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**ABSTRACT**

**Background**

Preterm infants are usually nursed in incubators, but cot-nursing may provide an alternative. While there may be benefits of nursing preterm infants in open cots, there may be potential risks such as nosocomial infection caused by more handling due to easier access.

**Objectives**

To assess effects of cot-nursing versus incubator care on temperature control and weight gain in preterm infants.

**Search methods**

The standard search strategy of the Cochrane Neonatal Review Group was used. This included searches of electronic databases including the Cochrane Central Register of Controlled Trials (The Cochrane Library), Oxford Database of Perinatal Trials, MEDLINE, CINAHL, and EMBASE, as well as previous reviews including cross references through November 2009.

**Selection criteria**

All trials using random or quasi-random patient allocation in which infants receiving care in standard newborn cots were compared to infants managed in a conventional air heated incubator.

**Data collection and analysis**

The authors independently assessed trial quality and extracted data for the primary outcomes of temperature control and weight gain. Meta-analysis was conducted using a fixed-effect model.

**Main results**

Eleven potential studies were identified of which five, involving 247 infants, were included in this review. When compared to incubator care, cot-nursing resulted in no significant difference in mean body temperature (MD 0.02 degrees C; 95% CI -0.02 to 0.07, four trials), though the one trial that reported on episodes of hyperthermia found this to be statistically more common in the cot-nursing group (RR 1.48; 95% CI 1.04 to 2.09). There were no statistically significant differences in weight gain. In the cot-nursing group, fewer infants were breast fed on discharge (typical RR 0.74; 95% CI 0.48 to 1.14, three trials, 150 infants) and fewer infants died prior to hospital discharge (typical RR 0.59, 95% CI 0.28 to 1.25, four trials, 235 infants) but these results failed to reach statistical significance. The comparison of cot-nursing using a heated water-filled mattress versus incubator care, which included five trials and a total of 231 infants, produced similar results. Cot-nursing with warming of the nursery resulted in statistically significantly smaller
weight gain during week one compared to the incubator group in one trial that involved 38 infants (MD -5.90 g/kg/day; 95% CI -11.13 to -0.67) but no significant difference was found for weeks two and three.

Authors’ conclusions

Cot-nursing using a heated water-filled mattress has similar effects to incubator care with regard to temperature control and weight gain. Important clinical outcomes need to be investigated further using randomised controlled trials. This is especially the case in the situation of developing countries, where differences in these outcomes are likely to be encountered. As limited data is available on cot-nursing using a space-heated room, this method is not recommended as practice.

**PLAIN LANGUAGE SUMMARY**

**Cot-nursing versus incubator care for preterm infants**

Prematurely born infants are usually nursed in incubators to provide the warmest environment possible. Using cots instead of incubators, allows mothers to have easier access to their babies. However, additional warmth is needed to maintain their body temperature, such as extra clothing, bedding and a heated room. This updated review randomly assigned 247 preterm infants (in five trials), to an intervention of cot-nursing using a heated water-filled mattress. The control babies received routine care in an air heated incubator. One trial had three-arms, including cot-nursing in a room heated with a manually controlled space heater. In the included trials infants in the incubator groups were nursed naked apart from wearing a nappy, except in one trial in which the infants also wore a cotton jacket and booties. Three comparisons were undertaken: the overall comparison of cot-nursing versus incubator care, and two subgroup comparisons: cot-nursing with heated water-filled mattress versus incubator care, and cot-nursing using warming of the nursery versus incubator care. The results of the review showed no evidence of effect of cot-nursing versus incubator care on weight gain in the overall analysis, or in the subgroup analysis comparing cot-nursing using a heated water-filled mattress with incubator care. However, cot-nursing with warming of the nursery during week one when compared to incubator care revealed poorer weight gain. The primary outcomes related to temperature control (mean body temperature and episodes of cold stress) indicated on overall analysis no effect of cot-nursing compared to incubator care. Episodes of hyperthermia in the cot-nursing group were reported more frequently in one trial. The secondary outcomes of oxygen consumption, breast feeding at hospital discharge, episodes of nosocomial sepsis, maternal perceptions of infant’s condition, maternal stress and anxiety and death prior to hospital discharge revealed there was no effect of cot-nursing compared to incubator care. There was, however, a strong trend towards less death prior to hospital discharge. This was largely related to the results were obtained from the trials undertaken in Turkey and Ethiopia and thus may not be applicable to neonatal nurseries in developed countries. Nevertheless the implications of these findings deserve consideration, particularly in the context of a developing country.

**BACKGROUND**

**Description of the condition**

An optimal thermal environment is desirable for preterm infants. When an infant is challenged by cold, the baby attempts to conserve body heat by vasoconstriction and to maintain body temperature by increasing the rate of heat production. This involves thermogenesis by the metabolism of brown adipose tissue and an increase in oxygen consumption. The increase in energy expenditure may reduce weight gain (Glass 1969). Traditionally for preterm infants in the intensive care unit, temperature has been maintained by the use of air heated incubators or thermo controlled radiant heaters. The more stable preterm infants have usually been nursed in incubators, being moved to open cots at 1700 to 1800 g (Sutter 1988), though practice varies widely between neonatal units.

**Description of the intervention**

Given the complexities of caring for a preterm infant in an incubator, there is a need to assess the effectiveness of nursing in an open cot. This method of nursing does require a number of extra measures to ensure body temperature is maintained. These have included extra clothing/bedding, warming up the nursery and heating the cot mattress.
**How the intervention might work**

Metabolic effects were studied in infants in an open nursery cot provided with a small electric heating element below the mattress (Hey 1970). Oxygen consumption and heat loss fell compared to when the infants were studied in an unheated cot. In more recent years, a heated water-filled mattress (HWM) has been developed to maintain the temperature of a preterm infant, who would otherwise be nursed in an air heated incubator (Tunell 1986). The mattress can be placed in a standard baby cot. With the HWM there is conductive heat transfer to the baby and indirect heating of the air around the baby (limiting convective heat loss), thus tending to keep the baby at a normal temperature. Preliminary clinical results indicated that during treatment in the heated cot, the skin temperature was generally found to be 35 to 37 degrees C in all parts of the body covered by a blanket, while the skin of the face exposed to room air was 3 to 4 degrees C lower (Tunell 1986). This may be beneficial, as it has been suggested that a lower skin face temperature may have a positive effect on thermal comfort and behavioural state (Bruck 1968).

