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[Intervention Review]

Maternal positions and mobility during first stage labour

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ABSTRACT

Background

It is more common for women in both high- and low-income countries giving birth in health facilities, to labour in bed. There is no evidence that this is associated with any advantage for women or babies, although it may be more convenient for staff. Observational studies have suggested that if women lie on their backs during labour this may have adverse effects on uterine contractions and impede progress in labour, and in some women reduce placental blood flow.

Objectives

To assess the effects of encouraging women to assume different upright positions (including walking, sitting, standing and kneeling) versus recumbent positions (supine, semi-recumbent and lateral) for women in the first stage of labour on duration of labour, type of birth and other important outcomes for mothers and babies.

Search methods

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (31 January 2013).

Selection criteria

Randomised and quasi-randomised trials comparing women randomised to upright versus recumbent positions in the first stage of labour.

Data collection and analysis

We used methods described in the *Cochrane Handbook for Systematic Reviews of Interventions* for carrying out data collection, assessing study quality and analysing results. Two review authors independently evaluated methodological quality and extracted data for each study. We sought additional information from trial authors as required. We used random-effects analysis for comparisons in which high heterogeneity was present. We reported results using the average risk ratio (RR) for categorical data and mean difference (MD) for continuous data.

Main results

Results should be interpreted with caution as the methodological quality of the 25 included trials (5218 women) was variable.

For Comparison 1: Upright and ambulant positions versus recumbent positions and bed care, the first stage of labour was approximately one hour and 22 minutes shorter for women randomised to upright as opposed to recumbent positions (average MD -1.36, 95% confidence interval (CI) -2.22 to -0.51; 15 studies, 2503 women; random-effects, $T^2 = 2.39$, $Chi^2 = 203.55$, df = 14, ($P < 0.00001$), $I^2 = 93\%$). Women who were upright were also less likely to have caesarean section (RR 0.71, 95% CI 0.54 to 0.94; 14 studies, 2682 women) and less likely to have an epidural (RR 0.81, 95% CI 0.66 to 0.99, nine studies, 2107 women; random-effects, $T^2 = 0.02$, $I^2 = 61\%$). Babies of mothers who were upright were less likely to be admitted to the neonatal intensive care unit, however this was based on one trial (RR 0.20, 95% CI 0.04 to 0.89, one study, 200 women). There were no significant differences between groups for other outcomes including duration of the second stage of labour, or other outcomes related to the well being of mothers and babies.

For Comparison 2: Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), there were no significant differences between groups for outcomes including duration of the second stage of labour, or other outcomes related to the well being of mothers and babies.

Authors' conclusions

There is clear and important evidence that walking and upright positions in the first stage of labour reduces the duration of labour, the risk of caesarean birth, the need for epidural, and does not seem to be associated with increased intervention or negative effects on mothers' and babies' well being. Given the great heterogeneity and high performance bias of study situations, better quality trials are still required to confirm with any confidence the true risks and benefits of upright and mobile positions compared with recumbent positions for all women. Based on the current findings, we recommend that women in low-risk labour should be informed of the benefits of upright positions, and encouraged and assisted to assume whatever positions they choose.

PLAIN LANGUAGE SUMMARY

Mothers' position during the first stage of labour

There is little doubt that women should be encouraged to utilise positions which give them the greatest comfort, control and benefit during first stage labour. As women in most western societies now lie in bed for the entire duration of their labour, it is important that they understand the risks and benefits of the positions they choose.

This review included 25 studies (involving 5218 women). Although many studies were not of high quality, and most of the women were low risk, they did show that the first stage of labour may be approximately one hour and twenty minutes shorter for women who are upright or walk around. As every contraction is potentially painful, and prolonged labour can be an overwhelming and exhausting process resulting in an increased need for medical intervention, this is a meaningful outcome for women. Indeed other important outcomes for women who were upright and mobile compared with lying down in bed included a reduction in the risk of caesarean birth, less use of epidural as a method of pain relief, and less chance of their babies being admitted to the neonatal unit. More research of better quality is still needed to validate these results for all women in labour. However, based on the results of this review we recommend that wherever possible, women should be encouraged and supported to use upright and mobile positions of their choice during first stage labour, as this may enhance the progress of their labour and may lead to better outcomes for themselves and their babies.

SUMMARY OF FINDINGS

Summary of findings for the main comparison. Summary of Outcomes

Comparison 1: Upright and ambulant positions versus recumbent positions and bed care

Outcomes showing significance

	Primary Outcomes	Secondary Outcomes
Maternal	**1. Shorter duration of labour if upright.** Subgroup analysis demonstrated this when: • women were nulliparous compared with multiparous • women had spontaneous labour compared with induction • women were sitting compared with recumbent/supine/lateral • women were walking compared with recumbent/supine/lateral • women were sitting, standing, squatting, kneeling or walking compared with recumbent/supine/lateral • women were siting, standing, squatting, kneeling or walking compared with a supine only position Sensitivity analysis, which excluded lower quality trials, comparing sitting, standing, squatting, kneeling or walking with recumbent/supine/lateral did confirm this result. **2. More likely to have a vaginal birth if upright.** Subgroup analysis demonstrated this when: • women were walking compared with recumbent/supine/lateral • women were sitting, standing, squatting, kneeling or walking compared with recumbent/supine/lateral Sensitivity analysis, which excluded lower quality trials, comparing sitting, standing, squatting, kneeling or walking with recumbent/supine/lateral did confirm this result. **3. Less likely to have operative birth if upright.** Subgroup analysis demonstrated this when: • women were sitting compared with recumbent/supine/lateral • women were walking compared with recumbent/supine/lateral • women were sitting, standing, squatting, kneeling or walking compared with recumbent/supine/lateral Sensitivity analysis, which excluded lower quality trials, did confirm this result. **3. Less likely to have caesarean birth if upright.** Subgroup analysis demonstrated this when: • women were walking compared with recumbent/supine/lateral	**1. Less likely to have an epidural if upright.** **2. Lower pain scores if upright.** **3. BUT More anxiety for nulliparous women if upright.** However this outcome is only from 1 study of 206 women. Note: there were no data for: spontaneous rupture of membranes or hypotension requiring intervention.

	Sensitivity analysis, which excluded lower quality trials, comparing sitting, standing, squatting, kneeling or walking with recumbent/supine/lateral did confirm this result.	
Fetal / Neonatal		**1. Less likely to have admission to NICU if mother is upright.**

Comparison 2: Upright and ambulant positions versus recumbent positions and bed care (all women: epidural)

Outcomes showing significance

	Primary Outcomes	Secondary Outcomes
Maternal	**1. More likely to have operative vaginal birth if multiparous and upright (subgroup analysis: parity only).** Note: there were no data for: duration of first stage labour; maternal satisfaction.	Note: there was no data for: artificial rupture of membranes; spontaneous rupture of membranes; estimated blood loss > 500 mL; perineal trauma.
Fetal / Neonatal	Note: there were no data for: fetal distress requiring immediate birth or use of neonatal mechanical ventilation.	Note: there were no data for: admission to the NICU.

NICU: neonatal intensive care unit

BACKGROUND

In cultures not influenced by Western society, women progress through the first stage of labour in upright positions and change position as they wish with no evidence of harmful effects to either the mother or the baby (Andrews 1990; Gupta 2012; Roberts 1989). Women in the developed world too, when encouraged, will choose a number of different positions as the first stage of labour progresses (Carlson 1986; Fenwick 1987; Roberts 1989; Rooks 1999), even though it is more common nowadays for them to labour in bed (Boyle 2000; Roberts 1989; Simkin 1989). Some studies have suggested that as a woman reaches five to six centimetres dilatation, there is a preference to lie down (Roberts 1980; Roberts 1984; Williams 1980). This may explain why women in randomised trials frequently have difficulty maintaining the position to which they have been assigned (Goer 1999), and suggests that there may not be a perfect universal position for women in the first stage of labour.

Description of the condition

Heralding the onset of second stage labour, first stage labour involves a co-ordinated series of complex physiological changes which results in full dilatation of the cervix. In readiness for birth of the baby (second stage) and separation and delivery of the placenta and membranes (third stage), the process of first stage labour may occur gradually over a period of days, or rapidly over a period of minutes. There are many factors which influence the duration and successful completion of first stage labour. These include the intensity and frequency of uterine contractions, whether the membranes have ruptured or not, the position and size of the baby or babies, the positioning and functioning of the placenta, the adequacy of the pelvis, and the physical and psychological well being of the mother.

Description of the intervention

Women who are in early labour are encouraged to remain in upright and mobile positions such as sitting, standing and walking until they are ready to give birth to their babies. There are many variations to being upright and mobile, but the key component is the ability for women to move and change position more quickly and easily as their labour progresses. Upright and mobile positions can be commenced and maintained in different places such as the home, shower or bath. They can be used with a variety of props such as a recliner chair or birthing ball. They can be alternated with other upright positions and can include comfort measures such as rocking the hips from side to side, leaning on a partner for support and intimacy and providing access to the lower back for massage or heat therapy.

How the intervention might work

Upright and mobile positions use gravity to aid descent of the fetal head into the pelvis. As the head is applied directly and evenly on the cervix, uterine contractions are intensified in strength, regularity and frequency. It is this uterine efficiency which aids cervical dilatation and successful completion of the first stage of labour. Study findings (Caldeyro-Barcia 1960; Lupe 1986; Mendez-Bauer 1980; Roberts 1983; Roberts 1984; Ueland 1969) have indicated that although contractions increased in strength in the upright or lateral position compared to the supine position, they were often negatively affected when a labouring woman lay down after being upright or mobile. This effect can often be reversed if the woman returns to an upright position. As effective contractions are vital to aid cervical dilatation and fetal descent, they have an important role in helping to reduce dystocia (slow progress in labour) (Roberts 1989; Rooks 1999; Walsh 2000).

Upright and mobile positions are also less likely to cause compression of the abdominal blood vessels by the pregnant uterus and this maximises uterine blood flow to the placenta and fetus during labour. Numerous studies show that a supine position in labour may have adverse physiological effects on the condition of the woman and her baby and on the progression of labour. The weight of the pregnant uterus can compress the abdominal blood vessels, compromising the mother's circulatory function including uterine blood flow (Abitbol 1985; Huovinen 1979; Marx 1982; Ueland 1969), and this may negatively affect the blood flow to the placenta (Cyna 2006; Roberts 1989; Rooks 1999; Walsh 2000). A recent study found an association between women who sleep supine during pregnancy and stillbirth (Stacey 2011). A related Cochrane review focuses on maternal position for fetal malpresentation in labour Hunter 2007.

