Elective induction: an analysis of economic and health consequences
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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
The use of elective induction for labour (either at 39, 40 or 41 weeks) as the labour management strategy to follow.

Type of intervention
Other: Labour management strategies.

Economic study type
Cost-effectiveness analysis.

Study population
The hypothetical cohort of patients comprised 100,000 pregnant women, both nulliparous and multiparous, with either an unfavourable cervix or a favourable cervix, at 39, 40 or 41 weeks' gestation. A Bishop cut-off score of 5 at the time of induction was used to define a “favourable” and "unfavourable" cervix.

Setting
The setting was a hospital. The study was carried out in the USA.

Dates to which data relate
The effectiveness data were collected from studies published between 1966 and 2001. The cost data were collected from studies published between 1997 and 2000. The price year was 2001.

Source of effectiveness data
The effectiveness data were derived from a non-systematic review of published studies and some authors’ assumptions.

Modelling
A decision-tree model was used to estimate the health benefits and costs of the labour management strategies considered at analysis. For the case of expectant management, a Markov technique was used. A cycle of one week was considered. The time period considered in the economic evaluation was from either week 39, 40 or 41 during pregnancy, to week 42.

Outcomes assessed in the review
The outcomes assessed and used as input parameters in the model were:

the probability of having a Caesarean delivery at 39 weeks associated with spontaneous labour for both nulliparous and multiparous women;
the relative risks of Caesarean delivery associated with induction for both nulliparous and multiparous women with either a favourable or unfavourable cervix;

the relative risk of Caesarean delivery associated with spontaneous labour at 39, 40, 41 and 42 weeks;

the probability of meconium happening at 39 weeks, and the relative risk of meconium at weeks 40, 41 and 42;

the probability of meconium aspiration syndrome if meconium happened;

the overall probability of spontaneous labour within 1 week, both in the case of a favourable or unfavourable cervix, during the pregnancy weeks considered at analysis;

the overall probability that an unfavourable cervix became favourable within 1 week, during the pregnancy weeks considered at analysis;

the probability of having an abnormal antenatal testing;

the probability of foetal death at 39, 40 and 41 weeks; and

the probability of the Caesarean delivery of a foetal death.

Study designs and other criteria for inclusion in the review
The authors did not report that specific study designs were considered for inclusion in the review. Most of the studies were not described. One of the included studies was a case-control study.

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
At least 17 studies were included in the review.

Methods of combining primary studies
The method used to combine the primary studies was not reported, but it seems to have been a narrative method.

Investigation of differences between primary studies
The authors reported ranges of values, which were obtained from the review of the literature, for the estimates reported. However, they did not provide any explanations for the differences obtained.

Results of the review
The probability of having a Caesarean delivery at 39 weeks associated with spontaneous labour was 12.8% for nulliparous women and 3.8% for multiparous women.
The relative risk of Caesarean delivery associated with induction was 1.4 for nulliparous women with a favourable cervix, 2.3 for nulliparous women with an unfavourable cervix, 1.1 for multiparous women with a favourable cervix, and 2.2 for multiparous women with an unfavourable cervix.

The relative risk of Caesarean delivery associated with spontaneous labour was 1.0 at 39 weeks, 1.1 at 40 weeks, 1.3 at 41 weeks, and 1.5 at 42 weeks.

The probability of meconium happening was 12.2% at 39 weeks, 1.4% at 40 weeks, 1.8% at 41 weeks, and 2.3% at 42 weeks.

The probability of meconium aspiration syndrome if meconium happened was 2.4%.

The probability that a spontaneous labour happened within 1 week was 70% in the case of a favourable cervix, and 45% in the case of an unfavourable cervix.

The probability that an unfavourable cervix became favourable within 1 week was 15%.

The probability of having an abnormal antenatal testing was 3.6%.

The probability of foetal death was 0.05% at 39 weeks, 0.09% at 40 weeks, and 0.12% at 41 weeks.

The probability of the Caesarean delivery of a foetal death was 0%.

**Methods used to derive estimates of effectiveness**
The authors made assumptions to derive estimates of effectiveness.

**Estimates of effectiveness and key assumptions**
The authors assumed an increased risk of Caesarean delivery for multiparous women.

**Measure of benefits used in the economic analysis**
The summary measures of benefit used were the excess number of Caesarean deliveries and the decrease in foetal deaths after induction was performed, compared with the expectant labour management strategy. These measures of benefits were reported for all types of women considered at analysis (nulliparous and multiparous women, with either a favourable or an unfavourable cervix) at 39, 40 and 41 weeks' gestation. The measures were obtained from the model, and the results reported were incremental.

**Direct costs**
The direct costs considered in the economic analysis were those of the health service. These were associated with vaginal delivery, Caesarean delivery, the excess cost of induction resulting either in vaginal delivery or in Caesarean delivery for women with both favourable and unfavourable cervix, meconium aspiration syndrome, and antenatal testing. The resource quantities were not reported separately from the costs. The direct costs were obtained from published studies. Therefore, the costs were estimated on the basis of actual data.