**Why it is important to do this review**

Parents experience a feeling of loss following the birth of a preterm infant. This is compounded by the separation of an infant in an incubator from its mother. Stress and anxiety are frequently experienced by new mothers (Shields-Poe 1997). Maternal perceptions of their infants may influence infant development (Watt 1989). Maternal perceptions and feelings may be more positive in the case of infants receiving cot-nursing because of greater maternal access to babies in open cots. Additionally, nursing staff may perceive that better care may be provided to infants nursed in open cots due to increased accessibility.

The cost of an air-heated incubator is substantial compared to the relatively cheap alternative of an open cot. If it could be demonstrated that nursing an infant in an open cot instead of an incubator could be achieved without adverse effect, then considerable benefit could accrue in economic terms both in developing and developed countries.

Although there may be benefits of nursing infants in open cots, there may be potential risks. It is possible that Infants nursed in cots may be handled more due to easier open access, which could result in an increased risk of nosocomial infection. Conversely, there may be risks of nursing infants in incubators, such as exposure to excessive noise, resulting in negative effects on behavioural state and longer term development (Benini 1996).

**OBJECTIVES**

**Primary:**

Among preterm infants allocated to cot-nursing versus incubator care in the neonatal period, to assess effects on their temperature control and weight gain. Secondary outcomes investigated include oxygen consumption, length of hospital stay, breast feeding at hospital discharge, episodes of nosocomial sepsis, maternal and nursing perceptions of the care and condition of the babies, and cost effectiveness.

**Secondary:**

1. to conduct subgroup analyses on infants < 1500 g and those small for gestational age;
2. to conduct subgroup analyses in which differing types of cot-nursing, i.e. cot-nursing with extra clothing/bedding, cot-nursing with warming of the nursery, cot-nursing with a heating element placed below the mattress and cot-nursing with a heated water-filled mattress, will be compared with incubator care using manual temperature control or servo-control and with the infants being either naked or clothed;
3. to conduct subgroup analyses according to the age at which cot-nursing was introduced (from birth or later during the neonatal period).

**METHODS**

**Criteria for considering studies for this review**

**Types of studies**

All trials using random or quasi-random patient allocation in which infants receiving care in newborn cots were compared to infants managed in an air heated incubator.

**Types of participants**

Preterm infants (< 37 weeks’ gestation) in the neonatal period. Studies involving both appropriate and small for gestational age infants were included.

**Types of interventions**

Care in newborn cots using methods of providing additional warmth that include extra clothing/bedding, space heated room, heating element below the mattress or a heated water filled mattress, compared to care in an incubator. Trials included, were cot-nursing interventions compared with methods used for incubator care: manual temperature control, servo-control, naked babies, clothed babies.
Types of outcome measures

Primary outcomes
1. Infant’s body temperature (degrees C).
2. Episodes of cold stress (temperature < 36 degrees C).
3. Episodes of hyperthermia (temperature > 37.5 degrees C).
4. Weight gain (g/kg/day).

Secondary outcomes
1. Oxygen consumption (ml/kg/min).
2. Length of hospital stay (days).
4. Episodes of nosocomial sepsis.
5. Maternal perceptions of infant’s condition.
7. Nursing perceptions of ability to provide care.
8. Cost.

Planned sub-group analyses:
- Birth weight < 1500 g
- Infants small for gestational age

Interventions:
- Cot-nursing with extra clothing/bedding;
- Cot-nursing with warming of the nursery;
- Cot-nursing with heating element below the mattress;
- Cot-nursing with heated water-filled mattress.

Data collection and analysis
The systematic review followed the method described of the Cochrane Collaboration, documented in the Cochrane Handbook for Systemic Reviews of Interventions (Higgins 2008).

Selection of studies
Authors have independently assessed for inclusion of all potential studies, identified as a result of the search strategy.

Data extraction and management
All publications retrieved from the search were assessed for inclusion independently by the two review authors. Data was collected on a specifically designed form to ensure uniformity and validity of content. The methodological quality of each trial was assessed and data were extracted independently by the two review authors. Differences were resolved by discussion.

Assessment of risk of bias in included studies
The criteria and standard methods of the Cochrane Neonatal Review Group were used to independently assess the methodological quality of any included trials in the following terms:
1. selection bias - blinding of randomisation (including sequence generation and allocation concealment);
2. performance bias - blinding of intervention (participants, personnel and outcome assessors);
3. attrition bias - complete follow-up (any incomplete outcome data);
4. detection bias - blinding of outcome assessment (any differences between study groups, in how outcomes are determined);
5. reporting bias - selective outcome reporting (free of suggestive reporting and discloses any differences in reported and unreported findings);
6. other sources of bias - other problems that could put the study at a high risk of bias.

The review authors judged from the report of the trial whether each of the criteria for method of avoidance of bias was met. The eligible trial was assessed for the criteria listed below and marked as: A) yes (low risk), B) no (high risk), C) can’t tell (unclear risk). Additional information from the trial authors was requested to clarify methodology and results as necessary. This information was added to the Risk of Bias table.

Measures of treatment effect
Standard methods of Cochrane Neonatal Review Group were used to synthesise the data. For individual trials, mean differences (and 95% confidence intervals) are reported for continuous variables. For categorical outcomes, the risk ratio (RR) and number needed...
to treat (NNT) where appropriate (and 95% confidence intervals) are reported. For the meta-analysis, mean differences (MD) (and 95% confidence intervals) are reported for continuous variables, and the relative risk and number needed to treat where appropriate (and 95% confidence intervals) for categorical outcomes. A fixed-effect model was used.

**Unit of analysis issues**

The crossover trial (Sarman 1992) in this review reported data taken from the end of the first observation period before the one crossover, therefore, these data were included in the meta-analysis. The means and standard deviations from the Green-Abate 1994 trial on weight gain for the two intervention groups were combined for the overall comparison using methods as described in Armitage 1994. Subgroup analyses were performed as proposed when data permitted.

**Dealing with missing data**

Additional information was requested from the authors of each trial as necessary for clarification of methodology or data (Sarman 1989a; Sarman 1989b; Sarman 1992; Sarman 1993; Green-Abate 1994). All available data was included. The potential impact of missing data has been included in the discussion section.

