

Cesarean section: analysis of the experience before and after the National Consensus Conference on Aspects of Cesarean Birth

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Objective: To examine the effect of recommendations to reduce the cesarean section rate issued by the National Consensus Conference on Aspects of Cesarean Birth in 1986 on obstetric practices and to identify current patient factors that predict cesarean section.

Design: Descriptive retrospective cross-sectional study.

Setting: A tertiary care perinatal referral centre and a general teaching hospital with a level 2 nursery in Hamilton, Ont.

Patients: All patients who gave birth at the two hospitals in 1982 (4121 women) and 1990 (4431).

Main outcome measures: Cesarean section rates and indications and predictors of cesarean section.

Results: Although a trial of vaginal delivery after cesarean section was offered 93% more often in 1990 than in 1982 ($p = 0.0002$), the rate of vaginal delivery increased only 2.6%, for a reduction of 8.7% in the total cesarean section rate and of 15% in the repeat cesarean section rate. The incidence rate and treatment of dystocia did not change. The rate of cesarean section for breech presentation remained unchanged, and fetal distress was rarely confirmed with pH measurement in scalp blood before cesarean section. The most important predictors of cesarean section in 1990 were previous cesarean section and labour induction. For the nulliparous women and the multiparous women with no previous cesarean section labour induction was the most important predictor.

Conclusions: The rate at which patients with previous cesarean section are offered a trial of vaginal delivery has increased significantly since 1982; however, the total and repeat cesarean section rates have not decreased proportionally. Induction of labour is currently the most important correctable predictor of cesarean section. The active management of dystocia, efforts to increase the rate of vaginal breech delivery and appropriate methods to diagnose fetal distress need to be improved; such improvements should reduce the cesarean section rate further.

Objectif : Examiner les effets, sur les pratiques en obstétrique, des recommandations de réduction des taux de césariennes formulées en 1986 par le Congrès national du consensus sur les aspects des accouchements par césarienne et préciser les facteurs actuels, chez les patientes, qui permettent de prévoir une césarienne.

Conception : Étude croisée rétrospective descriptive.

Cadre : Centre de consultations périnatales de soins tertiaires et hôpital général d'enseignement avec pouponnière de niveau 2 à Hamilton (Ont.).

Patientes : Toutes les patientes qui ont accouché dans ces deux hôpitaux en 1982 (4 121 femmes) et 1990 (4 431 femmes).

Principales mesures de résultats : Taux et indications de césariennes et facteurs de prévision des césariennes.

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Résultats : Même si un essai d'accouchement par voie vaginale après une césarienne a été offert dans 93 % plus de cas en 1990 qu'en 1982 ($p = 0,0002$), le taux d'accouchements par voie vaginale n'a augmenté que de 2,6 %, pour une diminution de 8,7 % du taux total de césariennes et de 15 % du taux de césariennes répétées. Le taux d'incidence et le traitement de la dystocie n'ont pas changé. Le taux de césariennes pour les présentations par le siège est demeuré le même, et on a rarement confirmé des cas de détresse foetale par mesure du pH sanguin du cuir chevelu avant la césarienne. Les facteurs les plus importants de prévision des césariennes en 1990 étaient césariennes antérieures et travail provoqué. Chez les nullipares et les multipares n'ayant jamais subi de césarienne, le déclenchement du travail était le facteur prévisionnel le plus important.

Conclusions : Le taux de patientes ayant déjà subi une césarienne qui se voient offrir un essai d'accouchement par voie vaginale a augmenté considérablement depuis 1982; toutefois, le taux total de césariennes et le taux de césariennes à répétition n'ont pas diminué en proportion. Actuellement, le déclenchement du travail est le principal facteur prévisionnel de césarienne qu'il est possible de corriger. Il faut améliorer la gestion active de la dystocie, consacrer des efforts pour augmenter le taux d'accouchement par voie vaginale des présentations par le siège et élaborer des méthodes appropriées pour diagnostiquer les cas de détresse foetale; ces améliorations devraient permettre de réduire encore plus le taux de césariennes.

