The newborn individualized developmental care and assessment program is not supported by meta-analyses of the data
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Authors' objectives
To systematically review the effectiveness of the Newborn Individualised Developmental Care and Assessment Programme (NIDCAP), compared with conventional care, to improve long-term neurodevelopmental outcomes or short-term medical and neurodevelopmental outcomes in pre-term and/or low birth weight infants.

Searching
MEDLINE (1966 to May 2001), EMBASE (1989 to 2001), CINAHL (1982 to March 2001), PsycINFO (1984 to 2000), and the Cochrane Controlled Trials Register (Issue 2, 2001) were searched for relevant articles. The search terms were not provided. Additional sources were personal files, prior reviews, reference lists and contact with experts. There were no language limitations.

Study selection
Study designs of evaluations included in the review
Randomised and quasi-randomised controlled trials (RCTs) and prospective cohort study designs were included in the review.

Specific interventions included in the review
Studies that evaluated hospital-based developmental care according to the NIDCAP framework, compared with standard care, were included in the meta-analysis.

Participants included in the review
Studies that included infants less than 36 weeks' gestation or less than 2,500 g at birth were selected for the review.

Outcomes assessed in the review
The primary outcome of interest was school-age neurodevelopmental outcome. The secondary outcomes included short-term neurodevelopment at 9, 21 and 24 months, as measured by the corrected mental and physical developmental indexes of the Bayley Scales of Infant Development, medical outcomes and hospital charges or costs.

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
RCTs were assessed using two methods: criteria developed by the Cochrane Neonatal Group (see Other Publications of Related Interest no.1) and scores on the Jadad scale (see Other Publications of Related Interest no.2). The quality of cohort studies was not systematically assessed. The authors stated that the methodologic quality of RCTs was assessed 'independently', presumably by at least two reviewers.

Data extraction
The authors stated that the data were extracted 'independently', presumably by at least two reviewers.

Methods of synthesis
How were the studies combined?
Relative risks (RR) and risk differences for dichotomous data, and weighted mean differences (WMDs) for continuous
data, were calculated for all analyses, along with 95% confidence intervals (CIs). The number-needed-to-treat was calculated when a statistically-significant reduction in the risk difference was found. The studies were combined using a fixed-effect model when homogeneous, or a random-effects model when statistically-significant heterogeneity was discovered. Separate meta-analyses were carried out for RCTs and cohort studies.

How were differences between studies investigated?
Statistical heterogeneity was investigated using the chi-squared statistic.

Results of the review
Five RCTs and three phase-lag studies met the inclusion criteria. The total number of participants was not reported.

All the RCTs were of poor methodological quality, based on Jadad's quality assessment score and the methods of the Cochrane Neonatal Group. Multiple flaws and biases were observed amongst all five RCTs. Cohort studies were not assessed for methodologic quality.

Meta-analysis of RCTs.

The NIDCAP had no significant effects on intraventricular haemorrhage, patent ductus arteriosus, necrotising enterocolitis, retinopathy of prematurity, pneumothorax, pulmonary interstitial emphysema, chronic lung disease, cognitive and motor development at 24 months, duration of hospitalisation, or gestational age at discharge.

Significant effects were reported for the following:
cognitive neurodevelopment at 9 to 12 months (3 RCTs, WMD 16.58, 95% CI: 9.33, 23.82);
motor neurodevelopment at 9 to 12 months (3 RCTs, WMD 9.24, 95% CI: 0.68, 17.81);
duration of ventilation (2 RCTs, WMD -25.70, 95% CI: -43.94, -7.46);
duration of supplemental oxygen (2 RCTs, WMD -41.06, 95% CI: -65.29, -16.83);
weight gain (g/day) (2 RCTs, WMD 3.24, 95% CI: 0.57, 5.92);
head growth (cm/week) (1 RCT, WMD 0.25, 95% CI: 0.11, 0.39);
days to full oral feeds (1 RCT, WMD -44.90, 95% CI: -86.12, -3.68).

Meta-analysis of prospective cohort studies.

All of the outcomes were statistically non significant, with the exception of the following:
retinopathy of prematurity (1 cohort, RR 5.16, 95% CI: 1.58, 16.84);
chronic lung disease at 28 days (3 cohorts, RR 0.50, 95% CI: 0.30, 0.83);
cognitive neurodevelopment at 9 months: (1 cohort, WMD 45.24, 95% CI: 35.92, 54.56);
duration of supplemental oxygen (2 cohorts, WMD -6.64, 95% CI: -12.73, -0.55);
weight gain (g/day) (1 cohort, WMD -3.46, 95% CI: -6.69, -0.23);
days to full oral feeds (2 cohorts, RR -14.73, 95% CI: -23.45, -6.02).

Cost information
Four RCTs and two cohort studies reported savings with NIDCAP in comparison with standard care. A meta-analysis of
two USA-based RCTs demonstrated a statistically-significant reduction in hospital charges.

**Authors' conclusions**
No conclusions could be drawn from the research performed to date because of all the methodologic flaws identified.

**CRD commentary**
This review was based on a fairly well-defined question and was supported by appropriate inclusion criteria. The search for relevant literature appears to have been reasonably comprehensive, covering electronic databases, personal files, reference lists and contact with experts. Study inclusion was not limited by the language of publication. The validity of the RCTs was assessed using two different sets of criteria, possibly by multiple reviewers. The investigation of statistical heterogeneity and the meta-analysis of the included studies conformed to the usual standards. However, even though only a very small number of studies were included in the review, there were few details of these for the reader to examine. Nevertheless, the authors' conclusion that recommendations could not be made due to the poor quality of the existing evidence seems justified.

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

Practice: The authors did not state any implications for practice.

Research: Well-designed and executed studies with appropriate power would be required to prove or disprove the effectiveness of NIDCAP to improve long-term (school age) neurodevelopment and short-term medical outcomes. These studies should include cost-effectiveness evaluations.

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**Other publications of related interest**

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