

## Recent trends in cesarean section rates in Ontario

Geoffrey M. Anderson, MD, PhD  
Jonathan Lomas, MA

After increasing steadily for 15 years the cesarean section rate in Ontario stabilized at 20.2 per 100 deliveries in the fiscal years 1986-87 and 1987-88. An important factor in the stabilization was a decrease in the rate of repeat section. The diagnosis and management of dystocia and fetal distress continue to put upward pressure on the cesarean section rate, which is higher than would be expected if recent practice guidelines had been fully implemented. There is a need for further research into the appropriate management of labour and delivery and into more targeted techniques for bringing practice into line with appropriate standards of care.

Après avoir augmenté de façon constante pendant 15 ans, le taux de césarienne en Ontario s'est stabilisé à 20,2 pour 100 accouchements au cours des années fiscales 1986-87 et 1987-88. La baisse du nombre d'interventions itératives est un facteur important de cette stabilisation. La reconnaissance et le traitement des dystocies et de la souffrance foetale tendent encore à garder le taux de césarienne à un niveau plus élevé que ce que laisserait entrevoir la mise en pratique intégrale des recommandations thérapeutiques récentes. Il y a lieu de continuer les recherches sur la conduite à tenir dans le travail et l'accouchement et sur de meilleurs moyens d'amener les praticiens à se conformer aux normes pertinentes.

*From the Health Policy Research Unit, University of British Columbia, Vancouver, and the Centre for Health Economics and Policy Analysis, Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ont.*

*Reprint requests to: Dr. Geoffrey M. Anderson, Health Policy Research Unit, 429-2194 Health Sciences Mall, University of British Columbia, Vancouver, BC V6T 1Z6*

Cesarean section rates in both Canada and the United States increased steadily over the 1970s and early 1980s. In the United States the rate quadrupled, from 5.5 per 100 deliveries in 1970 to 22.7 in 1985.<sup>1,2</sup> In Canada the rate increased from 5.7 in 1970 to 15.9 in 1980.<sup>1</sup> The rate in Ontario mirrored the national trend, increasing from 6.8 in 1971 to 18.7 in 1982.<sup>3,4</sup>

Analysis of the rates in Canada and the United States showed that four indications were responsible for most cesarean deliveries: previous cesarean section, breech presentation, dystocia and fetal distress. Analysis of the rates on an indication-specific basis showed that dystocia and previous cesarean section were the main factors accounting for the overall rate increases in the 1970s.<sup>5,6</sup> By the early 1980s, however, previous cesarean section had become the principal factor behind the continued rise.<sup>2,4</sup>

The steady increase in the overall cesarean section rate, combined with debate over the most appropriate approach to the diagnosis and management of the main indications for cesarean section, resulted in growing professional and public concern.<sup>7,8</sup> In response to these concerns the medical profession in both Canada and the United States attempted to develop clinical guidelines that could be used to aid physicians in managing labour and delivery.<sup>9,10</sup> These indication-specific guidelines, if adopted, would lead to a decrease in the cesarean section rate.

We analysed obstetric care data from Ontario for the period 1983-84 through 1987-88 to determine recent trends in the overall cesarean section rate and to examine the effect of the diagnosis and management of the main indications for cesarean section on these trends. Our goal was to examine current obstetric management in the light of existing practice guidelines, to suggest policies that could help bring management in line with the

guidelines and to identify barriers to full implementation of these policies.

## Methods

The data sources and methods used in this study are similar to those that we used in previous research<sup>4</sup> and are only briefly outlined.

For each discharge from an acute care hospital in Ontario the Hospital Medical Records Institute (HMRI) receives an abstract containing information about the patient and the institution as well as detailed diagnostic and procedural data. The data are computerized and checked for internal validity by the HMRI. These data form the basis of both provincial and federal hospital care statistics.

