**Evaluating a midwife-led model of antenatal care for women with a previous cesarean section: a retrospective, comparative cohort study**

**Abstract**

*237 (250max) words*

Background: Research is yet to identify effective and safe interventions to increase the vaginal birth after cesarean (VBAC) rate. This research aimed to compare intended and actual VBAC rates before and after implementation of midwife-led antenatal care for women with one previous caesarean and no other risk factors in a large, tertiary maternity hospital in England.

Methods: This was a retrospective, comparative cohort study. Data were collected from the medical records of women with one previous lower segment cesarean and no other obstetric, medical or psychological complications who gave birth at the hospital before (2008) and after (2011) the implementation of midwife-led antenatal care. Chi-squared analysis was used to calculate odds ratio, and logistic regression to account for confounders.

Results: Intended and actual VBAC rates were higher in 2011 compared with 2008: 90% vs. 77%, adjusted odds ratio (aOR) 2.69 (1.48 to 4.87); and 61% vs. 47%, aOR 1.79 (1.17 to 2.75), respectively. Mean rates of unscheduled antenatal care sought via the delivery suite and inpatient admissions were lower in 2011 than 2008. Postnatal maternal and neonatal safety outcomes were similar between the two groups, except mean postnatal length of stay, which was shorter in 2011 compared with 2008 (2.67 versus 3.15 days).

Conclusions: Implementation of midwife-led antenatal care for women with one previous cesarean offers a safe and effective alternative to traditional obstetrician-led antenatal care, and is associated with increased rates of intended and actual VBAC.

Key words: vaginal birth after cesarean (VBAC), midwife-led care, previous cesarean, antenatal care

**Introduction**

Approximately one in ten women receiving maternity care in the UK has previously given birth by cesarean section (1–3) and can plan either elective repeat caesarean section or vaginal birth after cesarean (VBAC). VBAC is considered a safe and viable option for the majority of women who have previously given birth by lower segment cesarean section, with low rates of maternal and perinatal morbidity and mortality (4–8). Whilst the known short-term risks of each intended mode of birth are low, emerging evidence about perinatal epigenetics (9,10) and the vaginal microbiome (11,12)point to the protective effects of labor and vaginal birth against long-term risks such as impaired immune response, asthma, obesity and type 2 diabetes. Approximately 75% of women who plan VBAC are successful (13–15), with rates up to 90% for those with a previous vaginal birth (16,17). Yet, women with a previous cesarean account for 32% of the overall cesarean rate in England, of which 70% are elective (1). Encouraging and supporting appropriate women to plan VBAC can avoid the risks of elective repeat cesarean section.However, a recent meta-analysis of interventions to increase VBAC rates indicated that none were clinically or statistically effective (18).

The antenatal care of women with a previous cesarean should provide them with information and control over decision-making about mode of birth. However, the decision-making process can be difficult for some women, fraught with frustrations of seeking information and the added burden of fear acquired from their previous experience (19,20). The literature indicates that the way antenatal care is provided and the health professional providing it can influence the decisions women make and how they feel about the process (21–23).

The majority of women in the UK receive maternity care from the National Health Service. Traditionally, women who have one or more obstetric or medical risk factors, including having previously birthed by cesarean, receive obstetrician-led antenatal care, and women at no- or low-risk receive midwife-led antenatal care. Women may request obstetric-led care despite being suitable for midwife-led care, although this is unusual. Midwife-led models of care provided within a multidisciplinary framework for consultation and referral are beneficial and recommended for women who are not at risk of substantial obstetric complications (24,25). Within a multidisciplinary framework, midwife-led antenatal care was implemented by consultant midwives at a large, English, tertiary-referral maternity hospital during 2009 and 2010. Midwives received professional development to be the lead clinician for women with a previous cesarean, including undertaking an evidence-based risk assessment, recommending the most appropriate mode of birth, counselling women about their mode of birth options and supporting them to make informed decisions.

The aim of this study was to compare intended and actual VBAC rates at one hospital before and after the implementation of midwife-led antenatal care. Secondary outcomes included maternal and neonatal safety.

