

Reducing the cesarean section rate in a rural community hospital

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Objective: To determine the success of a program designed to reduce the cesarean section rate in a rural community hospital, to identify reasons for any reduction in the rate and to identify any accompanying increases in the maternal and neonatal morbidity and mortality rates.

Design: Longitudinal study of modes of delivery.

Setting: A 44-bed community hospital with a medical staff of nine family physicians serving a population of 9000.

Patients: All 1161 women who gave birth at the hospital from Jan. 1, 1985, to Dec. 31, 1989. Routinely recorded data were manually extracted from medical charts and entered into a computer database.

Intervention: The guidelines of the National Consensus Conference on Aspects of Cesarean Birth (NCCACB) for vaginal birth after cesarean section (VBAC), management of breech presentation and the diagnosis of dystocia requiring cesarean section were introduced at the hospital in 1985.

Outcome measures: The annual overall cesarean section rates and the rates among nulliparous women, multiparous women eligible for VBAC and multiparous women ineligible for VBAC.

Results: The overall cesarean section rate decreased from 23% in 1985 to 13% in 1989 ($p = 0.001$). Among the nulliparous women the rate decreased from 23% to 12%, but the difference was insignificant ($p = 0.069$); this decrease was due to a drop in the number of dystocia-related cesarean sections. The rate among VBAC-eligible multiparous women decreased from 93% to 36% ($p < 0.001$) because of an increased acceptance of VBAC by the patients and the physicians. The rate among multiparous women ineligible for VBAC was virtually unchanged. There were 20 neonatal transfers to an intensive care unit, with no tendency toward an increase over the study period. None of the mothers died; one newborn, of a nulliparous woman, died from a prolapsed umbilical cord.

Conclusions: The program was accompanied by a significant decrease in the cesarean section rate. Rural hospitals with facilities and personnel for emergency cesarean sections should consider the introduction of a similar program.

Objectif: Déterminer la réussite d'un programme conçu pour réduire le taux de césariennes dans un hôpital communautaire en milieu rural, identifier les motifs de toute réduction de ce taux et identifier toute augmentation connexe des taux de morbidité et de mortalité maternelles et néonatales.

Conception: Étude longitudinale des modes d'accouchement.

Contexte: Un hôpital communautaire de 44 lits avec un personnel médical de neuf

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médecins de famille desservant une population de 9 000 habitants.

Patients : L'ensemble des 1 161 femmes qui ont accouché à l'hôpital du 1^{er} janvier 1985 au 31 décembre 1989. Les données ont été notées systématiquement, extraites à la main des fiches médicales et entrées dans une base de données informatiques.

Intervention : En 1985, l'hôpital a adopté les lignes directrices de la National Consensus Conference on Aspects of Cesarean Birth (NCCACB) pour l'accouchement par voie vaginale après une césarienne, le traitement d'une présentation du siège et le diagnostic d'une dystocie nécessitant une césarienne.

Mesures des résultats : Les taux globaux de césarienne, les taux de césarienne chez les nullipares, les multipares ayant accouché par voie vaginale après une césarienne et les multipares qui n'ont pas accouché par voie vaginale après une césarienne.

Résultats : Le taux global de césariennes a diminué de 23 % en 1985 à 13 % en 1989 ($p = 0,001$). Chez les nullipares, le taux a diminué de 23 % à 12 %, mais la différence n'était pas significative ($p = 0,069$); cette diminution était attribuable à une baisse du nombre de césariennes reliées à une dystocie. Chez les multipares ayant accouché par voie vaginale après une césarienne, le taux a diminué de 93 % à 36 % ($p < 0,001$) en raison d'une acceptation accrue de l'accouchement par voie vaginale après une césarienne par les malades et les médecins. Chez les multipares n'ayant pas accouché par voie vaginale après une césarienne, le taux était pratiquement inchangé. Vingt nouveau-nés ont été dirigés vers une unité de soins intensifs, aucune tendance à la hausse n'ayant été constatée au cours de la période d'étude. Toutes les mères ont survécu; le nouveau-né d'une nullipare est décédé à la suite d'une procidence du cordon.