The HMRI granted permission for us to examine the discharge data for deliveries in Ontario for fiscal years 1983-84 to 1987-88. (The fiscal year runs from Apr. 1 to Mar. 31.) A diagnosis was recorded for each delivery from the four-digit ICD-9<sup>11</sup> code on the abstract. However, the HMRI allows up to eight diagnoses on each abstract, and a single delivery may be associated with two or more indications for cesarean section. Certain indications (e.g., dystocia and breech presentation) tend to occur together, and it is important to allocate these deliveries to a single category in a manner that is both logical and clinically meaningful. Therefore, in consultation with obstetricians, we established the following causal model and decision rules to classify deliveries that had more than one diagnosis.

- All deliveries for which one of the diagnoses was a previous cesarean section were assigned to the diagnostic class "previous cesarean section". (Only 5.5% to 7.9% of deliveries with the diagnosis of previous cesarean section had any other indication noted on the abstract.)

- Cases with a diagnosis of breech presentation with dystocia or fetal distress, or both, were assigned to the diagnostic class "breech". (This rule recognizes breech presentation as a potential cause of both dystocia and fetal distress.)

- Cases with a diagnosis of dystocia and fetal distress were assigned to the diagnostic class "dystocia". (This rule recognizes dystocia as a potential cause of fetal distress.)

- A case was assigned to the diagnostic class "fetal distress" only if that diagnosis and none of

the other three diagnoses appeared on the abstract.

- Cases that did not fall into any of these four classes were classified as "other".

This model has been previously used by researchers in Canada<sup>4</sup> and the United States<sup>2</sup> to describe and analyse trends in cesarean section rates. With it we were able to calculate three more specific rates: the cesarean section rate attributable to each indication (the total number of cesarean sections for cases assigned to that indication divided by the total number of deliveries); the indication incidence rate, a measure of the frequency at which patients receive a particular diagnosis (the total number of deliveries allocated to a diagnostic category divided by the total number of deliveries); and the indication-specific cesarean section rate, a measure of the frequency at which patients with a specific indication undergo cesarean section (the number of deliveries with a particular indication in which a cesarean section was done divided by the total number of deliveries with that indication).

## Results

The overall cesarean section rate increased from 19.6 per 100 deliveries in 1983-84 to 20.3 in 1985-86, then levelled off at 20.2 (Table I). Previous cesarean section accounted for around 40% of the cesarean sections in each of 1983-84, 1985-86 and 1987-88, and the other three specific indications together accounted for just over one-third, dystocia being the largest contributor, followed by breech presentation and fetal distress (Table II). Over the period 1983-84 to 1985-86, when the overall cesarean section rate was increasing, previous cesarean section accounted for most of the increase, followed by fetal distress. During the more recent period, owing to a levelling off of the rates attributable to all the indications, the overall cesarean section rate stabilized.

Between 1983-84 and 1985-86 the incidence of previous cesarean section as an indication increased (even though the use of repeat cesarean section in these cases dropped slightly), the use of cesarean section for breech presentation increased slightly, and both the incidence rate and the indication-specific cesarean section rate for fetal distress increased (Table III).

The levelling off of the overall cesarean section rate in 1986-87 and 1987-88 exhibited some

Table I — Number of deliveries and cesarean sections, as well as cesarean section rate per 100 deliveries, in Ontario in 1983-84 to 1987-88

Year	No. of deliveries	No. of cesarean sections	Cesarean section rate
1983-84	124 389	24 428	19.6
1984-85	131 310	26 178	19.9
1985-86	132 655	26 932	20.3
1986-87	134 788	27 295	20.2
1987-88	134 633	27 167	20.2

cancelling out of the independent effects of the indication incidence and indication-specific cesarean section rates. The continued rise in the incidence of previous cesarean section was counteracted by the drop in the use of repeat cesarean section in these cases. The same effect occurred for fetal distress but not for dystocia: just under one-third of women with dystocia continued to receive cesarean section, even though the incidence rate increased.

## Discussion

We found that after increasing for 15 years the cesarean section rate in Ontario stabilized at between 20.2 and 20.3 per 100 deliveries in the period 1985-86 to 1987-88. These rates are lower than those recently reported for the United States, where the rate was 22.7 in 1985,<sup>2</sup> but are substantially higher than those in Europe. For example, in 1983 the rate in England and Wales was 10.1,<sup>1</sup> compared with 19.6 in Ontario. Although it is difficult to separate all the factors that lead to differences in obstetric practice between Canada and Europe, the European experience suggests that modern obstetrics need not be synonymous with cesarean section rates that are over 20%.

