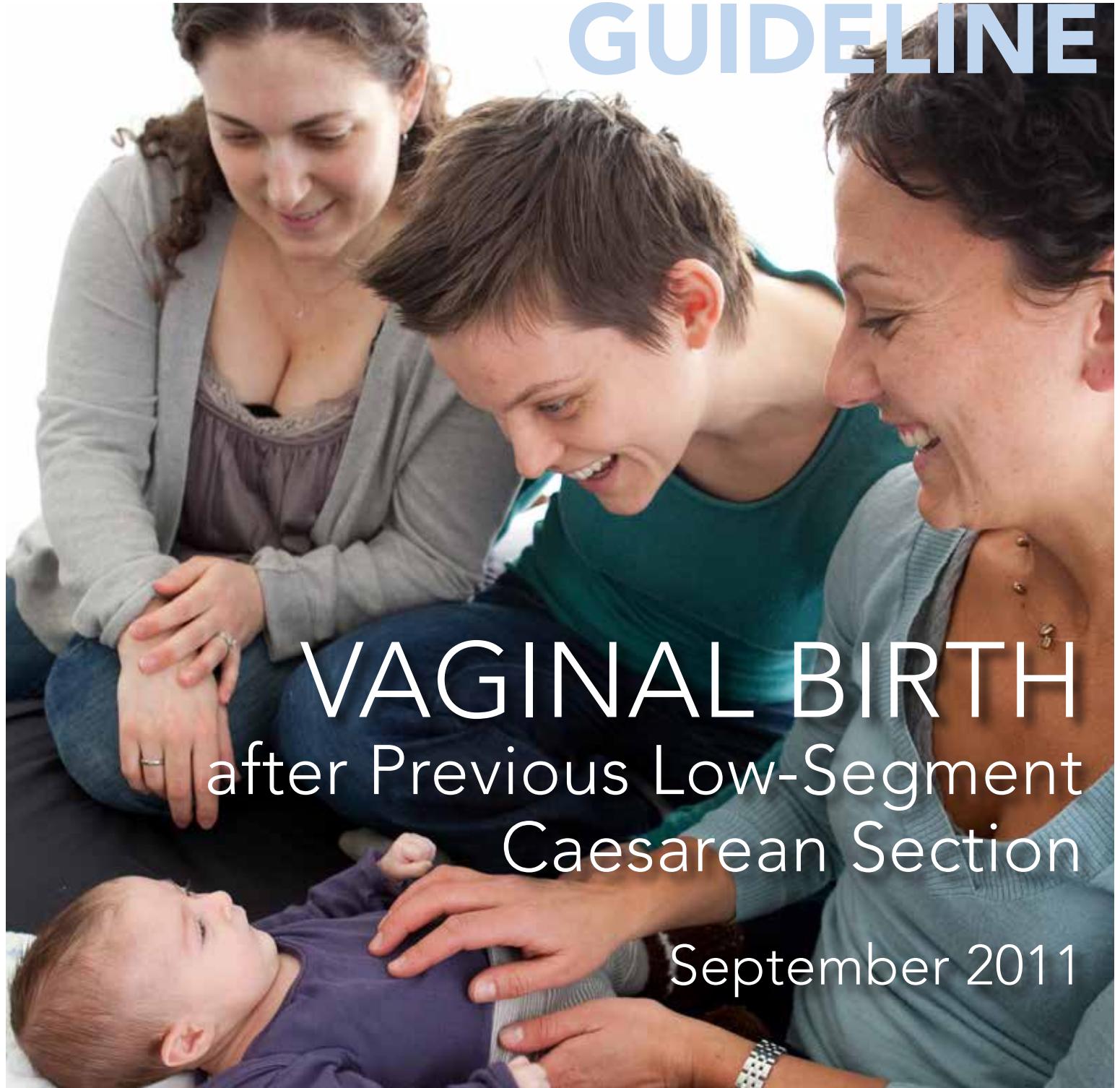# CLINICAL PRACTICE 14
GUIDELINE

VAGINAL BIRTH
after Previous Low-Segment Caesarean Section

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Association *of*
Ontario Midwives
Delivering what matters.

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The AOM is committed, through our statement on Gender Inclusivity and Human Rights, to reflect and include trans, genderqueer and intersex communities in all aspects of our work.In this document, there are references to sources that use gendered language to refer to populations of pregnant and birthing people. In order to accurately represent these sources, we may have maintained gendered language. We support research and knowledge translation that engages and reflects the entire childbearing population.

VAGINAL BIRTH
after Previous Low-Segment Caesarean Section

Statement of Purpose:

The goal is to provide an evidence-based clinical practice guideline (CPG) that is consistent with the midwifery philosophy and model of care. Midwives are encouraged to use this CPG as a tool in clinical decision-making. This CPG is independent of and not intended to replace the standards of the College of Midwives of Ontario.

Objective:

The objective of this CPG is to provide a critical review of the research literature on the management of uncomplicated pregnancy in clients who have had a previous low-segment caesarean section (LSCS).

Outcomes of Interest:

1. uterine rupture
2. maternal morbidity and mortality
3. hypoxic-ischemic encephalopathy (HIE)
4. other neonatal morbidity and mortality

Methods:

A search of the Medline, CINAHL databases and Cochrane library from 1994-2010 was conducted using the key words: vaginal birth after caesarean, VBAC, uterine rupture, and prior caesarean section. Additional search terms were used to provide more detail on individual topics as they related to VBAC. Older studies were accessed in cases of commonly cited statistics, or significant impact on clinical practice.

Review:

This CPG was reviewed using a modified version of the AGREE instrument (1), the AOM Values-based Approach to CPG Development (2), as well as consensus of the VBAC Working Group, CPG Subcommittee, the Insurance and Risk Management Program and the Board of Directors.

Abbreviations

BMI	Body Mass Index (kg/m^2)
CI	Confidence interval
CS	Caesarean section
EDB	Estimated date of birth
EFM	Electronic fetal monitoring
ERCS	Elective repeat caesarean section
HIE	Hypoxic-ischemic encephalopathy
IA	Intermittent auscultation
LSCS	Low-segment caesarean section
LUS	Lower uterine segment
NICU	Newborn intensive care unit
OR	Odds ratio
PPH	Post-partum hemorrhage
RR	Relative risk
VBAC	Vaginal birth after caesarean section

KEY TO EVIDENCE STATEMENTS AND GRADING OF RECOMMENDATIONS, FROM THE CANADIAN TASK FORCE ON PREVENTIVE HEALTH CARE

Evaluation of evidence criteria		Classification of recommendations criteria	
I	Evidence obtained from at least one properly randomized controlled trial	A	There is good evidence to recommend the clinical preventive action
II-1	Evidence from well-designed controlled trials without randomization	B	There is fair evidence to recommend the clinical preventive action
II-2	Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group	C	The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making
II-3	Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category	D	There is fair evidence to recommend against the clinical preventive action
III	Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	E	There is good evidence to recommend against the clinical preventive action
		L	There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making

Reference: (3)

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INTRODUCTION

From the late 1980s to mid-1990s vaginal birth after caesarean (VBAC) rates increased in North America. This was a response to public and professional concerns about rising caesarean section rates and increasing evidence indicating that in the absence of contraindications, VBAC is a safe choice. (4) However, since the mid-1990's, the rate of VBAC has declined dramatically in Canada, with the repeat caesarean section (CS) rate having increased from 64.7% in 1995 to 82.4% in 2008. (5,6) This increase has occurred despite a consensus, reflected in professional guidelines, that VBAC is a safe and appropriate option for most individuals who have had a previous CS. (7-10)

Overall rates of CS have also increased in Canada since the mid-1990s. Both the decrease in VBAC and the increase in repeat CS reflects an increase in the rate of primary CS in Canada, from 12.6% in 1995-06 to 18.6% in 2004-05, a trend that is likely multifactorial. (5) Concerns about safety, place of birth and medico-legal pressures have shaped past and current discussions and practices regarding VBAC. The risks and benefits of both elective repeat caesarean section (ERCS) and VBAC and options for labour management are important components of informed choice discussions for clients with a history of CS. This CPG supports VBAC as a safe choice for the majority of clients with prior CS and acknowledges the growing body of evidence that multiple CS have the potential to cause long-term harm.

Incidence

CS rates in Ontario are slightly higher than CS rates across Canada as a whole. The primary CS rate in Ontario was 19.6% in 2008-09 and the repeat CS rate was 85.3% (see Table 1). Individuals over age 35 had an increased rate of primary CS (23.7% in Canada and 24.0% in Ontario) compared to 17.5% and 18.5%, respectively, for those younger than 35 years of age. (6)

TABLE 1: CAESAREAN SECTION RATES: CANADA, ONTARIO AND ONTARIO MIDWIFERY CARE

	Overall CS Rate % (95% CI)	Primary CS Rate % (95% CI)	Repeat CS Rate % (95% CI)
Canada	25.6 (25.4-25.7)+	18.5 (18.4-18.7) ±	82.4 (82.1-82.8) ±
Ontario	26.7 (26.5-26.9)+	19.6 (19.4-19.8) ±	85.3 (84.8-85.8) ±
Ontario midwifery care	15.2* (14.9-15.5)**		46.1* (44.4-47.8)**

+ 2004-2005; source: (5)
± 2008-2009; source: (6)
* 2003-2008; source: (11)
** 2003-2008; source: (12)

An analysis of outcomes specific to Ontario midwifery clients suggests a lower rate of both primary and repeat CS among midwifery clients. From 2003-2008 the rate of CS for all midwifery clients in Ontario was 15.2%. During this period Ontario midwives attended 3262 births to clients with a history of CS. The rate of repeat caesarean section among this group was 46.1%. From 2006-08, VBAC was planned by 1095/1536 (71.3%) of midwifery clients who had a history of CS, and 779/1095 (71.2%) of these labours resulted in a vaginal delivery. (11)

VBAC: Review of Recent Research

The highest quality and most current research supports VBAC as a safe choice for the majority of clients with a prior LSCS, and overall rates of complications are low for both VBAC and ERCS. (13)

This CPG provides a summary of the research on the risks and benefits of VBAC and ERCS, to aid midwives in facilitating informed choice discussions with clients who have a history of one or more previous LSCS. The midwife will typically discuss the benefits and risks of VBAC and ERCS in light of a client's specific clinical circumstances. This information, along with the client's values and risk tolerance, will factor into the decision-making about method and place of birth in the current pregnancy. This CPG also reviews some of the important considerations in the management of labour after a previous CS.

The midwife's role in promoting informed choice regarding VBAC and ERCS is influenced by the midwifery profession's strong belief in the promotion of "normal birth" (14) and the Canadian obstetrical community's commitment of support for birth as a natural process. (15) The midwife's professional responsibility to advocate for the option of VBAC takes place within the broader context of escalating rates of CS, which works to normalize technological intervention and undermine confidence in vaginal birth. Helping clients make informed choices within this context, and discussing risk without instilling fear, requires a high degree of skill and time on the part of midwives. Quantifying, weighing and communicating risk is especially difficult in the perinatal period, given dominant cultural norms of risk aversion and conceptualizations of pregnancy and birth as inherently problematic undertakings that warrant preemptive medical intervention. (16)

The Canadian Association of Midwives provides an apt description of how midwives may be able to best support their clients, by "trusting pregnant people and supporting their ability to trust themselves, their bodies and the birth process." (17)[1,2]

Notwithstanding the midwife's fundamental commitment to keeping birth normal is an acknowledgement that there are situations when VBAC is contraindicated and ERCS should be recommended.