Moving about can increase a woman's sense of control in labour by providing a self-regulated distraction from the challenge of labour (Albers 1997). Women who labour in water can move more easily than on land (Cluett 2009) and there is evidence to suggest immersion in water may reduce pain in labour (Jones 2012). Support from another person also appears to facilitate normal labour (Hodnett 2012). Increasing a woman's sense of control may have the effect of decreasing her need for analgesia (Albers 1997; Hodnett 2012; Lupe 1986; Rooks 1999) and it has also been suggested that upright positions in the first stage of labour may increase women's comfort (Simkin 2002).

Why it is important to do this review

Recumbent (lying down) positions in the first stage of labour are often promoted by care providers because they provide convenient access to the mother for abdominal palpation, fetal monitoring and vaginal examinations. Indeed some developments in technology such as fetal monitoring, epidurals for pain relief and the use of intravenous infusions have made it difficult and potentially unsafe for women to move about during labour. It is important, therefore, to assess the available evidence so that maternal positions which are shown to be safe and effective during first stage labour are actively encouraged. Clinicians providing care in first stage labour also need to provide clear, consistent, and evidence based explanation, so that women will understand both the risks and benefits of the positions they use and enable them to make informed decisions about the position choices they think will afford them most comfort.

OBJECTIVES

The purpose of this review is to assess the effects of different upright and recumbent positions and mobilisation for women in the first stage of labour on duration of labour, type of birth and other important outcomes for mothers and babies.

The primary objective is:

- to compare the effects of upright (defined as walking and upright non-walking, e.g. sitting, standing, kneeling, squatting and all fours) positions with recumbent positions (supine, semi-

recumbent and lateral) assumed by women in the first stage of labour on maternal, fetal and neonatal outcomes.

The secondary objectives are:

- to compare the effects of semi-recumbent and supine positions with lateral positions assumed by women in the first stage of labour on maternal, fetal and neonatal outcomes;
- to compare the effects of walking with upright non-walking positions (sitting, standing, kneeling, squatting, all fours) assumed by women in the first stage of labour on maternal, fetal and neonatal outcomes;
- to compare the effects of walking with recumbent positions (supine, semi-recumbent and lateral) assumed by women in the first stage of labour on maternal, fetal and neonatal outcomes;
- to compare allowing women to assume the position/s they choose with recumbent positions (supine, semi-recumbent and lateral) assumed by women in the first stage of labour on maternal, fetal and neonatal outcomes.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised or quasi-randomised trials. We planned to include cluster randomised-trials which were otherwise eligible. Cross-over trials might be useful for short-term outcomes such as fetal heart rate patterns, but would not be appropriate for the main outcomes of this review and were not included.

Types of participants

Women in the first stage of labour.

Types of interventions

The type of intervention was the position or positions assumed by women in the first stage of labour. The positions assumed by a woman in the first stage of labour can be broadly categorised as being either upright or recumbent.

The positions considered recumbent were:

- semi recumbent;
- lateral;
- supine;
- dorsal (not prespecified in the protocol).
- bed care (not prespecified in the protocol).

The positions considered upright included:

- sitting;
- standing;
- walking;
- kneeling;
- squatting;
- all fours (hands and knees).

Types of outcome measures

- Maternal outcomes
- Fetal outcomes
- Neonatal outcomes

Primary outcomes

Primary maternal outcomes:

- duration of first stage of labour;
- mode of birth (spontaneous vaginal, operative vaginal or caesarean);
- maternal satisfaction with positioning and with the childbirth experience.

Primary fetal and neonatal outcomes:

- fetal distress requiring immediate birth;
- use of neonatal mechanical ventilation.

Secondary outcomes

Secondary maternal outcomes:

- pain as experienced by the woman;
- use of analgesics (amount and type, e.g. epidural/opioid);
- duration of second stage of labour;
- augmentation of labour using oxytocin;
- artificial rupture of membranes;
- hypotension requiring intervention;
- estimated blood loss > 500 mL;
- perineal trauma (including episiotomy and third and fourth degree tears).

Secondary neonatal outcomes:

- Apgar scores of less than seven at five minutes following birth; less than three at five minutes following birth and less than four at birth;
- admission to the neonatal intensive care unit;
- perinatal death (not prespecified in the protocol).

Search methods for identification of studies

Electronic searches

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register by contacting the Trials Search Co-ordinator (31 January 2013).

The Cochrane Pregnancy and Childbirth Group's Trials Register is maintained by the Trials Search Co-ordinator and contains trials identified from:

1. monthly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
2. weekly searches of MEDLINE;
3. weekly searches of Embase;
4. handsearches of 30 journals and the proceedings of major conferences;
5. weekly current awareness alerts for a further 44 journals plus monthly BioMed Central email alerts.

Details of the search strategies for CENTRAL, MEDLINE and Embase, the list of handsearched journals and conference proceedings, and the list of journals reviewed via the current awareness service can be found in the 'Specialized Register' section within the editorial information about the Cochrane Pregnancy and Childbirth Group.

Trials identified through the searching activities described above are each assigned to a review topic (or topics). The Trials Search Co-ordinator searches the register for each review using the topic list rather than keywords.

Searching other resources

We performed a manual search of the references of all retrieved articles and contacted expert informants.

We did not apply any language restrictions.

Data collection and analysis

We used methods described in the *Cochrane Handbook for Systematic Reviews of Interventions* for data collection, assessing study quality and analysing results (Higgins 2011).

Selection of studies

A minimum of two review authors independently assessed for inclusion all the potential studies identified as a result of the search strategy. We resolved any disagreement through discussion, or when required, we consulted an additional person.

Data extraction and management

For methods used in previous updates, please see Appendix 1.

For this update, we used the following methods.

We designed a form to extract data. At least two review authors extracted the data using the agreed form. We resolved discrepancies through discussion, or if required we consulted a third author. We entered data into Review Manager software (RevMan 2012), and checked for accuracy.

When information regarding any of the above was unclear, we attempted to contact authors of the original reports to provide further details.

Assessment of risk of bias in included studies

Two review authors independently assessed risk of bias for each study using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We resolved any disagreement by discussion or by involving a third assessor. Please see the 'Risk of bias' tables following the Characteristics of included studies tables for the assessment of bias for each study.

(1) Sequence generation (checking for possible selection bias)

We described for each included study the methods used to generate the allocation sequence to assess whether methods were truly random.

We assessed the methods as:

- low risk of bias (any truly random process, e.g. random number table; computer random number generator);
- high risk of bias (any non-random process, e.g. odd or even date of birth; hospital or clinic record number);
- unclear risk of bias.

(2) Allocation concealment (checking for possible selection bias)

We described for each included study the method used to conceal the allocation sequence in sufficient detail and determined whether group allocation could have been foreseen in advance of, or during, recruitment, or changed afterwards.

We assessed the methods as:

- low risk of bias (e.g. telephone or central randomisation; consecutively numbered sealed opaque envelopes);
- high risk of bias (open random allocation; unsealed or non-opaque envelopes; alternation; date of birth);
- unclear risk of bias.

(3.1) Blinding of participants and personnel (checking for possible performance bias)

We described for each included study the methods used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. We considered that studies were at low risk of bias if they were blinded, or if we judged that the lack of blinding would be unlikely to affect results. We assessed blinding separately for different outcomes or classes of outcomes.

We assessed the methods as:

- low, high or unclear risk of bias for participants;
- low, high or unclear risk of bias for personnel.

(3.2) Blinding of outcome assessment (checking for possible detection bias)

We described for each included study the methods used, if any, to blind outcome assessors from knowledge of which intervention a participant received. We assessed blinding separately for different outcomes or classes of outcomes.

We assessed methods used to blind outcome assessment as:

- low, high or unclear risk of bias.

(4) Incomplete outcome data (checking for possible attrition bias through withdrawals, dropouts, protocol deviations)

We described for each included study the completeness of outcome data, including attrition and exclusions from the analysis. We state whether attrition and exclusions were reported, the numbers (compared with the total randomised participants), reasons for attrition/exclusion where reported, and any re-inclusions in analyses which we have undertaken.

We assessed the methods as:

- low risk of bias (e.g. no missing outcome data; missing outcome data balanced across groups);
- high risk of bias (e.g. numbers or reasons for missing data imbalanced across groups; 'as treated' analysis done with substantial departure of intervention received from that assigned at randomisation);
- unclear risk of bias.

(5) Selective reporting (checking for reporting bias)

We described for each included study how we investigated the possibility of selective outcome reporting bias and what we found.

We assessed the methods as:

- low risk of bias (where it is clear that all of the study's pre-specified outcomes and all expected outcomes of interest to the review have been reported);
- high risk of bias (where not all the study's pre-specified outcomes have been reported; one or more reported primary outcomes were not prespecified; outcomes of interest are reported incompletely and so cannot be used; study fails to include results of a key outcome that would have been expected to have been reported);
- unclear risk of bias.

(6) Other bias (checking for bias due to problems not covered by 1 to 5 above)

We described for each included study any important concerns we have about other possible sources of bias.

We assessed whether each study was free of other problems that could put it at risk of bias:

- low risk of other bias;
- high risk of other bias;
- unclear whether there is risk of other bias.

(7) Overall risk of bias

We made explicit judgements about whether studies were at high risk of bias, according to the criteria given in the Handbook (Higgins 2011). With reference to (1) to (6) above, we assessed the likely magnitude and direction of the bias and whether we considered it is likely to impact on the findings. We explored the impact of the level of bias through undertaking sensitivity analyses - see 'Sensitivity analysis' below.

Measures of treatment effect

We carried out statistical analysis using the Review Manager software (RevMan 2012). We used fixed-effect meta-analysis for combining data in the absence of significant heterogeneity if trials were sufficiently similar. When significant heterogeneity was present, we used a random-effects meta-analysis.

Dichotomous data

For dichotomous data, we have presented results as summary risk ratio (RR) with 95% confidence intervals (CI).

Continuous data

For continuous data (e.g. maternal pain and satisfaction when measured as scores or on visual analogue scales) we used the mean difference (MD) if outcomes were measured in the same way between trials. We planned to use the standardised mean difference (SMD) to combine trials that measured the same outcome, but used different methods.