The cesarean section rate has risen in the last two decades. In the United States it increased from 5.5% in 1970 to 22.7% in 1985.¹⁻³ Similarly in Canada the rate climbed from 6.8% in 1971 to 18.7% in 1982^{4,5} and reached 19.6% in 1989.⁶ There is evidence, at least in Ontario, that the rate stabilized between 1983 and 1988, at 20.2%.^{7,8} In response to increasing public and government concerns, the National Consensus Conference on Aspects of Cesarean Birth convened in 1985 and made recommendations to reduce the rate of cesarean section.⁹

To determine whether these recommendations have affected obstetric practice and to examine additional factors influencing the cesarean section rate not addressed by the consensus conference we compared the obstetric practices at two hospitals before (in 1982) and after (in 1990) the recommendations were published.

Methods

Data were collected from two hospitals in Hamilton, Ont.: a tertiary care perinatal referral centre for southwestern Ontario and a general teaching hospital with a level 2 nursery. We accessed the labour and delivery database for deliveries in 1982 and 1990. Data were analysed with the use of the Statistical Package for the Social Sciences (version 3).¹⁰ To assure the validity of the database a manual audit was done on 2% of the charts, and the data were compared with the computer variables. Miscoding was found in 1/1200 entries. Missing variables were excluded from the analysis. We used frequency counts to calculate different rates, such as delivery type and cesarean section rates by indication.

The level of statistical significance was set at $p \leq 0.05$. We used 2×2 tables and the χ^2 test in the univariate analysis of predictors of cesarean section. Multivariate logistic regression was used to determine the variables that were significant independent predictors of cesarean section. We included all statistically significant factors in the regression model.

None of the patients was excluded from the analysis. Large for gestational age (LGA) and small for gestational age (SGA) were defined if the attending physician suspected either condition before delivery.

Results

Differences in obstetric practice

There were 4121 deliveries in 1982 and 4431 in 1990. The characteristics of the patients were similar for gestational age at delivery, proportion with a vertex presentation and proportion with a previous cesarean section (Table 1). The mean maternal age was higher and the proportion of nulliparous women lower in 1990 than in 1982 (Table 1).

There was a statistically significant, although clinically small, reduction of 8.7% in the overall rate of cesarean section ($p = 0.02$) (Table 2). The rate of primary cesarean section was relatively unchanged. The rate of repeat cesarean section decreased by 15%. A trial of labour was offered to women with a singleton vertex presentation and previous cesarean section 93% more often in 1990 than in 1982. An increase was also noted in the rates of vaginal delivery overall, spontaneous vaginal delivery and the use of a vacuum extractor. Epidural anesthesia was used slightly more often in 1990 than in 1982. A

decrease was observed in the frequency of forceps delivery and continuous electronic fetal monitoring.

Indications for cesarean section

When we compared the primary indications for cesarean section in 1982 and 1990, previous cesarean section was the most common indication in both years, although less so in 1990 (Table 3). In 1982 dystocia was the second most common indication, followed by "other" maternal and fetal indications, breech presentation and fetal distress. In 1990, however, other maternal and fetal indications replaced dystocia; the third and fourth most common indications were breech presentation and fetal distress.

The incidence rate of dystocia and the use of oxytocin to treat this condition did not change significantly over the study period, nor did the incidence rates of breech presentation and fetal distress. The pH of cord blood was measured in 98%

of the cesarean sections done because of fetal distress in 1990, as compared with 58% in 1982; the pH of scalp blood was rarely obtained in either year.

Predictors of cesarean section in 1990

To determine which current prenatal factors were independently predictive of cesarean section we examined only the deliveries in 1990. Women who underwent cesarean section were similar to those who underwent vaginal delivery in mean age (28.9 [standard deviation (SD) 5.1] v. 27.8 [SD 5.0] years) and mean gestational age at delivery (36.7 [SD 4.2] v. 37.6 [SD 4.4] weeks). Nulliparity, insulin-dependent diabetes mellitus, toxemia, hypertension, antepartum hemorrhage, a fetus thought to be large or small for gestational age, continuous electronic fetal monitoring, epidural anesthesia, previous cesarean section, labour induction and age more than 30 years were statistically significant predictors of cesarean section in the univariate analysis. Premature labour

