Evidence-based strategies for reducing cesarean section rates: a meta-analysis
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CRD summary
This review assessed the effectiveness of interventions to reduce Caesarean section rates. The authors concluded that rates can be reduced by health workers analysing and modifying their practice, and the use of multifaceted strategies. However, given the limited reporting of the review process and the potential weaknesses in the analysis and interpretation of data, the authors' conclusions may not be reliable.

Authors' objectives
To assess the effectiveness of interventions to reduce Caesarean section rates and to determine whether identifying barriers to change improves effectiveness.

Searching
MEDLINE, EMBASE and the Cochrane Controlled Trials Register were searched from 1990 to June 2005 using the search terms reported. Additional studies were identified from the reference lists of included studies and from suggestions made by experts.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs), quasi-RCTs, controlled before-and-after studies and interrupted time series studies were eligible for inclusion. Studies had to either report relevant and interpretable data or this information needed to be obtainable to be included in the review. Before-and-after studies had to collect contemporaneous data, while interrupted time series studies had to collect data for at least three time points before and after the intervention. Before-and-after studies had to compare the intervention site with an appropriate control site (unspecified), while interrupted time series studies had to clearly specify the intervention time. The included studies were a mixture of RCTs, cluster-RCTs and interrupted time series. Most of the included studies were based within one centre.

Specific interventions included in the review
Studies evaluating interventions for reducing Caesarean section rates appeared to be eligible for inclusion. The included studies assessed one or more of the following strategies: peer-review programmes, active management based on protocols, education of clinical staff and the public, mandatory second opinions and continuity of midwifery care. Comparator or control interventions were not specified.

Participants included in the review
Inclusion criteria were not defined in terms of the participants. The participants in the included studies were all pregnant women.

Outcomes assessed in the review
To be eligible for inclusion, studies needed to report an objective measurement of performance. All of the included studies reported Caesarean section rates. Other secondary outcomes assessed in the review were reason for Caesarean, mortality, morbidity and admission to intensive care.

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

Assessment of study quality
Study quality was assessed according to the Cochrane and Effective Practice and Organisation of Care quality scale; further details were provided in the review. Only studies described as 'fair' or 'good' quality were eligible for inclusion. The authors did not state how the validity assessment was performed.

Data extraction
Two reviewers independently extracted information using a standardised data extraction checklist. Any differences were resolved by consensus. Relative risks (RRs) with 95% confidence intervals (CIs) were calculated for dichotomous outcomes. Adjusted risk ratios were calculated for cluster-RCTs in order to control for any imbalance between participant groups. Interrupted time series studies were adjusted to take changes over time into account.

**Methods of synthesis**

How were the studies combined?
The outcome data from the included studies were combined in a meta-analysis, using the DerSimonian and Laird random-effects method. Pooled RRs with 95% CIs were presented. Begg's adjusted rank correlation test, Egger's regression asymmetry test and funnel plots were used to assess publication bias.

How were differences between studies investigated?
Heterogeneity was assessed using the Q and I-squared tests. A meta-regression model was used to determine which variables significantly contributed to the overall variability between the studies. A subgroup analysis was used to explore differences between the studies based on the variables identified in the meta-regression analysis.

**Results of the review**

Ten studies (n=776,909) were included. Of these, three were RCTs (n=3,057), two were cluster-RCTs (n=683,277) and the remaining five were interrupted time series (n=90,575).

All of the RCTs were considered good quality; one cluster-RCTs and one interrupted time series study were also considered good quality. All of the other included studies were considered fair quality. The cluster-RCTs, which were considered only to be fair quality, generally failed to report baseline measurements clearly. The interrupted time series studies generally failed to use an appropriate time trend analysis.

Overall, there was a significant reduction in Caesarean section rates in the intervention groups (RR 0.81, 95% CI: 0.75, 0.87; 10 studies). However, significant statistical heterogeneity was found between the studies (I-squared 87.6%, p<0.00001).

Meta-regression analysis showed that the strategy used, the study design and the identification of barriers all contributed significantly to the overall variability between studies. Subgroup analysis was performed for the following groups of studies: audit and feedback strategy (4 studies); quality improvement strategy (4 studies); multifaceted strategy (2 studies); controlled design (5 studies); non-controlled design (5 studies); no identification of barriers (6 studies) and identification of barriers (3 studies). All the results remained significant, as did the significant heterogeneity between many of the subgroups.

There was a significant reduction in Caesarean section rates between groups for the following indicators: dystocia (6 studies), repeat Caesarean section (4 studies), foetal distress (3 studies) and maternal indications (1 study).

There was no significant difference between study groups for stillbirth rate (1 study), perinatal and neonatal mortality (3 studies), admission to intensive care (5 studies) or perinatal and maternal morbidity (3 studies).

No evidence of publication bias was found.

**Authors' conclusions**

Caesarean section rates can be reduced by interventions that involve health workers in analysing and modifying their practice. The authors advised the use of multifaceted strategies, based on audit and feedback, to improve clinical practice and said that findings support the assumption that the identification of barriers to change is a major key to success.

**CRD commentary**

This review addressed a specific research question with clearly defined study design inclusion criteria. The literature search was reasonable and advice from experts was sought, thereby reducing the potential for publication bias. However, the authors did not state whether any language restrictions were in place, which introduces the potential for language bias. Similarly, they did not describe how papers were selected for inclusion or how many reviewers assessed
their validity, so the potential for reviewer error and bias cannot be assessed. However, the use of two independent reviewers to extract data from the studies would appear to reduce the risk of bias and error for this procedure.

The authors provided a good description of the design and interventions used in the included studies, but only the results for the primary outcomes were presented. The method of analysis was described in good detail and heterogeneity between the studies was assessed. However, in view of the diversity in study design and the significant heterogeneity identified between the studies, the decision to combine the data may not have been appropriate and these results should therefore be treated with caution. The authors’ advice to use multifaceted strategies over audit and feedback and quality improvement seems overstated, given that all strategies were significant and the evidence for multifaceted strategies was limited to only two heterogeneous studies using interrupted time series. In view of the limited reporting of the review process and potential weaknesses in the analysis and interpretation of the data, the authors’ conclusions may not be reliable.

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

Practice: The authors stated that interventions to reduce Caesarean section rates should be based on multifaceted strategies using audit and detailed feedback.

Research: The authors stated that further studies are needed to assess morbidity in relation to mode of delivery.

**Funding**

Research Centre of Sainte-Justine Hospital, Montreal, Canada.

**Bibliographic details**


**PubMedID**

17324180

**DOI**

10.1111/j.1523-536X.2006.00146.x

**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Adult; Canada /epidemiology; Cesarean Section /statistics & numerical data; Cesarean Section, Repeat /statistics & numerical data; Elective Surgical Procedures /statistics & numerical data; Evidence-Based Medicine; Female; Humans; Infant, Newborn; Obstetric Labor Complications /epidemiology; Outcome Assessment (Health Care); Perinatal Care /statistics & numerical data; Pregnancy; Randomized Controlled Trials as Topic; Regression Analysis; Research Design

**AccessionNumber**

12007000818

**Date bibliographic record published**

30/11/2007

**Date abstract record published**

30/11/2007

**Record Status**

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