Contraindications to VBAC

The contraindications to planning a VBAC are generally accepted by other guidelines and professional organizations to be:

- Previous classical or inverted T uterine scar.
- Previous hysterotomy or myomectomy entering the uterine cavity.
- Previous uterine rupture.
- Presence of a contraindication to labour such as placenta previa or transverse lie.
- Declining VBAC and requesting a caesarean section. (7,18)

[1] Updated to reflect inclusive language with permission of CAM
[2] For further practical guidance on presenting balanced and understandable information on risk, see Risk assessment and risk distortion: finding the balance, RG Jordan and PA Murphy (2009). (16)

TABLE 2: RISK OF COMPLICATIONS BY METHOD OF DELIVERY (13)

Outcome	Absolute Risk		Direction of Effect	Relative Risk VBAC vs ERCS (95% CI)
	Planned VBAC	ERCS		
Maternal death	0.04/1000	0.013/1000	Risk decreased by VBAC	0.33 (0.13-0.88)
Uterine rupture	4.7/1000	0.26/1000	Risk increased by VBAC	20.74 (9.77-44.02)
Hysterectomy	1.7/1000	2.8/1000	No significant difference between VBAC and ERCS	0.65 (0.40-1.06)
Blood transfusion	9/1000	12/1000	No significant difference between VBAC and ERCS	0.81 (0.57-1.15)
Perinatal death*	1.3/1000	0.5/1000	Risk increased by VBAC	1.82 (1.24-2.67)
Neonatal death**	1.14/1000	0.55/1000	Risk increased by VBAC	2.06 (1.35-3.13)

*term deliveries, 20 weeks gestation to first 7 days of life
** term deliveries, first 28 days of life

Limitations of Available Research

Past research has focused on the risks and benefits of VBAC compared with ERCS. However, a significant portion of VBAC research remains beset by a lack of rigorous methodology, limited comparability of groups assessed, and imprecise and non-standard definitions of important outcomes. (8,19,20)[3] Observational studies provide the bulk of current evidence on the risks and benefits of VBAC and ERCS. While a non-randomized study design introduces a significant potential for bias, consequently limiting the reliability and validity of findings, a randomized study comparing mode of delivery has not been conducted and may not be feasible. Observational research may not be generalizable to all practice environments, nor Ontario midwifery care specifically.

While flawed, the growing body of evidence comparing outcomes associated with VBAC and ERCS offers increasingly precise estimates of effect. A systematic review published in 2010 by Guise et al offers a particularly valuable contribution to the VBAC evidence base, with pooled sample sizes of greater than 400 000 for select outcomes. Large studies are particularly important when looking at rare events such as maternal death and uterine rupture. In the case of maternal death, Guise et al included 12 studies with 402 883 participants; while maternal deaths were rare in both groups, the large sample size provides improved power to detect the reduction in maternal death (p =.027) experienced by participants attempting VBAC, compared to those undergoing ERCS. (13) While many findings of Guise et al 's meta-analysis were consistent with previous research, their increased precision permits midwives to have greater confidence in the evidence they share with clients.

The factors contributing to the decline in VBAC and subsequent rise in CS are not well understood and may be affecting decision-making at the level of the client, health care provider, hospital, and policy.(13) Researchers have also had difficulty predicting who will experience the rare adverse outcomes associated with VBAC or ERCS (see Table 2). (21) Given the low absolute risk of serious complication and the low relative risks associated with each predictive factor, it is unlikely midwives will be able to accurately predict outcomes such as uterine rupture in any particular client.

[3] For instance, the manner in which uterine rupture is defined in a given study (whether or not dehiscence is included and how uterine dehiscence is defined) can greatly affect reported rates of uterine rupture and associated morbidity. Also, many studies compare actual route of delivery, rather than intended route, meaning that participants who intended to labour but have a caesarean, or participants who go into labour before a planned caesarean, could be misclassified and their outcomes counted in the wrong research study arm. Such misclassification masks potential adverse effects of desiring one route of delivery but having another.

BENEFITS AND COMPLICATIONS OF VBAC COMPARED WITH ERCS

Pregnancy and Intrapartum Outcomes

MATERNAL MORTALITY

Death is a very rare outcome of pregnancy among individuals with prior CS, corresponding to an incidence of approximately 10/100 000 when all studies were combined in meta-analysis. The largest meta-analysis to date estimated an absolute risk of maternal mortality of 4/100 000 for planned VBAC vs. 13/100 000 for ERCS. (13) However, other individual studies have found no significant difference in maternal mortality rates between groups planning VBAC and planning ERCS. (22,23)

UTERINE RUPTURE

Though rare, uterine rupture is a significant risk associated with having had a previous CS. Evidence continues to suggest that individuals who plan a VBAC experience a greater risk of uterine rupture than those planning ERCS.

Incidence of Uterine Rupture

The large meta-analysis by Guise and colleagues (2010) identified 4 studies reporting uterine rupture outcomes based on mode of delivery. It suggests the absolute risk of uterine rupture for all individuals with a prior CS regardless of route of delivery is 3/1000 (95% Confidence Interval 2.3-4.1/1000). Risk of uterine rupture with VBAC was 4.7/1000 (95% CI 2.8-7.7/1000) compared to 0.26/1000 (95% CI 0.09-0.82/1000) for ERCS.(13) It is important to note that the absolute risk for either choice remains < 0.5%.

Secondary analysis of data from a large case-control study published in 2005 by Macones et al assessed the incidence of uterine rupture and associated risk factors. Investigators found 134 cases of uterine rupture among participants choosing VBAC, equivalent to an absolute risk of 9.8/1000 (95% CI 8.1-11.4/1000). (24) See Table 3 for a comparison of studies examining risk of uterine rupture by mode of delivery.

Outcomes of Uterine Rupture

Rupture of the uterus can be a catastrophic event for both parent and baby and requires emergency medical and surgical intervention. Despite this, outcomes are largely favourable. In the studies analysed by Guise et al, 6% of uterine ruptures were associated with neonatal death. (13) Among the 17 898 planned VBACs included in Landon et al's prospective study, rupture-associated perinatal death occurred in only 2 of 124 ruptures (1.6%). (23) In a retrospective study from Norway of 18 794 births after a prior CS, perinatal death occurred in 3.7% of cases of uterine rupture. Hysterectomy associated with uterine rupture occurred in 3.8% of cases of rupture. (25) Given the low likelihood of uterine rupture, and the low likelihood that uterine rupture will lead to adverse outcomes, the ultimate risk of serious or lasting complications occurring as a result of attempted VBAC is low.

TABLE 3: LIKELIHOOD OF HYSTERECTOMY BASED ON NUMBER OF PRIOR CAESAREAN SECTIONS (13)

Type of Study	Absolute Risk		Direction of Effect	Relative Risk VBAC vs ERCS (95% CI)	Source
	Planned VBAC	ERCS			
Guise et al Meta-analysis of 4 studies N=47 202	4.7/1000	.26/1000	Risk increased by VBAC*	20.74 (9.77-44.02)	(13)
Macones et al Retrospective cohort study N=25 005	9.8/1000	0.4/1000	Risk increased by VBAC*	21.1 (8.6-51.5)	(24)

*P<.001

Predictive Factors for Uterine Rupture

Researchers have attempted to identify the presence or absence of factors that could be used to accurately predict the relatively small proportion who will experience a uterine rupture during VBAC in an effort to improve selection of candidates for VBAC and potentially decrease risks. (21) In the study published by Macones et al the only variable that remained significantly associated with uterine rupture after adjustment for other factors was prior vaginal delivery, which had a protective effect (Odds Ratio 0.38, 95% CI 0.23-0.62). (24) Guise's much larger systematic review also demonstrated decreased risk of uterine rupture with interdelivery intervals > 24 months. Researchers have not yet developed any scoring models able to accurately predict who is more likely to experience uterine rupture. (13) Specific predictive factors are discussed in greater detail below.

OTHER CONSIDERATIONS

Many of the potential complications of ERCS are risks associated with all CS deliveries, and have been documented in other guidelines. (10) Meta-analysis suggests rates of hysterectomy, hemorrhage, and transfusion do not differ significantly between individuals planning VBAC and those planning ERCS. (13) Individuals choosing VBAC may experience fewer postpartum fevers (RR 0.73, CI 0.68-0.78) (13,24) and shorter hospital stays. (26)

Birth Experiences

Recent studies have examined experiences of CS compared to vaginal delivery. The Maternity Experiences Survey explored experiences surrounding labour, birth, parent-infant contact, and breastfeeding in over 6000 participants. Participants who had CS reported "less optimal" mother-infant contact, such as skin-to-skin contact and were more likely to experience practices that do not support breastfeeding, though there is little reason for these practices to differ by mode of delivery, unless a baby is admitted to the NICU. (26)

An earlier study suggested that one benefit of a planned VBAC may include a feeling of a sense of control in the decision-making process. (27) In another study, participants who underwent VBAC experienced less postpartum discomfort and described a feeling of wellness sooner than participants recovering from CS. (28)

Choosing a VBAC gives clients the opportunity to experience normal physiologic labour and birth and minimize intervention. The role of midwifery is "to understand, promote, and facilitate physiologic processes, and to intervene only when necessary." (17) Supporting clients who plan a VBAC is consistent with this role.

LONG-TERM CONSIDERATIONS

Pelvic Floor Health

Existing evidence does not allow estimations of the risks or benefits of VBAC vs ERCS with respect to pelvic floor morbidities, including pelvic organ prolapse and urinary and anal incontinence, due to the absence of research evaluating these outcomes among VBAC populations. The most relevant evidence compares pelvic floor morbidities among groups who have had CS only, vaginal delivery only, and both caesarean and vaginal deliveries.

