Efficacy and safety of intrapartum electronic fetal monitoring: an update

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Authors' objectives
To compare the efficacy and safety of routine electronic foetal monitoring of labour with intermittent auscultation.

Searching
MEDLINE was searched from 1966 to 1994 and references in published reports were obtained. Experts in the field and from the Cochrane Collaboration were contacted for unpublished data.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were included.

Specific interventions included in the review
Electronic foetal monitoring, and auscultation. Intermittent electronic foetal monitoring, intermittent Doppler ultrasound, and two forms of auscultation were also included in some trials, but were not directly assessed in this review.

Reference standard test against which the new test was compared
The review did not include any diagnostic accuracy studies that compared the performance of the index test with a reference standard of diagnosis.

Participants included in the review
Pregnant women and their infants in both high- and low-risk pregnancies, from 10 clinical centres in the United States, Europe, Australia and Africa, were included.

Outcomes assessed in the review
The outcomes assessed were Apgar score, neonatal seizures, neonatal intensive care unit admissions, stillbirths, neonatal deaths, Caesarean delivery, operative vaginal delivery.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the authors performed the selection.

Assessment of study quality
Study quality was assessed on 13 factors (based on 22 previously developed weighted criteria) and a percentage quality score was calculated. A single reviewer assessed study quality.

Data extraction
The data were abstracted by one researcher and their accuracy independently confirmed by another. Authors were contacted for data not presented in published reports.

Methods of synthesis
How were the studies combined?
Meta-analysis was performed, using relative risks (RRs) calculated as: (1) the combined risk estimate for each of eight outcomes (1-minute Apgar score < 7, 1-minute Apgar score < 4, neonatal seizures, neonatal intensive care unit admissions, still births, neonatal deaths, Caesarean delivery, and operative vaginal delivery); (2) the total operative
deliveries (Caesarean and operative vaginal delivery); and (3) perinatal deaths (foetal and neonatal). Where adjustments for multiple comparisons were made, original data of neonatal seizure were pooled rather than risk estimates, owing to the lack of data. For the other outcomes, risk estimates were weighted by sample size and then weighted to get an overall estimate.

A cumulative meta-analysis was also performed, according to increasing quality score and study size. A random-effects model was used for outcomes in which significant heterogeneity was present.

**How were differences between studies investigated?**

A test for heterogeneity was performed. Subgroup analyses were undertaken for five groups of studies: all studies comparing routine electronic foetal monitoring with auscultation; studies in which electronic foetal monitoring was performed without foetal scalp sampling; studies in which electronic foetal monitoring was performed with foetal scalp sampling; studies with low- medium- and high-quality scores; United States and non-United States studies.

**Results of the review**

Twelve RCTs (58,855 pregnant women, 59,324 infants) were included. Nine trials (18,561 pregnant women, 18,695 infants) compared continuous electronic foetal monitoring with auscultation. Three trials (40,294 pregnant women, 40,629 infants) compared continuous electronic foetal monitoring with alternative approaches (intermittent electronic foetal monitoring, intermittent Doppler ultrasound, and two forms of auscultation).

A statistically significant decrease was associated with routine electronic foetal monitoring for a 1-minute Apgar score of less than 4 (RR 0.82, 95% confidence interval, CI: 0.65, 0.98), and neonatal seizures (RR 0.5, 95% CI: 0.30, 0.82). Monitoring based on the Apgar score was only significant for non-United States studies, whilst monitoring of neonatal seizures was only significant for high-quality studies. A statistically significant increase associated with the use of electronic foetal monitoring was found in the Caesarean delivery rate (RR 1.21, 95% CI: 1.04, 1.39) and total operative delivery (RR 1.23, 95% CI: 1.15, 1.31). The risk of Caesarean delivery was greatest in low-risk pregnancies. No significant differences were observed in 1-minute Apgar score of less than 7, rate of admissions to neonatal intensive care units, and perinatal death. Only 3 of the 12 studies scored more than 60% on quality score. Although all studies described the regimens, provided well-defined end points, used appropriate analyses and reported complications, few stated clear hypotheses, provided power calculations, implemented adequate blinding or undertook subgroup analyses.

**Authors' conclusions**

The only clinically significant benefit from the use of routine electronic foetal monitoring was in the reduction of neonatal seizures. Because of the increase in Caesarean and operative vaginal deliveries, the long-term benefit of this reduction (which is unclear) must be evaluated in the decision reached jointly by the pregnant woman and her clinician before their decision on the use of electronic foetal monitoring or intermittent auscultation during labour. Future RCTs should focus on clearly specified clinical questions: (1) Which groups might benefit most from intensive intrapartum surveillance? (2) What are the essential or desirable elements of this technique? (3) What is the long-term follow-up of children in the 12 studies already conducted?

**CRD commentary**

This was a very thorough review, with a good discussion of the limitations and benefits of meta-analysis for this subject. The authors objectives only included the use of published trials, which could bias the results. However, the review details revealed that unpublished studies were searched for, but none were found.

**Implications of the review for practice and research**

There appears to be no justification for the routine use of continuous electronic foetal monitoring during normal labour. The authors suggest that a decision regrading monitoring during labour should be reached jointly by the pregnant woman and her clinician, taking into account the research evidence. This is in line with current policy on provision of choice about interventions during pregnancy and childbirth.
Bibliographic details

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Other publications of related interest

These leaflets are available from MIDIRS, 9 Elmdale Road, Clifton, Bristol BS8 1SL, UK.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.