Unit of analysis issues

Cluster-randomised trials

We intended to include cluster-randomised trials in the analyses along with individually-randomised trials, and to adjust sample sizes using the methods described in Gates 2005 and Higgins 2011.

We identified no cluster randomised trials in this version of the review, but if we identify such trials in future searches we will include them in updates.

Cross-over Trials

Cross-over trials might be useful for short-term outcomes such as fetal heart rate patterns, but would not be appropriate for the main outcomes of this review and were not included.

Dealing with missing data

For included studies, we noted levels of attrition. Where data were not reported for some outcomes or groups, we attempted to contact the study authors for further information.

Intention-to-treat analysis (ITT)

We had intended to analyse data on all participants with available data in the group to which they were allocated, regardless of whether or not they received the allocated intervention. If in the original reports participants were not analysed in the group to which they were randomised, and there was sufficient information in the trial report, we attempted to restore them to the correct group (e.g. this applied to data from the Calvert 1982 study).

Assessment of heterogeneity

We assessed statistical heterogeneity in each meta-analysis using the T^2, I^2 and Chi^2 statistics. We regarded heterogeneity as substantial if the T^2 was greater than zero and either the I^2 was greater than 30% or there was a low P value (less than 0.10) in the Chi^2 test for heterogeneity. In such cases we took the following steps:

1. we performed a sensitivity analysis, in which methodological weak trials were removed from the analyses and results compared for the primary outcomes;
2. we visually inspected forest plots for evidence of inconsistency in results;
3. we compared the results of fixed-effect and random-effects analyses.

Assessment of reporting biases

If there were 10 or more studies in the meta-analysis for any particular outcome, we investigated reporting biases (such as publication bias) using funnel plots. We assessed possible asymmetry visually. If asymmetry was suggested by a visual assessment, we performed exploratory analyses to investigate it.

Data synthesis

We carried out statistical analysis using the RevMan software (RevMan 2012). We used fixed-effect meta-analysis for combining data where it was reasonable to assume that studies were estimating the same underlying treatment effect: i.e. where trials examined the same intervention, and where we judged the trials' populations and methods to be sufficiently similar. If we suspected clinical heterogeneity was sufficient to expect the underlying treatment effects differed between trials, or if substantial statistical heterogeneity was detected, we used random-effects meta-analysis to produce an overall summary. We only performed this analysis if we considered the average treatment effect across trials was clinically meaningful. We defined heterogeneity as substantial if a given meta-analysis resulted in an I^2 value greater than 30%, and

there was inconsistency among trials in the direction or magnitude of effects (judged visually in the forest plot), or a low (less than 0.10) P value in the Chi^2 test for heterogeneity. The random-effects summary was treated as the average range of possible treatment effects and the clinical implications of treatment effects differing between trials is discussed. If the average treatment effect was not clinically meaningful, we did not combine trials. Where we used random-effects analyses, the results were presented as the average treatment effect with 95% confidence intervals, and the estimates of T^2 and I^2.

Subgroup analysis and investigation of heterogeneity

For the main outcomes of duration of first stage labour and method of birth, we performed subgroup analyses by:

1. Parity: nulliparous women versus multiparous women;
2. Onset of labour: spontaneous labour versus induction of labour;
3. Position types: specific upright positions and or combinations versus specific recumbent positions:
   a. sitting versus recumbent/supine lateral;
   b. walking versus recumbent/supine lateral;
   c. sitting, standing, squatting, kneeling and/or walking (mixed) versus recumbent/supine lateral;
   d. sitting versus bed care;
   e. walking versus bed care;
   f. sitting, standing, squatting, kneeling and/or walking (mixed) versus bed care;
   g. sitting, standing, squatting, kneeling and/or walking versus supine only.

We had also planned subgroup analysis by women with a low-risk pregnancy (no complications, greater than or equal to 37 weeks' gestation, singleton with a cephalic presentation) versus high-risk pregnancy, but data were not available to carry out this analysis.

We assessed subgroup differences by interaction tests available within RevMan (RevMan 2012). We reported the results of subgroup analyses quoting the χ^2 statistic and P value, and the interaction test I^2 value.

Sensitivity analysis

We carried out sensitivity analyses to explore the effect of trial quality for important outcomes in the review. Where there was high or unclear risk of bias associated with allocation concealment, we excluded poor quality studies from the analyses in order to assess whether this made any difference to the overall result.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies

Results of the search

We identified a total of 84 reports representing 57 studies by the search strategy.

Included studies

We included 25 studies with a total of 5218 women in the review Table 1.

Studies were carried out in 13 countries from 1963 to 2012 (almost 50 years): seven in the UK (Boyle 2002; Calvert 1982; Collis 1999; Fernando 1994; Flynn 1978; McManus 1978; Williams 1980); five in the USA (Andrews 1990; Bloom 1998; Mitre 1974; Nageotte 1997; Vallejo 2001); two in France (Frenea 2004; Karraz 2003); and one each in Australia (MacLennan 1994), Brazil (Miquelutti 2007), Finland (Haukkama 1982;), Hong Kong (Chan 1963), India (Mathew 2012), Iran (Taavoni 2011), Japan (Chen 1987), Sweden (Bundsen 1982), Taiwan (Gau 2011), Thailand (Phumdoung 2007) and Tunisia Ben Regaya 2010.

Most trials had small numbers of participants of between 40 to 300 women. Exceptions to this included Boyle 2002 (409 women); Nageotte 1997 (761 women) and Bloom 1998 (1067 women).

The majority of the trials included women at more than 36 weeks' gestation with no obstetric or medical complications (Andrews 1990; Ben Regaya 2010; Bloom 1998; Calvert 1982; Chen 1987; Collis 1999; Frenea 2004; Haukkama 1982; Karraz 2003; MacLennan 1994; Miquelutti 2007; Mitre 1974; Nageotte 1997; Phumdoung 2007; Taavoni 2011; Vallejo 2001).

Twelve studies included only nulliparous women (Andrews 1990; Ben Regaya 2010; Chan 1963; Collis 1999; Fernando 1994; Mathew 2012: Miquelutti 2007; Mitre 1974; Nageotte 1997; Phumdoung 2007; Taavoni 2011; Vallejo 2001);

There was considerable variation about the combinations of upright, mobile and recumbent used in the study protocols. Variations included:

1. walking compared with lateral position (Flynn 1978); walking compared with dorsal or lateral positions (Ben Regaya 2010; Frenea 2004); walking compared with supine, semi supine or lateral position (Karraz 2003); walking compared with care in bed (Bloom 1998; Boyle 2002; Bundsen 1982; Nageotte 1997; Williams 1980);
2. walking or sitting compared with supine or lateral positions (Chan 1963); walking or sitting compared with lateral position (McManus 1978; Vallejo 2001); walking or sitting compared with care in bed (Calvert 1982; Haukkama 1982; MacLennan 1994; Mathew 2012); walking, sitting or standing compared with care in bed (Collis 1999; Fernando 1994); walking, sitting, squatting, kneeling, or standing compared with supine, lateral or prone positions (Andrews 1990); walking, sitting, standing, crouching or kneeling compared with care in bed (Miquelutti 2007);
3. sitting compared with supine position (Mitre 1974); sitting compared with dorsal or lateral position (Chen 1987); sitting, standing, kneeling or squatting compared with care in bed (Gau 2011); and sitting compared with care in bed (Taavoni 2011);
4. kneeling compared with supine position (Phumdoung 2007).

Excluded studies

We excluded 32 studies from the review. Several of the studies were not randomised trials or it was not clear that there had been random allocation to groups (Allahbadia 1992; Asselineau 1996; Caldeyro-Barcia 1960; Li 2010; Solano 1982); three of the studies used cross-over designs (Melzack 1991; Molina 1997; Roberts 1984).

One study (Diaz 1980) was excluded because more than 30% of the intervention group were excluded post-randomisation, as they did not comply with the protocol. This high rate of attrition meant it was difficult to interpret results. In the Hemminki 1983 study, women in the two groups received different packages of care, so it was not possible to separate out the treatment effect of maternal position on outcomes. It remains unclear if McCormick 2007 was successfully completed or not.

In some studies, the intervention did not compare mobility or upright positions with recumbent positions; for example, Cobo 1968 and Wu 2001 examined lying in bed on one side rather than the other, or lying supine. Liu 1989 compared semi-upright position with the lying flat position. These positions were both defined as recumbent positions for the purpose of this review. In some studies position/mobility was compared with an alternative intervention, for example the Hemminki 1985 study included women experiencing delay in labour and compared the use of immediate oxytocin with ambulation and delayed oxytocin. Similarly, Read 1981 examined oxytocin in labour. There were a couple of epidural studies, the COMET 2001 study compared women receiving different types of epidural, whereas, Ducloy-Bouthors 2006 compared epidural spread. One study (Weiniger 2009) compared walking to the toilet to void with using a bedpan in bed. In another (Hodnett 1982) the primary outcome was electronic fetal monitoring, with all women having bed care receiving an epidural, which was not the case for the ambulating women. Two studies focused on interventions in the second, rather than in the first stage of labour (Stewart 1983; Radkey 1991).

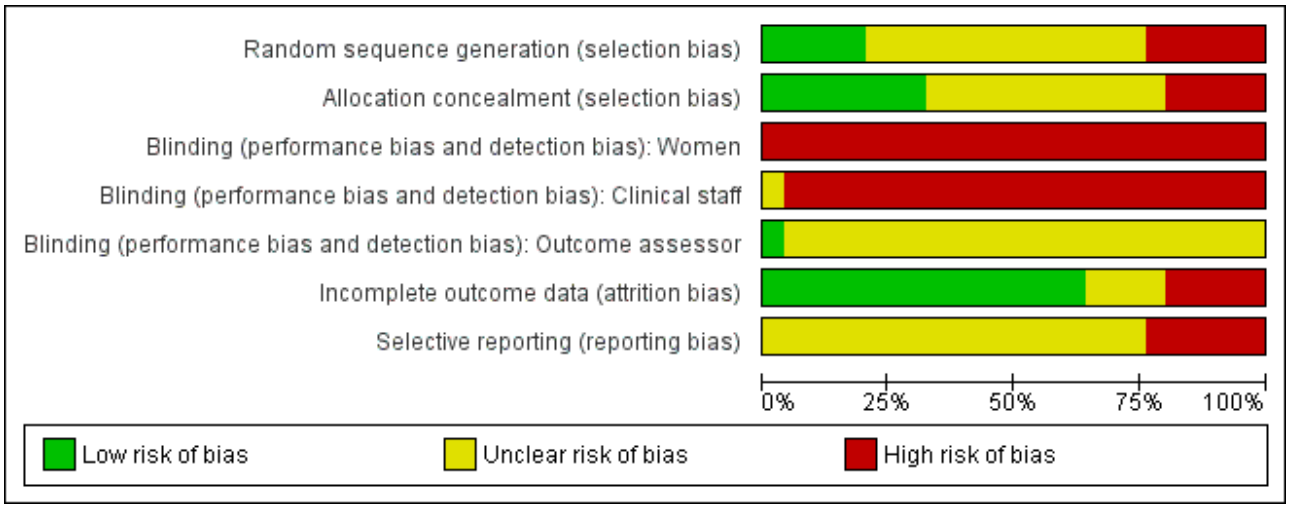
Several studies, which may otherwise have been eligible, focused on outcomes which had not been pre-specified in this review. For example, Danilenko-Dixon 1996 focused on cardiac output, while the study by Schmidt 2001 and those by Ahmed 1985; Cohen 2002; Divon 1985, and Schneider-Affeld 1982 (reported in brief abstracts) did not provide sufficient information on outcomes or present outcome data in a form that we were able to use in the review.