Although international comparisons can provide one context within which the appropriateness of cesarean section rates can be examined, a more comprehensive analysis requires identification of

the indications that play the most important role in determining cesarean section rates and comparison of the management of these indications with research evidence and accepted standards of practice.

In Canada 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 factors that should be taken into consideration when one makes the diagnosis of dystocia.<sup>9</sup> The Society of Obstetricians and Gynaecologists of Canada and the Association of Professors of Obstetrics and Gynaecology fully endorsed the report and urged implementation of all its recommendations.<sup>9,12</sup> The guidelines provide an accepted standard against which the description of practice derived from the HMRI data can be compared.

Our results are similar to those of our study of cesarean section rates in Ontario over the period 1979-80 to 1982-83<sup>4</sup> in showing that previous cesarean section was the single most important indication in determining the overall cesarean section rate and that when the overall cesarean section rate was increasing, most of the increase could be attributed to previous cesarean section; more specifically, the increasing incidence of previous cesarean section as an indication seems to be the most important factor in increases in the overall cesarean section rate.

The implication is that efforts directed at the

Table II — Distribution of cesarean sections by attributable indication in selected years

Indication	% of all deliveries (and of cesarean sections)		
	1983-84	1985-86	1987-88
Previous cesarean section	7.7 (39.1)	8.1 (40.1)	8.1 (39.9)
Breech presentation	2.1 (10.5)	2.1 (10.6)	2.1 (10.2)
Dystocia	3.4 (17.4)	3.5 (17.3)	3.6 (18.0)
Fetal distress	1.7 (8.6)	1.9 (9.5)	1.9 (9.7)
Other	4.8 (24.4)	4.6 (22.6)	4.5 (22.2)
Total*	19.7 (100.0)	20.2 (100.1)	20.2 (100.0)

\*Totals may not be identical to those in Table I because of rounding.

Table III — Indication incidence rates\* and indication-specific cesarean section rates† for selected years

Year	Indication							
	Previous cesarean section		Breech presentation		Dystocia		Fetal distress	
	Incidence rate	Indication-specific section rate	Incidence rate	Indication-specific section rate	Incidence rate	Indication-specific section rate	Incidence rate	Indication-specific section rate
1983-84	8.1	95.0	3.2	64.7	10.8	31.6	5.4	31.4
1985-86	8.6	94.3	3.1	68.2	10.8	32.6	5.8	33.0
1987-88	8.8	91.3	3.0	68.1	11.4	32.0	6.4	30.9

\*Number of deliveries allocated to a particular indication divided by the total number of deliveries, multiplied by 100.

†Number of deliveries with a particular indication in which a cesarean section was done divided by the total number of deliveries with that indication, multiplied by 100.

indications for primary cesarean section will be required to achieve long-term reductions in the cesarean section rate even if short-term reductions can be achieved by focusing on reducing the rate of repeat section. As overall cesarean section rates in Ontario have stabilized, the effect of changes in the rate attributable to previous cesarean section has been reduced. Although the incidence of this indication continues to increase, the repeat cesarean section rate has decreased enough to counteract any effects this may have on overall cesarean section rates.

However, even though the repeat cesarean section rate has decreased slightly, less than 10% of women with a previous cesarean section had vaginal deliveries in 1987-88. The NCCACB report recommends a trial of labour for most women with a previous cesarean section. Since the system for coding procedures used in Canada does not include a code for trial of labour, the HMRI database cannot be used to calculate rates of trials of labour. Thus, although it is not possible to examine trends in the rate of trials of labour directly, the fact that less than 1 woman in 10 with a previous cesarean section has a vaginal delivery raises concern about compliance with the NCCACB guidelines.

Breech presentation accounted for about 10% of the cesarean sections in Ontario. The cesarean section rate for this indication was approximately 55 per 100 deliveries in 1979-80<sup>4</sup> but had increased to over 68 by 1987-88. The effect of this increasing indication-specific rate on the overall cesarean section rate was attenuated by the relatively low incidence of this indication.

