Cost-effectiveness of cardiotocography plus ST analysis of the fetal electrocardiogram compared with cardiotocography only


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.

CRD summary
This study examined the cost-effectiveness of adding ST-segment analysis of the foetal electrocardiogram (ECG) to cardiotocography, compared with cardiotocography alone, for foetal surveillance during labour. The authors concluded that, over a short period, the additional costs of ST-segment analysis were very low compared with cardiotocography alone and compared with the total costs of labour. The methods were valid and transparent and the authors’ conclusions appear to be robust.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
This study examined the cost-effectiveness of adding ST-segment analysis of the foetal electrocardiogram (ECG) to cardiotocography, compared with cardiotocography alone, for foetal surveillance during labour.

Interventions
Intrapartum foetal monitoring by cardiotocography with ST-segment analysis of an ECG was compared against cardiotocography alone. A scalp electrode was applied to the foetal head in both strategies. For cardiotocography with ST-segment analysis, this was connected to an ST analysis foetal head monitor. For cardiotocography alone, it was connected to a conventional monitor.

Location/setting
Netherlands/hospital.

Methods
Analytical approach:
This economic evaluation was carried out alongside a clinical trial, with a short time horizon from randomisation at 36 weeks of gestation or later to delivery. The authors stated that the analysis was carried out from the perspective of the health care provider.

Effectiveness data:
The clinical data came from a recently published randomised controlled trial (RCT), which was carried out in the obstetric departments of three academic and six general hospitals in the Netherlands (Westerhuis, et al. 2010, see ‘Other Publications of Related Interest’ below for bibliographic details). Adult women in labour with a singleton high-risk pregnancy, a foetus in cephalic presentation, a gestational age of over 36 weeks, and an indication for internal electronic foetal monitoring were included in the trial and allocated by block randomisation to either group. The analysis included 5,667 women, with 2,827 in the intervention group and 2,840 in the control group. Women were not followed-up after childbirth. The key endpoint was the incidence of metabolic acidosis, which was defined as an umbilical cord artery acidity below pH 7.05 and a base deficit in the extracellular fluid compartment of more than 12 millimoles per litre.

Monetary benefit and utility valuations:
Not considered.
Measure of benefit:
The prevented cases of metabolic acidosis were the summary benefit measure.

Cost data:
The economic analysis included the costs of scalp electrodes for foetal monitoring, foetal blood sampling, mode of delivery, medication, and length of stay on neonatal wards and in the neonatal intensive care unit. The quantities of resources were estimated from the clinical trial, using the Case Record Form. The unit costs were estimated using various approaches, including a bottom-up costing method, a top-down method, purchase prices, and Dutch standardised prices. All costs were in Euros (EUR) and the price year was 2007.

Analysis of uncertainty:
Bootstrapping was applied to calculate 95% confidence intervals around the clinical and economic outcomes. One-way sensitivity analyses were carried out on five parameters: depreciation years and number of devices needed per centre; cost of training in ST-segment analysis; unit costs for foetal blood sampling; inclusion of post-partum stage; and alternative definitions of metabolic acidosis.

Results
The rate of metabolic acidosis was 0.7% in the intervention group and 1.0% in the control group (RR 0.70, 95% CI 0.38 to 1.28).

The mean cost per patient was EUR 1,345 (95% CI 1,013 to 2,115) in the intervention group and EUR 1,316 (95% CI 978 to 2,080) in the control group (difference EUR 29, 95% CI -9 to 77).

The incremental cost per metabolic acidosis case prevented with the intervention was EUR 9,667.

The cost-effectiveness ratio was highly sensitive to variations in the training costs and the efficacy of the intervention. For example, the cost-effectiveness ratio fell to EUR 3,222 when assuming a 0.9% difference in the incidence of metabolic acidosis and it rose to EUR 29,000 when the incidence of metabolic acidosis was 0.1%.

Authors' conclusions
The authors concluded that, over a short period, the additional costs of ST-segment analysis were very low compared with cardiotocography alone and compared with the total costs of labour.

CRD commentary
Interventions:
The comparators were appropriately selected as the usual strategy of cardiotocography alone was compared against the proposed strategy of ECG analysis plus cardiotocography. A brief description of each strategy was given.

Effectiveness/benefits:
The clinical data were from an appropriate RCT. RCTs are generally considered to be valid sources of evidence because of their design. The details of this RCT were published in a companion paper and some key methodological characteristics and results were reported. The sample of women was large and power calculations appear to have been carried out to ensure sufficient power to demonstrate statistically significant differences. The intention-to-treat principle was used and the authors stated that the two groups were comparable at baseline. These points enhance the validity of the clinical comparison. The summary benefit measure was specific to the interventions and might be difficult to compare with the benefits of other health care interventions.

Costs:
The authors acknowledged that only those costs borne by the health care provider over a short period were considered. A clear description of each category of costs was provided, and the unit costs were generally presented separately from the resource quantities, increasing the transparency of the analysis. The resource use was collected using the Case Record Form, which should have ensured that the data were detailed. The unit costs were from Dutch sources that used various valid approaches. The costs were varied in the sensitivity analyses, which included alternative scenarios. The price year was reported.
Analysis and results:
The results were clearly reported and an incremental approach was used to synthesise the costs and benefits of the two strategies. The authors acknowledged that a longer time horizon could have better captured all the costs and benefits. The uncertainty was investigated, using a deterministic approach, which considered variations in selected inputs. Bootstrapping allowed the calculation of likely ranges for the outcomes, which showed that the findings were robust. The authors reported that another published economic evaluation had shown the cost-effectiveness of cardiotocography plus ST-segment analysis, using quality-adjusted life-years as the main benefit measure. The results appear to be transferable to other settings with similar cost structures.

Concluding remarks:
The methods were valid and transparent and the authors’ conclusions appear to be robust.

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