Risk of bias in included studies

The overall quality of the included studies was difficult to assess as many of the studies gave very little information about the methods used.

The methodological quality graph Figure 1 shows the review authors' judgements about each methodological quality item presented as percentages across all included studies.

Figure 1. Methodological quality graph: review authors' judgements about each methodological quality item presented as percentages across all included studies.



The methodological quality summary Figure 2 shows the review authors' judgements about each methodological quality item for each included study.

Figure 2. Methodological quality summary: review authors' judgements about each methodological quality item for each included study.

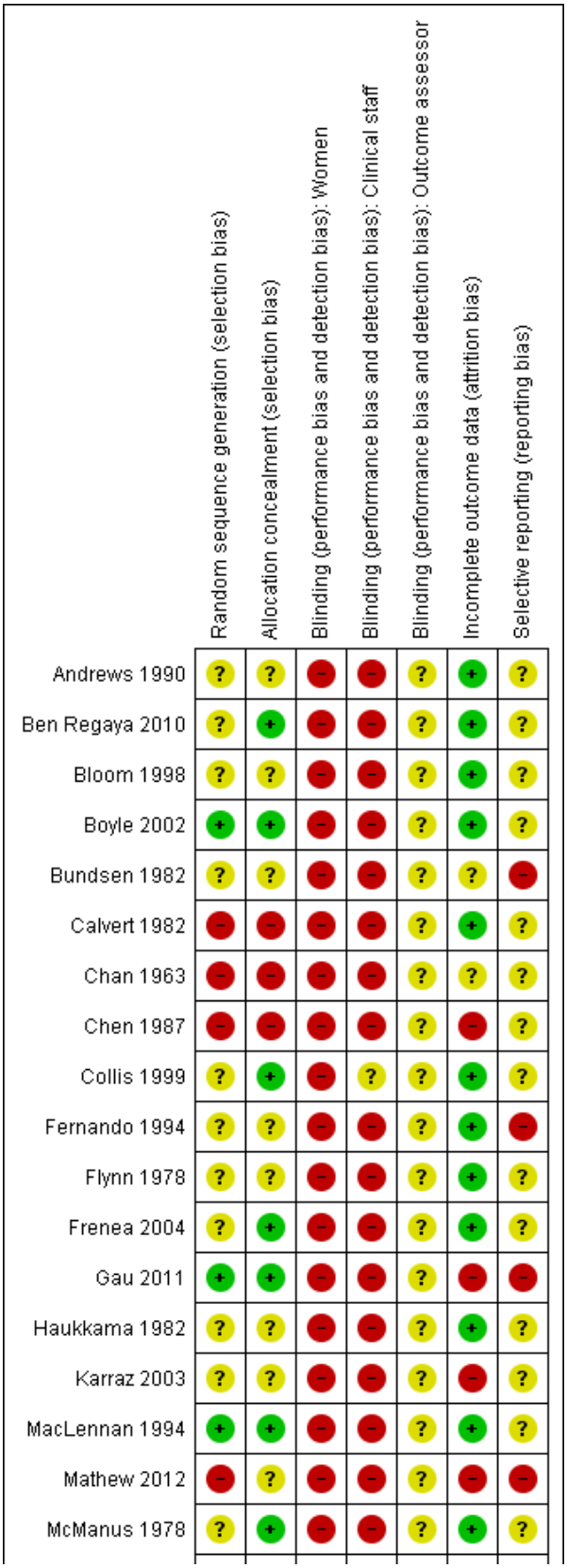
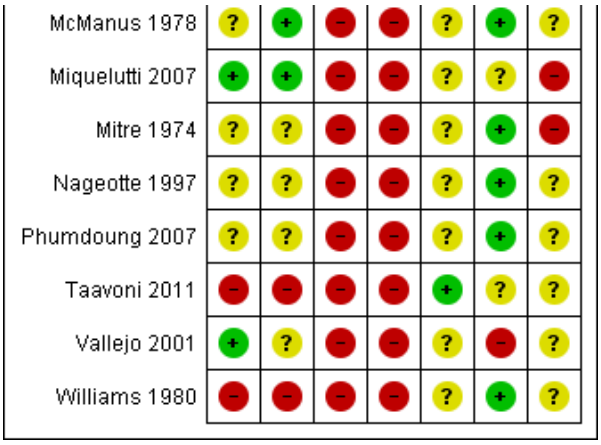


Figure 2. (Continued)



Allocation

The method of sequence generation was often not mentioned in the included studies. In the studies by Boyle 2002, Gau 2011, Miquelutti 2007 and Vallejo 2001, a computer-generated list of random numbers was used; MacLennan 1994 used variable blocks with stratification; six of the included studies utilised a quasi-randomised design, where the allocation to groups was according to hospital or case-note number or by alternate allocation (Calvert 1982; Chan 1963; Chen 1987; Mathew 2012; Taavoni 2011; Williams 1980); for the remaining 14 studies, the method of sequence generation was not stated.

The methods used to conceal group allocation from those recruiting women to the trials were also frequently not described. Eight studies referred to group allocation details being contained in envelopes. In the studies by Boyle 2002, Collis 1999, Gau 2011, MacLennan 1994, and Miquelutti 2007 the envelopes were described as sealed and opaque, and in the other studies envelopes were described as plain, numbered or sealed (Ben Regaya 2010, Frenea 2004; McManus 1978). In sensitivity analysis where studies of better and poorer quality have been separated, we regarded the eight studies that gave details of allocation concealment as the better quality studies, while we regarded those studies where allocation concealment was inadequate (e.g. in the quasi-randomised studies), or where methods were unclear as poorer quality.

Blinding

In the type of interventions we were considering (maternal positions and mobility), blinding women and their clinical carers to group allocation was not feasible. It was possible that partial blinding of outcome assessors could have been performed for some types of outcomes, but it was not clear that this was achieved in any of the included studies. The lack of blinding may introduce bias, and this should be kept in mind when interpreting the results.

Incomplete outcome data

Some studies failed to report on the outcomes of the total population recruited. An example of incomplete data is method of birth. The study by Miquelutti 2007 reported data for the number of women having spontaneous vaginal birth, but not for operative vaginal births or caesarean births. The study by Taavoni 2011 reported intention-to-treat data for the number of women having caesarean births, but no data were reported for the number having spontaneous vaginal or operative vaginal births.

Selective reporting

Several studies had limited outcomes to report, or claimed evidence of an outcome with little or no data to support it. For example, Bundsen 1982 concluded that telemetric monitoring (ambulation) had great value both psychologically and for medical reasons, but the only data provided was for the numbers of vacuum extractions and caesarean sections in each group. Mitre 1974 claimed that women in the sitting group had more comfort, but provided no supporting detail. In the study by Fernando 1994 no maternal outcomes were reported, and in many studies no neonatal outcomes were reported (Andrews 1990; Bundsen 1982; Karraz 2003; Mathew 2012; Phumdoung 2007; Taavoni 2011).

Other potential sources of bias

There was wide variation in the types of interventions tested in the included studies. Some authors gave very little information on the intervention employed, for example, how many centimetres dilated was the woman when the intervention was started, what exactly women were asked to do and what instructions were given to women in the control groups. Further, co-interventions in included studies also varied. This lack of detail means that the interpretation of results is not simple and readers should bear this variability in mind when reading the results of the review.

This review update includes pooled analyses for four comparisons with more than 10 studies. We constructed funnel plots for these comparisons (Figure 3; Figure 4; Figure 5; Figure 6). Visual assessment of the plots did not show asymmetry, suggesting there is no evidence of publication bias.

Figure 3. Funnel plot of comparison: 1 Upright and ambulant positions versus recumbent positions and bed care, outcome: 1.1 Duration of first stage labour (hours).