While imaging studies have demonstrated nerve and tissue damage associated with vaginal delivery and parity, the clinical importance of these findings is unclear, as there is no apparent cause-effect relationship between radiologic signs of pelvic floor damage and manifestations of symptoms, nor does CS provide a clear and consistent protective effect. (29-31) Research suggests that individuals who deliver exclusively by CS are less likely to experience urinary incontinence than those who have had exclusively vaginal deliveries (32-34) or both vaginal and caesarean deliveries. (35)

Press et al conducted a systematic review comparing prevalence of postpartum urinary incontinence after CS and vaginal deliveries. For cohort studies with follow-up more than one year postpartum, individuals who had a CS were slightly less than half as likely to experience symptoms of stress incontinence compared with those who had vaginal deliveries (98/1000 compared to 230/1000), (OR 0.44, 95% CI 0.33-0.60); risk of developing either severe stress incontinence or urge incontinence was equivalent regardless of mode of delivery. (32)

Despite the reduction of risk experienced by individuals who delivered exclusively by CS, many still experienced symptoms – in one study conducted at 12 years post-delivery, prevalence of urinary incontinence among individuals who had only CS was 40%. The rate of urinary incontinence experienced by individuals who had both vaginal deliveries and CS (59.4%) was similar

to that experienced by individuals who had all deliveries vaginally (54.7%) (p = .308). (35)

Studies assessing postpartum anal incontinence in individuals who have had both CS and vaginal deliveries suggest that mode of delivery is not clearly associated with risk of long-term anal or fecal incontinence. (29,34-36)

A limited body of research suggests a strong and statistically significant association between pelvic organ prolapse and vaginal delivery. (37-39) Using data from Swedish health registries, researchers found that individuals who had delivered exclusively by CS experienced a significantly lower absolute risk of in-patient diagnosis of pelvic organ prolapse (2.2/1000) than those who had undergone both caesarean and vaginal deliveries (7.3/1000) (p < .001). (37)

Neonatal/Perinatal Outcomes

The absolute risk of adverse neonatal or perinatal outcomes is estimated to be very small for individuals who have had a previous CS, whether or not they plan VBAC or ERCS. Neonatal benefits of VBAC include early skin-to-skin contact and earlier initiation of chest or breastfeeding; some evidence also suggests that vaginal birth is associated with higher rates of exclusive chest or breastfeeding at 3 and 6 months compared to CS. (26) For all caesarean deliveries, there is a small risk to the baby of laceration (0.5% - 1.5%). (40,41)

NEONATAL/PERINATAL MORTALITY

Though evidence is conflicting, most meta-analyses point to a higher rate of perinatal or neonatal mortality with VBAC compared to ERCS. A meta-analysis of high and medium quality studies found a perinatal death rate (20 weeks' gestation to first 7 days of life) of 1.3/1000 for planned VBAC, compared with 0.5/1000 for ERCS (p = .002) and a neonatal death rate (first 28 days of life) of 1.1/1000 for planned VBAC vs 0.6/1000 for ERCS (p = .001). (13) An earlier meta-analysis found fetal or neonatal death to be more frequent with planned VBAC (5.8/1000), compared to ERCS (3.4/1000, p = 0.001). (22)

Conversely, Landon's prospective study found that rates of neonatal death were not significantly different between planned VBAC and ERCS groups (0.08% vs. 0.05%, p = 0.19). (23) Since a small proportion of uterine ruptures are associated with neonatal or perinatal death, the increased risk of perinatal or neonatal mortality associated with VBAC might be attributable to the greater likelihood of uterine rupture experienced by those who choose VBAC over ERCS. (13) In the data collected by Al Zirqi et al perinatal death occurred in 3.7% of planned VBACs that resulted in uterine rupture and 0.1% of planned VBACs that were rupture-free (p < .001). (25)

HYPOXIC-ISCHEMIC ENCEPHALOPATHY

Although a handful of studies have consistently indicated a higher incidence of neonatal hypoxic-ischemic encephalopathy (HIE) among infants born by VBAC, there is little consistency in the measurements used throughout this research. Therefore, the associations between labouring after a prior CS and HIE and related outcomes are not clear. Landon et al found a higher incidence of HIE in the VBAC group (12/15 338 vs. 0/15 014 in the ERCS group), with 7 of these cases occurring in conjunction with uterine rupture. (23) In the data collected by Al Zirqi et al HIE was significantly more prevalent among those who laboured and experienced uterine rupture (3.7%) than those who laboured without rupture (0.1%) (p < .001). (25)

RESPIRATORY MORBIDITY

Compared to VBAC, ERCS has been associated with neonatal respiratory morbidity at term, though overall estimates of effect relative to mode of delivery are hindered by inconsistent definition and classification of respiratory conditions. Studies included in the meta-analysis performed by Guise presented conflicting information on whether VBAC or ERCS resulted in more transient tachypnea of the newborn (TTN). (13) In one recent cohort study, infants born by ERCS were significantly more likely to require oxygen in the delivery room and newborn intensive care unit (NICU) than infants born by VBAC, and less likely to require bag-mask ventilation and endotracheal intubation.

After controlling for confounding variables, infants born by ERCS were also more likely to be admitted to the NICU than infants born by VBAC (adjusted OR 2.93, 95% CI 1.28-6.72). (42) A prior retrospective study of 989 participants undergoing VBAC or ERCS found an increased risk of respiratory problems (adjusted OR 2.3, 95% CI 1.4-3.8) and TTN (adjusted OR 2.6, 95% CI 1.5-4.5) in the ERCS group. (43)

There is little research on the relationship between VBAC and ERCS and health and development in childhood. However, observational studies of individuals having elective CS, compared to vaginal deliveries, particularly those that include participants with previous CS, provide some limited data pertinent to the long-term paediatric implications of VBAC and ERCS.

A meta-analysis of 21 studies of the relationship between CS and asthma suggests a weak association (OR 1.18, 95% CI 1.05-1.32). The generalizability of these findings is limited, given marked heterogeneity of study populations and methodological differences among the studies included. A meta-analysis of 6 studies of the relationship between CS and allergic disorders other than asthma found an OR of 1.32 (95% CI 1.12-1.55) for food allergy/food atopy and 1.23 (95% CI 1.12-1.35) for allergic rhinitis. No significant association between CS and eczema or atopic dermatitis was found.

The biological mechanisms linking mode of delivery to long-term asthma or allergy are not currently known; one hypothesis is that delivery method influences immune system development, either by the direct effect of labour on immune regulatory cells or through the exposure to vaginal microbes. Associations between mode of delivery and asthma or allergy may also be confounded by chest or breastfeeding; in some of the studies included in the above meta-analyses, CS was also associated with decreased rates of initiation and duration of chest or breastfeeding. (44)

Multiple Caesarean Sections

While evidence regarding the outcome of multiple CS is limited, meta-analysis has identified a number of complications associated with multiple deliveries by CS:

- Hemorrhage/transfusion: overall rates of hemorrhage and transfusion with multiple CS were less than 5%, but risk appears to increase with the number of CS. (13)

- Adhesions: incidence of adhesions increased with the number of CS. This could increase the risk of a more difficult repeat CS, postoperative complications, or complications with future gynaecological surgeries. (45,46)

- Surgical injury: bladder, bowel, and ureter injury are rare outcomes that appear to increase with multiple CS. (13)

- Abnormal placentation: incidence of placental abruption and placenta previa and concomitant risk of morbidity for parent and fetus increases with number of prior CS. (45)

- Hysterectomy: likelihood of hysterectomy increases with number of prior CS (see Table 4). (13)

TABLE 4: LIKELIHOOD OF HYSTERECTOMY BASED ON NUMBER OF PRIOR CAESAREAN SECTIONS (13)

Number of prior CS	Range of odds ratios in studies included in meta-analysis
1	0.7 to 2.14
≥ 1	1.4 to 7.9
≥ 2	3.8 to 18.6

Research suggests the risk of placenta accreta increases with each CS (see Table 5). (47) In one large observational study, incidence of placenta accreta was 0.24% in participants having their first CS, and 2.13%, 2.33%, and 6.74% for fourth, fifth, and sixth or more CS, respectively. (48) The morbidity attributable to placenta accreta is substantial: antepartum hemorrhage and associated preterm birth; postpartum hemorrhage and associated complications, including disseminated intravascular coagulation, shock, and death. Placenta accreta is the most common indication for CS-associated hysterectomy in one large, US-based prospective study. (49)

TABLE 5: LIKELIHOOD OF PLACENTA ACCRETA BASED ON NUMBER OF PRIOR CAESAREAN SECTIONS (47)

Number of prior CS	Odds ratio (95% CI)
1	-
2	1.3 (0.7-2.3)
3	2.4 (1.3-4.3)
4	9.0 (4.8-16.7)
5	9.8 (3.8-25.5)
≥ 6	29.8 (11.3-78.7)

In individuals with previous CS, the likelihood of placenta accreta is particularly high when placenta previa is present (see Table 6), though the linear relationship between risk of placenta accreta and number of CS persists regardless. (47) The association between placenta

previa and placenta accreta is attributed to the poorer decidualization of the lower segment of the uterus. (50)

Decision models have been used to create probability estimates of the downstream consequences of either VBAC or ERCS. When individuals were planning at least two subsequent pregnancies, the cumulative risk of hysterectomy was lower with a strategy of VBAC (907/100 000) than ERCS (1465 /100 000). If other outcome variables were included, such as transfusion and endometritis, the model is even more supportive of VBAC. (51)

Clients who are planning to have more than one child after a prior CS may especially benefit from choosing VBAC over ERCS. Risk of maternal increases with number of prior CS, especially for individuals with more than three prior CS, while there are few risks associated with cumulative VBACs. (52) The long-term reproductive choices of clients should be incorporated

TABLE 6: INCIDENCE OF PLACENTA ACCRETA WITH PLACENTA PREVIA (47)

Number of prior CS	%
1	3.3
2	11
3	40
4	61
5	67
≥ 6	67

into counselling on the risks and benefits of VBAC vs ERCS and the conversation should include a discussion of risks of major morbidity associated with caesareans in future pregnancies. (51,53) Due to the increased risks associated with multiple CS, VBAC should be recommended to clients with history of LSCS who are planning to have 2 or more additional children.

RECOMMENDATIONS

Recommendations 1-3 presuppose an absence of contraindications to vaginal birth/VBAC (see list of contraindications on page 4).

1. The risks and benefits of VBAC compared with ERCS should be discussed with clients who have a history of CS. This discussion, including the client's decision, should be appropriately documented in the client's chart. II-2B

2. Recommend planned VBAC as a means to achieve the benefits of normal childbirth, while being sensitive to each client's concerns and values and respecting her informed decision. III-C

3. Recommend planned VBAC for clients intending to have more than one child after the previous CS. Increased maternal and perinatal morbidity associated with ERCS and multiple CS has long-term health implications. II-2B

SUMMARY STATEMENT: BENEFITS AND COMPLICATIONS OF VBAC & ERCS

VBAC
The best available evidence suggests VBAC is a safe choice for the majority of clients with a prior CS. II-2B

VBAC provides the opportunity for clients to experience person and family-centred maternity care, promotes normal physiologic labour and birth, and minimizes unnecessary interventions. III-C

Short-term neonatal benefits include: early skin-to-skin contact, early initiation of chest or breastfeeding, and shorter hospital stays. Long-term benefits include an increase in exclusive chest or breastfeeding at 3 and 6 months. II-2C

Benefits include a lower risk of hysterectomy, transfusion and endometritis. II-2B

VBAC is associated with a higher risk of uterine rupture than ERCS, although the most up-to-date estimates suggest the absolute risk remains below 0.5%. While rupture of the uterus can be a catastrophic event requiring emergency medical and surgical intervention, it infrequently results in long-term damage to parent or infant. No models have been able to accurately predict who is more likely to experience uterine rupture. II-2B

Neonatal and perinatal complications associated with VBAC may include an increased risk of perinatal mortality, with an absolute risk of 1.3/1000 for VBAC compared to 0.5/1000 for ERCS according to a recent meta-analysis; other studies have found no significant difference. The absolute risk for fetal or neonatal mortality is estimated to be very small for individuals who have had a previous CS, whether or not they plan VBAC for their subsequent pregnancy or have ERCS. II-2B

ERCS
Compared to VBAC, ERCS is associated with a lower risk of uterine rupture and decreased rates of neonatal mortality. II-2B

ERCS is associated with the same increased risks of maternal morbidity as CS in general. It is also associated with an increased risk of minor neonatal respiratory morbidity. II-2B

Individuals who deliver exclusively by CS are less likely to experience urinary incontinence and pelvic organ prolapse than those who have had both vaginal and caesarean deliveries. II-2B

Multiple CS increases the risk of hemorrhage, adhesions, surgical injury, hysterectomy, infection, placenta previa, and placenta accreta. Increased maternal morbidity associated with ERCS and multiple CS have long-term health implications, especially for individuals who plan to have more than one child after the current CS. II-2B

CAN VBAC OUTCOMES BE PREDICTED?

