



Cochrane
Library

Cochrane Database of Systematic Reviews

Interventions to prevent hypothermia at birth in preterm and/or low birth weight infants (Review)

McCall EM, Alderdice F, Halliday HL, Vohra S, Johnston L

McCall EM, Alderdice F, Halliday HL, Vohra S, Johnston L.

Interventions to prevent hypothermia at birth in preterm and/or low birth weight infants.

Cochrane Database of Systematic Reviews 2018, Issue 2. Art. No.: CD004210.

DOI: 10.1002/14651858.CD004210.pub5.

www.cochranelibrary.com

[Intervention Review]

Interventions to prevent hypothermia at birth in preterm and/or low birth weight infants

Emma M McCall¹, Fiona Alderdice², Henry L Halliday³, Sunita Vohra⁴, Linda Johnston^{5,6,7}

¹School of Nursing and Midwifery, Queen's University Belfast, Belfast, UK. ²National Perinatal Epidemiology Unit, Nuffield Department of Population Health, University of Oxford, Oxford, UK. ³Retired Honorary Professor of Child Health, Queen's University Belfast, Belfast, UK. ⁴Department of Pediatrics, University of Alberta, Edmonton, Canada. ⁵Lawrence S Bloomberg Faculty of Nursing, University of Toronto, Toronto, Canada. ⁶Soochow University, Taipei, Taiwan. ⁷The University of Melbourne, Melbourne, Australia

Contact address: Emma M McCall, School of Nursing and Midwifery, Queen's University Belfast, Medical Biology Centre, 97 Lisburn Road, Belfast, Northern Ireland, UK. e.mccall@qub.ac.uk.

Editorial group: Cochrane Neonatal Group.

Publication status and date: New search for studies and content updated (conclusions changed), published in Issue 2, 2018.

Citation: McCall EM, Alderdice F, Halliday HL, Vohra S, Johnston L. Interventions to prevent hypothermia at birth in preterm and/or low birth weight infants. *Cochrane Database of Systematic Reviews* 2018, Issue 2. Art. No.: CD004210. DOI: 10.1002/14651858.CD004210.pub5.

Copyright © 2018 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

ABSTRACT

Background

Newborn admission temperature is a strong predictor of outcomes across all gestations. Hypothermia immediately after birth remains a worldwide issue and, if prolonged, is associated with harm. Keeping preterm infants warm is difficult even when recommended routine thermal care guidelines are followed in the delivery room.

Objectives

To assess the efficacy and safety of interventions designed for prevention of hypothermia in preterm and/or low birth weight infants applied within 10 minutes after birth in the delivery room, compared with routine thermal care or any other single/combination of intervention(s) also designed for prevention of hypothermia in preterm and/or low birth weight infants applied within 10 minutes after birth in the delivery room.

Search methods

We used the standard search strategy of Cochrane Neonatal to search the Cochrane Central Register of Controlled Trials (CENTRAL; 2016, Issue 5), MEDLINE via PubMed (1966 to 30 June 2016), Embase (1980 to 30 June 2016), and CINAHL (1982 to 30 June 2016). We also searched clinical trials databases, conference proceedings, and reference lists of retrieved articles for randomised controlled trials and quasi-randomised trials.

Selection criteria

Trials using randomised or quasi-randomised allocations to test interventions designed to prevent hypothermia (apart from 'routine' thermal care) applied within 10 minutes after birth in the delivery room for infants at < 37 weeks' gestation and/or birth weight ≤ 2500 grams.

Data collection and analysis

We used Cochrane Neonatal methods when performing data collection and analysis.

Main results

Twenty-five studies across 15 comparison groups met the inclusion criteria, categorised as: barriers to heat loss (18 studies); external heat sources (three studies); and combinations of interventions (four studies).

Barriers to heat loss

Plastic wrap or bag versus routine care

Plastic wraps improved core body temperature on admission to the neonatal intensive care unit (NICU) or up to two hours after birth (mean difference (MD) 0.58°C, 95% confidence interval (CI) 0.50 to 0.66; 13 studies; 1633 infants), and fewer infants had hypothermia on admission to the NICU or up to two hours after birth (typical risk ratio (RR) 0.67, 95% CI 0.62 to 0.72; typical risk reduction (RD) -0.25, 95% CI -0.29 to -0.20; number needed to treat for an additional beneficial outcome (NNTB) 4, 95% CI 4 to 5; 10 studies; 1417 infants). Risk of hyperthermia on admission to the NICU or up to two hours after birth was increased in infants in the wrapped group (typical RR 3.91, 95% CI 2.05 to 7.44; typical RD 0.04, 95% CI 0.02 to 0.06; number needed to treat for an additional harmful outcome (NNTH) 25, 95% CI 17 to 50; 12 studies; 1523 infants), but overall, fewer infants receiving plastic wrap were outside the normothermic range (typical RR 0.75, 95% CI 0.69 to 0.81; typical RD -0.20, 95% CI -0.26 to -0.15; NNTH 5, 95% CI 4 to 7; five studies; 1048 infants).

Evidence was insufficient to suggest that plastic wraps or bags significantly reduce risk of death during hospital stay or other major morbidities, with the exception of reducing risk of pulmonary haemorrhage.

Evidence of practices regarding permutations on this general approach is still emerging and has been based on the findings of only one or two small studies.

External heat sources

Evidence is emerging on the efficacy of external heat sources, including skin-to-skin care (SSC) versus routine care (one study; 31 infants) and thermal mattress versus routine care (two studies; 126 infants).