**Assessment of heterogeneity**

The treatment effects of individual trials and heterogeneity between trials was examined by inspecting the forest plots. The I² statistic was used to assess heterogeneity among the trials in each analysis. Where substantial heterogeneity was found, sub-group analysis was explored. Heterogeneity was graded as 0 to 30% (might not be important); 31% to 50% (moderate heterogeneity); 51% to 75% (substantial heterogeneity); 76% to 100% (considerable heterogeneity).

**Assessment of reporting biases**

All information available was included in this review.

**Data synthesis**

Statistical analysis was performed using the Review Manager software (RevMan 2008). Data was combined, where trials with similar population and methods, were examining the same intervention. For estimates of typical relative risk and risk difference, we used the Mantel-Haenszel method. For measured quantities, we used the inverse variance method. All meta-analysis were done using the fixed effect model.

**RESULTS**

**Description of studies**

See: Characteristics of included studies; Characteristics of excluded studies.

**Results of the search**

Eleven trials were considered potentially eligible for inclusion in this review. Five trials were included (Sarman 1989a; Sarman 1989b; Sarman 1992; Green-Abate 1994; Gray 2004), six trials were excluded (Marks 1984; Deiriggi 1990; Sarman 1993; Darragh 1994; West 2005; Weintraub 2007).

**Included studies**

Five trials involving 247 infants (inclusive), are included in this review. One trial of 12 infants (Sarman 1992) utilised a cross-over design. Participants in the studies were quite diverse with the weight of the infants in the studies of Green-Abate 1994, Sarman 1989b and Gray 2004 ranging from 1000 to 1999 g. 2000 g thus including some lighter babies than the Sarman 1989a and Sarman 1992 studies where mean weights were 1582 g and 1458 g. The Sarman 1989b study also included babies who were hypothermic at the time of enrolment. Furthermore the setting for the Green-Abate 1994 and Sarman 1989b studies was in a developing country compared to a developed country for the other three studies. The intervention in the five trials was cot-nursing with a heated water-filled mattress. The control babies received routine care in an air heated incubator. The study of Green-Abate 1994 was a three-arm trial that also studied cot-nursing in a room heated with a manually controlled space heater. In the included trials infants in the incubator groups were nursed naked apart from wearing a nappy, except in the apart from the study of Gray 2004 in which the infants also wore a cotton jacket and booties. Primary outcomes in the studies included weight gain (g/kg/day) and body temperature measurements. Body temperatures were variably obtained from the forehead, axilla, abdomen, foot and rectum (Sarman 1989a; Sarman 1989b; Green-Abate 1994; Gray 2004). Green-Abate 1994 reported the core-to-skin temperature gradient only. The secondary outcome of oxygen consumption was measured by indirect calorimetry (Sarman 1989a; Sarman 1992). Information was sought and obtained from the authors of three trials (Sarman 1989a; Sarman 1989b; Sarman 1992) concerning the method of randomisation blinding. In the case of Sarman 1989a and Sarman 1989b, additional information was sought and obtained on mean body temperature as it was presented in graphical form only in the publications. Furthermore, information was requested from Sarman 1989a, Sarman 1989b and Green-Abate...
on the number of babies that had hypothermic and hyperthermic episodes. These data were not available from the Sarman 1989a and Sarman 1989b trials, with no additional information having been received at the time of undertaking this review from Green-Abate 1994.

**Excluded studies**

Seven trials were excluded from this review. One trial studied infants randomised to care with and without a heated water mattress (Marks 1984), but both groups were nursed in an incubator. Two trials assessed a water bed compared to a standard mattress (Deiriggi 1990; Darragh 1994), but again both groups were nursed in incubators. Another trial (West 2005) compared infants being transferred from incubators to cots at different weights. Data were only presented for the infants in cots, not in incubators. Weintraub 2007 examined changes in energy expenditure in preterm infants during weaning from an incubator. As the incubator group was examined with the incubator turned off, the trial was not included. The infants in the Sarman 1993 trial were subsets of other trials (Sarman 1989a; Sarman 1989b). This report concerned mothers’ perceptions of preterm infants treated in an incubator or on a heated water-filled mattress.

**Risk of bias in included studies**

**Allocation**

All the included trials, including the crossover trial of Sarman 1992, assigned babies to study groups by random allocation. Adequate concealment of treatment allocation was achieved in the Green-Abate 1994 and Gray 2004 trials by the use of sealed envelopes. The Sarman 1989a; Sarman 1989b and Sarman 1992 trials used random sample tables administered by a senior nurse who was not involved in the trial.

**Blinding**

Blinding of intervention and outcome was not possible and blinding of assessment was undertaken.

**Incomplete outcome data**

In the Green-Abate 1994 study five infants were excluded from the analysis in the publication due to death related to incidental illnesses. Two had been randomised to the incubator group, two to the heated water-filled mattress group and one to the space-heated group. The five infants have been included in this review for the outcome of death prior to hospital discharge. In the Sarman 1989a study, there were fewer babies examined in weeks two and three compared to week one as babies were transferred to an ordinary cot when the study endpoint for an individual baby had been reached (mattress temperature of 36 degrees C for those randomised to the heated water-filled mattress group and an air temperature of 30 degrees C in the incubator for the incubator group). In the Gray 2004 study five infants in the study group withdrew prior to the endpoint being reached; four infants were transferred to incubator care, two because of increasing apnoeic episodes, one because of persisting vomiting and one because of hyperthermia and one was transferred to another hospital. Three infants in the control group did not complete the trial to the study endpoint, all being transferred to regional hospitals. In all cases the available data were analysed.

**Other potential sources of bias**

Summaries of quality assessments of the included trials are included in ‘Characteristics of Included Studies’ tables and potential sources of bias are stated in the Risk of Bias tables.

**Effects of interventions**

The results of this review come from five studies involving a total of 247 babies. Three comparisons were undertaken: the overall comparison of cot-nursing vs incubator care, and two subgroup comparisons: cot-nursing with heated water-filled mattress vs incubator care, and cot-nursing using warming of the nursery versus incubator care.

**Cot-nursing (any type) vs. incubator (COMPARISON 1):**

Five trials of 247 infants contributed to this comparison. Data were available for pre-specified primary outcome measures, body temperature, episodes of cold stress, episodes of hyperthermia and weight gain, and for the secondary outcomes of oxygen consumption, not breast feeding at hospital discharge, episodes of nosocomial sepsis, maternal perceptions of infant’s condition, maternal stress and anxiety and death prior to hospital discharge.