The overall likelihood that an attempted VBAC will occur as planned is 60% to 80%. (13,54). Among clients receiving care from Ontario midwives in 2006-08, 71% of individuals with a history of CS who opted for VBAC ultimately delivered vaginally. (11) Many attempts have been made to accurately categorize individuals based on the likelihood that a planned vaginal birth will occur, using algorithms or scoring systems that assess predictive factors. (55) However, there is no compelling evidence that any one algorithm is valid in a wide range of settings or populations.

It is similarly difficult to predict who will experience rare adverse outcomes associated with VBAC and ERCS. With the exception of previous obstetrical history, the presence or absence of factors detectable at the time of or prior to labour have not proven useful in identifying the relatively small proportion who will experience a uterine rupture during VBAC at term. (21) Given the low absolute risk of complication, including uterine rupture, and the low relative risks associated with each predictive factor, it is unlikely midwives will be able to accurately predict which clients face a greater likelihood of adverse outcomes.

The low risk of complication must also be considered when interpreting the available evidence on the prediction of adverse outcomes, as much of the research discussed below uses odd ratios to express effect size, with estimates of absolute risk available in only a handful of cases. Both relative risks and odd ratios are used to indicate how many times higher or lower the risk of an outcome is in one group (e.g. individuals planning VBAC) compared to another group (individuals planning ERCS).

Though odds ratios tend to approximate true relative risks when outcomes are rare (i.e. they occur in < 10% of cases), their utility in clinical practice may nevertheless be limited. (56) In many instances where mode of delivery may be associated with an increase in likelihood of certain events, absolute risk of harm remains low. In the large meta-analysis by Guise and colleagues, the absolute risk of uterine rupture among participants choosing VBAC was 4.7/1000 (95% CI 2.8- 7.7/1000) and 0.26/1000 (95% CI 0.09-0.82/1000) among those choosing ERCS. The relative risk of uterine rupture in the Guise meta-analysis (20.74, 95% CI 9.77-44.02) suggests that choosing VBAC is associated with a risk of uterine rupture 20 times higher than the risk of uterine rupture experienced by those who choose ERCS; nevertheless, absolute risk of uterine rupture is < 0.5% regardless of mode of delivery. (13) Using a relative measure of comparison (such as a relative risk or an odds ratio) without also discussing absolute risk in informed choice discussions may hinder understanding of the magnitude of the complication being discussed.

Known Predictive Factors
There is strong evidence to suggest the following factors are associated with likelihood of VBAC and/or complications.

TABLE 7: PREDICTIVE FACTORS

KNOWN PREDICTORS: There is strong evidence to suggest the following factors are associated with likelihood of VBAC and/or uterine rupture.

Predictive factor	Likelihood of vaginal birth	Likelihood of uterine rupture	Source(s)
Prior vaginal birth	Higher	Lower	(13,21,24,52,57-62)
Delivery interval < 24 months	Not known	Higher	(13,62)

POSSIBLE PREDICTORS: There is some evidence to suggest the following factors are associated with likelihood of VBAC and/or uterine rupture. There is insufficient evidence to make definitive conclusions with respect to the role of these factors.

Predictive factor	Likelihood of vaginal birth	Likelihood of uterine rupture	Source(s)
Induction of labour	May be lower	May be higher	(13,23,24,63,64)
Augmentation of Labour	May be lower	May be higher	(13,23,24)
BMI ≥ 25-30	May be lower	No difference noted	(13,65-67)
Age ≥ 35	May be lower	Conflicting evidence, may be slightly higher	(13,68)

FACTORS OF UNKNOWN SIGNIFICANCE: It is not currently known whether or not the presence of these factors influence the likelihood of either VBAC or complications.

	Source(s)
Thickness of lower uterine segment	(69,70)
CS closure technique	(13,71,72)
Multiple CS	(61,73-75)
Unknown uterine scar	(23,76)
Twin gestation	(77,78)
Pregnancy beyond 40+0 weeks' gestation	(57,79,80)
Macrosomia	(13,81,82)

PRIOR VAGINAL BIRTH

Likelihood of Vaginal Birth: Higher

Having had a prior vaginal birth is a consistent positive predictor of VBAC success in the current pregnancy, especially if past VBAC has occurred. In one study, rate of VBAC among participants with no prior vaginal delivery was 65%, 83% for those who had a vaginal delivery before their past CS, and 94% if past VBAC. (81) In the meta-analysis performed by Guise et al idividuals with prior VBAC were three to seven times more likely to have a VBAC for their current delivery, compared to those choosing VBAC who had not had a prior vaginal delivery. (13) If labour is induced, limited evidence suggests a higher likelihood of VBAC among individuals who have had at least one prior vaginal delivery (OR 6.8, 95% CI 3.04-13.9). (13)

Likelihood of Uterine Rupture: Lower

A history of prior vaginal birth either before or following a previous caesarean has also been associated with a decreased rate of morbidity associated with VBAC. (57-59) Overall, studies have found adjusted ORs ranging from 0.26-0.62 for uterine rupture during VBAC among participants with prior CS and prior vaginal deliveries, compared with participants with prior CS and no prior vaginal deliveries. (21,24,60-62) Prior VBAC is also associated with a decreased risk of uterine rupture. (52)

INTERDELIVERY INTERVAL LESS THAN 24 MONTHS

Likelihood of Uterine Rupture: Higher

In the largest meta-analysis available, a delivery interval of less than 24 months increased the risk of uterine

rupture, with ORs ranging from 2.05 to 2.65 noted by Guise and colleagues. (13) A Canadian cohort study with 1527 participants found an adjusted OR for uterine rupture in participants with an interdelivery interval of ≤ 24 months of 2.65 (95% CI 1.08-6.46). Uterine rupture occurred at a rate of 4.8% among participants with an interdelivery interval of ≤ 12 months, 2.7% with an interval of 13-24 months, 0.9% with an interval of 25-36 months, and 0.9% with an interval of > 36 months (p = .04). Individuals with a prior vaginal delivery were excluded from the study. (62)

Possible Predictors

While there is some evidence to suggest the following factors are associated with likelihood of VBAC and/or complications, there is insufficient evidence to make definitive conclusions with respect to the role of these factors.

INDUCTION OF LABOUR

Research on the effects of induction of labour on VBAC is conflicting. Studies conducted in the 1980s found no difference in likelihood of CS or uterine rupture when participants with previous CS who were induced were compared to participants with previous CS who began labour spontaneously. (83-85) Later research suggested lower rates of VBAC among participants with previous CS undergoing induction, and a higher likelihood of uterine rupture. (23,86-88) Due to variations in timing and methods of induction, the overall risk of uterine rupture attributable to induction is difficult to assess. Researchers have also looked to study design to explain inconsistencies in outcomes, noting methodological differences that could impact the association between induction and likelihood of VBAC and/or uterine rupture, including whether participants were stratified by history of vaginal birth or cervical status at the time of induction. (63,89)

Likelihood of Vaginal Birth: May Be Lower

Meta-analysis by Guise et al of 27 fair quality studies estimated a pooled VBAC rate of 63% (95% CI 58-67%) after induction of labour by any mechanical or pharmacological method, ranging from 54% with Foley catheter to 62% with oxytocin induction and 63% with prostaglandin induction (with or without oxytocin augmentation). (13)

A recent prospective study comparing outcomes among 11 778 participants with one prior CS who experienced either induction of labour or spontaneous labour found an association among obstetric history, cervical status and likelihood of vaginal birth. Participants with no prior vaginal delivery who were induced (with oxytocin, or by artificial rupture of membranes) had a VBAC rate of 51% vs. 64.7% for those with spontaneous labours. For participants who had a prior vaginal delivery, the rates were 83.3% and 88.3% respectively (see Table 8). Participants with unfavourable cervices were less likely to experience VBAC than those entering spontaneous labour (adjusted OR 0.46 95% CI 0.39-0.53) and participants with favourable cervices who underwent induction had similar rates of VBAC as those in spontaneous labour (adjusted OR 1.19 95% CI 0.93-1.53). (63)

There is little available research assessing the effectiveness of Foley catheter use for labour induction. One study, conducted among individuals in Israel in their second pregnancies who had undergone CS in their first pregnancy, found no difference in likelihood of vaginal birth with use of transcervical Foley catheter and prostaglandin for cervical ripening. Participants undergoing cervical ripening by Foley catheter were more likely to undergo CS than those who entered labour spontaneously (49.1% vs. 35.2%, p < 0.01). (90) Another study compared VBAC rates for induction by Foley catheter compared to spontaneous labour, finding lower rates of

TABLE 8: VBAC OUTCOME BY INDUCTION STATUS (63)

Obstetric History	Likelihood of Vaginal Birth		Odds ratio (95% CI)	P-value
	Induced Labour*	Spontaneous Labour		
Prior vaginal delivery	83.3%	88.3%	0.66 (0.56-0.78)	< 0.001
No prior vaginal delivery	51.0%	64.7%	0.57 (0.51-0.63)	< 0.001

* Induction by artificial rupture of membranes, prostaglandin only, or oxytocin with or without prostaglandin

vaginal delivery in the Foley catheter group (51% compared to 65%). In this study, the researchers did not adequately control for baseline or confounding variables. (91)

Likelihood of Uterine Rupture: May Be Higher

Guise et al estimated pooled rates of uterine rupture of 1.1% for oxytocin, 2% for prostaglandins, and 6% for misoprostol. (13) The larger studies included in this meta-analysis are described in greater detail later. While the overall direction of this data suggests that risk of uterine rupture may be higher when oxytocin and/or prostaglandins are used to induce labour, the magnitude of this risk is difficult to quantify.

Among the 17 898 participants who attempted VBAC in the four year prospective cohort study conducted by Landon et al of the Maternal-Fetal Medicine Units Network, induction of labour was associated with a significantly greater risk of uterine rupture, regardless of induction method (Tables 9 and 10). Participants undergoing induction with prostaglandins, with or without oxytocin, experienced the highest likelihood of uterine rupture (OR 3.95, 95 % CI 2.01-7.79). (23) A prospective study of 11 778 participants with one prior CS found induction of labour by artificial rupture of membranes, prostaglandin only, or oxytocin with or without prostaglandin increased risk of uterine rupture only among those with no prior history of vaginal delivery (Table 9). (63) Macones et al noted a similar association in a large case-control study, with increased risk of uterine rupture observed when prostaglandin and oxytocin were used sequentially (adjusted OR 4.54, 95% CI 1.66-12.42), but not when prostaglandin or oxytocin alone were used for induction. (24) Guise et al suggest these findings may be evidence of a broader trend towards increased risk of uterine rupture in labours augmented with oxytocin following induction with prostaglandin. (13) A secondary analysis of the Macones study provides some evidence of an increased risk of uterine rupture with higher doses of oxytocin, and a dose-dependent response, with risk increasing with dose. (64)

TABLE 9: INDUCTION OF LABOUR (ANY METHOD) AND RISK OF UTERINE RUPTURE

Study design	Absolute Risk of Uterine Rupture		P-value	Source
	Induced Labour	Spontaneous Labour		
Meta-analysis of 7 studies N = 5276	15/1000	7/1000	Not known	(13)
Retrospective cohort study N = 20 095	9/1000	5/1000	0.052	(88)
Prospective cohort study N = 17 898	10/1000	4/1000	< 0.001	(23)
Prospective cohort study N = 11 778	11/1000	6/1000	0.015	(63)
Stratified by obstetric history				
No prior vaginal delivery	15/1000	8/1000	0.02	(63)
Prior vaginal delivery	6/1000	4/1000	0.42	(63)

TABLE 10: UTERINE RUPTURE AND INDUCTION STATUS (23)

Type of labour	Rate of uterine rupture (%)	Odds ratio	P-value
Spontaneous	0.4	1.00	n/a
Induced	1.0	2.86 (1.75 – 4.67)	< 0.001
Mechanical dilation, with or without oxytocin	0.9	2.48 (1.30 – 4.75)	0.004
With oxytocin alone	1.1	3.01 (1.66 – 5.46)	< 0.001
With prostaglandins, with or without oxytocin	1.4	3.95 (2.01 – 7.79)	< 0.001

The data collected in the observational studies described above reflect a reality of clinical practice: there are numerous potential combinations of method, dosage and timing of induction. Given that uterine rupture is a rare outcome, researchers have struggled to assess the risks attributable to specific factors. (89) It is especially difficult to make assertive conclusions about the risks of prostaglandin use, as few participants in the studies noted above were induced with prostaglandins alone. Further research is needed to quantify the relative risks of various means of induction with confidence and precision.

