The costs of planned cesarean versus planned vaginal birth in the Term Breech Trial

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Abstract

Background: The Term Breech Trial compared the safety of planned cesarean and planned vaginal birth for breech presentations at term. The combined outcome of perinatal or neonatal death and serious neonatal morbidity was found to be significantly lower among babies delivered by planned cesarean section. In this study we conducted a cost analysis of the 2 approaches to breech presentations at delivery.

Methods: We used a third-party–payer (i.e., Ministry of Health) perspective. We included all costs for physician services and all hospital-related costs incurred by both the mother and the infant. We collected health care utilization and outcomes for all study participants during the trial. We used only the utilization data from countries with low national rates of perinatal death (≤ 20/1000). Seven hospitals across Canada (4 teaching and 3 community centres) were selected for unit cost calculations.

Results: The estimated mean cost of a planned cesarean was significantly lower than that of a planned vaginal birth ($7165 v. $8042 per mother and infant; mean difference –$877, 95% credible interval –$1286 to –$473). The estimated mean cost of a planned cesarean was lower than that of a planned vaginal birth for both women having a first birth ($7255 v. $8440) and women having had at least one prior birth ($7071 v. $7559). Although the treatment effect was largest in the subgroup of women having their first child, there was no statistically significant interaction between treatment and parity since the 95% credible intervals for difference in treatment effects between parity equalling zero and parity of one or greater all include zero.

Interpretation: Planned cesarean section was found to be less costly than planned vaginal birth for the singleton fetus in a breech presentation at term in the Term Breech Trial.

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The Term Breech Trial was a large multicentre, international randomized controlled trial that was conducted to determine whether planned cesarean was safer than planned vaginal birth for the delivery of the singleton fetus in frank or complete breech presentation at term. The study involved 2088 women from 121 centres in 26 countries. Participants were randomly assigned to either planned cesarean or planned vaginal birth. Data were received for 2083 women. Of the 1041 women assigned to the planned cesarean group, 941 (90.4%) actually delivered by cesarean; of the 1042 women assigned to the planned vaginal birth group, 591 (56.7%) delivered vaginally. The study's main findings were that the combined outcome of perinatal or neonatal death and serious neonatal morbidity, excluding lethal congenital anomalies, was significantly lower in the planned cesarean group than in the planned vaginal birth group (17/1039 [1.6%] v. 52/1039 [5.0%], relative risk [RR] 0.33, 95% confidence interval [CI] 0.19–0.56), and that there were no statistically significant differences between the groups in terms of maternal rates of death or serious maternal morbidity (41/1041 [3.9%] v. 33/1042 [3.2%], RR 1.24, 95% CI 0.79–1.95).[1]

In this study we sought to determine whether a policy of planned cesarean section in the event of breech presentation is more or less expensive than a policy of planned vaginal birth. We report the estimated cost of each management strategy and discuss the economic and policy implications of our findings.

Methods

A full description of the methods is available in the unabridged version of this article (www.cmaj.ca/cgi/content/full/174/8/1109). A detailed description of the Term Breech Trial and its findings can be found elsewhere.[1,2]

In brief, women with a singleton live fetus in a frank or complete breech presentation at term were randomly assigned to planned vaginal delivery or planned cesarean section. The cesarean was scheduled for 38 weeks' gestation or

later. Vaginal breech deliveries were undertaken by experienced clinicians.

Our analysis was undertaken from the perspective of a third-party payer (e.g., Ministry of Health). Health care resource use was collected for all women and infants who participated in the trial, but for this analysis we used only the resources used by women and infants recruited from countries with low (≤ 20/1000) national rates of perinatal death, as reported in 1996 by the World Health Organization.[3] We collected information on health care utilization up to 6 weeks postpartum from case report forms for all mothers and infants.

To obtain reliable unit costs for health care services, reports from 4 teaching hospitals and 3 community hospitals in 3 provinces (British Columbia, Alberta and Ontario) were used. The hospitals were chosen because of their accessibility and quality of financial information.[4] Physician fees for the services were obtained from the respective provincial fee schedules.[5–7] Because unit cost estimates varied across the 7 hospitals and physician fees varied between the different provinces, we used the midpoint unit cost between the high and low unit cost estimates for the analysis.

Results were analyzed according to the intention to treat approach. The study (including the economic component) was approved by the research ethics committees of all participating centres, and the women who participated gave informed consent before enrolling in the trial.

