Willingness or unwillingness to perform cesarean section for impending preterm delivery at 24 weeks' gestation: a cost-effectiveness analysis
Cazan-London G, Mozurkewich E L, Xu X, Ransom S B

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
This study evaluated two clinical strategies for the management of a 24-week gestation with imminent delivery. The first strategy was aggressive obstetric management (intensive foetal heart monitoring and willingness to perform Caesarean section for foetal indication). The alternative option was a non-aggressive scheme (expectant management with no foetal heart monitoring and unwillingness to perform a Caesarean section).

Type of intervention
Treatment and management.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised a hypothetical cohort of patients with imminent preterm delivery at 24 weeks' gestation.

Setting
The setting was secondary care. The economic study was performed in the USA.

Dates to which data relate
The effectiveness evidence came from studies published between 1997 and 2005. The resource use and cost data were mainly obtained from two studies published in 2000 and 2004 (St John et al. 2000 and Honeycutt et al. 2004, see 'Other Publications of Related Interest' below for bibliographic details). The price year was 2004.

Source of effectiveness data
The effectiveness data were derived from a review of published studies.

Modelling
A decision tree model was used to estimate the cost and health outcomes of the two obstetric management strategies. The decision tree depicted the paths and probabilities of all relevant clinical outcomes, including intrauterine foetal death, neonatal death after admission to neonatal intensive care, and survival with or without major morbidities. Survival was based on 120 days of life or discharge from the hospital. Major morbidities included survival with cerebral palsy, mental retardation, blindness or retinopathy of prematurity (ROP) Grades 3 and 4, hearing loss, and "other" morbidity. "Other" morbidity included necrotising enterocolitis requiring surgery, oxygen dependence at discharge or 120 days, and seizures. The time horizon of the model was the newborn infant's entire lifetime.
Outcomes assessed in the review
The outcomes estimated from published studies were the probabilities of live birth, survival, intact survival and presenting with major morbidities.

Study designs and other criteria for inclusion in the review
The authors stated that a review of the obstetric and paediatric literature on preterm birth at the threshold of viability was conducted.

Sources searched to identify primary studies
Not reported.

Criteria used to ensure the validity of primary studies
Not reported.

Methods used to judge relevance and validity, and for extracting data
Not reported.

Number of primary studies included
Fourteen studies were included in the review.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The probability of a live birth was 1.00 with aggressive management and 0.95 with non-aggressive management.

The probability of survival was 0.56 (range: 0.17 to 0.68) with aggressive management and 0.34 (range: 0.17 to 0.68) with non-aggressive management.

The probability of intact survival was 0.30 (range: 0.03 to 0.58) with aggressive management and 0.40 (range: 0.03 to 0.58) with non-aggressive management.

For both management strategies:

the probability of cerebral palsy was 0.23,

the probability of mental retardation was 0.27,

the probability of blindness or ROP was 0.21,

the probability of hearing loss was 0.10, and

the probability of presenting "other" major morbidity was 0.19.
Measure of benefits used in the economic analysis
The summary measures of health benefit used were intact (healthy) survival and overall survival (intact plus non-intact). These were derived from the decision model.

Direct costs
The cost of initial hospitalisation and the lifetime costs of developing disabilities were included in the economic evaluation. Initial hospitalisation covered hospital costs and physician fees. The lifetime costs were for physician visits, inpatient hospital stays, assistive devices, and home and automobile modifications. These costs were mainly obtained from the literature (St John et al. 2000 and Honeycutt et al. 2004). Institutional cost-charge ratios were used to calculate the cost of initial hospitalisation. Any maternal hospitalisation costs were included since the literature reviewed did not provide information about it. It was not reported whether discounting was applied or not, although it would have been appropriate since the lifetime costs were considered. The unit costs and the quantities of resources used were not reported separately. The price year was 2004.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The authors reported that the indirect costs associated with productivity loss and premature mortality due to developmental disabilities were considered in the analysis. No further details were provided. These costs were obtained from Honeycutt et al. (2004).