**Methods**

A retrospective, cohort study was conducted in a large, tertiary-referral, teaching hospital on the South-coast of England. The two cohorts comprised women from 2008 who received traditional obstetrician-led antenatal care, and women from 2011 who received midwife-led antenatal care. Both obstetrician-led and midwife-led antenatal care are compound packages of care with multiple, differing components (Figure 1). Women who received obstetrician-led care in 2008 attended up to three appointments with a hospital doctor under the auspices of their consultant obstetrician and received the rest of their care from a community midwife. The hospital doctor took the main role in supporting women to make their mode of birth choice. Women who received midwife-led care in 2011 had all of their care from a midwife, including support with making their mode of birth choice. In both care models, women access unscheduled antenatal care via the obstetric day unit, or the delivery suite during night-time hours, if they are in labor or at imminent risk of substantial complications.

During 2013, data was collected from the medical records of women who gave birth at the hospital in 2008 (prior to implementation of midwife-led care) and 2011 (post implementation). Ethical approval was given from the National Research Ethics Service Committee South Central — Berkshire (11/SC/0378). The author and data retrieval assistants attended ‘Good Clinical Practice’ training in the ethical and organizational standard to which all clinical research should be conducted.

Eligibility criteria included women with one previous cesarean who received antenatal and intrapartum care at the hospital during 2008 and 2011. Exclusion criteria included any other medical, obstetric or psychological risk factors that warrant obstetrician-led care (including body mass index <18 or >40 kg/m2, maternal age <16 years), two or more prior cesareans, a previous classical or unknown cesarean incision, a cesarean for a recurrent indication, and significant complications following the prior cesarean.

The primary outcomes were intended and actual mode of birth, either VBAC or cesarean. The sample size was determined based on actual mode of birth to test a non-inferiority hypothesis that the VBAC rate in 2011 would be no lower than in 2008. A VBAC rate difference of less than 2% was considered clinically insignificant by senior clinicians. Hence presuming 80% statistical power and 5% significance, a sample size of 424 (212 in each group) was required to find a clinically relevant VBAC rate increase over 2%.

Women who fit the inclusion criteria were identified using the hospital obstetric database. All consecutive eligible women starting at the end of 2008 and 2011, respectively, were included until the sample size was reached. Data were collected from the women’s medical records, meaning no contact with women was required. The Ethics Committee deemed that individual consent was not required as data were collected by members of the women’s care-team and only anonymized data were shared outside of the care-team. The data retrieval assistants were familiar with the medical records, understood the aim of the research, and received training in completing the data collection tool. Eligibility for inclusion was reconfirmed using the medical records. Data were collected on handwritten data collection sheets, with no patient identifying details. Intended and actual mode of birth, intrapartum care details, maternal and neonatal safety, and antenatal care details were collected. Missing data were considered to be likely missing independent of their actual value; hence analysis was undertaken on all available data. Reliability of data collection was ensured through an independent check of 5% of all cases by a midwife from the hospital who was not involved in the study.

The data were analyzed using SPSS for Windows (version 20.0; IBM Corp, Armonk, NY, USA). The statistical tests used were planned with a statistician in advance of data collection and statistics advice was sought during the analysis process. The groups were compared on an intention to treat basis, meaning that data were analyzed by year, regardless of the type of care received. The chi-squared test was used to establish the degree to which a relationship existed between the year and the intended and actual mode of birth. The chances of a woman opting for and achieving VBAC in 2011 compared to in 2008 are displayed as odds ratios (OR), with 95% confidence intervals (CI). Confounding factors were accounted for using logistic regression. Variables that are known to affect VBAC rates were identified prospectively based on literature review and included in the logistic regression model. These factors are all known at booking and hence would not be influenced by the type of care received; they included maternal age (15), body mass index (13), time since previous cesarean (14,26), number of previous vaginal births and previous VBACs (14), and whether the previous cesarean was for ‘dystocia’ or ‘breech’ (14,27,28). Analysis of secondary outcomes used the chi-squared test for binary outcomes. Fisher’s exact test was used where more than 20% of the variables had expected outcomes <5 (29). The independent *t*-test and Mann-Whitney U test were used for linear data with normal and non-normal distribution, respectively. Data are presented as mean (standard deviation [SD]), unless otherwise stated.