OTHER CONSIDERATIONS

Some clients choosing VBAC may be interested in alternatives to induction, such as sweeping of membranes. One small study of 213 participants found that sweeping membranes at term in participants planning VBAC did not shorten pregnancy duration, or affect induction or repeat CS rates. (92) However, other larger studies not specific to VBAC have found sweeping membranes to be effective in reducing the duration of pregnancy and reducing the need for induction among nulliparas (93) or participants with an unfavourable cervix. (94)

There is little evidence regarding the safety and effectiveness of commonly used herbs, homeopathics, acupuncture and castor oil for induction and/or augmentation of labour for individuals planning VBAC. This lack of evidence should be discussed with clients before considering their use.

AUGMENTATION OF LABOUR

Likelihood of Vaginal Birth: May Be Lower
Guise et al identified six studies reporting rates of VBAC with oxytocin used only for augmentation of labour, with a pooled rate of VBAC of 68% (95% CI 64% - 72%); the strength of this evidence is low. (13) Dystocia, which creates the need for augmentation, may be the causal factor influencing the likelihood of vaginal birth, rather than augmentation itself. It is possible that the augmentation may actually increase the likelihood of vaginal birth when dystocia is identified, though it would be difficult to clearly differentiate this relationship in research settings. Further discussion of labour progress may be found in intrapartum management considerations.

Likelihood of Uterine Rupture: Conflicting Evidence – No Difference or Higher

Guise et al 's meta-analysis did not find an increased risk of uterine rupture with oxytocin augmentation of spontaneous labour following prior CS. (13) Macones et al also found no significant association between augmentation of labour and uterine rupture, when groups whose labours were augmented were compared to groups who laboured spontaneously. (24) However, a large prospective study of risk factors for uterine rupture among 17 898 participants attempting VBAC found oxytocin augmentation of labour associated with a significantly greater risk of uterine rupture when participants whose labours were augmented were compared to those who labour spontaneously (OR 2.42, 95% CI 1.49-3.93). (23)

Dystocia may be the true causal factor influencing risk of uterine rupture in augmented labours, and the relationship between oxytocin augmentation and increased risk of uterine rupture may simply reflect the position of augmentation on the causal pathway. Among a subset of individuals who had undergone multiple previous CS, augmentation with oxytocin was associated with only a slight increase in uterine rupture, compared to those whose labours were not augmented (OR 1.46, 95% CI 1.02-2.10). (61)

BODY MASS INDEX ≥ 25-30

Likelihood of Vaginal Birth: May Be Lower
Research suggests that individuals who are considered overweight (body mass index [BMI] ≥ 25) or obese (BMI ≥ 30) may experience a lower likelihood of vaginal birth than those with BMI <25. Research studies have used different BMI levels to assess outcomes.

Individuals with BMI ≥ 30 are at a greater risk of undergoing CS as well as having an increased risk of complications from CS regardless of past obstetric history. (95) Research also suggests that pre-pregnancy BMI is an independent factor associated with likelihood of VBAC. In one study of 510 participants with a single CS, participants with pre-pregnancy BMI ≥ 30 were less likely to experience VBAC compared to those with a BMI of 20-25 (546/1000 vs 705/1000). Participants with BMI < 19.8 were most likely to experience a planned VBAC (850/1000). After controlling for other factors, including recurring indications for CS, increasing BMI was significantly associated with a lower rate of vaginal birth. (65) In a retrospective study of 6718 Germans

with one prior CS who chose to labour, participants with a BMI ≥ 25 were significantly less likely to have a planned VBAC than those with BMI < 25; the rate of VBAC success declined with increasing body mass (see Table 11). When the analysis was adjusted for age, birth weight, induction of labour, and pre-eclampsia, BMI ≥ 25 remained associated with a lower rate of VBAC. (66)

TABLE 11: LIKELIHOOD OF VBAC SUCCESS RELATIVE TO BMI (66)

BMI (kg/m2)	Odds Ratio
< 25	1
25-29.9	0.81
30-34.9	0.66
35-39.9	0.38
≥ 40	0.39

Similar findings were reported in a secondary analysis of data from a large prospective study: Likelihood of VBAC decreased with increasing BMI, with individuals with BMI ≥ 40 twice as likely to experience repeat CS than those with BMI ≤ 25 (39.3% vs. 15.2%). (67) Midwives should note that research on intervention rates for individuals with BMI ≥ 25 is potentially confounded by a "labelling effect". Researchers have noted a tendency to intervene sooner and more often in individuals with BMI ≥ 25, observing higher rates of use of oxytocin, epidural analgesia, forceps and vacuum extraction, and earlier decisions to perform CS persisting after adjusting for the higher prevalence of gestational diabetes, pre-eclampsia and macrosomia in this group. (96)

Likelihood of Uterine Rupture: No Difference Noted

A secondary analysis detected a non-statistically significant difference in risk of uterine rupture with BMI ≥ 40, compared to BMI of 18.5 - 24.9 (1.2% vs. 0.6%). (67) In the German study noted above, no association between BMI and uterine rupture was found. The rate of uterine rupture was low (0.1%) across the study population, which the authors attribute to a low rate of prostaglandin use for induction (< 1%) and CS closure techniques. (66)

Risks of other complication may be increased with BMI regardless of the intended route of delivery. BMI ≥ 25 is associated with increased risk of infection overall, with no difference between labour after a previous caesarean and ERCS. (13)

For more information on management of pregnancy in clients with a high BMI, see AOM Clinical Practice Guideline No. 12: The Management of Pregnant People with a High or Low Body Mass Index. (97)

AGE ≥ 35

Likelihood of Vaginal Birth: May Be Lower

Risk of CS is increased with advancing age regardless of past obstetric history. (98) Research assessing the relationship between age ≥ 35 years and the likelihood of a successful VBAC suggests a similar increased risk of repeat CS. A secondary analysis of a retrospective cohort study of 25 005 found that participants ≥ 35 years who planned a VBAC were slightly more likely to have a repeat CS (OR 1.14, 95% CI 1.03-1.25). Compared to those aged 21–34, partcipants aged 35–39 were 10% less likely and > 39 years were 18% less likely to deliver by planned VBAC (p = 0.08). (68)

Guise et al's systematic review found a less consistent association between age and likelihood of VBAC. In 5 of 8 studies included, participants under the age of 40 were more likely than those 40 and older to have a planned VBAC; in the remaining studies, there was no statistically significant relationship between age and likelihood of vaginal birth. (13) As with BMI, research assessing obstetric birth outcomes relative to age may be confounded by a "labelling effect". (99)

Likelihood of Uterine Rupture: Conflicting Evidence – May Be Higher

The secondary analysis of the retrospective cohort study described above noted a similar incidence of VBAC-related complications across age groups, with uterine rupture, bladder, ureter or bowel injury, and/or uterine artery laceration occurring in approximately 2-3% of participants choosing VBAC. After controlling for other factors related to these complications (prior vaginal delivery, augmentation or induction of labour, and gestational age at delivery), age ≥ 35 was associated with a slightly greater risk of VBAC-related complications (adjusted OR 1.39, 95% CI 1.02-1.89, p = .039). (68)

Factors of Unknown Significance

It is not currently known whether the presence of the following factors influences the likelihood of either VBAC or complications.

THICKNESS OF LOWER UTERINE SEGMENT

In general, individuals with a history of caesarean section have a thinner lower uterine segment (LUS) at term. Ultrasonographic measurement of the LUS is an emerging approach to predicting risk of uterine rupture during VBAC. Measurement techniques include either measuring the thinnest portion or the full thickness of the LUS. (69) Inter- and intra-observer accuracy of measurements have been shown to be reliable when technicians are well trained, though training specifications have yet to be developed. (70)

Measurement of the Thinnest Portion of the LUS

Studies have not yet identified a standard measurement at which the risk of uterine rupture is significantly increased. A Canadian study of 102 individuals with one or more previous CS suggested that participants between 36 and 38 weeks' gestation who have a LUS thickness of > 1 mm at the thinnest portion are at low risk of uterine rupture. This study assessed LUS thickness at the shortest distance between the urinary bladder wall-myometrium interface and the myometrium/chorioamniotic membrane-amniotic fluid interface. (69)

Measurement of the Full Thickness of the LUS

In comparison, other Canadian research measuring the full thickness of the LUS in 236 participants between 35 and 38 weeks' gestation suggested that a full LUS thickness of < 2.3 mm was associated with a significant increase in uterine rupture (9.1% vs. 0%; p < .02). In this study the LUS was examined longitudinally and transversely and measured at 3 different points, with the lowest value selected. (70)

The measurement of LUS thickness to determine increased risk of uterine rupture shows some promise as a screening tool. However, the research available at present has failed to identify a consistent association between LUS thickness and risk of rupture. Future research and standardization of technique may change this. This approach to predicting risk increases the use of technology and interventions during pregnancy, without substantiating data that this use of intervention will improve outcomes.

CS CLOSURE TECHNIQUE

Variation in surgical technique for caesarean section has been suggested as a factor influencing risk of uterine rupture. However, research comparing uterine rupture in individuals who had a prior CS with single-layer

closure of the uterus and those who had a prior CS with two-layer closure presents unclear findings. A recent Canadian case-control study found that prior single-layer closure was associated with an increased risk of uterine rupture compared to prior two-layer closure (OR 2.69, 95% CI 1.21-3.38), though birth weight and prior vaginal birth may have been confounding variables. (71)

Other studies have found no difference in risk of uterine rupture for single-layer vs. two-layer closure. (72) Guise et al's review of the available literature did not find compelling evidence to recommend against VBAC for individuals with single-layer closure, despite some evidence of increased risk. (13)

MULTIPLE CS

The available research provides inconclusive information on the likelihood of VBAC among individuals with more than one prior CS. One study found no association between VBAC success and number of prior CS (73), while another study suggested that participants with more than one prior CS experienced a rate of vaginal delivery decreased by as much as 8% (p < 0.001). (61) As noted previously, prior vaginal delivery consistently increases the rate of success regardless of the number of prior CS.