Currency
US dollars ($).

Sensitivity analysis
Sensitivity analyses were conducted to assess the robustness of the model parameters. One-way sensitivity analyses were performed in which the probability of overall survival and intact survival was varied over the range of probabilities found in the effectiveness analyses. Two-way sensitivity analyses also were conducted, and these allowed both the probability of overall survival and the probability of intact survival to vary.

Estimated benefits used in the economic analysis
The probability of an intact survivor was 16.8% (range: 1.1 to 35.4) with aggressive management (willingness to perform a Caesarean section) versus 12.9% (range: 0.5 to 26.7) with non-aggressive management (unwillingness to perform a Caesarean section).

The probability of nonintact survival (survival with major morbidity) was 39.2% (range: 7.1 to 66.0) with aggressive management versus 19.4% (range: 6.74 to 62.7) with non-aggressive management.

Cost results
With aggressive management, the cost per birth was $399,761, the overall cost per intact infant was $2,379,531, and the overall cost per surviving infant was $713,859.

With non-aggressive management, the cost per birth was $218,162, the overall cost per intact infant was $1,688,562, and the overall cost per surviving infant was $675,425.

Synthesis of costs and benefits
The incremental cost-effectiveness ratios were calculated to combine the costs and the benefits of the alternative management strategies.

The cost per additional intact survivor was $4,680,387.

The cost per additional survivor was $766,241.

The sensitivity analyses showed that under all the assumptions tested, non-aggressive management cost less than aggressive management.

**Authors' conclusions**

Although aggressive management improved the probability of survival, the more cost-effectiveness management option was non-aggressive management (unwillingness to perform Caesarean section) in the setting of a 24 weeks’ gestation with imminent spontaneous or indicated delivery. This is due to the strong relationship to the increased probability of survival with major morbidity when physicians are willing to perform Caesarean section for foetal indications.

**CRD COMMENTARY - Selection of comparators**

The rationale for the choice of the comparator was clear. Both alternatives of management reflected current practice at the authors' setting. You should consider whether they are valid options in your own setting.

**Validity of estimate of measure of effectiveness**

The effectiveness evidence was obtained from published studies. It appears that a systematic review of the literature has been conducted. However, the sources searched to identify primary studies were not reported, nor was the methodology used to extract and combine the primary data. The uncertainty around the effectiveness estimates were investigated in the sensitivity analyses. This enhances the external and internal validity of the study.

**Validity of estimate of measure of benefit**

The summary measures of benefit used in the economic evaluation were specific to the intervention evaluated. Therefore, comparisons with the results of other studies are difficult. The use of more generalisable measures, such as life-years gained or quality-adjusted life-years, would have been helpful, where feasible.

**Validity of estimate of costs**

The authors reported the perspective that was adopted in the study. It seems that all the relevant costs were considered. The cost estimates came from completed studies. Detailed information on the costs was not provided, and the unit costs and the quantities of resources used were not reported separately. This reduces the possibility of replicating the study in other settings. However, the price year was given, thus facilitating reflation exercises in other settings. The cost items were not evaluated in the sensitivity analyses. This reduces the validity of the cost estimations.

**Other issues**

The authors did not compare their results with those of other studies. They considered the scope to generalise their findings to other US settings. The authors reported some limitations of their study. However, the results reported in the study were presented clearly, and the conclusions reflected the scope of the study.

**Implications of the study**

The authors suggested that both absolute survival and long-term handicaps must be taken into consideration when proceeding with aggressive intervention in extremely preterm pregnancy. The results of this study suggested that the most cost-effective option is non-aggressive management (unwillingness to perform Caesarean section) in the setting of a 24 weeks’ gestation with imminent spontaneous or indicated delivery. A prospective trial comparing obstetric
management of these pregnancies, if ethical, would inform future studies.

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Other publications of related interest


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