The NCCACB report stated that "there has been an increasing trend in Canada toward universal performance of cesarean section for breech presentation. Extensive review of the research literature has failed to uncover any evidence to support this trend."<sup>9</sup> The report went on to recommend vaginal delivery for the most common forms of breech presentation. The growing reliance on cesarean section in the management of breech presentation in Ontario again raises concern about compliance with the NCCACB guidelines.

Even though the overall cesarean section rate stabilized between 1985-86 and 1987-88, the rate attributable to dystocia continued to increase, accounting for 18% of all cesarean sections in 1987-88. This pattern was also found in our previous study,<sup>4</sup> reflecting changes in both incidence and indication-specific rates. This suggests that dystocia may have a growing role in maintaining, or perhaps even increasing, the overall cesarean section rate.

The NCCACB report noted that there was little research evidence on which to base recommendations for the diagnosis and management of dystocia. However, a large and growing number of deliveries are identified as having this ill-defined diagnosis. It is difficult to provide a meaningful and acceptable definition of dystocia, and more

research is needed to link information on the progress of labour to fetal and maternal outcomes.

Fetal distress also accounted for about 10% of the cesarean sections in Ontario. This indication played an important role in the increase in the overall cesarean section rate between 1983-84 and 1985-86. The steady rise in the incidence of the diagnosis of fetal distress, noted even in the period 1985-86 to 1987-88, is consistent with findings from the United States<sup>2</sup> and continues the trend noted in Ontario for the period 1979-80 to 1982-83.<sup>4</sup> In 1979-80 only 2.4% of deliveries in Ontario were assigned to the diagnostic category "fetal distress";<sup>4</sup> by 1987-88 the rate had increased to 6.4%.

Our results, combined with our previous analysis of obstetric practice in Ontario,<sup>4</sup> indicate an apparent epidemic of fetal distress. In less than 10 years the probability that a delivery would be designated as involving fetal distress more than doubled. It is important to determine the extent to which this rapid increase represents a true increase in the incidence of fetal distress, an improved ability to correctly identify fetal distress or an increased incidence of misdiagnosis of fetal distress. Since the diagnosis is linked to the use of electronic fetal monitoring, the development of practice guidelines for fetal distress is clearly related to the appropriate use of this technology.

Although some investigators feel that universal electronic fetal monitoring is warranted,<sup>13</sup> the results of large trials<sup>14,15</sup> and recent reviews<sup>16,17</sup> indicate that it may not be of any benefit in most deliveries, and, on the basis of this evidence, recommendations have been made to limit its use to high-risk groups.<sup>18,19</sup> The rapid increase in the diagnosis of fetal distress in Ontario may suggest that these recommendations are not being followed.

## Conclusions

The HMRI data used in our paper to describe obstetric practice do not provide information on fetal or maternal outcomes or the detailed clinical information needed for a definitive comparison of practice with accepted standards of care. We recommend that such a definitive study be done. However, in the interim our results suggest that there may not be complete congruence between professionally endorsed standards of care, such as those provided by the NCCACB, and recent obstetric practice. This raises several issues regarding the diffusion and implementation of such standards of care.

Despite the fact that the NCCACB report was published in *CMAJ*<sup>9</sup> and summarized in the *Bulletin of the Society of Obstetricians and Gynaecologists of Canada*<sup>12</sup> and was mailed to each obstetrician in the country, physicians may have been unaware of the guidelines. It is also possible that although the recommendations were endorsed by

the two major professional associations that represent those providing obstetric care many physicians did not agree with the recommendations. There is clearly a need to review the process of diffusion of practice guidelines and the awareness, knowledge and attitudes of practitioners. There is also a need to critically assess strategies for conveying information to practitioners other than by simply publishing or distributing guidelines.

Physicians play a central role in determining obstetric management, but they operate in an environment that can modify or restrict their behaviour. The management of labour and delivery almost always occurs in a hospital setting, and the facilities available within the hospital as well as the policy defined by the institution can alter practice. Guidelines need to be developed and implemented in the context of available resources and in cooperation with the institutions in which they will be implemented.