When compared to individuals with one previous CS, one large retrospective study found an increased rate of uterine rupture with two or more caesareans, corresponding to an incidence of 1.8% vs 0.9% (OR 2.30 CI 1.37-3.85). (73) However, the largest prospective study available found no significant difference in rates of uterine rupture based on number of prior CS, with rupture occurring in 0.9% of participants with multiple prior CS and 0.7% with a single prior CS (OR 1.36 95% CI 0.69-2.69). (61)

A systematic review of the literature on individuals with two prior CS found a uterine rupture rate of 1.59% and a VBAC success rate of 71.7% vs a uterine rupture rate of 0.72% and a VBAC success rate of 76.5% with only one prior CS. Maternal morbidity was not significantly different between individuals with two prior CS who underwent VBAC and ERCS. There was not enough data to draw conclusions on infant morbidity. (74)

There is very little research available on adverse outcomes associated with three or more prior CS. A 2010 study compared maternal morbidity with 3 or more prior CS

versus only one or two prior CS. Study participants who chose VBAC (89/860) experienced rates of vaginal delivery that were not significantly different from those with only one or two prior CS. There were no uterine ruptures. This study, although small, begins to address a significant research gap in knowledge of outcomes for those who have had three or more prior CS. (75)

UNKNOWN UTERINE SCAR

There is little information available on the impact of having an unknown uterine scar on adverse outcomes during VBAC. The evidence that is available does not suggest a significant increased risk of uterine rupture or decreased likelihood of VBAC. Two retrospective studies have found an approximately 0.5% rate of uterine rupture among individuals with an unknown scar, comparable to the risk experienced by those with a known incision. (23,76) It is important to note that consultation with a physician is required according to the College of Midwives of Ontario for any previous uterine surgery other than one documented LSCS. (100)

TWIN GESTATION

In a prospective study of 412 cases of twin gestation among participants with prior CS, 64.5% planning VBAC delivered both twins vaginally, and 16% delivered one twin vaginally, and one twin by CS. Prior vaginal birth was not associated with a greater likelihood of vaginal delivery among participants in the planned VBAC group. There was no increased risk of uterine rupture among participants with twin gestation who chose to labour, compared to those who chose ERCS, but the study did not have sufficient power to adequately examine uterine rupture as an outcome. The study found comparable rates of neonatal morbidity and mortality at ≥ 34 weeks gestation between VBAC and ERCS groups. (77)

In a large retrospective cohort study that included 535 twin pregnancies, similar rates of vaginal delivery (adjusted OR 1.1, 95% CI 0.8-1.6), uterine rupture (adjusted OR 1.2, 95% CI 0.3-4.6), and major maternal morbidity (adjusted OR 1.6, 95% CI 0.7-3.7) were found when twin pregnancy and singleton pregnancy groups were compared. This study did not collect data on neonatal outcomes. (78)

PREGNANCY BEYOND 40+0 WEEKS GESTATION

A retrospective cohort study (N = 11 587) compared outcomes among individuals with at least one prior CS who laboured at any time before their estimated date of birth (EDB) to those who laboured past 40+0 weeks' gestation. Approximately 78% who laboured prior to their EDB had a vaginal birth, compared to 70% who laboured past their EDB, corresponding to an OR of 1.36 (95% CI 1.24-1.50) after adjustment for confounders, including induction and/or augmentation of labour. There were no significant differences in uterine rupture or overall maternal morbidity between the two groups. (79)

Another study demonstrated that individuals with a prior CS who laboured after 41+0 weeks had a vaginal delivery rate of 65% compared to 75% for those with a prior CS who laboured prior to 41+0 weeks' gestation. (57) In an earlier small study of pregnancies beyond 40+0 weeks' gestation, prior vaginal birth and higher parity were positive predictors of vaginal birth. (80) The relationship between VBAC outcomes and gestational age may be influenced by the presence of other factors independently associated with decreased likelihood of VBAC, such as macrosomia (see below). To help put research into context, it is necessary to take individual client's circumstances into consideration when discussing implications of gestational age and VBAC outcomes.

MACROSOMIA

Macrosomia is associated with a higher likelihood of primary CS irrespective of obstetric history. (101) Research also shows a decreased likelihood of VBAC in babies weighing ≥ 4000g; babies weighing ≥ 4500 grams are even less likely to be delivered via VBAC compared with infants weighing 4000-4499g. (13) Though macrosomia is associated with lower likelihood of VBAC, it is very difficult to predict which babies will be more than 4000g before they are born, as neither ultrasound nor physical exam can accurately predict macrosomia. (102) As with BMI and age, research assessing obstetric birth outcomes relative to birth weight may be confounded by a "labelling effect". (16)

In one study of 9960 individuals with a singleton gestation and a history of one previous CS, birth weight was significantly associated with likelihood of vaginal birth only in participants with no prior vaginal deliveries. VBAC occurred as planned in 68% of deliveries with birth weights of < 4000g, and 52%, 45%, and 38% of deliveries with birth weights of 4000-4249g, 4250-4500g, and > 4500g respectively. Among participants who had a history of both vaginal

delivery and CS, likelihood that VBAC would occur as planned was not influenced by birth weight, nor was risk of uterine rupture associated with birth weight. In comparison, participants with no previous vaginal deliveries and birth weights of ≥ 4000g were significantly more likely to experience uterine rupture than those with no previous vaginal deliveries and birth weights of < 4000g (RR 2.3, P = .001). (81)

A retrospective study (N=2586) assessed the association between neonatal birth weight and adverse obstetric outcomes in individuals planning VBAC. Participants were categorized according to the birth weight of their infants (< 3500g, 3500-3999g, and ≥ 4000g) and prior vaginal delivery. Birth weight was directly correlated to the rate of unplanned ERCS (19%, 28%, and 38% respectively; p < .01) and uterine rupture (0.9%, 1.8%, and 2.6%; p < .05). After adjustment for confounding variables, birth weight of ≥ 4000g remained associated with uterine rupture (OR 2.62, 95% CI 1.001-6.85), unplanned ERCS (OR 2.47, 95% CI 1.82-3.34), and third- and fourth-degree perineal laceration (OR 2.64, 95% CI 1.66-4.19) in participants who birthed vaginally. (82)

SUMMARY STATEMENT: PREDICTIVE FACTORS

Prior vaginal birth
Prior vaginal birth including prior VBAC reduces risk of morbidity and increases the likelihood that VBAC will occur as planned in the current pregnancy. II-2B

Delivery interval < 24 months
Individuals with a delivery interval of < 24 months experience an increased risk (ORs 2.05-2.65) of uterine rupture during VBAC labour. As the absolute risk remains low, shorter interdelivery intervals should not be a reason to recommend against VBAC. II-2B

Induction of labour
There is a small decreased likelihood of VBAC (54%-69% compared with 73.4%) and increased risk of uterine rupture with induction of labour (15/1000 vs 8/1000 in one meta-analysis). The absolute risk of uterine rupture is unclear due to conflicting research and variation in induction protocols used. As there is insufficient evidence to quantify the absolute risk of uterine rupture, decisions about whether or not to induce labour must be made on a case-by-case basis and will depend on the preference of the client and the comfort and experience of the consultant physician. II-2C

No recommendation on the use of alternatives to medical labour induction such as herbs, homeopathics, acupuncture or castor oil in individuals with a prior CS can be made due to the absence of good quality research and lack of evidence regarding efficacy and safety. II-3C

Augmentation of labour
Limited evidence suggests a lower likelihood of vaginal birth with oxytocin augmentation of labour. However, the lower likelihood of vaginal birth may be due to the indication for the augmentation, rather than augmentation itself. In clinical circumstances in which augmentation is warranted, it is possible that augmentation may actually increase the likelihood of vaginal birth, but this distinction is not made in the research on VBAC outcomes to date. The absolute risk of uterine rupture when labour is augmented is unclear due to conflicting research and variation in augmentation protocols used (high dose, low dose). As there is insufficient evidence to quantify the absolute risk of uterine rupture, decisions about whether or not to augment labour must be made on a case-by-case basis and will depend on the preference of the client and the comfort and experience of the consultant physician. II-2C

BMI ≥ 25-30
Individuals with pre-pregnancy BMI ≥ 25 - 30 are at greater risk of undergoing primary CS and repeat CS, with risk increasing with BMI class. No consistent associations between BMI and uterine rupture have been found. Risks of other complications (such as infection) may be increased with BMI, independent of the intended route of delivery. II-2C

Age ≥ 35

Age ≥ 35 years is associated with increased rates of CS and has been associated with a slightly greater risk of VBAC-related maternal complications and increased rates of uterine rupture. II-2C

LUS thickness

Assessment of LUS thickness by ultrasound has not been shown to consistently predict whether or not uterine rupture will occur during planned VBAC. There is currently insufficient evidence to recommend the use of LUS measurement as a screening tool. II-2C

CS closure technique

Evidence is conflicting on whether a single-layer closure for prior caesarean section increases risk of uterine rupture during VBAC. Having a history of single layer closure alone is not sufficient reason to recommend against labouring after a prior caesarean. II-2C

Multiple CS

The most recent evidence suggests that clients with multiple CS should not be discouraged from planned VBAC because of this factor alone. II-2B For clients requesting VBAC with more than one previous CS, midwives are advised to counsel clients that some studies show increased rates of morbidity and uterine rupture, though study results are conflicting. III-C

Unknown uterine scar

There is limited evidence on the significance of unknown uterine scar from previous CS. Available evidence does not show an increased risk of uterine rupture during VBAC for individuals with an unknown scar. II-2C NOTE: the CMO's Consultation and Transfer of Care Standard requires a consult for "any CS other than one documented previous LSCS." (100)

Twin gestation

Individuals with twin gestation and a history of prior CS experience similar rates of maternal morbidity with VBAC and ERCS, and only slightly decreased rates of vaginal delivery, compared to those with a singleton pregnancy and prior CS. II-2C

Pregnancy beyond 40+0 weeks' gestation

Limited research suggests a higher likelihood of vaginal delivery for individuals planning VBAC who laboured prior to 40+0 weeks' gestation, compared to those who laboured after their EDB, independent of induction status. Limited evidence suggests no significant differences in uterine rupture or overall maternal morbidity by mode of delivery. The absolute decrease in likelihood of vaginal birth after 40+0 weeks' gestation is not sufficient reason to recommend against planned VBAC after 40+0 weeks. There is no evidence to suggest benefit from inducing clients so that they deliver before 40+0 weeks' gestation, nor reason to induce labour if spontaneous labour has not occurred by 40+0 weeks' gestation. II-2C

Macrosomia

Because it is difficult to predict future birth weight using ultrasound or physical examination, suspicion of macrosomia is not sufficient reason to rule out VBAC. Clients may be informed of the limitations of predicting fetal size, as well as findings of research assessing VBAC success and rates of uterine rupture for infants who are macrosomic. While evidence is limited due to retrospective study design and small sample sizes, studies note decreasing rates of VBAC success and increasing rates of uterine rupture with increasing fetal weight at and above 4000g. Suspected macrosomia is not a contraindication to planning VBAC. III-C

4. Midwives should discuss the relevant factors which may influence the likelihood of success or risk of VBAC with their clients. Inform clients that such factors are not contraindications to VBAC but may be considerations in their care during labour. III-C

5. In developing the plan for care of a client planning a VBAC, request and review a copy of the operative record from the previous caesarean section(s). Inability to obtain the previous record should be documented in the client's chart. III-C

6. For clients planning VBAC, induction of labour should be avoided unless the benefits outweigh the risks. When necessary, midwives should consult obstetrics and review the risks and benefits of methods of induction with the client and the consultant. As with any clinical situation in which midwives manage care, a clear plan for ongoing communication with the consultant about progress in labour and maternal and fetal well being is recommended when midwives are primary care providers for induction of VBAC labour. III-C.