Conclusions : Le programme a été associé avec une diminution significative du taux de césariennes. Les hôpitaux en milieu rural munis des installations et dotés du personnel pour pratiquer des césariennes d'urgence devraient envisager l'adoption d'un programme semblable.

The cesarean section rate in Canada increased from 5.7 per 100 deliveries in 1970 to 15.9 per 100 deliveries in 1980.¹ Data from Ontario² and Alberta³ have shown that the rate has increased since 1980 but not as quickly.³ In response to growing professional and public concern over the increasing cesarean section rate the National Consensus Conference on Aspects of Cesarean Birth (NCCACB) released a report in 1986 that presented scientifically based guidelines for the appropriate management of previous cesarean section and breech presentation and that discussed criteria for the diagnosis of dystocia.⁴

During the 1980s the cesarean section rate at the Hinton General Hospital, Hinton, Alta., rose to a peak of 23% in 1985. This rate was felt to be unacceptably high, and some physicians began to offer the option of vaginal birth after cesarean section (VBAC). After the release of the NCCACB report the medical staff accepted a formal protocol for the performance of VBAC and made a commitment to try to follow the guidelines for VBAC, management of breech presentation and diagnosis of dystocia requiring cesarean section.

Initially only four physicians at the hospital performed VBACs, some because of their education or background and some because they wanted to improve their obstetric practice. During the study period the practice gradually spread to all other physicians as acceptance of VBAC by mothers and hospital staff increased and satisfactory outcomes occurred.

Although the cesarean section rate was discussed annually, at grand rounds, there was no formal process of peer review. Consultation was mandatory before primary cesarean section but not before a repeat section.

In 1990 a decision was made to do a study. The objectives were to answer the following questions: How much had the cesarean section rate changed at the Hinton General Hospital from 1985 to 1989? What were the reasons for any change in the rate? Had the change in the rate been accompanied by a change in the maternal and neonatal morbidity and mortality rates?

Methods

Study site

The Hinton General Hospital is a 44-bed community hospital serving a local population of 9000 people. It is 280 km west of Edmonton. The medical staff comprises nine family physicians; all practise obstetrics, and several are trained in anesthesia and surgery. The physicians work out of two clinics. During the study period two physicians left and three joined the staff. Four different physicians performed the cesarean sections. About 230 babies are delivered at the hospital per year, most of the pregnancies being low risk. The staff manage most complicated deliveries, although a small number of high-risk pregnancies (e.g., premature labour before 35 weeks' gestation) are referred to Edmonton.

Because of the 24-hour, year-round surgical and anesthetic coverage, a portion of deliveries are referred from neighbouring communities for induction, repeat cesarean section, VBAC or emergency cesarean section. Since 1985 the anesthetic service has made available a 24-hour epidural service for obstetric patients.

Study population

We studied all deliveries at the hospital from Jan. 1, 1985, to Dec. 31, 1989: Fifteen items of routinely recorded information were extracted manually from each chart by medical records staff; the information included parity, maternal length of stay and neonatal transfer. The data were subsequently entered into a computer database with the use of Plan Perfect spreadsheet software (WordPerfect Corporation, Orem, Utah). If a patient delivered vaginally we recorded whether she had previously undergone cesarean section and whether the present delivery involved forceps, epidural analgesia, induction or oxytocin augmentation. If a patient had a cesarean section we documented whether she had previously undergone cesarean section, whether vaginal delivery was attempted, the indication for the current cesarean section, whether oxytocin augmentation was used and whether the cervical dilatation was less than 4 cm at the time of cesarean section. Since there was no neonatal intensive care unit and no pediatrician, newborns with all but the most minor neonatal problems were transferred; thus, neonatal transfers were used as an indicator of neonatal morbidity. Maternal length of stay (in days) was used as an indicator of maternal morbidity.

We divided the women who underwent cesarean section into two groups: nulliparous women and multiparous women. The latter group was subdivided into those who were eligible for VBAC (i.e., those who had previously undergone cesarean section and fulfilled the requirements for VBAC) and those ineligible for VBAC (i.e., those who had previously undergone only vaginal delivery plus those who had previously undergone cesarean section but did not fulfil the requirements for VBAC).