**Primary outcomes:**

**Body temperature (Outcomes 1.1 - 1.3):**

There was no difference between the cot-nursing and incubator groups in mean body temperature [mean difference (MD) 0.02 degrees C; 95% confidence interval (CI) - 0.20 to 0.07]. There was, however, statistical heterogeneity (I² 83%) due to the inclusion of the trial (Sarman 1989b) in which most of the babies on recruitment had a temperature < 36 degrees C. As the Green-Abate 1994 trial only reported the core-skin temperature gradient, it was not possible to use this data in the meta-analysis. Only the Gray 2004 trial reported the number of infants with episodes of cold stress and hyperthermia. No differences between the cot-nursing and incubator groups were found. Similarly only the Gray 2004 trial reported on episodes of hyperthermia, with this outcome being found to occur more frequently in the cot-nursing group (RR 1.48; 95% CI 1.04 to 2.09). Green-Abate 1994 reported on the
number of temperature measurements in the hypothermic and hyperthermic range per person-hours and hence these data were not used in this analysis.

**Weight gain (Outcome 1.4):**

The Sarman 1989a, Green-Abate 1994 and Gray 2004 trials provided data on weight gain (g/kg body weight/day) subgrouped by week. The results showed no significant differences between the cot-nursing and incubator groups in either weeks one, two or three, either in the individual trials or in the meta-analysis (week one MD 0.19 g/kg/day; 95% CI -2.39 to 2.77; week two MD 0.91 g/kg/day; 95% CI -0.51 to 2.33; week three MD 0.35 g/kg/day; 95% CI -4.41, 5.11). The results for week one indicated statistical heterogeneity (I² 59%), which related to the trial of Green-Abate 1994 which included babies cot-nursed in a space heated room as well as those on a heated water-filled mattress. Interestingly, the Green-Abate 1994 trial did not report any statistically significant differences in caloric intake between the groups during the trial period, these data were not provided by either Sarman 1989a or Gray 2004.

**Secondary outcome measures:**

**Oxygen consumption (ml/kg/min) (Outcome 1.5):**

Two trials contributed data for the outcome of oxygen consumption (Sarman 1989a; Sarman 1992). Neither trial found evidence of effect, and no significant difference between the two groups was found in the meta-analysis (MD -0.17 ml/kg/min; 95% CI -0.47 to 0.13).

**Not breast feeding at hospital discharge (Outcome 1.6):**

The Sarman 1989a, Sarman 1989b and Gray 2004 trials collected data on breast feeding on discharge. Sarman 1989b and Gray 2004 found no evidence of effect, but Sarman 1989a found a reduction in the number of infants not breast feeding at discharge that was of borderline statistical significance. In the meta-analysis, cot-nursing resulted in a reduction in the number of infants not breast feeding at discharge, but this was not statistically significant (typical RR 0.74; 95% CI 0.48 to 1.14).

**Episodes of nosocomial sepsis (Outcome 1.7):**

Two trials (Gray 2004; Sarman 1989a) reported data on nosocomial sepsis. No sepsis occurred during the Sarman 1989a trial, while no significant differences between the two groups were reported in the Gray 2004 trial (typical RR 0.27; 95% CI 0.01 to 6.41).

**Maternal perceptions of infants condition (Outcome 1.8):**

In the Gray 2004 trial, mothers completed questionnaires on the perceptions of their preterm infants using the Neonatal Perception Inventory (Broussard 1970; Broussard 1971). At the time of randomisation there were no differences between the cot-nursing and incubator groups of mothers. On completion of the trial, again no differences between the groups were reported (MD -1.0; 95% CI -2.96 to 0.96).

**Maternal stress and anxiety (Outcome 1.9):**

The Gray 2004 trial collected data on maternal anxiety and stress levels using the anxiety scale of the Delusions Symptoms States Inventory (DSSI) (Bedford 1978) and the Los Angeles Stress Scale (Neader 1973). In these questionnaires, no differences between the two groups either at randomisation or during follow-up were reported (MD -2.9; 95% CI -6.54 to 0.74).

**Death prior to hospital discharge (Outcome 1.10):**

No significant difference was shown for the outcome of death prior to discharge either in the individual trials (Sarman 1989a, Sarman 1989b; Green-Abate 1994; Gray 2004) or in the meta-analysis, though there was a strong trend towards less death in the cot-nursing group (RR 0.59; 95% CI 0.28 to1.25).

**Cot-nursing with heated water-filled mattress and incubator care (Comparison 2):**

Five trials with 223 infants were included in this comparison.

**Primary outcomes:**

**Body temperature (Outcomes 2.1 - 2.3):**

Data on mean body temperature were obtained from the four trials (Sarman 1989a; Sarman 1989b; Sarman 1992; Gray 2004) with the results being the same as for the overall comparison. The one trial that reported number of infants with episodes of cold stress and hyperthermia (Gray 2004) indicated that there were no differences between the cot-nursing and incubator groups for episodes of cold stress, while there was an increase in episodes of hyperthermia in the cot-nursing group (RR 1.48; 95% CI 1.04 to 2.09).

**Weight gain (Outcome 2.4):**

No statistically significant difference was shown in weight gain in either weeks one, two or three of treatment, either in the individual trials, (Sarman 1989a; Green-Abate 1994; Gray 2004) or in the meta-analyses: mean difference (MD) and 95% CI for weeks one, two and three were 1.30 g/kg/day (-1.48 to 4.08), 0.90 g/kg/day (-0.57 to 2.37) and 1.21g/kg/day (-3.77 to 6.18) respectively.

**Secondary outcomes (Outcomes 2.5 - 2.10):**

For the secondary outcome measures of oxygen consumption, breast feeding at hospital discharge, episodes of nosocomial sepsis, maternal perceptions of infant’s condition and maternal stress and anxiety the same trials were included as for the overall comparison and hence the same results were obtained. No statistically significant difference was shown for death, the only other reported secondary outcome, either in the individual trials (Sarman 1989a; Sarman 1989b; Green-Abate 1994; Gray 2004) or in the meta-analysis: (typical RR 0.63; 95% CI 0.30 to 1.34).

