Cost-effectiveness of fetal lung maturity testing in preterm labor

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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
Fetal lung maturity testing in preterm labour.

Type of intervention
Diagnosis; treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Women with preterm labour followed over a 7-day period. Preterm labour was defined as regular uterine contractions with cervical change before 37 weeks; intact membranes; and no maternal or fetal indications for early delivery, such as preeclampsia, chorioamnionitis, or fetal growth restriction, or conditions that might delay pulmonary maturity, such as diabetes.

Setting
Tertiary care. The economic study was carried out in the United States.

Dates to which data relate
The effectiveness data were based on studies published in the literature between 1992 and 1996. Prices were adjusted to 1996 US dollars.

Source of effectiveness data
The estimate for final outcomes was derived from a review of the published literature and on the authors’ opinions.

Modelling
The probabilities of delivery and subsequent RDS over the 7-day time frame of the analysis were evaluated using a Markov model.

Outcomes assessed in the review
The review assessed the following outcomes: sensitivity of lung maturity test; specificity of lung maturity test; efficacy of corticosteroids (less than 24 hours, 24 hours to 7 days); delivery without tocolysis (within 24 hours, within 48 hours, within 7 days); delivery with tocolysis (within 24 hours, within 48 hours, within 7 days).

Study designs and other criteria for inclusion in the review
Sources searched to identify primary studies
Not stated.

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

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

Number of primary studies included
Four studies were included.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The sensitivity and specificity of the lung maturity test were taken to be 0.93 (range: 0.9 - 0.99) and 0.5 (range: 0.5 - 0.99). The efficacy of corticosteroids <24 hours was 0.8 (range: 0.56 - 1) and for 24 hours to 7 days was 0.35 (range: 0.25 - 0.45). The probability of delivery without tocolysis within 24 hours, 48 hours and within 7 days was taken to be 0.197 (range: 0.01 - 0.5), 0.354 (range: 0.01 - 0.5) and 0.472 (range: 0.01 - 0.5), respectively. The probability of delivery with tocolysis within 24 hours, 48 hours and within 7 days was taken to be 0.071 (range: 0.01 - 0.5), 0.214 (range: 0.01 - 0.5) and 0.382 (range: 0.01 - 0.5) respectively.

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

Estimates of effectiveness and key assumptions
It was assumed that in those infants identified as having immature lungs through testing after 34 weeks, corticosteroids would have equal efficacy in the prevention of RDS as in those identified before 34 weeks.

Measure of benefits used in the economic analysis
Cases of RDS prevented was the outcome measure used in the economic analysis. The probabilities of delivery and subsequent RDS over the 7-day time frame of the analysis were evaluated using a Markov model.

Direct costs
Hospital costs were considered only. All costs were obtained from the Cost and Payment Systems of the Beth Israel-Deaconess Medical Centre and represent their best internal estimate of hospital costs, as opposed to charges. Costs of neonatal care with and without RDS were estimated by calculating the total hospital costs for admissions to the neonatal intensive care unit. Costs attributable to RDS were calculated by subtracting the median total hospital cost of an infant
with RDS from the median cost of an infant of the same gestational age without RDS.

**Indirect Costs**
Not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
Ranges used in sensitivity analyses were derived from the range of values reported in various studies, the effect estimates of individual studies (e.g. 95% confidence limits) or by consensus of the authors.

**Estimated benefits used in the economic analysis**
The benefits used in the economic analysis were not presented separately.

**Cost results**
When the probability of RDS was taken to be 25% then the average cost/patient under the treat none, TESTALL and TREATALL strategies was $20,485, $14,653 and $14,493, respectively. When the probability of RDS was taken to be 12.5% then the average cost/patient under the treat none, TESTALL and TREATALL strategies was $12,485, $9,887 and $10,014. When the probability of RDS was taken to be 1% then the average cost/patient under the treat none, TESTALL and TREATALL strategies was $5,124, $5,500 and $5,894 respectively. The marginal cost of RDS was $25,000 (range: $5,000 - 100,000) and the marginal cost of preterm delivery ranged from $0 to $10,000.

**Synthesis of costs and benefits**
With probabilities of RDS greater than 2%, both TREATALL and TESTALL were cost-saving compared with no treatment. Above a probability of 17%, TREATALL was cost-saving compared with both of the alternative strategies. Between 2% and 17%, TREATALL resulted in fewer cases of RDS than TESTALL, but with a marginal cost per extra case prevented ranging from $10,500 at a probability of 17% to over $1,000,000 at a probability of 2.5%. The analysis found that the cost of RDS was an important factor in determining the optimal strategy. Non-RDS-related costs during early delivery also represented a major determinant of the optimal management strategy. When the cost of care for a non-RDS case compared with a case born 1 week later was greater than $1,300, TREATALL was the preferred strategy.

**Authors’ conclusions**
The most cost-effective strategy for the prevention of RDS in idiopathic preterm labour depends largely on gestational age, as the probabilities of both RDS and non-RDS morbidity are highly correlated with gestational age. Based on the model, the available literature and current costs, amniocentesis and fetal lung maturity testing appears to be the most cost-effective strategy in this specific clinical setting within the limited time frame of 34-36 weeks gestation. Further validation of the model and development of similar models for the evaluation of other clinical scenarios are needed.

**CRD COMMENTARY - Selection of comparators**
The reason for the choice of comparators is clear.

**Validity of estimate of measure of benefit**
The estimates of the measure of benefit used in the economic analysis were not presented separately in the study although they could be calculated from table 3.
Validity of estimate of costs
Resource quantities were not reported separately from the costs. Appropriate details of cost estimation were given.

Other issues
The authors stated that their costs were derived from a single institution which limits the generalisability of their results (especially of the specific gestational age findings). They also indicated that the probability of delivery within 7 days after the onset of preterm labour in the model was derived from the placebo arm of a reported randomised treatment trial. It may therefore not be generalizable to other populations and may over- or underestimate the actual probability of delivery. The study could have adopted a broader (societal) perspective.

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