Each of the three groups were studied for significant changes in the cesarean section rate over the 5-year study period. One-sided exact tests for linear trend⁵ were used to test for significant reductions in the rate with the use of EGRET software (Statistics and Epidemiology Research Corporation, Seattle). Exact tests were also used to test for trends in the rate of epidural analgesia, forcep use and induction. We examined the indications for cesarean section in the nulliparous and VBAC-eligible multiparous groups to try to identify the reasons for any reductions in the cesarean section rate.

VBAC protocol

The VBAC protocol followed the NCCACB guidelines. All multiparous women with a documented history of no more than one transverse lower-segment cesarean section and a single cephalic presentation were considered eligible. In 1987 eligibility was expanded to include those who had previously undergone no more than two lower-segment cesarean sections. The protocol requires that two units of blood be cross-matched at 37 weeks' gestation and that another member of the medical staff be consulted before VBAC is initiated. The surgeon, the anesthetist and the operating room staff are notified when the patient is in labour. The mother is closely monitored, but electronic fetal monitoring is not mandatory. The use of oxytocin and epidural analgesia is not excluded.

Epidural analgesia is offered to any woman in labour who requests it unless the anesthetist believes it to be contraindicated. An intravenous line is established, and the patient is given at least 500 mL of an isotonic solution. An epidural catheter is inserted and analgesia established with the use of intermittent boluses of 0.25% bupivacaine. The anesthetist usually remains in the hospital but may leave after each dose is set, usually 15 to 30 minutes after administration, and return for "top-ups."

Dystocia management

The NCCACB recommended two changes in the management of dystocia. First, it recommended waiting for labour to become established beyond the latent phase (cervical dilatation of 3 cm) and for slow labour to progress to a successful, albeit delayed, vaginal delivery. Second, it recommended augmenting a nonprogressive labour with the use of oxytocin. We modified the NCCACB criterion for establishment of labour to a cervical dilatation of 4 cm. Consequently, cesarean sections in which oxytocin was not used or in which oxytocin was used but dilatation was less than 4 cm were not considered to have been performed because of true dystocia. All cesarean sections with an indication of dystocia, failure to progress, cephalopelvic disproportion, oblique presentation or deep transverse arrest were classified as dystocia-related, since these are the conditions in which improvement in the expulsive forces may result in vaginal delivery.

Results

Cesarean section trends

During the study period there were 1161 deliveries. Complete information was obtained in all

cases except for two neonatal transfers, for which the reasons were not recorded. The proportion of multiparous women increased from 57% to 63%. The overall cesarean section rate dropped from 23% to 12% ($p = 0.001$) (Table 1). The rate in the nulliparous group decreased from 23% to 11%, but the difference was not statistically significant ($p = 0.069$). A significant reduction in the rate among multiparous women eligible for VBAC (from 93% to 36%) was observed ($p < 0.001$). There was no reduction in the rate in the group of multiparous women ineligible for VBAC; 22 women in this group had previously undergone only vaginal delivery, and

15 had previously undergone cesarean section but did not fulfil the VBAC eligibility criteria.

Reasons for the reduced cesarean section rates

Of the 88 cesarean sections in the nulliparous group 58 (66%) were performed for dystocia (Table 2). The number of dystocia-related cesarean sections decreased from 16 in 1985 to 8 in 1989; this accounted for most of the reduction in the cesarean section rate in this group.

Of the 137 multiparous women eligible for VBAC 65 (47%) were not offered or refused VBAC,

Table 1: Rate of cesarean section by patient group at a rural community hospital from 1985 to 1989