**Cot-nursing using warming of the nursery vs incubator care (Comparison 3):**

**Weight gain (g/kg/day) (Outcome 3.1); Death prior to hospital discharge (Outcome 3.2):**

One trial involving 45 infants was included in this analysis (Green-Abate 1994). Infants receiving cot-nursing with warming of the nursery had less weight gain than those in the incubator group during week one (MD -5.90 g/kg/day; 95% CI -11.13 to -0.67. No statistically significant differences were shown for weight gain in
weeks two (MD 1.40 g/kg/day; 95% CI -2.70, 5.50) or three (MD -6.00 g/kg/day; 95% CI -18.81 to 6.81). Data on temperature control were not presented in a way that could be included in the review. The only secondary outcome that could be analysed was death and there was no significant difference between the groups (RR 0.44; 95% CI 0.04 to 4.49).

Data were not available for the secondary outcome measures of length of hospital stay, nosocomial and nursing perceptions and cost. Due to insufficient data, other planned sub-group analyses could not be performed (for detail please refer to the secondary objectives of the review included under “Objectives”).

DI S C U S S I O N

Summary of main results

The results of the review showed no evidence of effect of cot-nursing versus incubator care on weight gain in the overall analysis, or in the subgroup analysis comparing cot-nursing using a heated water-filled mattress with incubator care. However, cot-nursing with warming of the nursery during week one when compared to incubator care revealed poorer weight gain which was on average 6 g/kg/day less (Green-Abate 1994). The primary outcomes related to temperature control - mean body temperature and episodes of cold stress indicated on overall analysis no effect of cot-nursing compared to incubator care. Episodes of hyperthermia in the cot-nursing group were reported more frequently in one trial (Gray 2004). It was reported that it was considered concerns raised by staff providing nursing care at the beginning of the trial of the possibility of cold stress/hypothermia, may have led to the temperature of the mattress being set higher than appropriate. The secondary outcomes of oxygen consumption, breast feeding at hospital discharge, episodes of nosocomial sepsis, maternal perceptions of infant’s condition, maternal stress and anxiety and death prior to hospital discharge revealed there was no effect of cot-nursing compared to incubator care. There was, however, a strong trend towards less death prior to hospital discharge. This was largely related to the results were obtained from the trials undertaken in Turkey (Sarman 1989b) and Ethiopia (Green-Abate 1994) and thus may not be applicable to neonatal nurseries in developed countries. Nevertheless the implications of these findings deserve consideration, particularly in the context of a developing country. The protocol did not place strict a priori definitions for the primary or secondary outcomes. Hence we used the operational definitions as reported by the investigators in the eligible trials.

This review has a number of limitations. The numbers of babies enrolled in the included trials are relatively small and data were either not available or only available for very few infants for many of the pre-specified important clinical outcomes for this review. Importantly, the outcome measure related to safety - episodes of nosocomial sepsis was only addressed in two studies (Sarman 1989a; Gray 2004).

Quality of the evidence

No trials were identified that compared care in newborn cots with additional warmth provided by extra clothing/bedding or a heated element below the mattress. Furthermore, comparisons of cot nursing interventions with varying methods for incubator care e.g. servo-controlled incubators, naked babies in incubators, could not be performed due to lack of available trials. Two trials (Sarman 1989b; Green-Abate 1994) took place in developing countries (Ethiopia and Turkey) where major differences in medical and nursing care were evident in comparison to developed countries. In the study carried out in Turkey (Sarman 1989b), a limited number of nurses were available in the nursery, with care largely being provided by the mothers. Accordingly, one may not be able to generalize from these the results. One included trial (Gray 2004) assessed the effect of cot-nursing on maternal perceptions and maternal stress and anxiety and found no difference in comparison to the incubator group of infants. Another study (Sarman 1993) reported mothers’ perceptions of their preterm infants treated in a cot with a heated water-filled mattress versus in an incubator. This pilot study suggested that the babies treated in a cot on a heated water-filled mattress were healthier and more vigorous than those in an incubator and that the mothers felt that their babies ‘belonged to them’. These data could not be included as the infants were subsets of two other trials. The heated water-filled mattress was designed as a cheap and technically simple device that when placed in a cot could be used as an alternative to incubator care (Tunell 1986). No studies were identified which compared the costs of cot-nursing compared to nursing a baby in an incubator.

Agreements and disagreements with other studies or reviews

The results of the review provides evidence that cot nursing is comparable to incubator care, without any indication that there is an increased risk of adverse outcome. Indeed it has been recommended that when a preterm infant is stable without the requirement for respiratory support, then cot-nursing and in particular using the HWM may replace incubator care (Tunell 2004).
A U T H O R S ’ C O N C L U S I O N S

Implications for practice
Despite there being a relatively small number of trials included and infants studied, it would seem overall that cot-nursing using a heated water-filled mattress has similar effects to incubator care with regard to temperature control and weight gain. While limited data are available for important secondary outcomes including episodes of nosocomial sepsis, not breast feeding at hospital discharge and death prior to hospital discharge, together with cost it is suggested that cot-nursing with a heated water-filled mattress may be employed for preterm infants. Even though little information is available on cot-nursing in a space-heated room, it is suggested that cot-nursing in this manner is not appropriate.

Implications for research
Further investigation of the role of cot-nursing for preterm infants using randomised controlled trials is necessary. Different forms of providing extra warmth to the infants while in cots need to be examined in comparison with varying methods of incubator care. Important clinical outcomes to be addressed in future research include thermoregulation, weight gain, breast feeding, mortality and nosocomial infection. The issue of cost is important, especially as it pertains to developing countries. A formal assessment of expenditure for equipment purchase, the cost of nursing care and length of hospital stay needs to be carried out.

A C K N O W L E D G E M E N T S

We thank Prof R Tunell and Dr I Sarman for providing unpublished data related to the following publications: Sarman 1989a, Sarman 1989b, Sarman 1992, Sarman 1993.

R E F E R E N C E S

References to studies included in this review

Gray 2004 (published data only)

Sarman 1989b (published data only)

Green-Abate 1994 (published data only (unpublished sought but not used))

Sarman 1989a (published and unpublished data)

Sarman 1989b (published and unpublished data)

Sarman 1992 (published and unpublished data)

References to studies excluded from this review

Darragh 1994 (published data only)

Deiriggi 1990 (published data only)

Marks 1984 (published data only)
Marks KH, Calder PD, Nardis EE, Ultman JS. A warming mattress for premature infants. Pediatric Research 1984;18:333A.