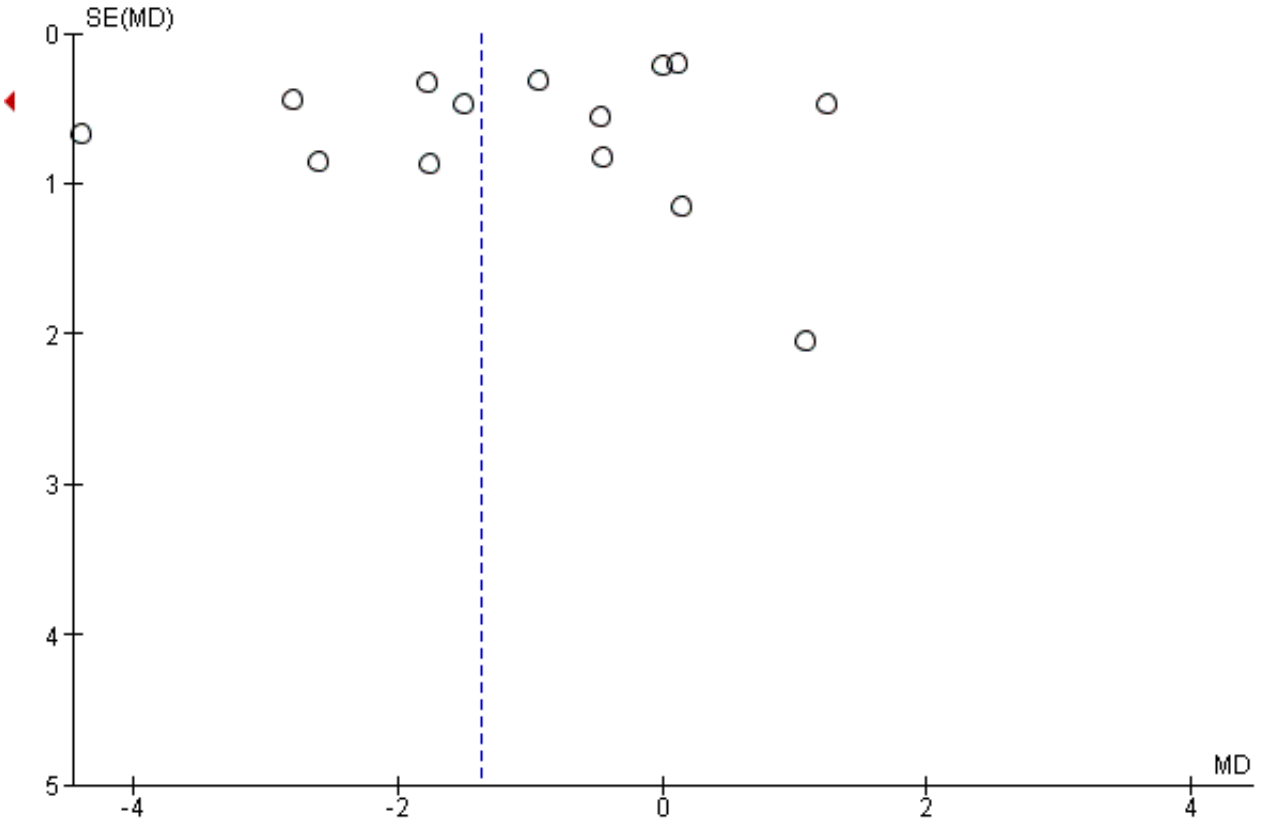


Figure 4. Funnel plot of comparison: 1 Upright and ambulant positions versus recumbent positions and bed care, outcome: 1.8 Mode of birth: spontaneous vaginal.

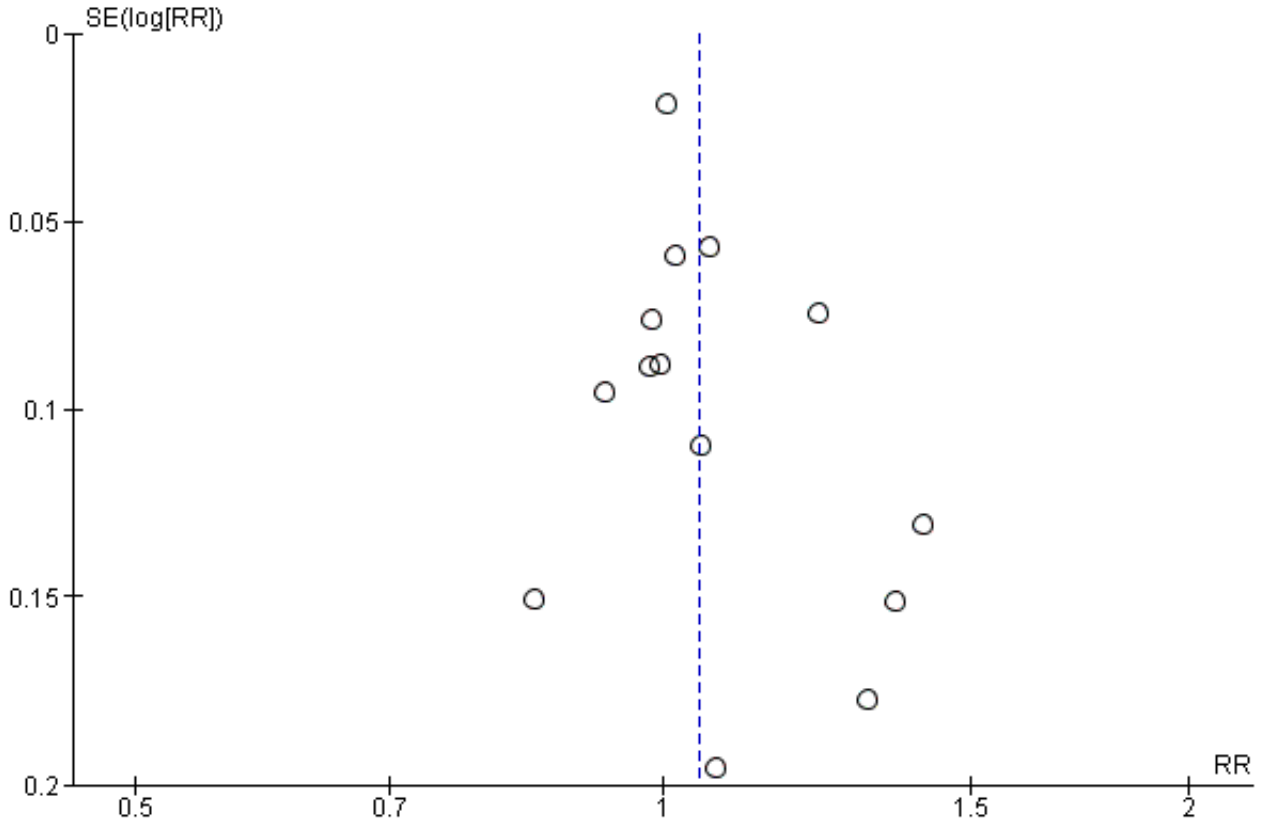


Figure 5. Funnel plot of comparison: 1 Upright and ambulant positions versus recumbent positions and bed care, outcome: 1.15 Mode of birth: operative vaginal: all women.

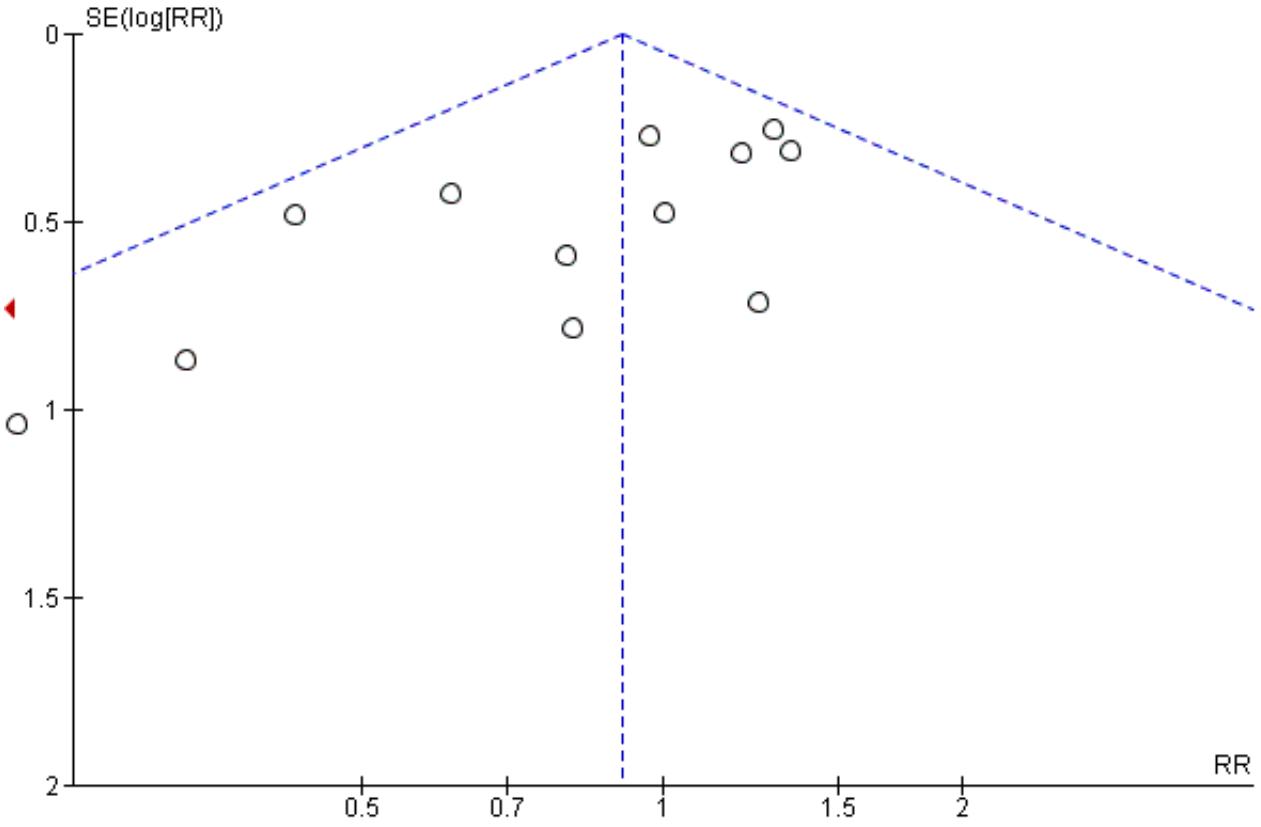
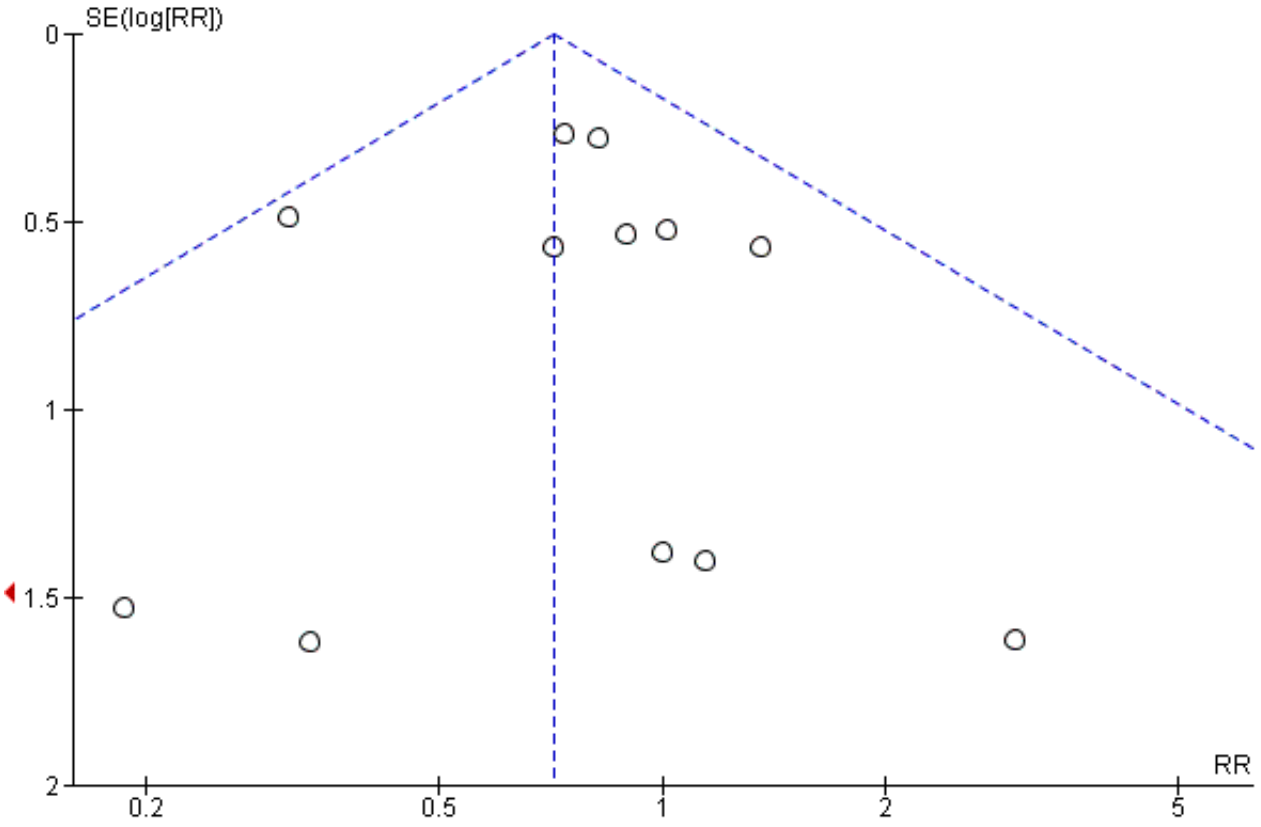