Group	1985	1986	1987	1988	1989	Total
Nulliparous women						
No. of deliveries	102	91	90	84	89	456
No. (and %) of cesarean sections	23 (23)	19 (21)	21 (23)	14 (17)	11 (12)	88 (19)
95% confidence limits (CLs)	14, 31	13, 29	15, 32	9, 25	6, 19	16, 23
Multiparous women eligible for VBAC*						
No. of deliveries	27	28	24	25	33	137
No. (and %) of cesarean sections	25 (93)	19 (68)	11 (46)	12 (48)	12 (36)	79 (58)‡
95% CLs	83, 102	51, 85	26, 66	28, 68	20, 53	49, 66
Multiparous women ineligible for VBAC†						
No. of deliveries	108	108	104	128	120	568
No. (and %) of cesarean sections	7 (6)	5 (5)	6 (6)	11 (9)	8 (7)	37 (7)
95% CLs	2, 11	1, 9	1, 10	4, 13	1, 11	4, 9
All						
No. of deliveries	237	227	218	237	242	1161
No. (and %) of cesarean sections	55 (23)	43 (19)	38 (17)	37 (16)	31 (13)	204 (18)§
95% CLs	18, 29	14, 24	12, 22	10, 20	9, 17	15, 20

*This includes those who had previously undergone cesarean section and fulfilled the requirements for VBAC (vaginal birth after cesarean section).
†This includes those whose previous deliveries had been vaginal and those who had previously undergone cesarean section but did not fulfil the requirements for VBAC.
‡ $p < 0.001$.
§ $p = 0.001$.

Table 2: Indications for cesarean section among the nulliparous women

Indication	Year; no. (and %) of women					Total no. (and %) (n = 88)
	1985 (n = 23)	1986 (n = 19)	1987 (n = 21)	1988 (n = 14)	1989 (n = 11)	
Dystocia	16 (70)	12 (63)	12 (57)	10 (71)	8 (73)	58 (66)
NCCACB criteria not met*	11 (48)	8 (42)	6 (29)	2 (14)	0	27 (31)‡
NCCACB criteria met	5 (22)	4 (21)	6 (29)	8 (57)	8 (73)	31 (35)‡
Breech presentation	4 (17)	3 (16)	2 (10)	1 (7)	1 (9)	11 (12)
Fetal distress	1 (4)	1 (5)	4 (19)	1 (7)	1 (9)	8 (9)
Pregnancy-induced hypertension	1 (4)	0	1 (5)	1 (7)	1 (9)	4 (5)
Other†	1 (4)	3 (16)	2 (10)	1 (7)	0	7 (8)

*NCCACB = National Consensus Conference on Aspects of Cesarean Birth.
†This includes herpes genitalis (two cases), brow presentation (one), hydrocephalus (one), premature twins (one), cervical stenosis from cone biopsy (one) and chorioamnionitis (one).
‡ $p < 0.001$.

and 72 (53%) agreed to undergo VBAC (Table 3). The proportion of those who agreed increased from 7% in 1985 to 79% in 1989. The overall rate of successful VBAC was 81%, with little variation in the rate during the study period. Of the 79 women in this group who underwent cesarean section, only 14 (18%) were performed because of a failed VBAC. Of these, eight were performed for dystocia, only one meeting the NCCABC criteria.

The overall rate of epidural analgesia increased from 35% to 57% ($p < 0.001$). There was also a significant increase in the epidural rate among the nulliparous women ($p < 0.001$) and among the multiparous women who attempted VBAC ($p < 0.001$).

There was no increase in the overall rate of forceps use. The rate of induction among the nulliparous and VBAC-eligible multiparous women did not increase either.

Morbidity and mortality rates

The mean length of stay for women who underwent cesarean section was 5.6 days. The increased rate of VBAC was accompanied by a tendency toward an overall decrease in the maternal length of stay (Table 4). Scar dehiscence occurred in two cases, resulting in emergency cesarean section. Nei-

ther mother needed blood transfusions, and neither neonate was transferred. The length of hospital stay for the two mothers was 5 and 4 days respectively. There were 20 neonatal transfers during the study period, and there was no tendency for the number to increase. The reasons for neonatal transfer are shown in Table 5.

There were no maternal deaths and only one neonatal death, due to a prolapsed umbilical cord; the infant was born to a nulliparous woman.

Discussion

The cesarean section rate at the Hinton General Hospital decreased by almost 50% once a concerted effort was made to reduce the rate. Among nulliparous women a decrease in the number of dystocia-related cesarean sections was observed. Our modified criteria for the diagnosis of dystocia appear to have resulted in vaginal delivery for some women who previously would have undergone cesarean section.