Sarman 1993 (published and unpublished data)

Weintraub 2007 (published data only)

West 2005 (published data only)

Zecca 2010 (published data only)
Zecca E, Corsello M, Priolo F, Tiberi E, Barone G, Romagnoli C. Early weaning from incubator and early

**Additional references**

**Armitage 1994**

**Bedford 1978**

**Benini 1996**

**Broussard 1970**

**Broussard 1971**

**Bruck 1968**
Bruck K. Which environmental temperature does the premature infant prefer?. *Pediatrics* 1968;41:1027–30.

**Glass 1969**

**Hey 1970**
Hey EN, O'Connell B. Oxygen consumption and heat balance in the cot-nursed baby. *Archives of Disease in Childhood* 1970;45:335–43.

**Higgins 2011**

**Neader 1973**

**RevMan 2008**

**Shields-Poe 1997**

**Sutter 1988**

**Tunell 1986**

**Tunell 2004**

**Watt 1989**

**References to other published versions of this review**

**Gray 2001**

* Indicates the major publication for the study.
## Characteristics of included studies

### Gray 2004

| Methods          | Blinding of randomisation - Yes  
|                 | Blinding of intervention - No  
|                 | Complete follow-up - No  
|                 | Blinding of outcome measure - No  |
| Participants     | 74 infants of weight 1300 - 1500g  
|                 | Exclusions were infants with major malformations, chromosomal abnormality, symptomatic infection, cardiac abnormalities including patent ductus arteriosus and the likelihood that the infant would be transferred to another hospital before the trial endpoint had been reached  |
| Interventions    | 1. Cot-nursing (HWM) 41 infants nursed in cots on heated water-filled mattresses with temperature adjustment to maintain an axillary temperature of 36.5-37.0 degrees C. Each infant wore a disposable nappy, a cotton jacket, a bonnet and booties, was swaddled in a cotton wrap and covered with a blanket  
|                 | 2. Controls: Incubator care. 33 infants nursed in air-heated incubators with the temperature adjusted to maintain an axillary temperature of 36.5-37.0 degrees C. Each infant wore a disposable nappy, a cotton jacket and booties  |
| Outcomes         | Weight gain (g/kg body weight/day), mean daily axillary temperature, episodes of cold stress (temperature <36.2 degrees C), and hyperthermia (temperature >37.5 degrees C), mortality, sepsis, apneic/bradycardic episodes, breast feeding on discharge  |
| Notes            |  |

### Risk of bias

<table>
<thead>
<tr>
<th>Bias</th>
<th>Authors' judgement</th>
<th>Support for judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random sequence generation (selection bias)</td>
<td>Low risk</td>
<td>Randomisation using sealed envelopes</td>
</tr>
<tr>
<td>Allocation concealment (selection bias)</td>
<td>Low risk</td>
<td>Adequate</td>
</tr>
<tr>
<td>Blinding (performance bias and detection bias)</td>
<td>High risk</td>
<td>Blinding of intervention</td>
</tr>
<tr>
<td>Incomplete outcome data (attrition bias)</td>
<td>Low risk</td>
<td>Complete follow-up - no - 5 infants withdrew prior to end of study, 4 infants were transferred to incubator, 2 due to apneic episodes, 1 because of persistent vomiting, 1 due to hyperthermia and 1 was transferred to another hospital</td>
</tr>
</tbody>
</table>
Selective reporting (reporting bias) | Low risk
---|---
Other bias | Low risk

### Green-Abate 1994

**Methods**

- Blinding of randomisation - Yes
- Blinding of intervention - No
- Complete follow-up - No
- Blinding of outcome measure - No

**Participants**

67 infants of birthweight 1000 - 1999g. Exclusions were infants who needed respiratory support or parenteral feeding.

**Interventions**

1. Cot-nursing (SHR)
   - 24 infants nursed in cots in a special care neonatal ward with space heating to maintain a room temperature between 27 and 32 degrees C. The babies were dressed with a cotton shirt and diaper and wrapped in a flannel blanket with the baby then being covered with a synthetic quilted blanket. Additional covering of the cot was given if body temperature fell <36 degrees C. A layer of clothing was removed if body temperature exceeded 37.5 degrees C.
2. Cot-nursing (HWM)
   - 22 infants. Each infant was dressed with a cotton shirt and diapers and wrapped in a flannel blanket with the baby then being covered with a synthetic quilted blanket. The water temperature was adjusted to maintain a core body temperature of 36 -37.5 degrees C.
3. Controls: Incubator care
   - 21 infants nursed in air-heated incubators. with the temperature being adjusted manually to maintain a body core temperature of 36 -37.5 degrees C. Each infant was naked apart from diapers.

**Outcomes**

- Weight gain (g/kg body weight/day), energy intake, rectal, forehead, abdominal wall and dorsal foot temperature, mortality

**Notes**

Five deaths were excluded in the publication but have been included in this review for the outcome of death

### Risk of bias

<table>
<thead>
<tr>
<th>Bias</th>
<th>Authors' judgement</th>
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<tbody>
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</tr>
<tr>
<td>Blinding (performance bias and detection bias)</td>
<td>High risk</td>
<td>Blinding of intervention</td>
</tr>
</tbody>
</table>

(Cot-nursing versus incubator care for preterm infants (Review)

Copyright © 2011 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.)
**Sarman 1989a**

<table>
<thead>
<tr>
<th>Methods</th>
<th>Blinding of randomisation - Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blinding of intervention - No</td>
</tr>
<tr>
<td></td>
<td>Complete follow-up - Yes</td>
</tr>
<tr>
<td></td>
<td>Blinding of outcome measure - No</td>
</tr>
</tbody>
</table>

| Participants | 34 preterm infants of weight 1400 - 1999g. Exclusions were infants with infection, cardiopulmonary disease, gross malformations, requirement for supplemental oxygen. Gestational age across the groups was 28-35 weeks with a birthweight of 904 - 1980g |

| Interventions | 1. Cot-nursing (HWM). 17 infants nursed in cots on heated water-filled mattresses with temperature adjustment made so that rectal temperature was maintained at 35.5 - 37.5 degrees C. Each infant was dressed in a cotton shirt, nappy, cotton dress and a cotton cap for babies <1500g |
|               | 2. Controls: Incubator care. 17 infants nursed in air-heated incubators with temperature adjustment so that rectal temperature was maintained at 35.5-37.5 degrees C. The infants were naked apart from nappies |

| Outcomes | Weight gain (g/kg body weight /day), breast milk feeding volume, oxygen consumption - minimal and average, rectal, forehead, foot and mean skin temperature, episodes of nosocomial sepsis, death prior to hospital discharge, length of hospital stay |