SSC was shown to be effective in reducing risk of hypothermia when compared with conventional incubator care for infants with birth weight ≥ 1200 and ≤ 2199 grams (RR 0.09, 95% CI 0.01 to 0.64; RD -0.56, 95% CI -0.84 to -0.27; NNTB 2, 95% CI 1 to 4). Thermal (transwarmer) mattress significantly kept infants ≤ 1500 grams warmer (MD 0.65°C, 95% CI 0.36 to 0.94) and reduced the incidence of hypothermia on admission to the NICU, with no significant difference in hyperthermia risk.

Combinations of interventions

Two studies (77 infants) compared thermal mattresses versus plastic wraps or bags for infants at ≤ 28 weeks' gestation. Investigators reported no significant differences in core body temperature nor in the incidence of hypothermia, hyperthermia, or core body temperature outside the normothermic range on admission to the NICU.

Two additional studies (119 infants) compared plastic bags and thermal mattresses versus plastic bags alone for infants at < 31 weeks' gestation. Meta-analysis of these two studies showed improvement in core body temperature on admission to the NICU or up to two hours after birth, but an increase in hyperthermia. Data show no significant difference in the risk of having a core body temperature outside the normothermic range on admission to the NICU nor in the risk of other reported morbidities.

Authors' conclusions

Evidence of moderate quality shows that use of plastic wraps or bags compared with routine care led to higher temperatures on admission to NICUs with less hypothermia, particularly for extremely preterm infants. Thermal mattresses and SSC also reduced hypothermia risk when compared with routine care, but findings are based on two or fewer small studies. Caution must be taken to avoid iatrogenic hyperthermia, particularly when multiple interventions are used simultaneously. Limited evidence suggests benefit and no evidence of harm for most short-term morbidity outcomes known to be associated with hypothermia, including major brain injury, bronchopulmonary dysplasia, retinopathy of prematurity, necrotising enterocolitis, and nosocomial infection. Many observational studies have shown increased mortality among preterm hypothermic infants compared with those who maintain normothermia, yet evidence is insufficient to suggest that these interventions reduce risk of in-hospital mortality across all comparison groups. Hypothermia may be a marker for illness and poorer outcomes by association rather than by causality. Limitations of this review include small numbers of identified studies; small sample sizes; and variations in methods and definitions used for hypothermia, hyperthermia, normothermia,

routine care, and morbidity, along with lack of power to detect effects on morbidity and mortality across most comparison groups. Future studies should: be adequately powered to detect rarer outcomes; apply standardised morbidity definitions; focus on longer-term outcomes, particularly neurodevelopmental outcomes.

PLAIN LANGUAGE SUMMARY

Interventions to prevent hypothermia at birth in preterm and/or low birth weight infants

Review question: What is known about the efficacy and safety of interventions designed to prevent hypothermia in preterm and/or low birth weight babies applied within 10 minutes after birth in the delivery room, compared with routine thermal care or any other single/combination of intervention(s)?

Background: Preventing low body temperature at birth in preterm and low birth weight babies may be important for survival and long-term outcomes. Babies rely on external help to maintain temperature, particularly in the first 12 hours of life. For vulnerable babies born preterm or at low birth weight, abnormally low body temperature (hypothermia) is a worldwide issue across all climates and has been linked to a variety of complications including death. Preventive action is taken by reducing heat loss and/or providing warmth through external heat sources. Precautionary steps routinely include ensuring a warm delivery room; drying immediately after birth, especially the head; wrapping in prewarmed dry blankets (including the head); prewarming surfaces; and eliminating draughts.

Search date: We used the standard search strategy of the Cochrane Neonatal Review Group to search CENTRAL (2016, Issue 5), MEDLINE (1966 to 30 June 2016), Embase (1980 to 30 June 2016), and the Cumulative Index to Nursing and Allied Health Literature (CINAHL; 1982 to 30 June 2016). We also searched clinical trials databases, conference proceedings, and reference lists of retrieved articles for randomised controlled trials and quasi-randomised trials.

Key results: This review identified 25 studies involving 2433 babies; researchers used additional preventive actions in the first 10 minutes of life to prevent problems with hypothermia. Use of plastic coverings, heated mattresses, and skin-to-skin contact kept infants warmer (and within normal body temperature ranges) than routine preventive action. However, care must be taken, particularly when these methods are combined, to avoid the unintended effect of making babies too warm, which may be harmful. Limitations consist of small numbers of babies and studies included in some comparison groups; variations in methods and definitions used for normal body temperature and routine care; and differences in materials used.

Although this review confirmed that some of these measures are effective in preventing hypothermia, results across all studies show no reduction in deaths and only limited improvement in short-term complications or illnesses normally associated with being too cold. Findings suggest that perhaps hypothermia is a marker for poorer outcomes, particularly in the most immature and smallest babies, rather than a direct cause. Review authors recommend that future studies should be large enough to detect changes for rarer illnesses, should define these illnesses in the same way so they can be combined across studies, and should focus on longer-term consequences.

Quality of the evidence: Overall for the main comparison group (plastic wraps or bags vs routine care), we are moderately confident that trial results and our conclusions are reliable. Across the remaining comparison groups, evidence is insufficient to allow firm judgements mainly because numbers of studies and sample sizes are small.

In comparisons of plastic wraps or bags versus routine care to keep preterm or low birth weight babies warm, we rated the quality of evidence as moderate for key outcomes. Across outcomes reporting on babies' regulation of their body temperature, we suspect that some small trials showing that the intervention did not keep these babies warmer may not have been published, findings of studies were not in agreement, or evidence was based on small numbers of studies or events. For major complications of brain injury and bleeding into the lung (pulmonary haemorrhage), the number of events was too small or findings were based on only one study. We suspect that some small trials reporting deaths may not have been published; however this was unlikely to have affected review findings.