7. When augmentation or induction of labour is required during a VBAC labour and the midwife is the primary care provider, the midwife should take into account how quickly the obstetrical and paediatric team will be available in the event that emergency assistance is required. This may include ongoing communication with the team about progress in labour and maternal and fetal well being. III-C

MANAGEMENT OF LABOUR FOR CLIENTS PLANNING VBAC

The care of a client with a history of one previous LSCS falls within the midwife's scope of practice; one previous CS is itself not an indication for consultation or transfer of care to a physician in either the antenatal or intrapartum periods. In the absence of complications, the midwife would be expected to remain the primary caregiver for clients with a history of one previous LSCS for the duration of pregnancy and first 6 weeks postpartum.

Antenatal Considerations

The midwife will typically discuss the intrapartum management of VBAC labour in light of a client's specific clinical circumstances. This information, along with the client's values and risk tolerance, will factor into decision-making surrounding labour and birth. While the highest quality and most current research supports VBAC as a safe choice for the majority of individuals with a prior LSCS, hospital and community standards may not be reflective of evidence-based practice. Nevertheless, community standards regarding VBAC, hospital and practice group protocols, as well as relevant midwifery

and obstetrical clinical guidelines should be addressed in discussion with a client planning VBAC in the antenatal period, as these considerations may influence the course of care. Informed choice discussions should include: fetal monitoring practices; pain management options; use of intravenous access; and choice of birth place.

Written Information for Clients

There is some evidence to suggest that decision aids and other written and electronic forms of client-directed information may be helpful for decisions regarding mode of birth following a previous CS. (103,104) A Cochrane review of decision aids directed at people facing health care decisions suggests that they increase relevant knowledge and improve the accuracy of perceptions of benefits and harms associated with treatment or screening options. (105) Written information should be used in conjunction with dynamic informed choice discussions with clients.

Intrapartum Monitoring

Systematic review suggests that the signs and symptoms of impending uterine rupture are inconsistent and prone to bias. The only consistent finding is an association

between fetal bradycardia and poor perinatal outcomes, which would suggest that prompt delivery in this scenario is warranted. (13,106)

Fetal bradycardia is also the most reliable sign of uterine rupture once it has occurred. A case-control study compared fetal heart rate characteristics of births with uterine rupture during VBAC (N = 36) compared with rupture-free VBACs (N = 100). The only findings that differentiated cases of uterine rupture from successful VBACs were increased rates of fetal bradycardia identified by electronic fetal monitoring (EFM) in the first stage (p < .01) and second stage of labour (p < .01). No significant differences were found in rates of mild or severe variable decelerations, late decelerations, prolonged decelerations, fetal tachycardia, or loss of uterine tone. (107)

Other classical signs of uterine rupture include maternal hypotension or tachycardia, hematuria and excessive vaginal bleeding. Other possible signs may be maternal restlessness or loss of fetal station. (108) Pain over the previous uterine incision has been found to be an unreliable sign, since abdominal pain is hard to evaluate during active labour. However, an individual may experience abnormal pain, a sudden change in pain, or an abnormal level of concern. Although these last symptoms may be difficult to objectively evaluate, the midwife should be alert to the client's verbal and non-verbal cues. There is a need for more research on the client experience of uterine rupture during midwifery care.

There is, as yet, incomplete evidence regarding the comparative risks and benefits of fetal monitoring methods. Nevertheless, routine continuous electronic fetal monitoring (EFM) for individuals planning VBAC has become standard in many communities, and is recommended by the SOGC. (7) The ability of routine EFM to predict uterine rupture in parturients with a previous CS has not been definitively established. Furthermore, the benefit of EFM in the prevention of poor long-term outcomes in normal pregnancies and births is not clear. (109) EFM is also associated with a higher rate of caesarean section, which may be an important consideration for clients attempting a VBAC. (110)

As the majority of research on the safety and outcomes of VBAC has been conducted using EFM, there is little evidence on the relative and absolute risks of severe adverse events in its absence. (111) In particular, there is scarce research on the safety and outcomes of VBAC using intermittent auscultation (IA). There is also no high quality evidence to identify the optimal frequency of IA during labour. The preponderance of EFM in clinical research may contribute to perceptions that EFM is a "safer" option despite little evidence of its effectiveness in preventing adverse outcomes.

Few studies have directly compared IA to EFM in VBAC labours. In one small trial from India, 100 participants with one prior CS and no contraindication to vaginal birth were randomized into two groups, one with IA (standard practice) and one with EFM during labour. The IA group had a vaginal delivery rate of 70% vs. 64% for EFM, and there were more CS performed for non-reassuring fetal heart rate in the EFM group (47% vs. 18% respectively), however, these differences were not significant statistically due to small sample size. There were no significant differences in maternal or neonatal outcomes between the two groups. The study was also too small to determine effect on rare outcomes such as severe neonatal morbidity. (112)

In the absence of clear evidence, the American College of Nurse-Midwives suggests the following IA protocol: every 15-30 minutes during the active phase; every 15 minutes during the second stage prior to expulsive efforts; and every 5 minutes after initiation of pushing may be reasonable. (111) Using IA to monitor VBAC labour may cause some delay in diagnosis of uterine rupture compared with EFM in the event that uterine rupture occurs in the absence of other signs and symptoms. It is possible that a delay of up to 15 minutes may be experienced if the uterine rupture occurs directly after the midwife has monitored the fetal heart and no other signs or symptoms of uterine rupture are present.

If labour is prolonged, if any fetal heart rate abnormalities are heard, or if there are any other signs or symptoms associated with uterine rupture, the AOM recommends the use of continuous EFM. The one-to-one nature of IA care-giving, and offering clients informed choice on type of fetal monitoring may improve satisfaction with labour and birth. (113)

8. Fetal heart monitoring may occur by:

    •   intermittent auscultation q 15 minutes in active labour and q 5 minutes in the second stage; or
    •   using continuous EFM per current protocols
        The relative and absolute risks of severe adverse events in the absence of continuous electronic fetal monitoring are unknown. III-C

9. Continuous EFM should be used if labour is prolonged or if any fetal heart rate abnormalities are noted with intermittent auscultation. II-2A

Labour Progress

Research suggests that dystocia may be a factor that increases risk of uterine rupture, but the quality of the research on this topic is low. A very small study of individuals who experienced uterine rupture (N = 42) found an OR of 13.7 (95% CI 6.4-29.3) for dystocia during the second stage of labour. (114) It is important for midwives attending a VBAC labour to diagnose the onset of active labour accurately and to be vigilant for prolonged labour. While a standard labour graph or partogram may be helpful in identifying dystocia, new evidence suggests that partograms currently in use have limited applicability among certain ethnic groups and nulliparous parturients. (115)

If progress in active labour is deemed to be abnormally slow, consultation should be initiated. If dystocia is identified, obstetric consultation should be requested and continuous fetal monitoring, intravenous access and ensuring appropriate blood work needed in preparation for CS or epidural should be initiated if not already in place while awaiting consultation.

SIGNS AND SYMPTOMS OF UTERINE RUPTURE

•   Fetal bradycardia in the first and second stage. II-2A

•   Maternal hypotension or tachycardia, haematuria and excessive vaginal bleeding. II-2B

•   Maternal restlessness or loss of fetal station. III-C

RECOMMENDATIONS

10. For clients with a prior history of CS it is important for midwives to diagnose and document the onset of active labour accurately and to be vigilant for prolonged labour. II-2A

11. For clients with a prior history of CS in whom prolonged labour has been identified, obstetric consultation should be requested and IV access and continuous EFM monitoring should be initiated, if not already in place, while awaiting obstetric consultation. III-A

Pain Management Options

There is no evidence to demonstrate that clients having a VBAC should be restricted in their choice of analgesia or anaesthesia for pain relief. The effect of epidural use on the likelihood of VBAC is not certain. Some evidence suggests that epidurals may reduce the likelihood of VBAC (55, 116) but one large study showed an increased likelihood of VBAC among participants who received epidurals compared to similar participants who did not. (57) While epidural may streamline preparation for surgery, should it be required, this potential benefit should be balanced with the associated risks of epidural, which include lower plasma levels of oxytocin post-epidural insertion (117) and the increased use of oxytocin augmentation with epidural. (118) As with all medical forms of pain relief, the risks and benefits of epidural analgesia should be discussed with the client in assisting her to make an informed decision.

One recent case-control study sought to estimate the association between epidural dosing and the risk of uterine rupture with attempted VBAC. The dose timing, frequency, and quantity were compared. Among 804 partcipants, 504 (62.7%) had epidural anaesthesia. A dose-response relationship was identified between the number of epidural doses and uterine rupture risk. After controlling for overall length of labour, four or more doses of epidural in the last 90 minutes of labour corresponded to an 8-fold increase in risk of rupture. (95% CI, 5.4-18.2). (119)

Choice of Birth Place: Considerations for Clients Choosing VBAC

Overall, there is limited evidence on safety and outcomes of planned out-of-hospital VBAC. The literature search for this guideline identified published data on 2293 individuals who began a VBAC labour intending to birth at home or in a birth centre. All studies included participants with prior vaginal births or prior VBAC. The only study with sufficient power to determine the incidence of uterine rupture was a prospective study of births in free-standing birth centres in the United States from 1990-2000. (120) In this study, 87% of participants who entered labour planning to give birth at one of the 41 birth centres delivered vaginally; the transfer rate before birth was 24%. Of the 6 uterine ruptures which occurred (a rate of uterine rupture of 0.4%), two resulted in fetal/neonatal death, equivalent to a perinatal mortality rate of 5/1000. When participants with multiple prior CS and gestational age ≥ 42 weeks were excluded (10% of total births), perinatal mortality was 2/1000. Overall adverse outcomes were 1.4%. (120)

In a retrospective study of Germans who began labour intending to deliver at a birth centre, 22% ultimately delivered by CS. No uterine ruptures or neonatal deaths were noted. Compared to participants who had a history of a single vaginal birth, VBAC candidates were more likely to be transferred to hospital and/or undergo CS. (121)

A secondary analysis of a prospective study examined VBAC home births attended by nurse-midwives in 29 practice groups in the USA in 1994-95. Of this group, 73% of practices accepted individuals with a prior CS, in many cases requiring a previous vaginal birth as well. A total of 57 participants planning a VBAC started labour with the intention of giving birth at home. More than half (56%) had a history of successful VBAC. Ultimately, 50 (87.7%) gave birth at home and 54 (94.8%) had a vaginal birth. Three (5.3%) had a repeat CS. There were no uterine ruptures, but there was one stillbirth, attributed to postdates with meconium. The very small and highly selective sample in this study make the results less externally valid, particularly for a rare event such as uterine rupture. (122)