**Notes**

**Risk of bias**

<table>
<thead>
<tr>
<th>Bias</th>
<th>Authors’ judgement</th>
<th>Support for judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random sequence generation (selection bias)</td>
<td>Low risk</td>
<td>Randomisation using a random table with blocks of 5 random numbers with 'matching in pairs' according to gestational age</td>
</tr>
<tr>
<td>Allocation concealment (selection bias)</td>
<td>Low risk</td>
<td>Adequate</td>
</tr>
<tr>
<td>Blinding (performance bias and detection bias)</td>
<td>High risk</td>
<td>Blinding of intervention</td>
</tr>
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</table>
### Sarman 1989a (Continued)

<table>
<thead>
<tr>
<th>Incomplete outcome data (attrition bias)</th>
<th>Low risk</th>
<th>Complete follow-up - yes - fewer babies examined in weeks 2 and 3 compared to week 1 as babies were transferred to an ordinary cot when the study endpoint for an individual baby had been reached</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selective reporting (reporting bias)</td>
<td>Low risk</td>
<td></td>
</tr>
<tr>
<td>Other bias</td>
<td>Low risk</td>
<td></td>
</tr>
</tbody>
</table>

### Sarman 1989b

| Methods | Blinding of randomisation - Yes  
Blinding of intervention - No  
Complete follow-up -Yes  
Blinding of outcome measure -No |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>60 infants weighing 1000-2000g, not older than 7 days who were cared for in air-heated incubators. Exclusions were infants with serious malformations, seizures, severe symptoms of respiratory distress requiring treatment with supplemental oxygen</td>
</tr>
</tbody>
</table>
28 infants nursed in cots with HWM with temperature adjustment made to obtain a rectal temperature of 36.5 - 37.5 degrees C. Each infant was dressed in a nappy, cotton shirt, dress and cotton cap for infants <1500g. The infant was covered with a blanket.  
2. Controls: Incubator care. 32 infants nursed in air-heated incubators with temperature adjustment with the aim of obtaining a rectal temperature of 36.5-37.5 degrees C. The infants were naked apart from nappies |
| Outcomes | Rectal and axillary temperature on first to third days after hospital admission, mortality, breast feeding on discharge |

### Risk of bias

<table>
<thead>
<tr>
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<th>Support for judgement</th>
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</thead>
<tbody>
<tr>
<td>Random sequence generation (selection bias)</td>
<td>Low risk</td>
<td>Randomisation using a random table with blocks of 5 random numbers with 'matching in pairs'</td>
</tr>
<tr>
<td>Allocation concealment (selection bias)</td>
<td>Low risk</td>
<td>Adequate</td>
</tr>
<tr>
<td>Blinding (performance bias and detection bias) All outcomes</td>
<td>High risk</td>
<td>Blinding of intervention</td>
</tr>
</tbody>
</table>
Incomplete outcome data (attrition bias) | Low risk | Complete follow-up
---|---|---
Selective reporting (reporting bias) | Low risk | 
Other bias | Low risk | 

Sarman 1992

Methods

- Blinding of randomisation - Yes
- Blinding of intervention - No
- Complete follow-up - Yes
- Blinding of outcome measure - No

Participants

12 healthy infants of weight 1310-1635g being treated in air-heated incubators without supplemental oxygen

Interventions

- Crossover design. 12 infants were studied for a 6 hour period in 2 environments on consecutive days
  1. Cot-nursing (HWM)
     - Heated, water-filled mattress in a cot, with infant dressed in a single cotton shirt and a diaper and covered with a quilt
  2. Single-walled air-heated incubator with infant wearing a diaper only

Outcomes

- Axillary, abdominal wall, dorsal foot temperatures, heart rate and resting oxygen consumption

Notes

Risk of bias

<table>
<thead>
<tr>
<th>Bias</th>
<th>Authors' judgement</th>
<th>Support for judgement</th>
</tr>
</thead>
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<tr>
<td>Blinding (performance bias and detection bias) All outcomes</td>
<td>High risk</td>
<td>Blinding of intervention</td>
</tr>
<tr>
<td>Incomplete outcome data (attrition bias) All outcomes</td>
<td>Low risk</td>
<td>Complete follow-up</td>
</tr>
<tr>
<td>Selective reporting (reporting bias)</td>
<td>Low risk</td>
<td></td>
</tr>
</tbody>
</table>

Other bias | Low risk | Only first period of cross-over data was included in review - no carry over effect
---|---|---
HWM - heated water-filled mattress
SHR-space heated room

**Characteristics of excluded studies** *(ordered by study ID)*

<table>
<thead>
<tr>
<th>Study</th>
<th>Reason for exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darragh 1994</td>
<td>Both groups of infants were studied in incubators</td>
</tr>
<tr>
<td>Deiriggi 1990</td>
<td>Both groups of infants were studied in incubators</td>
</tr>
<tr>
<td>Marks 1984</td>
<td>Both groups of infants were studied in incubators</td>
</tr>
<tr>
<td>Sarman 1993</td>
<td>Infants were subgroups of other studies</td>
</tr>
<tr>
<td>Weintraub 2007</td>
<td>Incubator group were managed with the incubator turned 'off'</td>
</tr>
<tr>
<td>West 2005</td>
<td>Infants were only studied in open cots</td>
</tr>
<tr>
<td>Zecca 2010</td>
<td>The study was excluded as it investigated a protocol for weaning from an incubator</td>
</tr>
</tbody>
</table>
## Data and Analyses