The price year was 2001 and the costs were adjusted for inflation using the medical care component of the consumer price index. A cost-to-charge ratio of 0.6 was used to convert charge data to costs. Discounting was not performed, which was appropriate as the period considered for the economic evaluation was 4 weeks at maximum. The costs reported were mainly the incremental costs when induction was compared with expectant management, stratified by gestational age, parity and cervical ripeness.

**Statistical analysis of costs**
No statistical analyses of the costs were reported.
Indirect Costs
No indirect costs were reported.

Currency
US dollars ($).

Sensitivity analysis
One-way sensitivity analyses appear to have been performed on all the parameter estimates used in the model, and the authors’ assumptions. Variations in costs were considered in order to account for differences in practice and regions. Therefore, the areas of uncertainty investigated were variability in the data and the generalisability of the cost results. The ranges used in the sensitivity analyses were obtained from the review of the literature.

Estimated benefits used in the economic analysis
The excess numbers of Caesarean deliveries with induction when compared with expectant management were:

for nulliparous women with an unfavourable cervix, 12,094 at week 39, 10,351 at week 40, and 8,171 at week 41;
for nulliparous women with a favourable cervix, 4,257 at week 39, 4,008 at week 40, and 3,745 at week 41;
for multiparous women with an unfavourable cervix, 3,294 at week 39, 2,852 at week 40, and 2,310 at week 41; and
for multiparous women with a favourable cervix, 167 at week 39, 85 at week 40, and 131 at week 41.

Cost results
The total costs of induction versus expectant management were only given for the hypothetical cohort of 100,000 nulliparous women with an unfavourable cervix at 39 weeks’ gestation. The total costs were $503 million with induction and $412 million with expectant management.

The other reported costs were the incremental costs for 100,000 women managed with induction versus those managed with expectant management. The results were:

$91 million (39 weeks), $71 million (40 weeks) and $39 million (41 weeks) for nulliparous women with an unfavourable cervix;
$49 million (39 weeks), $48 million (40 weeks), and $29 million (41 weeks) for nulliparous women with a favourable cervix;
$75 million (39 weeks), $58 million (40 weeks), and $26 million (41 weeks) for multiparous women with an unfavourable cervix; and
$47 million (39 weeks), $42 million (40 weeks), and $25 million (41 weeks) for multiparous women with a favourable cervix.

Synthesis of costs and benefits
The costs and benefits were not combined. The results from the sensitivity analyses showed that the model was robust to the cost results obtained, and induction of labour was not cost-saving under any of the analyses performed.

Authors’ conclusions
Induction of labour resulted in higher costs and a greater number of Caesarean deliveries, with the advantage of
preventing intrauterine foetal deaths. The magnitude of increased costs and excess of Caesarean deliveries depended on the gestational age at which induction occurred, the patient’s parity, and the Bishop score.

CRD COMMENTARY - Selection of comparators
The comparator chosen was expectant management, which was the traditional practice in the authors’ setting. It is worth noting that induction can be performed by several means (e.g. prostaglandin E2 as an intracervical gel or as a sustained-release insert). Depending on the method used, the costs and the benefits may vary. You must consider which health technologies are the most widely used in your own setting.

Validity of estimate of measure of effectiveness
The authors did not report that a systematic review of the literature had been carried out. The methods used to find and select the primary studies were unclear. The authors made assumptions to estimate some parameters, and these assumptions were justified with reference to the medical literature. Although it was difficult to assess the validity of the estimates used in the base-case analysis, the fact that the sensitivity analyses appear to have been performed using ranges found in the literature reduced the uncertainty surrounding the effectiveness results.

Validity of estimate of measure of benefit
The summary measures of benefit used in the economic analysis were obtained from the model. They appear to have been implicitly justified in terms of the hypothesis stated in the study. However, other summary measures of benefit, such as the life-years or quality-adjusted life-years gained with the avoided foetal deaths, would have been appropriate for comparing the results with those from other interventions.

Validity of estimate of costs
Most of the relevant costs appropriate to the perspective adopted appear to have been considered. The authors reported that some costs, such as those incurred because of admissions to the neonatal intensive care unit, or the additional costs incurred in future pregnancies as a result of repeated Caesarean deliveries, were not considered at analysis. The adoption of a broader perspective (i.e. societal) would have been appropriate for considering the productivity loss associated with foetal deaths. The charges were adjusted to reflect the true opportunity costs of the interventions analysed. The dates to which the costs related and the price year were reported, but since resource quantities were not reported separately from the costs, reflation exercises in other settings would be difficult. It would have been useful had the authors reported the cost per patient according to gestational age, parity and cervical ripeness. Cost-effectiveness ratios and incremental cost-effectiveness ratios could have been calculated as the cost per death prevented and per additional death prevented, respectively, where induction was compared with expectant management.

Other issues
The authors did not make appropriate comparisons of their findings with those from other studies. The issue of the generalisability of the results to other settings was addressed in the sense that differences in practice and regions were considered in the sensitivity analyses of the costs.

Implications of the study
The authors highlighted the fact that the study results may be interpreted in different ways, as the additional costs required to reduce foetal deaths may be excessive compared with the benefit obtained.

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None stated.

Bibliographic details

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Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
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