Table 1: Characteristics of women at two hospitals in Hamilton, Ont., who gave birth before (in 1982) and after (in 1990) the publication of recommendations to reduce the cesarean section rate

Characteristic	1982 (n = 4121)	1990 (n = 4431)	p value*
Mean age (and standard deviation [SD]), yr	26.6 (5.1)	28.0 (5.1)	< 0.0001
Mean gestational age at delivery (and SD), wk	37.9 (4.4)	37.5 (4.3)	NS
Vertex presentation, % of women	92.6	92.8	NS
Previous cesarean section, % of women	10.5	11.7	NS
Nulliparous women, %	46.0	43.2	< 0.01

*NS = not significant.

Table 2: Characteristics of deliveries

Characteristic	Year; no. (and %) of women		% change
	1982	1990	
Cesarean section			
Primary	647 (15.7)	656 (14.8)	-5.7
Repeat	305 (7.4)	279 (6.3)	-14.9
Total	952 (23.1)	935 (21.1)	-8.7
Trial of labour*	(n = 433)	(n = 518)	
Vaginal delivery	143 (33.0)	330 (63.7)	+93.0
Spontaneous	3169 (76.9)	3496 (78.9)	+2.6
Instrumental delivery	2048 (49.7)	2747 (62.0)	+24.7
Forceps	1117 (27.1)	678 (15.3)	-43.5
Vacuum	4 (0.1)	71 (1.6)	+1500
Continuous electronic fetal monitoring	2728 (66.2)	1839 (41.5)	-37.3
Epidural anesthesia	2365 (57.4)	2698 (60.9)	+6.1

*Offered to women with a singleton vertex presentation and previous cesarean section.

and postmaturity were not statistically significant predictors.

The logistic regression analysis revealed that the following were important independent predictors of cesarean section: nulliparity, previous cesarean section, labour induction and nonvertex presentation (Table 4). For the nulliparous patient with a singleton vertex presentation labour induction and an infant thought to be either large or small for gestational age were important predictors of cesarean section. For the multiparous patient with a singleton

vertex presentation and no previous cesarean section labour induction, a fetus thought to be small for gestational age and antepartum hemorrhage were important predictors.

Discussion

Several recent large studies have addressed changes in cesarean section rates.^{6,8,11} Our smaller but complete database of antenatal variables allowed us to perform a multivariate analysis of the in-

Table 3: Indications for cesarean section

Indication	Year; no. (and %) of cesarean sections		% change
	1982 (n = 876)	1990 (n = 900)	
Previous cesarean section	292 (33.3)	242 (26.9)	-19.2
Dystocia	227 (25.9)	200 (22.2)	-14.3
Oxytocin augmentation	86 (37.9)	76 (38.0)	+0.3
Breech presentation	122 (13.9)	115 (12.8)	-7.9
Vaginal delivery of newborn > 2500 g	37 (30.3)	39 (33.9)	+11.9
Fetal distress	111 (12.7)	109 (12.1)	-4.7
pH determined			
In cord blood	64 (57.7)	107 (98.2)	+70.2
In scalp blood	8 (7.2)	20 (18.3)	+154.2
Apgar score < 7			
At 1 min	59 (53.2)	46 (42.2)	-20.7
At 5 min	17 (15.3)	30 (27.5)	+79.7
Other	124 (14.2)	234 (26.0)	+83.1

Table 4: Results of multivariate logistic regression analysis of predictors of cesarean section in 1990*