### Comparison 1. Cot-nursing (any type) vs incubator care

<table>
<thead>
<tr>
<th>Outcome or subgroup title</th>
<th>No. of studies</th>
<th>No. of participants</th>
<th>Statistical method</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Body temperature (degrees C)</td>
<td>4</td>
<td>192</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>0.02 [-0.02, 0.07]</td>
</tr>
<tr>
<td>2 Episodes of cold stress (temperature &lt;36 degrees C)</td>
<td>1</td>
<td>74</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>1.07 [0.26, 4.46]</td>
</tr>
<tr>
<td>3 Episodes of hyperthermia (temperature &gt;37.5 degrees C)</td>
<td>1</td>
<td>74</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>1.48 [1.04, 2.09]</td>
</tr>
<tr>
<td>4 Weight gain (g/kg/day)</td>
<td>3</td>
<td>163</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>Subtotals only</td>
</tr>
<tr>
<td>4.1 Weight gain (g/kg/day) - week 1</td>
<td>3</td>
<td>152</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>0.19 [-2.39, 2.77]</td>
</tr>
<tr>
<td>4.2 Weight gain (g/kg/day) - week 2</td>
<td>3</td>
<td>48</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>0.91 [-0.51, 2.33]</td>
</tr>
<tr>
<td>4.3 Weight gain (g/kg/day) - week 3</td>
<td>2</td>
<td>48</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>0.35 [-4.41, 5.11]</td>
</tr>
<tr>
<td>5 Oxygen consumption (ml/kg/min)</td>
<td>2</td>
<td>58</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>-0.17 [-0.47, 0.13]</td>
</tr>
<tr>
<td>6 Not breast feeding at hospital discharge (survivors)</td>
<td>3</td>
<td>151</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>0.74 [0.48, 1.14]</td>
</tr>
<tr>
<td>7 Episodes of nosocomial sepsis</td>
<td>2</td>
<td>108</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>0.27 [0.01, 6.41]</td>
</tr>
<tr>
<td>8 Maternal perceptions of infant’s condition</td>
<td>1</td>
<td>49</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>-1.0 [-2.96, 0.96]</td>
</tr>
<tr>
<td>9 Maternal stress and anxiety</td>
<td>1</td>
<td>49</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>-2.90 [-6.54, 0.74]</td>
</tr>
<tr>
<td>10 Death prior to hospital discharge</td>
<td>4</td>
<td>235</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>0.59 [0.28, 1.25]</td>
</tr>
</tbody>
</table>

### Comparison 2. Cot-nursing using heated water-filled mattress (HWM) vs incubator care

<table>
<thead>
<tr>
<th>Outcome or subgroup title</th>
<th>No. of studies</th>
<th>No. of participants</th>
<th>Statistical method</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Body temperature (degrees C)</td>
<td>4</td>
<td>192</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>0.02 [-0.02, 0.07]</td>
</tr>
<tr>
<td>2 Episodes of cold stress (temperature &lt;36 degrees C)</td>
<td>1</td>
<td>74</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>1.07 [0.26, 4.46]</td>
</tr>
<tr>
<td>3 Episodes of hyperthermia (temperature &gt;37.5 degrees C)</td>
<td>1</td>
<td>74</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>1.48 [1.04, 2.09]</td>
</tr>
<tr>
<td>4 Weight gain (g/kg/day)</td>
<td>3</td>
<td>143</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>Subtotals only</td>
</tr>
<tr>
<td>4.1 Weight gain (g/kg/day) - week 1</td>
<td>3</td>
<td>133</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>1.30 [-1.48, 4.08]</td>
</tr>
<tr>
<td>4.2 Weight gain (g/kg/day) - week 2</td>
<td>3</td>
<td>133</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>0.90 [-0.57, 2.37]</td>
</tr>
</tbody>
</table>
**Comparison 3. Cot-nursing using space heated room (SHR) vs incubator care**

<table>
<thead>
<tr>
<th>Outcome or subgroup title</th>
<th>No. of studies</th>
<th>No. of participants</th>
<th>Statistical method</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain (g/kg/day)</td>
<td>2</td>
<td>37</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>1.21 [-3.77, 6.18]</td>
</tr>
<tr>
<td>Weight gain (g/kg/day) - week 1</td>
<td>1</td>
<td>38</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>-5.9 [-11.13, -0.67]</td>
</tr>
<tr>
<td>Weight gain (g/kg/day) - week 2</td>
<td>1</td>
<td>37</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>1.40 [-2.70, 5.50]</td>
</tr>
<tr>
<td>Weight gain (g/kg/day) - week 3</td>
<td>1</td>
<td>23</td>
<td>Mean Difference (IV, Fixed, 95% CI)</td>
<td>-6.0 [-18.81, 6.81]</td>
</tr>
<tr>
<td>Death prior to hospital discharge</td>
<td>4</td>
<td>211</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>0.63 [0.30, 1.34]</td>
</tr>
</tbody>
</table>

**WHAT'S NEW**

Last assessed as up-to-date: 30 March 2011.

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 March 2011</td>
<td>New citation required and conclusions have changed</td>
<td>Change to conclusions with addition of new trial.</td>
</tr>
<tr>
<td>31 March 2011</td>
<td>New search has been performed</td>
<td>This updates the review “Cot-nursing versus incubator care for preterm infants” published in the Cochrane Database of Systematic reviews (Gray 2001). Search updated March 31, 2011. One additional trial added to the review (Gray 2004). Change to conclusions.</td>
</tr>
</tbody>
</table>
HISTORY
Protocol first published: Issue 2, 2000
Review first published: Issue 1, 2003

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 February 2001</td>
<td>New citation required and conclusions have changed</td>
<td>Substantive amendment</td>
</tr>
</tbody>
</table>

CONTRIBUTIONS OF AUTHORS
Both review authors contributed equally to the review process with reviewers independently assessing trials for eligibility and trial quality, and extracting data.

DECLARATIONS OF INTEREST
One of the authors of this review (Peter Gray) was an investigator in one of the trials included in this review (Gray 2004).

SOURCES OF SUPPORT

Internal sources
- Department of Newborn Services, Mater Mothers’ Hospital, South Brisbane, Queensland, Australia.
- Mater Medical Research Institute - Mater Mothers' Hospital, South Brisbane, Queensland, Australia.

External sources
- Department of Health and Ageing, Commonwealth Government, Canberra supporting Centre for Clinical Studies, Mater Hospital, Brisbane, Australia.

INDEX TERMS

Medical Subject Headings (MeSH)
* Beds [adverse effects]; * Incubators, Infant; * Infant Equipment [adverse effects]; * Infant, Premature; Body Temperature Regulation; Fever [etiology]; Heating [adverse effects; methods]; Infant Care; Infant, Newborn; Randomized Controlled Trials as Topic.
MeSH check words

Humans