. **23**(7): p. 443-9.

109. Bland, J.M. and D.G. Altman, *Statistical methods for assessing agreement between two methods of clinical measurement.* Lancet, 1986. **1**(8476): p. 307-10.

110. Pajkrt, E., et al., *Intra- and interoperator repeatability of the nuchal translucency measurement.* Ultrasound Obstet Gynecol, 2000. **15**(4): p. 297-301.

111. Mantel, N. and W. Haenzsel, *Statistical aspects of the analyses of data from retrospective studies of disease.* J Nat Cancer Inst, 1959. **22**: p. 19-48.

112. Miettinen, O., *Simple interval estimation of risk ratio.* Am J Epidemiol, 1974. **100**: p. 515-6.

113. Robson, M.S., *Can we reduce the caesarean section rate?* Best Pract Res Clin Obstet Gynaecol, 2001. **15**(1): p. 179-94.

114. Chaillet, N. and A. Dumont, *Evidence-based strategies for reducing cesarean section rates: a meta-analysis.* Birth, 2007. **34**(1): p. 53-64.

115. Lee, Y.M. and M.E. D'Alton, *Cesarean delivery on maternal request: maternal and neonatal complications.* Curr Opin Obstet Gynecol, 2008. **20**(6): p. 597-601.

116. Visco, A.G., et al., *Cesarean delivery on maternal request: maternal and neonatal outcomes.* Obstet Gynecol, 2006. **108**(6): p. 1517-29.

117. Toledo, P., et al., *The accuracy of blood loss estimation after simulated vaginal delivery.* Anesth Analg, 2007. **105**(6): p. 1736-40, table of contents.

118. Villar, J., et al., *Maternal and neonatal individual risks and benefits associated with caesarean delivery: multicentre prospective study.* BMJ, 2007. **335**(7628): p. 1025.

119. Liu, S., et al., *Risk of maternal postpartum readmission associated with mode of delivery.* Obstet Gynecol, 2005. **105**(4): p. 836-42.

120. Dahlgren, L.S., et al., *Caesarean section on maternal request: risks and benefits in healthy nulliparous women and their infants.* J Obstet Gynaecol Can, 2009. **31**(9): p. 808-17.

121. Angioli, R., et al., *Severe perineal lacerations during vaginal delivery: the University of Miami experience.* Am J Obstet Gynecol, 2000. **182**(5): p. 1083-5.

122. Dahl, C. and P. Kjolhede, *Obstetric anal sphincter rupture in older primiparous women: a case-control study.* Acta Obstet Gynecol Scand, 2006. **85**(10): p. 1252-8.

123. Hornemann, A., et al., *Advanced age is a risk factor for higher grade perineal lacerations during delivery in nulliparous women.* Arch Gynecol Obstet, 2009.

124. Burrows, L.J., L.A. Meyn, and A.M. Weber, *Maternal morbidity associated with vaginal versus cesarean delivery.* Obstet Gynecol, 2004. **103**(5 Pt 1): p. 907-12.

125.	Dudding, T.C., C.J. Vaizey, and M.A. Kamm, *Obstetric anal sphincter injury: incidence, risk factors, and management.* Ann Surg, 2008. **247**(2): p. 224-37.

126.	Sobande, A. and M. Eskandar, *Multiple repeat caesarean sections: complications and outcomes.* J Obstet Gynaecol Can, 2006. **28**(3): p. 193-7.

127.	Mant, J., R. Painter, and M. Vessey, *Epidemiology of genital prolapse: observations from the Oxford Family Planning Association Study.* Br J Obstet Gynaecol, 1997. **104**(5): p. 579-85.

128.	Rinne, K.M. and P.P. Kirkinen, *What predisposes young women to genital prolapse?* Eur J Obstet Gynecol Reprod Biol, 1999. **84**(1): p. 23-5.