Results

The total number of participants from countries with low national perinatal rates of death was 515 mothers and 514 infants in the planned cesarean group and 512 mothers and 511 infants in the planned vaginal birth group (Fig. 1).

Women in the planned vaginal birth group had more antenatal visits, inductions or augmentations of labour or both with oxytocin, inductions or augmentations of labour or both with prostaglandins, and epidural analgesia than women in the planned cesarean group (see Table 1 of the unabridged version of the article at www.cmaj.ca/cgi/content/full/174/8/1109). More spinal anesthesia was given in the planned cesarean group. As expected, there were more cesareans in the planned cesarean group and more vaginal breech and

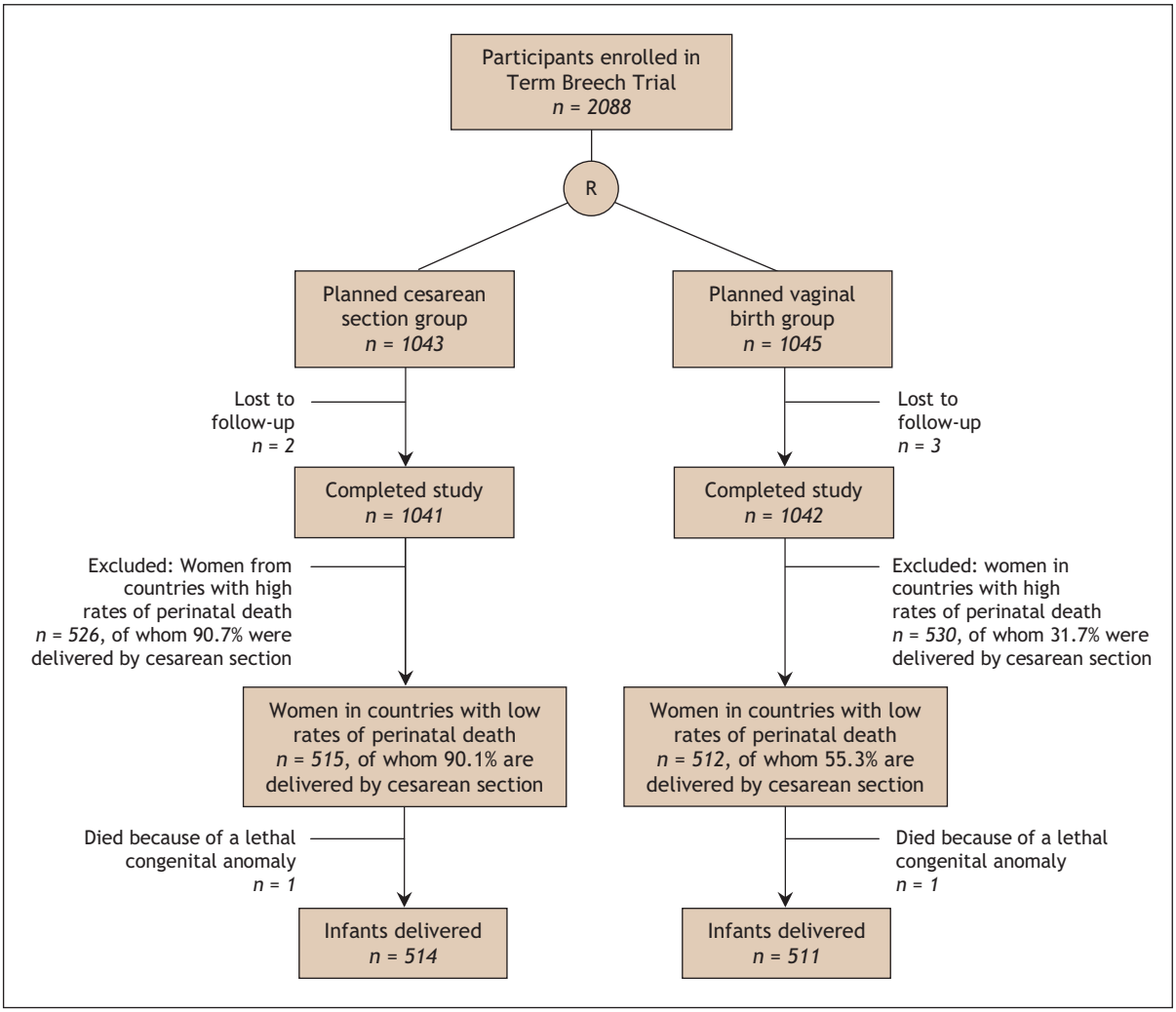

Fig. 1: Flow of participants through the study. A low national rate of perinatal death is ≤ 20/1000.

cephalic deliveries in the planned vaginal birth group. However, there were more cesareans in labour in the planned vaginal birth group than in the planned cesarean group. Infants in the planned cesarean group were less likely to receive care in the neonatal intermediate care unit or neonatal intensive care unit and more likely to have normal newborn examinations than infants in the planned vaginal birth group.