Figure 6. Funnel plot of comparison: 1 Upright and ambulant positions versus recumbent positions and bed care, outcome: 1.22 Mode of birth: caesarean birth.



Effects of interventions

See: **Summary of findings for the main comparison** Summary of Outcomes

Comparison 1: Upright and ambulant positions versus recumbent positions and bed care (without epidural: all women) - 18 trials, 3337 women.

Primary outcomes

Duration of the first stage of labour

The duration of the first stage of labour varied considerably within and between trials. There were high levels of heterogeneity when studies were pooled (I^2 = 93%). Hence, results need to be interpreted with caution. In view of the high levels of heterogeneity, we used a random-effects model for these analyses.

Overall the first stage of labour was approximately one hour and twenty-two minutes shorter for those randomised to upright compared with supine and recumbent positions. This analysis included pooled results from 15 trials (involving 2503 women) and the average effect between groups was statistically significant (average mean difference (MD) -1.36, 95% confidence interval (CI) -2.22 to -0.51; random-effects, T^2 = 2.39, Chi^2 = 203.55, df=14, (P < 0.00001), I^2 = 93%) (Analysis 1.1).

- Subgroup analysis: Parity

The duration of first stage was approximately one hour and thirteen minutes shorter for nulliparous women randomised to upright positions compared with supine and recumbent positions (average MD -1.21, 95% CI -2.35 to -0.07; 12 trials, 1486 women; random-effects, T^2 = 3.42, Chi^2 = 195.59, df = 11, (P < 0.00001), I^2 = 94%) (Analysis 1.2). For multiparous women the duration of first stage was approximately half an hour shorter for those randomised to upright positions, but the evidence of a difference between groups did not reach statistical significance.

- Subgroup analysis: Onset of labour

It was not possible to perform this subgroup analysis as there were no trials that reported that labour had been induced. For women with spontaneous labour, the duration of the first stage of labour was approximately one hour and twenty-five minutes shorter for those randomised to upright compared with supine and recumbent positions (average MD -1.43, 95% CI -2.35 to -0.50; 11 trials, 2114 women; random-effects, T^2 = 2.08, Chi^2 = 154.40, df = 10, (P < 0.00001), I^2 = 94%) (Analysis 1.3).

- Subgroup analysis: Position types and combinations

For women who were randomised to sit, compared to those who were randomised to a recumbent, supine or lateral position, the duration of the first stage of labour was approximately two hours and twenty-three minutes shorter (average MD -2.39, 95% CI -4.06

to -0.72; three trials, 252 women; random-effects, T^2 = 1.96, Chi^2 = 26.07, df = 2, (P < 0.00001), I^2 = 92%) (Analysis 1.4).

For women who were randomised to walk, compared to those who were randomised to a recumbent, supine or lateral position, the duration of the first stage of labour was approximately three hours and fifty-seven minutes shorter (average MD -3.96, 95% CI -5.36 to -2.57; three trials, 302 women; random-effects, T^2 = 1.04, Chi^2 = 6.58, df = 2, (P < 0.04), I^2 = 70%) (Analysis 1.4).

For women who were randomised to sit, stand, squat, kneel or walk compared with those who were randomised to a recumbent, supine or lateral position, the duration of the first stage of labour was approximately two hours and eleven minutes shorter (average MD -2.19, 95% CI -3.49 to -0.89; eight trials, 849 women; random-effects, T^2 = 3.24, Chi^2 = 119.83, df = 7, (P < 0.00001), I^2 = 94%) (Analysis 1.5). For women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to bed care, there was no difference in the duration of the first stage of labour. There was a difference between the two subgroups, those randomised to recumbent, supine or lateral position, compared with those randomised to bed care, and substantial heterogeneity was indicated (Chi^2 = 10.17, df = 1, (P = 0.001), I^2 = 90.2%) (Analysis 1.5).

For women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to a supine only position, the duration of the first stage of labour was approximately two hours and fourteen minutes shorter (average MD -2.24, 95% CI -3.23 to -1.26; two trials, 183 women; random-effects, T^2 = 0.36, Chi^2 = 3.32, df = 1, (P = 0.07), I^2 = 70%) (Analysis 1.6).

- Sensitivity Analysis

When trials of lower quality were excluded, and women who were randomised to sit, stand, squat, kneel or walk were compared to those who were randomised to a recumbent, supine or lateral position, the duration of the first stage of labour was approximately five hours shorter. However, this analysis only included results from one trial of 200 women (average MD -5.00, 95% CI -6.05 to -3.95) (Analysis 1.7).

Mode of birth

Spontaneous vaginal birth

Overall, more women had a spontaneous vaginal birth when randomised to upright versus recumbent positions, but these results were not quite statistically significant (Analysis 1.8).

- Subgroup analysis: Parity

More nulliparous women had a spontaneous vaginal birth when randomised to upright versus recumbent positions, but these results were not statistically significant (Analysis 1.9). There were no differences between subgroups of nulliparous and multiparous women (test for subgroup differences: Chi^2 = 0.53, df = 1 (P = 0.46), I^2 = 0%).

- Subgroup analysis: Onset of labour

More women with spontaneous onset of labour had a spontaneous vaginal birth when randomised to upright versus recumbent positions, but these results were not statistically significant (Analysis 1.10). There were no differences between subgroups (test for subgroup differences: Chi^2 = 1.95, df = 1 (P = 0.16), I^2 = 48.8%).

- Subgroup analysis: Position types and combinations

Women who were randomised to walk, compared to those who were randomised to a recumbent, supine or lateral position, were more likely to have spontaneous vaginal birth (risk ratio (RR) 1.26, 95% CI 1.11 to 1.42; three trials, 306 women; random-effects, T^2 = 0.00, Chi^2 = 1.05, df = 2, (P = 0.59), I^2 = 0%) (Analysis 1.11).

Women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to a recumbent, supine or lateral position, were more likely to have spontaneous vaginal birth (RR 1.14, 95% CI 1.03 to 1.26; six trials, 746 women; random-effects, T^2 = 0.01, Chi^2 = 8.33, df = 5, (P = 0.14), I^2 = 40%) (Analysis 1.12). For women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to bed care, there was no difference in the number of women achieving spontaneous vaginal birth. There was a difference between the two subgroups, those randomised to recumbent, supine or lateral position, compared with those randomised to bed care, and substantial heterogeneity was indicated (Chi^2 = 5.06, df = 1, (P=0.02), I^2 = 80.2%) (Analysis 1.12).

No trials comparing upright and mobile positions with supine only positions (Mitre 1974; Phumdoung 2007) reported mode of birth outcome data (Analysis 1.13).

- Sensitivity Analysis

When trials of lower quality were excluded, and women who were randomised to sit, stand, squat, kneel or walk were compared to those who were randomised to a recumbent, supine or lateral position, women were more likely to have spontaneous vaginal birth (RR 1.20, 95% CI 1.05 to 1.38; two trials, 240 women; Chi^2 = 0.42, df = 1, (P = 0.52), I^2 = 0%) (Analysis 1.14).

Operative vaginal birth

Overall, fewer women had operative vaginal birth when randomised to upright versus recumbent positions, however these results were not statistically significant (Analysis 1.15).

- Subgroup analysis: Parity

Fewer nulliparous women had operative vaginal birth when randomised to upright versus recumbent positions, however these results were not statistically significant (Analysis 1.16). There were no differences between subgroups of nulliparous and multiparous women (test for subgroup differences: Chi^2 = 0.00, df = 1 (P = 0.95), I^2 = 0%).

- Subgroup analysis: Onset of labour

Fewer women required operative vaginal birth when randomised to upright versus recumbent positions, irrespective of onset of labour, although results were not statistically significant (Analysis 1.17). There were no differences between subgroups (test for subgroup differences: Chi^2 = 0.64, df = 1 (P = 0.42), I^2 = 0%).

- Subgroup analysis: Position types and combinations

Women who were randomised to sit, compared to those who were randomised to a recumbent, supine or lateral position, were less

likely to have operative vaginal birth (RR 0.18, 95% CI 0.04 to 0.75; two trials, 225 women; $Chi^2 = 0.10$, df = 1, (P = 0.75), $I^2 = 0\%$) (Analysis 1.18).