Variable	All women		Nulliparous women with vertex presentation		Multiparous women with vertex presentation and no previous cesarean section	
	OR	p value	OR	p value	OR	p value
Nulliparity	3.4	< 0.0001	-	-	-	-
Diabetes mellitus	1.2	0.72	1.6	0.42	0.0	0.70
Previous cesarean section	20.0	< 0.0001	-	-	-	-
Labour induction	7.1	< 0.0001	4.5	< 0.0001	12.5	< 0.0001
Age > 30 yr	1.2	0.27	1.5	0.05	1.0	0.92
Nonvertex presentation	12.5	< 0.0001	-	-	-	-
Continuous electronic fetal monitoring	1.3	0.17	1.3	0.13	0.8	0.62
Fetus large for gestational age	3.0	0.10	3.3	0.02	2.9	0.19
Fetus small for gestational age	1.9	0.01	2.4	0.01	2.4	0.01
Hypertension	4.0	0.07	1000.0	0.52	6.2	0.44
Toxemia	0.9	0.91	1.3	0.48	1.5	0.44
Antepartum hemorrhage	1.9	0.05	1.3	0.65	7.7	0.0007
Epidural anesthesia	1.4	0.04	1.5	0.04	2.0	0.05

*OR = odds ratio.

dependent effects of each factor on cesarean section.

The consensus conference made recommendations in three major areas: vaginal birth after cesarean section (VBAC), dystocia and breech delivery.⁹ VBAC was recommended for all patients with a transverse scar and a cephalic presentation regardless of the indication for the previous cesarean section, provided that adequate information was given to the patient and informed consent obtained. Our findings revealed that physicians are actively endorsing this principle: 63.8% of the patients with a previous cesarean section in 1990, as compared with 33.1% in 1982, were offered VBAC.

Although the rate of repeat cesarean section decreased by 15% and the proportion of cesarean sections for which a previous cesarean section was the primary indication fell by 19.9% the rate of vaginal deliveries increased by only 2.6%. This apparent discrepancy is explained by the shift of "other" maternal and fetal factors from the third most common indication of cesarean section in 1982 to the second most common in 1990. It appeared that physicians were encouraging VBAC at first but then were opting out of that choice for other perceived or real reasons; thus, the cesarean sections are not being classified as repeat.

The consensus conference recommended that dystocia be treated early with oxytocin and that cesarean section be reserved for cases of true cephalopelvic disproportion with advanced cervical dilation, adequate uterine contractions, moulding and arrest of descent of the fetal head. The incidence rate of dystocia as an indication for cesarean section has changed little since 1982. More important, there has been no increase in the use of oxytocin. It appears that physicians have continued to rely on the clinical signs of dystocia and to choose cesarean section rather than wait for failure to progress despite augmentation of labour.

The consensus conference recommended a planned vaginal birth for frank or complete breech presentation if the estimated birth weight is 2500 to 4000 g. The prevalence rate of breech presentation remained unchanged after 1982. The rate of vaginal delivery in such cases involving infants weighing more than 2500 g increased by 12%, but this change was not significant. Whether this difference reflects a litigation-motivated decision, a lack of adequate training in breech delivery, patient pressure or a combination of various factors was not addressed in this study. External cephalic version in a breech presentation was not endorsed by the consensus conference; however, evidence suggests that routine version at term is acceptable to reduce the rate of cesarean section for this indication.¹²

In addition to the recommendation of the consensus conference, our study allowed us to comment

on several other significant practices not addressed by the report.

We recorded a decrease of 43.5% in the forceps delivery rate and a slight increase in the use of vacuum extraction from 1982 to 1990. The decrease in the forceps delivery rate is reflected in a 24.7% increase in the spontaneous vaginal delivery rate. Although there was no direct evidence, this would imply that the decrease was due to waiting for spontaneous vaginal delivery rather than the use of forceps after a set time in the second stage.

Fetal distress was an indication for cesarean section in 12.1% of the deliveries in 1990. However, the evidence for the appropriateness of this indication is weak, most of the infants having an Apgar score of more than 7 at 1 and 5 minutes. Although we measured the pH in cord blood more often in 1990, we did not use pH values in scalp blood as a test to ensure validity in cases of suspected fetal distress. Since there is poor correlation between abnormal fetal monitor strips and pH measurement¹³ one would expect a reduction in the rate of cesarean section for fetal distress if monitor evidence were validated.