Women in the planned cesarean group spent, on average, less time in the antenatal ward and in the labour and delivery room than women in the planned vaginal birth group. The mean lengths of stay of women in the planned cesarean group in the operating room and in the postnatal ward were longer than those of the women in the planned vaginal birth group. Infants in the planned cesarean group had a shorter length of stay in the neonatal intermediate and neonatal intensive care units and a longer length of stay in the regular nursery than those in the planned vaginal birth group (see Table 3 of the unabridged version of the article at www.cmaj.ca/cgi/content/full/174/8/1109).

Table 1: Mean cost and standard error (SE) per patient and cost difference between treatment arms*

Group, estimated unit cost†	Mean (SE) cost per patient, $		Mean cost difference,‡ $ (95% credible interval)
	Planned cesarean group	Planned vaginal birth group	
All women			
Midpoint	7 165 (110)	8 042 (175)	-877 (-1286 to -473)
Low	4 101 (63)	4 883 (104)	-782 (-1023 to -545)
High	10 230 (159)	11 200 (247)	-972 (-1554 to -403)
Parity = 0			
Midpoint	7 255 (121)	8 440 (208)	-1185 (-1663 to -719)
Low	4 135 (71)	5 057 (124)	-922 (-1206 to -644)
High	10 380 (173)	11 820 (297)	-1448 (-2135 to -787)
Parity ≥ 1			
Midpoint	7 071 (188)	7 559 (284)	-488 (-1163 to 166)
Low	4 066 (107)	4 672 (173)	-606 (-1010 to -216)
High	10 080 (272)	10 450 (400)	-368 (-1328 to 564)

*Costs are expressed in 2002 Canadian dollars.
†Midpoint estimates were calculated as the midpoint of the low and high unit costs.
‡Using WinBUGS1.4 assuming a gamma distribution and vague priors. The difference in treatment effects (95% credible interval) between the 2 parity subgroups (i.e., the interaction between treatment and parity) was -$697 (-$1508 to $130) for the midpoint estimate, -$316 (-$798 to $173) for the low estimate, and -$1080 (-$2237 to $86) for the high estimate.

The unit costs per hour of being in the antenatal ward, the labour and delivery room and the postnatal ward were higher for women who delivered by cesarean than for women who delivered vaginally. Variability in operating room unit costs was substantial, which reflected the fact that these data were collected from both teaching and community hospitals (see Table 4 of the unabridged version of the article at www.cmaj.ca/cgi/content/full/174/8/1109).

Planned cesarean was significantly (i.e., the credible intervals excluded zero) less expensive than planned vaginal birth in the midpoint ($7165 v. $8042), low ($4101 v. $4883) and high ($10 230 v. $11 200) sets of unit costs (Table 1). Although the treatment effect was largest in the subgroup of women having their first child, there was no statistically significant interaction between treatment and parity. The difference between treatment effects was –$697 (95% credible interval –$1508 to $130) for the midpoint unit cost, –$316 (–$798 to $173) for the low unit cost, and –$1080 (–$2237 to $86) for the high unit cost.

Table 2 presents the average cost per patient for each service by treatment arm. Services with substantially higher costs in the planned cesarean group were the physician fees for a prelabour cesarean and the in-hospital costs of the operating room, postpartum ward and regular nursery. Services with substantially higher costs in the planned vaginal birth group were the physician fees for vaginal breech delivery and epidural analgesia and the in-hospital costs of the labour and delivery room and the neonatal intermediate and intensive care units.

Interpretation

In the Term Breech Trial, costs of planned cesareans were lower than those of planned vaginal births, and this did not differ by parity group. Although the planned cesarean group had higher costs for prelabour cesareans, which included the fees for the procedure as well as the in-hospital costs for time in the operating room, the postnatal ward and the normal nursery, women in the planned vaginal birth group spent more time in the labour and delivery suite, and their infants required more care in the neonatal intensive and intermediate care units. Moreover, the fees for a vaginal breech delivery were higher than for a cesarean, and, overall, the planned vaginal birth group incurred more costs for epidural analgesia. The slightly greater cost of the cesareans in labour in the planned vaginal birth group was not a major contributor to the overall differences in costs.