Women who were randomised to walk, compared to those who were randomised to a recumbent, supine or lateral position, were less likely to have operative vaginal birth (RR 0.50, 95% CI 0.28 to 0.89; three trials, 306 women; $Chi^2 = 2.32$, df = 2, (P = 0.31), $I^2 = 14\%$) (Analysis 1.18). There was a difference between subgroups, ($Chi^2 = 12.06$, df = 4 (P = 0.02), $I^2 = 66.8\%$) (Analysis 1.18).

Women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to a recumbent, supine or lateral position, were less likely to have operative vaginal birth (RR 0.62, 95% CI 0.43 to 0.89; six trials, 746 women; $Chi^2 = 6.76$, df = 5, (P = 0.24), $I^2 = 26\%$) (Analysis 1.19). For women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to bed care, there was no difference in the number of women having operative vaginal birth. There was a difference between the two subgroups, those randomised to recumbent, supine or lateral position, compared with those randomised to bed care, and substantial heterogeneity was indicated ($Chi^2 = 7.29$, df = 1, (P=0.007), $I^2 = 86.3\%$) (Analysis 1.19).

Neither of the two trials comparing upright and mobile positions with supine only positions (Mitre 1974; Phumdoung 2007) reported mode of birth outcome data (Analysis 1.20).

- Sensitivity Analysis

When trials of lower quality were excluded, and women who were randomised to sit, stand, squat, kneel or walk were compared to those who were randomised to a recumbent, supine or lateral position, there was no statistically significant difference (Analysis 1.21).

Caesarean birth

Overall, women encouraged to maintain upright and mobile positions had lower rates of caesarean birth compared with those in the comparison recumbent groups. The analysis included pooled results from 14 trials (including 2682 women) and the difference between groups was statistically significant (RR 0.71, 95% CI 0.54 to 0.94, $Chi^2 = 9.27$, df = 12, (P = 0.68), $I^2 = 0\%$) (Analysis 1.22).

Subgroup analysis: Parity

Fewer women required caesarean birth, regardless of parity, but these results were not statistically significant (Analysis 1.23). There we no differences between nulliparous and multiparous women (test for subgroup differences: $Chi^2 = 0.64$, df = 1 (P = 0.42), $I^2 = 0\%$).

- Subgroup analysis: Onset of labour

Fewer women required caesarean birth, regardless of onset of labour, but these results were not statistically significant (Analysis 1.24). There were no differences between subgroups (test for subgroup differences: $Chi^2 = 0.45$, df = 1 (P = 0.50), $I^2 = 0\%$).

- Subgroup analysis: Position types and combinations

For women who were randomised to walk, compared to those who were randomised to a recumbent, supine or lateral position, those who were randomised to upright compared with recumbent positions had less caesarean births (RR 0.31, 95% CI 0.12 to 0.79; three trials, 306 women; $Chi^2 = 0.00$, df = 1, (P = 0.97), $I^2 = 0\%$) (Analysis 1.25).

Women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to a recumbent, supine or lateral position, were less likely to have caesarean birth, however this result did not reach significance (Analysis 1.26). Women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to bed care, were also less likely to have caesarean birth, however these results did not reach significance. For this outcome there was no difference between the two subgroups, those randomised to recumbent, supine or lateral position, compared with those randomised to bed care, ($Chi^2 = 0.09$, df = 1, (P = 0.77), $I^2 = 0\%$) (Analysis 1.26).

Neither of the trials comparing upright and mobile positions with supine only positions (Mitre 1974; Phumdoung 2007) reported mode of birth outcome data (Analysis 1.27).

- Sensitivity Analysis

When trials of lower quality were excluded, women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to a recumbent, supine or lateral position, were less likely to have caesarean birth (RR 0.35, 95% CI 0.14 to 0.86; two trials, 240 women; $Chi^2 = 0.63$, df = 1, (P = 0.43), $I^2 = 0\%$) (Analysis 1.28).

Maternal satisfaction

While some studies collected information on satisfaction with specific aspects of care (e.g. satisfaction with position, position preference and comfort score), the results were inconclusive. (Analysis 1.30; Analysis 1.31).

Fetal and neonatal outcomes

There were no significant differences between groups in terms of fetal distress requiring immediate delivery or use of neonatal mechanical ventilation (Analysis 1.43; Analysis 1.44).

Secondary outcomes

Maternal pain and analgesia

There were no statistically significant differences between the two trials reporting pain and anxiety outcomes for women in upright positions compared to those who received bed care (Analysis 1.33; Analysis 1.35), however women in recumbent positions reported higher pain scores at 4 cm and 8 cm dilatation using a Visual Analogue Scale (VAS) and the Verbal Response Scale (VRS) in one trial (87 women) (Analysis 1.34).

There were no differences between groups in terms of complaints of discomfort (RR 0.68, 95% CI 0.12 to 3.72; three trials, 338 women; $Chi^2 = 9.15$, df = 2, (P = 0.01), $I^2 = 78\%$) (Analysis 1.32), although the results for this outcome were very inconsistent, with results strongly in both directions reflected in the very high I^2 values. A random-effects analysis was used because of the heterogeneity, but it is important to note that the average treatment effect may not be a good summary. There were also no differences in the use of opioid analgesia (Analysis 1.29). However, women randomised to upright positions were less likely to have epidural analgesia, with

the difference reaching statistical significance (RR 0.81, 95% CI 0.66 to 0.99, nine studies, 2107 women; random-effects) (Analysis 1.29).

The amount of analgesia received by women in the two groups was measured in one trial, but the difference between groups was not statistically significant (Analysis 1.36).

Interventions in labour

Augmentation of labour using oxytocin

Women randomised to upright versus recumbent positions had less requirement for augmentation of labour, with the difference not quite reaching statistical significance (RR 0.89, 95% CI 0.76 to 1.05; eight studies, 1826 women) (Analysis 1.38). In three studies, amniotomy was carried out routinely on all women (Bundsen 1982; Chen 1987; McManus 1978) and in two studies, all women's labours were induced (Bundsen 1982; McManus 1978) (Analysis 1.39).

Duration of the second stage of labour

There was no difference between groups in the duration of the second stage of labour in the nine trials that reported this outcome (Analysis 1.37).

Maternal outcomes

No studies reported outcomes for hypotension requiring intervention Analysis 1.40. There was no difference for estimated blood loss greater than 500 mL Analysis 1.41. Women randomised to upright positions did have less use of episiotomy, but the difference did not reach statistical significance (RR 0.92, 95% CI 0.82 to 1.04; three studies, 1374 women) Analysis 1.42. No studies reported outcomes for second or third degree perineal tears Analysis 1.42.

Fetal and neonatal outcomes

There were no significant differences between groups in Apgar scores or admission to level I or II nursery (Analysis 1.45; Analysis 1.46).

Admission to neonatal intensive care units was reported in one study (200 women) as being less for babies born to mothers randomised to upright positions (RR 0.20, 95% CI 0.04 to 0.89) (Analysis 1.46).

Five studies examined perinatal deaths; three deaths were reported in one study (Chan 1963). One less death occurred in the group where mothers were assigned to upright positions, but the results were not statistically significant (Analysis 1.47).

Comparison 2: Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women) - seven trials, 1881 women

Primary outcomes

Duration of the first stage of labour

Duration of labour times were not used because they were recorded as either insertion of epidural time (which was highly variable) to 10 cm cervical dilatation (Frenea 2004; Vallejo 2001), or to delivery (at the end of second stage) (Collis 1999; Karraz 2003) (Analysis 2.1).

Mode of birth

Rates of spontaneous vaginal, operative vaginal and caesarean birth were similar for women randomised to upright versus recumbent positions (Analysis 2.2; Analysis 2.8; Analysis 2.14).

- Subgroup analysis: Parity

There were no differences between subgroups of multiparous women compared to nulliparous women in spontaneous vaginal births, operative vaginal births or caesarean sections (Analysis 2.3; Analysis 2.9; Analysis 2.15).

- Subgroup analysis: Onset of labour

Due to lack of data, it was not possible to perform subgroup analysis for onset of labour (Analysis 2.4; Analysis 2.10; Analysis 2.16).

- Subgroup analysis: Position types and combinations

For women who were randomised to sit, stand, squat, kneel or walk compared to those who were randomised to recumbent/supine/lateral or bed care, there was no differences between subgroups in spontaneous vaginal births, operative vaginal births or caesarean sections (Analysis 2.6; Analysis 2.12; Analysis 2.18).

- Sensitivity Analysis

There were no significant differences in the sensitivity analysis results relating to spontaneous vaginal births, operative vaginal births or caesarean births (Analysis 2.7; Analysis 2.13; Analysis 2.19).

Secondary outcomes

Maternal pain and other outcomes

There were no differences between groups in terms of number of women requiring additional bupivacaine bolus doses for pain relief (RR 0.57, 95% CI 0.22 to 1.48; two trials, 720 women; Chi^2 = 7.46, df = 1, (P = 0.006), I^2 = 87%) (Analysis 2.21), although the results for this outcome were very inconsistent, with results strongly in both directions reflected in the very high I^2 values. A random-effects analysis was used because of the heterogeneity, but it is important to note that the average treatment effect may not be a good summary. There were no statistically significant differences between groups in terms of the amount of analgesia women required for pain relief (Analysis 2.22), the number of women receiving oxytocin augmentation (Analysis 2.24), and the number of women experiencing hypotension (Analysis 2.26).

Neonatal outcomes

There was no information on perinatal mortality or admission to neonatal care units. There were no differences between groups in the incidence of Apgar scores of less than seven at one and five minutes (Analysis 2.31).

DISCUSSION

The objectives of this review were to assess the effects of positions and mobility during first stage of labour on duration of labour, type of birth and other important outcomes for mothers and babies.

The decision to treat trials comparing upright with recumbent positions (Comparison 1) differently from trials comparing upright with recumbent positions whereby all women have epidural at

time of study entry (Comparison 2), was based on the opinion that epidurals are associated with prolonged labour, an increased requirement for augmentation and an increased incidence of operative vaginal birth (Anim-Somuah 2011; Kemp 2013; Simmons 2012). When mode of birth outcomes for both comparisons were pooled (Table 2), we did find that women in the Comparison 1 group were more likely to have vaginal birth (83% compared to 59%), and women in Comparison 2 group were more likely to have operative vaginal birth (26% compared to 10%), and caesarean birth (16% compared to 7%). This demonstrated a difference in comparison characteristics and affirms our decision to treat the studies differently.