**Results**

The medical records of 424 women who were eligible for inclusion in the study were requested, 15 were unavailable, and a further five were excluded following eligibility review. A total of 405 women’s medical records were used in the analysis (2008 n=209; 2011 n=196). Data were checked for errors and cleaned, using the sort function in SPSS. Errors and missing entries were few (3.5%), with none for the primary outcomes.

The women included in the study had a mean age of 30.8 years (4.91) (range 19–53), and body mass index of 26.3 kg/m2 (4.97) (range 18–40). By definition, all women were multiparous (parity 1.3 [0.7], range 1–6). Baseline demographics were similar between the two groups (Table 1). The two groups were not statistically significantly different in demographic, social or obstetric status. There was no difference between the groups in the proportion of women whose previous cesarean was for dystocia, defined as cesarean for slow progress in the first or second stage of labor. However, the 2011 group had a higher proportion of previous cesarean due to breech and a lower proportion due to suspected fetal compromise than the 2008 group (Table 1).

All women in 2008 received obstetrician-led care, as there was no recommended alternative at this time. All women in the 2011 group received midwife-led care at booking, as none requested obstetrician-led, and 20.1% transferred to obstetrician-led care during their pregnancy due to arising risk factors requiring obstetric expertise or requesting elective repeat cesarean section. Analysis took place by year, regardless of the type of antenatal care women received.

There were significant differences in the antenatal care that women received in 2008 and 2011 (Table 2). In 2011 compared with 2008, women had more antenatal appointments in a community setting, fewer appointments in hospital, saw fewer different health professionals in the antenatal period, and had a longer period of time between their first mode of birth discussion and the decision (Table 2).

The overall rate of intended VBAC was 84% and of actual VBAC was 54%. A significantly higher proportion of women in 2011 compared with 2008 intended to birth by VBAC: 90.3% versus 77.0%, adjusted odds ratio (aOR) 2.69 (1.48 to 4.87) (Table 3). Similarly, a significantly greater proportion of women actually birthed by VBAC in 2011 compared with 2008: 61.2% versus 46.9%, aOR 1.79 (1.17 to 2.75) (Table 3). The spontaneous vaginal birth rate was higher in 2011 compared with in 2008: 43.4% versus 32.1%, OR 1.62 (1.08 to 2.43). Further analysis was undertaken for just the women who attempted VBAC, to investigate if the type of antenatal care received impacted on the successful VBAC rate. Of the 296 women who attempted VBAC, 78.4% were successful in 2011 (n=153), compared with 68.5% in 2008 (n=143). This difference was not statistically significant (OR 1.67 [0.99 to 2.82]), however, with a larger sample size it may have been.

The year in which care was provided was the only significant predictor of intended VBAC after controlling for confounders that are known at booking and not affected by the type of care received (Table 3). In addition to the year of care, previous vaginal birth was also significantly associated with actual VBAC. No other variables were shown to be significantly, independently associated with intending or achieving VBAC.

As a proxy measure to indicate safety, the mean rates of unscheduled antenatal care episodes were compared between the two groups. The rate of unscheduled antenatal care sought in the obstetric day unit was not statistically different between the two groups. However, the rate of unscheduled antenatal care sought in the delivery suite and antenatal inpatient admissions were higher in 2008 compared with 2011 (Table 2). The odds of seeking additional care were similar for all indications except ‘threatened preterm labor’, which was higher in 2011 (Table 2); although the small numbers of events provided limited statistical power to detect differences.

Postnatal maternal safety outcomes were similar between the two groups (Table 4). The only significant difference between the groups was postnatal length of stay, which was shorter in 2011 compared with the 2008 (Table 4) and would be expected due to the difference in cesarean rate. There were no significant differences between any neonatal safety outcomes, including 5-minute Apgar score, intrauterine death, birth trauma, admission to neonatal unit, treatment for respiratory distress, hypothermia or jaundice, or breastfeeding rates (Table 4).