In a study of all planned home births in BC from 2000-

2004, 88 of 2889 participants included were planning a VBAC. However, the comparison group of hospital births did not include individuals who had previous CS, limiting the researchers' ability to compare VBAC outcomes based on place of birth. In a subgroup analysis, researchers restricted the home birth group to individuals who had not had previous CS. Removing the 88 participants planning home VBAC from the analysis did not significantly change the relative risks of interventions or outcomes associated with home birth. No uterine ruptures were reported in the home birth group. (123)

A retrospective cohort study of Ontario midwifery clients from 2003-2008 showed that 3262/47 923 births (6.8%) occurred in individuals with a prior CS. While 25.3% of participants in this study planned a home birth, only 10% with a prior CS planned to give birth at home. The overall transfer rate during labour was higher among clients with prior CS (36.5%), compared to 24.6% for clients with no history of CS (RR=0.84, 95% CI 0.78-0.91). During the five years of the study, this rate of planned home birth by VBAC candidates decreased from 11.8% to 8.7%. (11) VBAC candidates who planned a home birth were more likely to deliver vaginally, regardless of where the birth ultimately took place. For clients planning a home birth at the onset of labour, the rate of vaginal birth was 81.2%, higher than the overall VBAC rate of 71.2% in this study population. The proportion of clients with previous vaginal births was higher in the home birth group than the VBAC group as a whole (60% vs. 45%), which may have accounted for some of the difference. Clients may also have been more likely to plan home birth in the absence of risk factors associated with decreased likelihood of VBAC success. Incidence of uterine rupture cannot be accurately calculated from this data set. There were no stillbirths or neonatal deaths associated with uterine rupture, and the neonatal morbidity/mortality composite measure did not differ between clients with a history of CS and those without. Further research is needed to directly compare outcomes among midwifery clients choosing home birth and hospital birth for VBAC. (11)

A 2003 survey of Ontario midwifery practices found that 65% of respondents reported that they attended

VBACs at home, though only 54% of practices offered this option to clients at the time. The most common reasons for not attending VBAC births at home were lack of obstetrical support (86%) and hospital policies (64%). Distance from hospital and increased risk were explanations cited less frequently. (124)

SUMMARY STATEMENT: CHOICE OF BIRTHPLACE

There is little high-quality research available on VBAC and home or out-of-hospital birth. Larger studies are needed to report on rates of VBAC at home compared to VBAC in hospital as well as outcomes of rare events such as uterine rupture.

RISK AND BENEFITS OF CHOICE OF BIRTHPLACE

Risks and benefits of choice of birthplace for clients planning VBAC should be thoroughly reviewed during informed choice discussions. Midwives should consider including the following points as part of the informed choice discussion relating to choice of birthplace for clients planning VBAC:

- The major limitation in providing evidence to clients wishing VBAC regarding choice of place of birth is that virtually all of the research about VBAC has utilized data from physician-attended hospital births, largely in tertiary centres.

- Clients should understand that access to surgery differs by hospital level in Ontario. Hospitals also vary in their requirements as to whether a physician must be "on site" during VBAC labour or able to provide emergent care within a specified time period (e.g. 30 minutes). At a level III hospital, there is continuous in-house presence of obstetric, anaesthetic and paediatric personnel.

- For clients choosing a level I hospital or out-of-hospital birth, it is important to clearly review the small but significant risk of uterine rupture and implications of potential increased delays in accessing hospital resources. Any delay in surgical intervention may have a serious impact on the outcome for both the client and their baby, either short or long term.

- Out-of-hospital settings increase the time required to access emergency care, and this time span can be additionally affected by distance from hospital, response times of emergency services and weather conditions. Clients should be made aware of the midwifery practice group protocol for managing VBAC in the home setting, and any mechanisms in place to ensure coordination with emergency medical services and hospital should assistance be required.

- Planned home birth may reduce the chance of a repeat CS and its attendant risks.

- Anxiety can inhibit the progress of labour; one of the benefits of supporting clients to give birth in the location of their choice is a reduction of the anxiety that can stem from previous birth experiences and place of birth.

HOSPITAL POLICIES AND VBAC

Midwives have a responsibility to ensure that evidence-based VBAC protocols exist in hospitals. By advocating for clients planning VBAC, midwives can help keep clients from feeling as if the only option for avoiding unnecessary intervention is out-of-hospital birth.

Midwives should familiarize themselves with any existing hospital procedures for clients who choose not to follow hospital protocols. For instance, many hospitals have a 'refusal of treatment' form that may be signed in the event that a client declines intervention. Such documents may be helpful in preventing or alleviating friction or conflict with other health care professionals.

In the event that ongoing conflict regarding a client's choice is not resolved by discussion among the parties involved, midwives may consider requesting a consultation with the hospital ethics service, if available.

13. An informed choice discussion regarding the risks and benefits of VBAC and choice of birth place should be comprehensive and well-documented. Documentation of this discussion should include: an outline of risks and benefits discussed, the client's values and preferences, and any recommendations made by the midwife, if applicable. III-C

14. Clients should be informed that there is little published evidence on outcomes, including safety of VBAC, in the out-of-hospital setting. While the quality of these studies varies, they do not demonstrate increased risk. III-C

15. For clients planning VBAC, describe the VBAC policies in place at the hospital(s) where the attending midwives have hospital privileges. The client's informed choices to accept or decline recommended interventions in hospital should be respected. III-C

POSTPARTUM CARE

Immediate Postpartum

In some situations, postpartum hemorrhage may be evidence of uterine rupture in the immediate postpartum period. (125) Midwives should consider uterine rupture in the differential diagnosis if a client has postpartum hemorrhage following VBAC or ERCS.

Prior to Discharge from Midwifery Care

Counselling clients after their VBAC or ERCS on future options related to mode of delivery can help in decision-making for future pregnancies. Midwives have an opportunity to share information on pregnancy spacing, and the future likelihood of additional VBACs. If a planned VBAC results in an unplanned repeat caesarean section, the midwife should review considerations for future pregnancies including:

- Pregnancy spacing.

- Emerging evidence on the safety and success rate of VBAC after more than one caesarean section.

- An opportunity for the client to discuss her experience if an unplanned CS took place.

RECOMMENDATION

16. For clients who have undergone a CS, discuss the association between delivery interval and risk of uterine rupture and considerations for family planning prior to discharge from midwifery care. II-2B

Conclusion

Clients who have had a CS in one or more previous pregnancies face complex choices. While overall rates of maternal and neonatal complications are low for clients planning a VBAC as well as those choosing a repeat ERCS, there are risks and benefits associated with each option. (13) A client's values and risk tolerance will factor into decision-making about method and place of birth in the current pregnancy.

The midwife's role is to ensure that clients are well informed of the risks and benefits of the choices they face in the course of their pregnancy, labour, and postpartum care. The evidence summarized in this CPG suggests VBAC should be recommended to clients who have had previous low-segment CS and have no contraindications to vaginal birth in the current pregnancy.

As with all clients, a midwife providing care to a client with a previous CS utilizes assessment skills, a commitment to appropriate use of technology, and one-to-one support to minimize risks and provide optimal care. According to the Canadian Association of Midwives, the role of midwifery is to "understand, promote and facilitate physiologic processes and to intervene only when necessary." (17) VBAC is the best option for clients who wish to avoid unnecessary intervention and who value birth as a physiologic process. In providing care to a client with a previous caesarean section, the highest-quality and most current research supports VBAC as a valid and safe choice for the majority of clients with a prior LSCS. (13)

Midwives will need to spend sufficient time ensuring a thorough informed choice discussion takes place regarding the choice of VBAC or ERCS. Options for care during labour also warrant thorough discussion, particularly when clients choose care different from that of the local community's standard of care. It is recommended that care in labour include regular assessment of progress, regular assessment of fetal well-being and prompt consultation for any concerns regarding slow progress in labour and/or abnormal fetal heart rate patterns or unusual pain or bleeding.

Finally, given the additional risks associated with any birth subsequent to CS, midwives have an important role to play in using evidence-based and best practices to reduce the incidence of primary CS.

RECOMMENDATIONS

1. The risks and benefits of VBAC compared with ERCS should be discussed with clients who have a history of CS. This discussion, including the woman's decision, should be appropriately documented in the woman's chart. II-2B

2. Recommend planned VBAC as a means to achieve the benefits of normal childbirth, while being sensitive to each clients's concerns and values and respecting her informed decision. III-C

3. Recommend planned VBAC for clients intending to have more than one child after the previous CS. Increased maternal and perinatal morbidity associated with ERCS and multiple CS has long-term health implications. II-2B

Note: Recommendations 1-3 presuppose an absence of contraindications to vaginal birth/VBAC (see list of contraindications on page 4).

4. Midwives should discuss the relevant factors which may influence the likelihood of success or risk of VBAC with their clients. Inform clients that such factors are not contraindications to VBAC but may be considerations in their care during labour. III-C

5. In developing the plan for care of a client planning a VBAC, request and review a copy of the operative record from the previous caesarean section(s). Inability to obtain the previous record should be documented in theclient's chart. III-C

6. For clients planning VBAC, induction of labour should be avoided unless the benefits outweigh the risks. When necessary, midwives should consult obstetrics and review the risks and benefits of methods

of induction with the client and the consultant. As with any clinical situation in which midwives manage care, a clear plan for ongoing communication with the consultant about progress in labour and maternal and fetal well-being is recommended when midwives are primary care providers for induction of VBAC labour. III-C.

7. When augmentation or induction of labour is required during a VBAC labour and the midwife is the primary care provider, the midwife should take into account how quickly the obstetrical and pediatric team will be available in the event that emergency assistance is required. This may include ongoing communication with the team about progress in labour and maternal and fetal well being. III-C.

8. Fetal heart monitoring may occur by:
   - intermittent auscultation q 15 minutes in active labour and q 5 minutes in the second stage; or
   - using continuous EFM per current protocols
     The relative and absolute risks of severe adverse events in the absence of continuous electronic fetal monitoring are unknown. III-C

9. Continuous EFM should be used if labour is prolonged or if any fetal heart rate abnormalities are noted with intermittent auscultation. II-2A

10. For clients with a prior history of CS it is important for midwives to diagnose and document the onset of active labour accurately and to be vigilant for prolonged labour. II-2A

11. For clients with a prior history of CS in whom prolonged labour has been identified, obstetric consultation should be requested and IV access and continuous EFM monitoring should be initiated, if not already in place, while awaiting obstetric consultation. III-A

12. Prompt consultation should be initiated if the client labouring after a previous CS experiences any unusual pain or if epidural anaesthesia is being used and is not effective. III-C

13. An informed choice discussion regarding the risks and benefits of VBAC and choice of birth place should be comprehensive and well documented. Documentation of this discussion should include: an outline of risks and benefits discussed, the client's values and preferences, and any recommendations made by the midwife, if applicable. III-C

14. Clients should be informed that there is little published evidence on the outcomes, including safety, of VBAC in the out-of-hospital setting. While the quality of these studies varies, they do not demonstrate increased risk. III-C

15. For clients planning VBAC, describe the VBAC policies in place at the hospital(s) where the attending midwives have hospital privileges. Client's informed choices to accept or decline recommended interventions in hospital should be respected. III-C

16. For clients who have undergone a CS, discuss the association between delivery interval and risk of uterine rupture and considerations for family planning prior to discharge from midwifery care. II-2B

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