Vaginal birth after Cesarean delivery: an historic cohort cost analysis

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Vaginal birth after Caesarean (VBAC) and elective repeat Caesarean delivery were under evaluation.

Type of intervention
Other: Delivery.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised women with a history of a single prior Caesarean delivery who were scheduled for delivery. The inclusion criteria were at least 36 weeks’ gestation and carrying a live, singleton foetus with no antenatally diagnosed anomalies and no contraindication to vaginal delivery.

Setting
The setting was secondary care (a hospital). The economic study was carried out at Shands Hospital at the University of Florida, Gainesville, USA.

Dates to which data relate
The effectiveness and resource data were collected from January 1999 to December 1999. The price year was not reported.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the effectiveness study.

Study sample
Power calculations were not reported. A total of 204 mother-infant pairs were included in the study. Of these women, 65 underwent repeat Caesarean delivery (“repeat” group) and 139 underwent attempted VBAC (“VBAC” group). The mean age of the women was 29.1 (+/- 6.4) years in the repeat group and 26.7 (+/- 5.4) years in the VBAC group. In the VBAC group, 104 women (74.8%) were delivered vaginally (“successful” group) and 35 women had a repeat Caesarean delivery (“failed” group).
Study design
This was a retrospective cohort study that was carried out in a single centre. The duration of follow-up was not stated, but it was likely to have been until discharge. No loss to follow-up was reported.

Analysis of effectiveness
All of the patients entered into the study were included in the analysis. All data were collected from the hospital's information system. The primary health outcomes used in the study were:

- the maternal rates of death, blood transfusion and hysterectomy; and
- the neonatal rates of death.

The secondary health outcomes were:

- uterine scar separation or rupture;
- ileus infection;
- 5-minute Apgar scores of less than 7;
- umbilical artery pH values of less than 7.20;
- neonatal intensive care unit (NICU) admission; and
- the mean number of neonatal hospital days.

The repeat group and VBAC group were not comparable at baseline in terms of age (29.1 versus 26.7 years; p=0.01), African American race (22% versus 40%; p=0.02), body mass index of at least 40 (39% versus 20%; p=0.01), gestational age (38.5 versus 39.0 weeks; p=0.02), and birth weight (3,528g versus 3,360g; p=0.05).

Effectiveness results
There were no maternal deaths, hysterectomies, or neonatal deaths in the cohort.

Only one health outcome (umbilical artery cord pH) showed statistical significant difference between the two groups. There was a higher proportion of women with a pH of less than 7.20 in the repeat group (32% versus 17%; p=0.01).

Clinical conclusions
The authors did not provide a clinical conclusion. However, as there were no significant differences in primary health outcomes (maternal deaths, hysterectomies, or neonatal deaths between the two groups), the authors might have concluded that the two delivery strategies were equivalent in terms of effectiveness.

Measure of benefits used in the economic analysis
Since the effectiveness analysis showed no significant differences in primary health outcomes between the two groups, the economic analysis was based on the difference in costs only (i.e. cost-minimisation analysis).

Direct costs
Discounting was not relevant as all the costs were incurred during less than one year. The cost/resource boundary of the study was not reported, but it was likely to have been that of the hospital. The categories of costs included in the analysis were maternal and neonatal care and hospitalisation. The resource data were obtained from the Shands Hospital Clinical Resources Department. The hospital costs (including labour, supply and equipment) were obtained from the hospital’s procedural costing system. The unit costs for nursing were estimated using cost-to-charge ratios. The unit
costs and the quantities of resources used were presented separately. The price year was not reported.

**Statistical analysis of costs**
The costs were presented as mean values with standard deviations. Statistical tests were carried out to compare the costs observed in the study groups.

**Indirect Costs**
The indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were not performed.

**Estimated benefits used in the economic analysis**
See the 'Effectiveness Results' section.

**Cost results**
The mean costs of care were higher in the elective repeat Caesarean group than in the VBAC group for mothers, neonates, and mother-infant pairs. For mothers, the mean cost was $4,155 (+/- 661) in the repeat group versus $3,675 (+/- 936) in the VBAC group, (p<0.001). For neonates, the mean cost was $1,794 (+/- 2,122) in the repeat group versus $1,187 (+/- 1,761) in the VBAC group, (p=0.03). Finally, for mother-infant pairs, the mean cost was $5,949 (+/- 2,365) in the repeat group versus $4,863 (+/- 2,151) in the VBAC group, (p=0.001).

The mean overall cost of maternal and neonatal care was $4,411 in the successful VBAC group compared with $6,272 in the failed VBAC group (the standard deviations and statistical analysis were not reported).

**Synthesis of costs and benefits**
The authors did not produce a summary measure that combined the costs and effectiveness, as there was a clinical equivalence of repeat and VBAC strategies. Therefore, the economic analysis only included the costs.

**Authors' conclusions**
In women with a single prior Caesarean delivery, a trial of labour is more cost-effective than an elective repeat Caesarean delivery.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of the comparator, trial of labour after a prior Caesarean delivery, was clear. Both procedures, natural labour and secondary Caesarean, are used after a prior Caesarean delivery. You should consider if the same applies to your own setting.

**Validity of estimate of measure of effectiveness**
A retrospective cohort study was performed. A randomised controlled trial would have been a more appropriate design for the study question. However, the women would not have been given the choice of the procedure. Power calculations were not carried out, thus the sample size was probably too small to detect some significant differences in outcomes.
between the groups. In addition, since the study groups were not comparable at baseline, confounding factors may be high. The data came from a single centre and this may hinder the generalisability of the results to other settings. Maternal deaths, hysterectomies, or neonatal deaths did not occur during the study period. A more appropriate measure of effectiveness would have been the measure of utility preferences estimated by those women undergoing the delivery procedure.

**Validity of estimate of measure of benefit**
The authors conducted a cost-minimisation analysis since the effectiveness analysis showed no significant differences in primary health outcomes between the two groups.

**Validity of estimate of costs**
The perspective of the study was not stated, although it would appear that the perspective of the hospital was adopted. Therefore, all the relevant categories of costs have been included in the analysis, with the exception of physician charges. The authors reported that this omission biases the results in favour of Caesarean deliveries, and is therefore unlikely to have affected their conclusions. Few details of the unit costs and quantities of resources used were reported, which limits transferability of the economic analysis to other settings. The price year was not reported and this limits reflation exercises. The cost estimates were derived from a single centre and were specific to the study setting. The authors reported a cost-to-charge ratio mechanism to derive the nursing costs, which is methodologically superior to the reporting of charges only. Discounting was not relevant and was not carried out. Sensitivity analyses were not performed on the costs. Statistical tests on the costs were performed when the cost estimates were compared.

**Other issues**
The authors did not compare their results with those from other published studies. The issue of the generalisability of the study was hardly addressed. The results were not reported selectively and the conclusions reflected the scope of the study. The authors reported some limitations of the study. For example, the exclusion of physician charges and the existence of annual variations in complication rates and inter-institutional variations. Sensitivity analyses were not performed to account for variability in the cost or effectiveness data. Consequently, caution should be exercised when extrapolating the study results to different contexts.

**Implications of the study**
The authors did not make any recommendations for policy or practice as a result of their study. However, they noted that logistic, psychosocial and medico-legal issues of Caesarean delivery should also be considered by women and their health care providers.

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None stated.

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**Other publications of related interest**

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