Cost-effective delivery management of the vertex and nonvertex twin gestation
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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
Using one of three alternative delivery methods (spontaneous vaginal delivery and breech extraction, spontaneous vaginal delivery and external cephalic version, and caesarean delivery) in pregnant women with vertex and nonvertex presenting twin pairs.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Pregnant women with vertex and nonvertex presenting twin pairs.

Setting
Hospital. The economic analysis was carried out in the USA.

Dates to which data relate
The effectiveness and resource use data were routinely collected from 1988 for a period of 9 years. The price year was 1996.

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

Link between effectiveness and cost data
Costing was retrospectively performed on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations were not used to determine the sample size. The study sample consisted of 84 twin gestations with vertex and nonvertex presenting twin pairs, whose records were selected to be reviewed from a total of 266 twin gestations. The breech extraction group consisted of 41 twin pairs with maternal mean (SD) age of 25.9 (5.5) years; the external cephalic version group had 19 twin pairs with maternal mean (SD) age of 24.4 (4.5) years; and finally the caesarean group consisted of 24 twin pairs with maternal mean (SD) age of 25.8 (6.1) years.

Study design
This was a retrospective cohort study, carried out in a single centre. The duration of the follow-up was until discharge. The loss to follow-up (missing data) was 24 infants (12 sets of twins), 4 sets in the breech extraction group, 3 sets in the external cephalic version group, and 5 sets in the caesarean group.

Analysis of effectiveness
The principle used in the analysis of effectiveness was treatment completers only. The clinical outcome measures were maternal morbidity (including intra-amniotic infection, postpartum endometritis, sepsis, or postpartum haemorrhage), maternal length of stay (days); the neonatal rates of pulmonary disease, neonatal infectious disease, the percentage of infants requiring the use of ventilator, the percentage of infants being admitted to the normal newborn nursery, and neonatal length of hospitalisation. The three study groups were found to be comparable in terms of maternal demographics, medical complications, gestational age, birth weight, foetal sex, or intrauterine growth restriction; but not in terms of the percentage of publicly funded or uninsured women.

Effectiveness results
The clinical outcome results were as follows:

- the rate of maternal morbidity, breech extraction group 26%, the external cephalic version group 42%, and the caesarean group 37%, (NS);
- maternal length of stay (days), breech extraction group 3.4, the external cephalic version group 6.3, and the caesarean group 7 days, (p<0.0001);
- the neonatal rates of pulmonary disease, breech extraction group 7%, the external cephalic version group 24%, and the caesarean group 31% (p=0.002);
- neonatal infectious disease, breech extraction group 1%, the external cephalic version group 0%, and the caesarean group 16% (p=0.0005);
- the percentage of infants requiring the use of ventilator, breech extraction group 5%, the external cephalic version group 12%, and the caesarean group 24% (p=0.01);
- the percentage of infants being admitted to the normal newborn nursery, breech extraction group 71%, the external cephalic version group 51%, and the caesarean group 50% (p=0.0001); and
- neonatal length of hospitalisation, breech extraction group 4.8, the external cephalic version group 12.4, and the caesarean group 17.8 days (p=0.0001).

Clinical conclusions
The study shows many of the maternal clinical outcomes to be similar among the various management strategies for vertex and nonvertex twin gestations. However, twins delivered by spontaneous vaginal delivery and breech extraction had significantly better clinical outcomes compared to the other two study groups.

Measure of benefits used in the economic analysis
No summary benefit measure was identified in the economic analysis, and only separate clinical outcomes were reported. As such a cost-consequences analysis was performed.

Direct costs
Costs were not discounted due to short time frame of the study. Some quantities were reported separately from the costs (such as length of stay (LOS)). Cost items were not reported separately. Cost analysis covered the costs of maternal hospitalisation including the delivery and postpartum course, and neonatal hospitalisation. The perspective adopted in the cost analysis was that of the third-party insurer or public payer. The source of the charge data was the NHS Economic Evaluation Database (NHS EED) produced by the Centre for Reviews and Dissemination. Copyright © 2017 University of York.
study hospital finance office. Charge data from a single institution were judged to be a good proxy for true costs. The date of the price data was 1996. Charge data were inflated to 1996 constant dollars. The cost analysis did not cover physician charges since they were deemed to be common to all three study groups.

**Statistical analysis of costs**
Analysis of variance was used to compare the overall differences in costs.

**Indirect Costs**
Not considered.

**Currency**
US dollars ($).

**Sensitivity analysis**
Not conducted.

**Estimated benefits used in the economic analysis**
Not applicable.

**Cost results**
The total maternal charges were: for the breech extraction group $5,890 +/- $2,304, for the external cephalic version group $8,638 +/- $4,175, and for the caesarean group $7,814 +/- $3,294, (p=0.01).

The values for overall neonatal charges were: for the breech extraction group $3,526 +/- $5,017, for the external cephalic version group $11,754 +/- $15,457, and for the caesarean group $36,994 +/- $54,318, (p=0.0001).

**Synthesis of costs and benefits**
Costs and benefits were not combined since the delivery method involving spontaneous vaginal delivery and breech extraction was the dominant strategy.

**Authors' conclusions**
There is no medical consensus regarding delivery management for vertex and nonvertex presenting twin pairs. When hospital charges are examined with clinical data, however, breech extraction of the nonvertex second twin is the most cost-effective delivery management strategy.

**CRD COMMENTARY - Selection of comparators**
No specific health technology was regarded as the comparator since it was stated that, at the time of the study, there was no medical consensus regarding delivery management for vertex and nonvertex presenting twin pairs.

**Validity of estimate of measure of benefit**
The internal validity of the estimates of effectiveness measures may be open to some doubt due to the retrospective nature of the study design, the relatively small sample size and the low power of the study (the retrospective power calculation showed that for identifying an arbitrary chosen difference of $2,000 in charges among the groups, the study sample had a power of 75%). These limitations were acknowledged by the authors. The study was a cost-consequences analysis.
Validity of estimate of costs
Quantities were not fully reported separately from the costs, although adequate details of methods of cost estimation were given. The retrospective nature of the cost analysis and the omission of some important cost items might have had adverse effects on its validity. Cost results may not, therefore, be generalisable to other settings.

Other issues
The authors’ conclusions may not to be fully justified given the caveats above and the lack of extensive sensitivity analyses. The issue of generalisability to other settings or countries was discussed and acknowledged as being somewhat limited. Appropriate comparisons, however, were made with other studies.

Implications of the study
The results of this retrospective analysis suggest that efforts should be made to offer breech extraction for suitable second twins in twin pairs with vertex and nonvertex presentations so that clinical outcomes are improved and resource use minimised.

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None stated.

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