**Discussion**

This is the first study to evaluate the influence of antenatal care on the mode of birth decision and outcome of women who have previously birthed by cesarean. The principle finding of this study was that women were more likely to intend and achieve VBAC following the implementation of midwife-led antenatal care than before. Indeed, following adjustment for clinical factors that are likely to influence each outcome, having received MLAC was the only factor that increased the odds of intended VBAC and one of two factors that increased the odds for actual VBAC, along with having previously birthed vaginally. Importantly, safety outcomes were similar in 2008 and 2011, assessed by comparing maternal and neonatal outcomes. Furthermore, rates of unscheduled antenatal care via the delivery suite and antenatal inpatient admission were lower in 2011 than 2008.

The overall rates of intended and actual VBAC in this study were 84% and 54%, respectively. These rates are notably high compared with other UK-based retrospective, observational studies that report an intended VBAC rate of 52% (30) and actual VBAC rates of 29–33% (1,26,30). Indeed, actual VBAC rates vary considerably between international studies, ranging from 25% to 56% (13–15,17). This corresponds with the well-documented variation in cesarean rates between hospitals that cannot be accounted for by clinical factors (1,31,32). Conversely, there is concordance between studies in successful VBAC rates: 71–75% (13–15); although outliers of 63% (26) and 85% (17) are also reported. In this study, women who received midwife-led antenatal care had a non-significantly higher successful VBAC rate (78.4%) compared with women who received care in 2008 (68.5%).

Following adjustment, receiving care following the implementation of midwife-led antenatal care was the only predictive factor for intended VBAC in this study. This finding correlates with a study from the United States, which found that women who received care from a registered nurse-midwife were about five times more likely to choose VBAC compared to those whose care was from a family practitioner or Ob-Gyn (doctor) (17). Unlike in the United States where women select and pay for their own health care provider, women in the UK receive care from a recommended health professional based on clinical factors. Hence, in comparison to Metz et al (17), the difference in VBAC rate in this study cannot be attributed to women’s selection of health care provider, and is more likely to be associated with receiving midwife-led care.

There is strong agreement in the literature that encouragement from a health professional for either mode of birth is influential in women’s decision making (33–36). Moreover, the health professional’s personal preference is particularly persuasive (21). Interestingly, women report that they can infer their health professional’s preference even if it is not explicitly stated (19). There is research evidence of variable quality suggesting that midwives have a stronger preference for VBAC and vaginal birth in general than obstetricians (37–40). The professional training and experiences of midwives and obstetricians differ, which possibly engender distinct beliefs and philosophies. Indeed, the differences between the professions could pre-date training as the individuals attracted to each profession may differ based on the underpinning philosophies inherent in each field, especially as academic entry requirements for midwifery and medical training are now similar in the UK. Health professionals’ personal attitudes also appear to be influenced by the hospital and even the department in which they work (41,42). The theory that individual professionals are influenced by the collective attitude of the unit in which they practise may explain the overall high VBAC rate in this study, especially after the implementation of midwife-led antenatal care.

Midwife-led models of care work on the premise that pregnancy is a normal life event, are women-centred and believe in women’s natural ability to give birth without routine intervention, or with appropriate referral and intervention if complications do arise (24,43). In addition to monitoring and responding to the physical well-being of women and their babies, midwife-led models focus on the psychological, spiritual and social well-being of the woman and her family, which correlates with the family and social factors that women prioritize when making a mode of birth decision (21,22). Conflicting advice is a known barrier to decision making (20) and was likely to be less in 2011 following the implementation of midwife-led antenatal care because women saw fewer different health professionals.