Other cost analyses of planned methods of delivery have also found that the total costs of a planned vaginal birth exceed the cost of an elective cesarean when labour is induced with oxytocin and if epidural anesthesia is also used.[8] Other analyses focusing more on a comparison of actual methods of delivery have the opposite results and show that cesarean section costs more than vaginal delivery.[9]

Our findings might be interpreted as a win–win situation (i.e., planned cesarean is both safer and less expensive than planned vaginal birth in the case of breech presentations at term). However, it would be a misinterpretation of the results of the Term Breech Trial to conclude that the option of planned vaginal birth should no longer be offered to Canadian women. The immediate risks of adverse outcome for the mother are likely somewhat greater with a policy of planned cesarean,[10] and some women may continue to prefer to plan a vaginal birth despite the higher risks to the infant. As well, the long-term risks and costs of a policy of cesarean com-

Table 2: Average cost per patient and cost differences between treatment arms for each service*

Service	Average cost per patient, $		Difference between treatment arms, $
	Planned cesarean group	Planned vaginal birth group	
Antenatal visit	6.97	19.33	-12.36
Induction or augmentation of labour			
Induction with oxytocin	0.87	8.81	-7.94
Augmentation with oxytocin	3.16	29.98	-26.82
Induction or augmentation with prostaglandins	1.16	6.91	-5.75
Epidural analgesia			
Day	43.29	106.24	-62.95
Evening or weekend	25.56	99.37	-73.81
Night	10.24	67.35	-57.11
Spinal anesthesia			
Day	103.47	30.67	72.80
Evening or weekend	40.29	13.15	27.14
Night	20.78	12.67	8.11
General anesthesia			
Day	12.88	10.87	2.01
Evening or weekend	15.68	14.20	1.48
Night	2.35	4.85	-2.50
Vaginal breech delivery			
Day	13.65	70.77	-57.12
Evening or weekend	16.13	112.31	-96.18
Night	19.30	67.93	-48.63
Vaginal cephalic delivery			
Day	2.49	5.01	-2.52
Evening or weekend	4.89	8.85	-3.96
Night	3.35	8.98	-5.63

pared with planned vaginal birth, over a lifetime, are not known. For example, this cost analysis did not include the resources used, and their costs, in future pregnancies of the participants.

In summary, using a range of unit costs and resource utilization data from countries with a low rate of perinatal death, we found that planned cesareans cost less than planned vaginal births for women with a singleton fetus in breech presentation at term in the Term Breech Trial. However, these cost savings are restricted to the procedures and care during and immediately following the birth.

This article has been peer reviewed.

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Table 2: continued

Service	Average cost per patient, $		Difference between treatment arms, $
	Planned cesarean group	Planned vaginal birth group	
Prelabour cesarean			
Day	201.80	42.82	158.98
Evening or weekend	61.76	11.99	49.77
Night	10.26	2.58	7.68
Cesarean in labour			
Day	56.33	78.25	-21.92
Evening or weekend	77.52	98.32	-20.80
Night	39.07	60.26	-21.19
Normal newborn examination	55.42	50.63	4.79
Consultation for admission to neonatal intermediate or intensive care units			
Day	2.23	3.56	-1.33
Evening or weekend	1.31	4.22	-2.91
Night	1.60	3.22	-1.62
Care in neonatal intermediate care unit	21.86	42.94	-21.08
Care in neonatal intensive care unit	7.07	29.41	-22.34
In-hospital ward or room stay			
Antenatal ward	226.87	266.91	-40.04
Labour and delivery room	653.00	1698.33	-1045.33
Operating room	977.08	582.28	394.80
Postnatal ward	2533.99	2246.48	287.51
Regular nursery	1624.73	1369.22	255.51
Neonatal intermediate care unit	196.76	405.63	-208.87
Neonatal intensive care unit	68.52	342.96	-274.44

*The midpoint estimate for all parity groups was used for these calculations; midpoint estimates were calculated as the midpoint of the low and high unit costs. The average cost of each service was calculated by dividing the total cost for that service by the total number of patients in each treatment arm, irrespective of whether the service was used by all patients. Costs are expressed in 2002 Canadian dollars.

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