The reduction in the cesarean section rate among VBAC-eligible multiparous women was associated with a greatly increased acceptance of VBAC by the women and the physicians. It is encouraging that this increased acceptance was not accompanied by a decrease in the success rate of VBAC.

Table 3: Outcome among multiparous women eligible for VBAC

Variable	Year; no. (and %) of women					Total no. (and %)
	1985	1986	1987	1988	1989	
No. of women eligible for VBAC	27	28	24	25	33	137
Refused or not offered VBAC	25 (93)	16 (57)	7 (29)	10 (40)	7 (21)	65 (47)†
Agreed to undergo VBAC	2 (7)	12 (43)	17 (71)	15 (60)	26 (79)	72 (53)
VBAC successful*	2 (100)	9 (75)	13 (76)	13 (87)	21 (81)	58 (81)
VBAC unsuccessful*	0	3 (25)	4 (24)	2 (13)	5 (19)	14 (19)

*The denominator used to calculate the percentages was the number of women who agreed to undergo VBAC.
† $p < 0.001$.

Table 4: Outcome of all deliveries as determined by the mean maternal lengths of stay and the number of neonatal transfers

Variable	1985	1986	1987	1988	1989
Mean maternal length of stay, d	4.9	5.1	4.9	4.5	4.0
With vaginal delivery	4.4	4.8	4.7	4.2	3.8
With cesarean section	6.5	6.2	6.0	5.8	5.6
With trial of VBAC	5.0	5.0	5.5	4.3	3.9
With successful VBAC	5.0	4.7	5.6	4.1	3.3
With unsuccessful VBAC*	—	6.0	5.0	5.5	6.2
No. of neonatal transfers	3	5	4	6	2

*Necessitating cesarean section.

Table 5: Reasons for neonatal transfer*

Reason	No. of transfers
Transient tachypnea of newborn	4
Prematurity	3
Neonatal jaundice	3
Low hemoglobin level†	1
Pierre Robin syndrome	1
Hydrocephalus and myelomeningocele	1
Aspiration of meconium	1
Benign ovarian cyst	1
Down's syndrome and congenital heart disease	1
Asphyxia due to prolapsed cord‡	1
Spells of "duskiness"	1

*Reasons for two neonatal transfers were not documented.

†This was due to hemorrhage from placenta previa at delivery.

‡This resulted in death.

We think that the availability of epidural analgesia was an important factor in encouraging the acceptance of VBAC and oxytocin use. Since epidural analgesia was introduced it has been increasingly offered to women in labour and has been met with widespread acceptance by patients, nursing staff and physicians.

Studies from large^{6,7} and small⁸ urban hospitals have demonstrated that the cesarean section rate in North America can be decreased. A recent study from Quebec showed that women undergoing VBAC were more likely than women undergoing repeat cesarean section to give birth in a hospital providing an intermediate or high level of obstetric care.⁹ Our study demonstrated that large reductions in the cesarean section rate can be achieved in smaller rural hospitals without an obvious increase in maternal or neonatal morbidity and mortality rates.

The NCCACB noted that uterine rupture may be catastrophic for mother and infant but that it was much less common than other acute obstetric emergencies.⁴ It recommended that hospitals providing obstetric care have units of blood, operating rooms, neonatal resuscitation equipment, and nursing, anesthetic and surgical personnel available so that, if necessary, a cesarean section can be performed within 30 minutes after the start of labour for any woman, including those undergoing VBAC. This excludes a number of smaller hospitals that cannot provide this level of service but includes a large number that do not at present offer VBAC.

Conclusion

Given the effect of the VBAC protocol on the cesarean section rate in our hospital, we believe that suitably equipped and staffed community hospitals should offer a VBAC service and adhere to the NCCACB criteria for the diagnosis of dystocia re-

quiring cesarean section in nulliparous women. These changes in practice are more likely to be accepted if epidural analgesia can also be provided. The use of other invasive procedures (e.g., forceps delivery) and maternal and neonatal morbidity and mortality rates should be monitored.

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