Research on the influence of the care environment has largely focussed on the intrapartum period. Findings indicate that rates of intervention are lower when labor care is provided to women at low-risk of obstetric complications in a non-obstetric unit compared with an obstetric unit (44). Caution must be taken in extrapolating findings to a different population and context of care. However, it is notable that this research found lower rates of unscheduled antenatal care via the delivery suite, inpatient admissions, and care sought for threatened preterm labor when antenatal care did not include routine, hospital-based, obstetric clinic appointments compared to antenatal care that did. Furthermore, the lower cesarean rate in 2011 compared with 2008 was not offset by a higher instrumental vaginal birth rate, as might be expected, and more women in 2011 had a spontaneous vaginal birth than in 2008. These findings are significant and perhaps unexpected as the intervention only applied to the antenatal period. Nonetheless, effective interventions aimed at avoiding labor intervention justifiably focus on maternal empowerment and alleviation of stress and anxiety (45–47).These are key aims in midwife-led models of antenatal care, which in this case appear to have had a positive impact on intrapartum outcomes.

A limitation of this study is the time difference between the two groups. Temporal trends, such as professional and societal attitudes towards VBAC and changes in clinical practice, may have influenced the VBAC rates demonstrated in these results. Professional acceptance of VBAC may have increased during the study years, founded on national efforts to optimize opportunities for normal birth and reduce caesarean rates (48). However, the national and local clinical guidelines that steer clinical practice did not change between 2008 and 2011, with the exception of the implementation of MLAC in local guidance. Furthermore, the VBAC rate in England did not change significantly between 2008 (29%) and 2011 (30%) (49). Indeed, the overall caesarean rate at the hospital actually increased between 2008 (20.5%) and 2011 (23.0%). This evidence suggests that the higher VBAC rates seen in 2011 than 2008 were influenced by the only significant change in practice: the implementation of midwife-led antenatal care. Collecting data for women who received MLAC and OLAC in the same year would have been optimal. However, allocating women to receive either midwife-led or obstetrician-led antenatal care in the same hospital at the same time was not possible because the hospital recommended midwife-led care for all eligible women following the implementation period; hence there were risks of selection bias and cross-contamination of the care women received. Likewise, collecting data from two different units, one providing midwife-led and the other obstetrician-led, would have increased the potential for bias through endemic differences in clinical practice, as demonstrated by variations in cesarean rates (1, 31, 32).

This research has shown a significant increase in VBAC rates following implementation of midwife-led antenatal care. However, there is no certainty about which, if any, single component of midwife-led antenatal care may have influenced more women to choose VBAC than obstetrician-led antenatal care, or whether the implementation of a new model of care aimed at appropriately increasing VBAC rates is the explanatory factor. However, the literature strongly suggests that midwife-led models of care do elicit different outcomes to other models of care (24). Further research is indicated to identify whether these outcomes are replicable in other units, and to provide evidence about safety. Qualitative exploration of the views of women and health professionals about their experiences of midwife-led antenatal care for women with a previous cesarean would provide further important information for clinicians and policy-makers. Midwife-led models of care are considered to offer cost-savings in comparison to obstetrician-led care in the UK (24,25,50). Health economic outcomes research is indicated to determine whether midwife-led antenatal care for this group of women is also cost-effective and could optimize maternity care for all women by releasing obstetricians to focus their time and expertise on those with complex obstetric needs.

**Conclusion**

Implementation of midwife-led antenatal care has been shown to be associated with increased intended and actual VBAC rates, reduced unscheduled antenatal care via the delivery suite and inpatient admission, with similar safety outcomes. Midwife-led antenatal care may provide women with one previous cesarean and no other risk-factors with a safe and appropriate alternative to traditional obstetrician-led care.

**Figure 1: Routine antenatal care schedules: Traditional obstetrician-led antenatal care in 2008 and routine care in 2011 following implementation of midwife-led antenatal care**



**Figure 1 legend**

Each square is a routine appointment with a health professional: \*routinely recommended opportunity to discuss mode of birth options; †birth planning appointment; ᵠrecommended final mode of birth decision discussion

Solid bar denotes time from first mode of birth discussion to mode of birth decision.

MW, midwife appointment in a community setting; Obs, obstetric appointment in a hospital setting.