129.	Soderberg, M.W., et al., *Young women with genital prolapse have a low collagen concentration.* Acta Obstet Gynecol Scand, 2004. **83**(12): p. 1193-8.

130.	Figueiredo, B., et al., *Mother-to-infant emotional involvement at birth.* Matern Child Health J, 2009. **13**(4): p. 539-49.

131.	Taylor, A., et al., *A new Mother-to-Infant Bonding Scale: links with early maternal mood.* Arch Womens Ment Health, 2005. **8**(1): p. 45-51.

132.	Ryding, E.L., et al., *Personality and fear of childbirth.* Acta Obstet Gynecol Scand, 2007. **86**(7): p. 814-20.

133.	Rijnders, M., et al., *Perinatal factors related to negative or positive recall of birth experience in women 3 years postpartum in the Netherlands.* Birth, 2008. **35**(2): p. 107-16.

134.	Waldenstrom, U. and E. Schytt, *A longitudinal study of women's memory of labour pain--from 2 months to 5 years after the birth.* BJOG, 2009. **116**(4): p. 577-83.

135.	Rouhe, H., et al., *Fear of childbirth according to parity, gestational age, and obstetric history.* BJOG, 2009. **116**(1): p. 67-73.

136.	Bragg, F., et al., *Variation in rates of caesarean section among English NHS trusts after accounting for maternal and clinical risk: cross sectional study.* BMJ. **341**: p. c5065.

137.	Eriksson, S.L., P.O. Olausson, and C. Olofsson, *Use of epidural analgesia and its relation to caesarean and instrumental deliveries-a population--based study of 94,217 primiparae.* Eur J Obstet Gynecol Reprod Biol, 2006. **128**(1-2): p. 270-5.

138.	Lowder, J.L., et al., *Risk factors for primary and subsequent anal sphincter lacerations: a comparison of cohorts by parity and prior mode of delivery.* Am J Obstet Gynecol, 2007. **196**(4): p. 344 e1-5.

139.	Prager, M., et al., *The incidence of obstetric anal sphincter rupture in primiparous women: a comparison between two European delivery settings.* Acta Obstet Gynecol Scand, 2008. **87**(2): p. 209-15.

140. Sultan, A.H., et al., *Anal-sphincter disruption during vaginal delivery.* N Engl J Med, 1993. **329**(26): p. 1905-11.

141. Waterstone, M., et al., *Postnatal morbidity after childbirth and severe obstetric morbidity.* BJOG, 2003. **110**(2): p. 128-33.

142. Pascali-Bonaro, D. and M. Kroeger, *Continuous female companionship during childbirth: a crucial resource in times of stress or calm.* J Midwifery Womens Health, 2004. **49**(4 Suppl 1): p. 19-27.

143. Sauls, D.J., *Effects of labor support on mothers, babies, and birth outcomes.* J Obstet Gynecol Neonatal Nurs, 2002. **31**(6): p. 733-41.

144. Waldenstrom, U., I. Hildingsson, and E.L. Ryding, *Antenatal fear of childbirth and its association with subsequent caesarean section and experience of childbirth.* BJOG, 2006. **113**(6): p. 638-46.

145. Johnson, R. and P. Slade, *Does fear of childbirth during pregnancy predict emergency caesarean section?* BJOG, 2002. **109**(11): p. 1213-21.

146. Gamble, J. and D.K. Creedy, *A counselling model for postpartum women after distressing birth experiences.* Midwifery, 2009. **25**(2): p. e21-30.

147. Tschudin, S., et al., *Pregnant women's perception of cesarean section on demand.* J Perinat Med, 2009.

148. *ACOG Committee Opinion No. 394, December 2007. Cesarean delivery on maternal request.* Obstet Gynecol, 2007. **110**(6): p. 1501.

149. Bergeron, V., *The ethics of cesarean section on maternal request: a feminist critique of the American College of Obstetricians and Gynecologists' position on patient-choice surgery.* Bioethics, 2007. **21**(9): p. 478-87.