Labour induction was an important predictor of cesarean section. For the nulliparous women with a vertex presentation and the multiparous women with a vertex presentation and no previous cesarean section induction was the main predictor; the next most important ones were antepartum hemorrhage and the clinical perception that the fetus was small for gestational age. These last two predictors were the only true prenatal factors that seemed to predispose to cesarean section. We did not address the indications for induction or whether cervical ripening was performed before induction. However, in light of our findings physicians should review carefully the indications for labour induction and ensure that their patients are informed of benefits and risks of induction.

In conjunction with the consensus conference recommendations, this review of delivery practices highlights several areas. Although physicians are actively endorsing VBAC, the cesarean section rate fell minimally and only shifted in indications; however, unlike previous investigators^{6,11} we have documented a slight but encouraging decline in the total cesarean section rate. Furthermore, the rate may have been even higher in the years between 1982 and 1990, and it may continue to decrease with future analysis; this would indicate a positive impact of the consensus conference.

There are still areas to be addressed in attempting to improve the situation further: (a) active management of dystocia with oxytocin augmentation, (b) ways to increase the vaginal delivery rate according to the guidelines from the consensus conference

and (c) confirmation of abnormal fetal heart rate patterns with pH values in scalp blood before fetal distress is diagnosed and cesarean section performed. Our review of the practices in 1990 demonstrates that the strongest correctable predictor of cesarean section is labour induction, regardless of the indication for the induction. Professional guidelines are only helpful in changing practices if they are part of a more comprehensive plan that includes public and physician education, quality-assurance programs and a change in the litigation atmosphere.

Our study has addressed only the maternal issues of cesarean section. Quality-assurance programs and future studies must ensure that zealous reductions in the cesarean section rate are not accompanied by increased risks to the fetus or neonate.

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Conferences

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Aug. 23-27, 1993: Modelling of the Structure and Metabolism of Proteins and Amino Acids Workshop — 3rd International Congress on Amino Acids

Vienna, Austria

Professor M. Hjelm, Institute of Child Health, London WC1N 1EH, England

Sept. 4-10, 1993: 15th World Congress of Neurology (sponsored by the World Federation of Neurology and the Canadian Neurological Society)

Vancouver

Secretariat, 645-375 Water St., Vancouver, BC V6B 5C6; tel (604) 681-5226, fax (604) 681-2503

Sept. 5-10, 1993: Challenges in a Changing World — Psychogeriatrics at the Turn of the 21st Century: 6th Congress of the International Psychogeriatric Association (IPA)

Berlin, Germany

Abstract deadline: Apr. 30, 1993

Official language: English

6th Congress of the IPA, GEROCON Geriatric Medicine, Consulting GmbH, Im Hoppenkamp 4, 5060 Bergisch-Gladbach 1, Germany; tel 011-49-2204-5-20-14, fax 011-49-2204-5-20-15

Sept. 10, 1993: Health Care Aide Clinic Day
North York, Ont.

Sybil Gilinsky, Continuing Education Department, Baycrest Centre for Geriatric Care, 3560 Bathurst St.,

North York, ON M6A 2E1; tel (416) 789-5131, ext. 2365

Sept. 20-22, 1993: Alzheimer's Disease International 9th Annual Conference — Global Challenge, Local Action
Toronto

Alzheimer Society of Canada, 201-1320 Yonge St., Toronto, ON M4T 1X2; tel (416) 925-3552, fax (416) 925-1649

Sept. 27-29, 1993: 1st International Conference on Community Health Nursing Research
Edmonton

Shirley Stinson or Karen Mills, c/o Edmonton Board of Health, 500-10216-124 St., Edmonton, AB T5N 4A3; tel (403) 482-1965, fax (403) 482-4194

Oct. 7-10, 1993: 3rd Congress of the Asian Pacific Society of Respirology (organized by the Singapore Thoracic Society)

Singapore

Secretariat, 3rd Congress of the Asian Pacific Society of Respirology, 336 Smith St. 06-302, New Bridge Centre, Singapore 0105; tel 011-65-227-9811, fax 011-65-227-0257

Oct. 15, 1993: Nursing Clinic Day

North York, Ont.

Sybil Gilinsky, Continuing Education Department, Baycrest Centre for Geriatric Care, 3560 Bathurst St., North York, ON M6A 2E1; tel (416) 789-5131, ext. 2365

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