In a broader social environment physicians are subject to both medicolegal concerns and more direct patient preferences for certain types of care. However, given that clinical guidelines are based on a careful assessment of research evidence and professional endorsement, adherence to these guidelines should provide both protection against unwarranted litigation and a solid basis for patient education. Analysis of practice should recognize the importance of the environment, but blame for the failure of practice to match standards should not be laid at the feet of lawyers and patients without some clear evidence to support that contention.

The cesarean section rate in Ontario has levelled off in recent years but seems to be higher than would be expected if recent practice guidelines were fully accepted and implemented. Existing strategies for bringing practice in line with guidelines may have had a role in stabilizing the rate, but more effective strategies may have to be identified to bring about further changes. There is a need to rigorously evaluate such strategies.

This research was supported by the Ontario Ministry of Health with research grant 01917 and personnel support to Mr. Lomas.

## References

1. Notzon FC, Placek PJ, Taffel SM: Comparison of national cesarean section rates. *N Engl J Med* 1987; 316: 386-389
2. Taffel SM, Placek PJ, Liss T: Trends in the United States cesarean section rate and reasons for the 1980-83 rise. *Am J Public Health* 1987; 77: 955-959
3. Wadhwa S, Nair C: Trends in cesarean section deliveries, Canada, 1968-1977. *Can J Public Health* 1982; 73: 47-51
4. Anderson GM, Lomas J: Determinants of the increasing cesarean birth rate: Ontario data 1979 to 1982. *N Engl J Med* 1984; 311: 887-892
5. Bottoms SF, Rosen MG, Sokol RJ: The increasing cesarean birth rate. *N Engl J Med* 1980; 302: 559-563
6. Baskett TF, McMillen RM: Cesarean section: trends and morbidity. *Can Med Assoc J* 1981; 125: 723-726
7. Pease WH: To section or not to section. *Am J Public Health* 1983; 73: 843-844
8. Baskett TF: Cesarean section: what is an acceptable rate? [E]. *Can Med Assoc J* 1978; 118: 1019-1020
9. Indications for cesarean section: final statement of the panel of the National Consensus Conference on Aspects of Cesarean Birth. *Can Med Assoc J* 1986; 134: 1348-1352
10. *Cesarean Childbirth* (publ [NIH] 82-2067), National Institutes of Health, Bethesda, Md, 1981
11. *International Classification of Diseases*, 9th rev, WHO, Geneva, 1978
12. Summary of the final statement of the panel of the National Consensus Conference on Aspects of Cesarean Birth. *Bull Soc Obstet Gynaecol Can* 1986; 8 (2): 8-10
13. Jenkins HML: Thirty years of electronic intrapartum fetal heart rate monitoring: discussion paper. *J R Soc Med* 1989; 82: 210-214
14. MacDonald D, Grant A, Sheridan-Pereine M et al: The Dublin randomized controlled trial of intrapartum fetal heart rate monitoring. *Am J Obstet Gynecol* 1985; 152: 524-539
15. Leveno KJ, Cunningham FG, Nelson S et al: A prospective comparison of selective and universal electronic fetal monitoring in 34,995 pregnancies. *N Engl J Med* 1986; 315: 615-619
16. Shy KK, Larson EB, Luthy DA: Evaluation of a new technology: the effectiveness of electronic fetal heart rate monitoring. *Annu Rev Public Health* 1987; 8: 165-190
17. Prentice A, Lind T: Fetal heart rate monitoring during labour — too frequent intervention, too little benefit? *Lancet* 1987; 2: 1375-1377
18. NIH Consensus Development Conferences: antenatal diagnosis — fetal distress. *Clin Pediatr (Phila)* 1979; 18: 585-598
19. *Report of the Federal Task Force on High Risk Pregnancies and Prenatal Record Systems*, Health Services and Promotion Branch, Dept of National Health and Welfare, Ottawa, 1982: 26

## Worthy of expression

*Should you become authors, express your opinions freely; defend them rarely. It is not often that an opinion is worth expressing, which cannot take care of itself. Opposition is the best mordant to fix the color of your thought in the general belief.*

— Oliver Wendell Holmes (1809-1894)