**Table 1: Baseline demographics of 405 women with one previous cesarean section and no other risk factors before (2008) and after (2011) implementation of midwife-led antenatal care; Southampton, England**

|  |  |  |
| --- | --- | --- |
|  | 2008n=209*Mean ± SD or No. (%)* | 2011 n=196*Mean ± SD or No. (%)* |
| Age (years)  | 30.67 ± 4.89 | 30.86 ± 4.95 |
| Body mass index (kg/m2) | 26.04 ± 4.95 | 26.55 ± 4.99 |
| Time since prior cesarean (months) | 50.84 ± 36.14 | 50.53 ± 35.43 |
| Indication for prior cesarean: Breech Suspected fetal compromise Dystocia Failed induction of labor Failed instrumental birth  Placenta previa Multiple birth Maternal request Other | 37 (17.8)53 (25.5)81 (38.9)9 (4.3)10 (4.8)5 (2.4)1 (0.5)2 (1.0)10 (4.8) | 56 (28.6)\*33 (16.8)\*79 (40.4)11 (5.6)6 (3.1)2 (1.0)1 (0.5)3 (1.5)5 (2.6) |
| Previously given birth vaginally  | 34 (16.3) | 45 (23.0) |
| Previously given birth by VBAC | 23 (11.0) | 31 (15.9) |
| Single parent  | 6 (3.0) | 6 (3.3) |
| Required interpreter  | 14 (7.0) | 9 (4.8) |
| Smoker  | 23 (12.1) | 17 (9.5) |
| Ethnic category  White Asian Black Mixed/other |  161 (77.7)31 (15.0)9 (4.3)6 (2.9) | 146 (75.2) 27 (13.9) 16 (8.2) 5 (2.5)  |

**Table 1 legend**

\* statistically significant at *p*<0.05 level

SD, standard deviation; VBAC, vaginal birth after cesarean.

**Table 2: Antenatal care of 405 women with one previous cesarean section and no other risk factors before (2008) and after (2011) implementation of midwife-led antenatal care; Southampton, England**

|  |  |  |
| --- | --- | --- |
|  | 2008n=209*Mean ± SD or No. (%)* | 2011n=196*Mean ± SD or No. (%)* |
| Gestation at booking (weeks) | 11.40 ± 4.00 | 11.05 ± 3.61 |
| Number of community antenatal appointments  | 7.56 ± 2.12 | 8.35 ± 1.90\* |
| Number of antenatal clinic appointments | 2.17 ± 1.21 | 0.60 ± 1.29\* |
| Number of antenatal carers | 4.78 ± 1.75 | 3.47 ± 1.87\* |
| Gestation of 1st mode of birth discussion (weeks) | 19.99 ± 6.43 | 13.00 ± 6.90\* |
| Gestation of birth plan (weeks) | 31.86 ± 6.42 | 33.32 ± 5.78\* |
| Time given to make mode of birth decision (weeks)ψ | 11.85 ± 7.47 | 20.01 ± 8.78\* |
| Number of unscheduled antenatal care visits via obstetric day unit (visits per woman) | 0.61 ± 1.19 | 0.76 ± 1.44 |
| Number of unscheduled antenatal care visits via delivery suite (visits per woman) | 0.25 ± 0.58 | 0.13 ± 0.38\* |
| Number of antenatal inpatient admissions (admissions per woman) | 0.18 ± 0.57 | 0.09 ± 0.41\* |
| Received unscheduled antenatal care for: Pre-eclamptic toxemia Reduced fetal movements Vaginal bleeding Abdominal pain Threatened preterm labor Anemia Urinary tract infection Obstetric cholestasis Presentation check ultrasound scan Small for gestational age Large for gestational age Umbilical artery Doppler  Ruptured membranes Other reason | 10 (4.8)24 (11.6)8 (3.9)16 (7.7)13 (6.3)0 (0.0)4 (1.9)2 (1.0)13 (6.3)6 (2.9)1 (0.5)0 (0.0)16 (7.7)28 (13.5) | 5 (2.6)24 (12.4)10 (5.2)17 (8.8)3 (1.5)\*1 (0.5)2 (1.0)3 (1.5)22 (11.3)9 (4.6)3 (1.5)2 (1.0)19 (9.8)19 (9.8) |

**Table 2 legend**

\* statistically significant at *p*<0.05 level; ψcalculated from gestation of 1st mode of birth decision to gestation of birth plan.

 The Mann-Whitney U test was used to analyse non-normally distributed data, based on rank means (not displayed).

SD, standard deviation

**Table 3: Adjusted odds ratios for the relationship between the intended and actual mode of birth and the type of antenatal care received and history of previous vaginal births; Southampton, England**

|  |  |
| --- | --- |
|  | Adjusted odds ratio (95% confidence interval) |
| *Outcome:* Intended to birth by VBAC*Predictors* Received care in 2008 (reference) Received care in 2011\* | 1.002.69 (1.48 to 4.87) |
|  No previous vaginal births (reference) Previously birthed vaginally | 1.00 4.28 (0.67 to 27.45) |
| *Outcome:* Achieved successful VBAC*Predictors* Received care in 2008 (reference) Received care in 2011\* No previous vaginal births (reference) Previously birthed vaginally\* | 1.001.79 (1.17 to 2.75)1.002.59 (1.26 to 5.30) |

**Table 3 legend**

\* statistically significant at *p*<0.05 level. All adjusted for maternal age, maternal body mass index, time since previous caesarean, previous vaginal births, previous VBACs, indication for previous caesarean.

VBAC, vaginal birth after caesarean.

**Table 4**: **Maternal and neonatal safety: 405 women with one previous cesarean section and no other risk factors before (2008) and after (2011) implementation of midwife-led antenatal care; Southampton, England**

|  |  |  |
| --- | --- | --- |
|  | 2008n=209*Mean ± SD or No. (%)* | 2011 n=196*Mean ± SD or No. (%)* |
| *Maternal safety outcomes* |  |  |
| Postpartum haemorrhage | 99 (47.6) | 85 (43.4) |
| Placental complications | 7 (3.4) | 3 (1.5) |
| Infection | 8 (4.0) | 11 (5.6) |
| Bowel complications | 1 (0.5) | 2 (1.0) |
| Bladder complications | 4 (2.0) | 6 (3.1) |
| Intensive treatment unit admissions | 1 (0.5) | 2 (1.0) |
| Postnatal readmissions  | 4 (2.0) | 6 (3.2) |
| Estimated blood loss (ml) | 616.02 ± 531.53 | 559.59 ± 702.13 |
| Length of postnatal stay (days) | 3.15 ± 1.35 | 2.67 ± 1.39\* |
| Perineal trauma *(n=218)*† Intact  1st degree tear 2nd degree tear 3rd degree tear 4th degree tear Labial tear Episiotomy | *(n=98)*17 (17.5)11 (11.3)23 (23.7)11 (11.3)0 (0.0)6 (6.2)39 (40.2) | *(n=120)*26 (21.7)14 (11.7) 36 (30.0) 9 (7.5) 1 (0.8)5 (4.2) 35 (29.2) |
| *Neonatal safety outcomes* |  |  |
| 5-minute Apgar score | 9.13 ± 0.72 | 9.07 ± 1.11 |
| Birth trauma | 9 (4.4) | 2 (1.1) |
| Intrauterine death | 0 (0.0) | 1 (0.5) |
| Admission to neonatal unit | 10 (4.9) | 10 (5.2) |
| Jaundice requiring treatment | 6 (3.0) | 5 (2.7) |
| Respiratory distress | 7 (3.5) | 9 (4.7) |
| Hypothermia requiring treatment | 4 (2.0) | 10 (5.3) |
| Breastfeeding initiated at birth | 160 (78.4) | 152 (78.8) |
| Breastfeeding exclusively at discharge | 102 (56.3) | 111 (59.4) |

**Table 4 legend**

† percentages exceed 100% as some women experienced more than one category of perineal trauma; \* statistically significant at *p*<0.05 level.

SD, standard deviation.

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