Summary of main results

We performed 80 meta-analyses in order to evaluate how a variety of maternal positions used during first stage labour affect the birth process and outcomes for mothers and babies.

For Comparison 1, women who were upright or mobile compared to those who were recumbent had a shorter first stage of labour (Analysis 1.1); were less likely to have a caesarean birth (Analysis 1.22); had less pain (Analysis 1.34); were less likely to have an epidural (Analysis 1.29); and their babies were less likely to be admitted to the neonatal intensive care unit (Analysis 1.46).

Subgroup analysis demonstrated that nulliparous women and those who had spontaneous labour at trial entry were more likely to have a shorter duration of labour when upright or mobile (Analysis 1.2; Analysis 1.3). Women who laboured with sitting, standing, squatting, kneeling or walking positions, compared with supine, dorsal or lateral recumbent positions, had shorter durations of labour (Analysis 1.4; Analysis 1.5; Analysis 1.6); more spontaneous vaginal births (Analysis 1.11; Analysis 1.12); less operative births (Analysis 1.18; Analysis 1.19); and less caesarean births (Analysis 1.25).

Sensitivity analysis was performed to exclude those trials of lower quality. Comparison was made between women who used sitting, standing, squatting, kneeling or walking positions, and those who used supine, dorsal or lateral recumbent positions. This analysis confirmed that being upright or mobile during first stage labour was more likely to result in a shorter duration of first stage labour (Analysis 1.7), more likely to result in spontaneous vaginal birth (Analysis 1.14) and less likely to result in caesarean birth (Analysis 1.28).

For Comparison 2, where all women had epidural at trial entry, subgroup analysis demonstrated that nulliparous women who were upright were more likely to have operative vaginal births, compared with multiparous women who were supine (Analysis 2.9).

The outcomes of this review demonstrate benefit to the well being of mothers and babies. There is evidence that adopting an upright or mobile position during first stage labour reduces the duration of first stage, with no additional risk to mother or baby. Therefore, women in low-risk labour should be informed of the benefits of upright positions, and encouraged and assisted to assume whatever position they choose. Moving around in labour often requires continuous one-to-one support from a midwife/nurse, this reduces the need for pain medication and increases the likelihood of spontaneous vaginal delivery (Hodnett 2012).

Overall completeness and applicability of evidence

When considering the results of this review, it is important to consider the new evidence that women encouraged to maintain upright positions had lower rates of caesarean birth. This is an important finding as rates of caesarean birth continue to rise worldwide and most women and healthcare clinicians would like to see a reduction in caesarean birth as the procedure is not without risk for both mother and baby. Another new finding was that babies of mothers who were upright were less likely to be admitted to the neonatal unit. However, it would be prudent to treat this finding with caution as it is based on the results of one study only.

Most of the included studies collected information on mode of birth, but few had the statistical power to detect differences between groups. Few included studies collected outcome data on review outcomes such as pain, maternal satisfaction, and neonatal outcomes. Disappointingly, the many studies reporting Apgar scores, did so by different methods and at differing end points. Most reported the numbers of babies with Apgar scores less that seven at one and or five minutes (Calvert 1982; Haukkama 1982; MacLennan 1994; McManus 1978; Miquelutti 2007; Williams 1980), but Bloom 1998 reported scores less than three at five minutes, Gau 2011 reported scores less than eight at five minutes, and others only reported scores as means (Ben Regaya 2010; Boyle 2002; Mitre 1974), meaning that outcome data could not be pooled uniformly in these instances.

Studies were carried out over a long period: from the early 1960s (Chan 1963) through to 2012 (Mathew 2012); and in a number of different healthcare settings Table 3. The cultural and healthcare context is likely to have been different at different times and in different settings, and there have also been changes in healthcare technologies. Within these changing contexts, the attitudes and expectations of healthcare staff, women and their partners towards pain, pain relief and appropriate behaviour during labour and childbirth have shifted. All of these factors are important in the interpretation of results.

Quality of the evidence

As labour is a dynamic and complex process with many physical and emotional variables, designing trials that examine interventions related to women in labour is challenging and it is difficult to avoid bias (Gupta 2000; Hollins Martin 2013; McNabb 1989; Stewart 1989). It is not possible to blind women or their caregivers to group allocation. In addition, it is difficult to standardise interventions. Due to the heterogeneity of trial interventions and participants, the inconsistencies within trials, and the variable trial quality, study findings are difficult to interpret, and the results of this review should be interpreted with caution.

For the main outcome, duration of first stage labour, there was considerable variation within and between studies in terms of average duration of first stage labour (hours). For nulliparous women means varied from 1.67 hours to 18.22 hours and for multiparous women means varied from 1.2 hours to 7.8 hours. Studies defined and measured the duration of the first stage of labour in different ways. For example, Chen 1987 recorded the duration as 5 to 10 cm, Taavoni 2011 as 4 to 8 cm, and Andrews 1990 as 4 to 9 cm.

The review included women from many countries around the world, all with differing ages, obstetric and medical histories, ethnicity, customs, beliefs and supports. There was considerable variation in the position interventions women received and how these positions were described. In the studies by Nageotte 1997 and Vallejo 2001, ambulation was defined as a minimum of five minutes of walking per hour, in the study by Frenea 2004 women were asked to walk 15 minutes each hour, and in the study by Andrews 1990 the position intervention was assumed when the woman was anywhere between 4 to 9 cm.

There was also variability in the amount of time women adhered to the protocol in terms of ambulation or staying in bed. In the study by Bloom 1998, of the 536 women assigned to the walking group only 380 women actually walked. In the study by Calvert 1982, of the 100 women assigned to telemetry, only 45 women actually got out of bed. In the study by MacLennan 1994, of the 96 women randomised to ambulate, only 37 women actually chose to ambulate for half an hour or more. In the study by Miquelutti 2007, women assigned to be upright only managed to achieve this for 57% of the time. It is clear that many of the women in these studies had difficulty maintaining the intervention position though out the whole duration of their first stage and preferred and often used alternative positions.

Further, there was also variation in the models of birth care, institutional procedures, and caregiver behaviour in relation to study protocols. In some studies, women were strongly encouraged by staff to mobilise (e.g. in the study by Miquelutti 2007 any woman in the intervention group that remained in bed for more than 30 minutes was asked to get out again) and in other studies, women had more choice and only gentle encouragement (Boyle 2002). In one study the intervention was only encouraged during the day as it was not felt that women would like to walk around at night (Karraz 2003), additionally women in the comparison group were not allowed out of bed even to walk to the toilet.

Potential biases in the review process

In order to minimise the potential for bias during the process of preparing this Cochrane Review, we have made every attempt to adhere to the study protocol (Lewis 2002). Any rationales for post hoc decisions to vary study protocol outcome data or methods of meta-analyses are clearly stated within the review.

Agreements and disagreements with other studies or reviews

The findings of this review should be considered alongside other related Cochrane reviews focusing on care during labour (e.g. Cluett 2009; Gupta 2012; Hodnett 2012; Hunter 2007; Kemp 2013). While position in the first stage of labour may have an independent effect, the position in second stage and other variables (e.g. the presence of a birth companion) are also important.

AUTHORS' CONCLUSIONS

Implications for practice

Upright positions and walking are associated with a reduction in the duration of the first stage of labour, use of epidural as a method of pain relief and caesarean birth. There is also evidence that there is less chance of babies being admitted to the neonatal unit. Despite many of the trials included in this review being of lesser quality, sensitivity analysis of the higher quality trials indicated that the main findings of this review were robust. It is likely that women's preferences for positioning change as the first stage of labour progresses (Gupta 2000) and, if given the opportunity, many women may choose an upright or ambulant position in early first stage labour and then choose to lie down as their labour progresses. Studies examining the physiology of maintaining a supine position in labour suggest adverse physiological effects on the labouring woman and her baby (Abitbol 1985; Huovinen 1979; Marx 1982; Roberts 1989; Rooks 1999; Stacey 2011; Walsh 2000). Therefore, we believe wherever possible, women should be informed of the benefits of upright positions, encouraged and supported to take up whatever positions they choose, they should not have their freedom of movement options restricted unless clinically indicated, and they should avoid spending long periods supine.

Implications for research

Overall, the quality of the studies included in the review was mixed and most studies provided little information on methods. Minimising risk of bias in trials on this topic is challenging, as blinding is not feasible and it is difficult to standardise interventions. At the same time, some aspects of study design can be controlled.

Some considerations for future research are as follows.

- There is a need for larger high-quality multicentre trials, with particular attention given to allocation concealment (selection bias) and reporting of all pre-specified outcome criteria (reporting bias).
- Researchers should clearly explain how they have defined the duration of first stage of labour and include full statistical details (e.g. P values and standard deviations (SDs)).
- Mode of birth outcomes should include full intention-to-treat data.
- More studies are needed that compare different upright positions (e.g. sitting upright versus walking) and different lying positions (e.g. lying on side versus back).
- More studies are needed that include women who are not low risk (e.g. all women undergoing induction of labour; all women with gestational diabetes or obesity; all women planning to have epidural pain relief prior to labour).
- There is a need to collect more detailed information on outcomes for mothers, such as the effect of position on complications (e.g. hypotension, precipitous birth, prolonged birth, post-partum haemorrhage).
- There is a need to improve and standardise measurements of all outcome data, including maternal pain, control and satisfaction.
- Few trials assessed comparable outcomes for babies and future studies need to focus on this.

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REFERENCES

References to studies included in this review

Andrews 1990 *{published data only}*

Andrews CM, Chrzanowski M. Maternal position, labour and comfort. *Applied Nursing Research* 1990;**3**(1):7-13.

Ben Regaya 2010 *{published data only}*

Ben Regaya L, Fatnassi R, Khlifi A, Fekih M, Kebaili S, Soltan K, et al. Role of deambulation during labour: a prospective randomized study [Interet de la deambulation au cours du travail obstetrical: etude prospective randomisee de 200 cas]. *Journal de Gynecologie, Obstetrique et Biologie de la Reproduction* 2010;**39**(8):656-62.

Bloom 1998 *{published data only}*

Bloom SL, Kelly MA, Beimer H, Garcia M, Burpo B, McIntire DD, et al. A randomized trial of the effects of ambulation on active labor. *American Journal of Obstetrics and Gynecology* 1998;**178**(1 Pt 2):S98.

* Bloom SL, McIntire DD, Kelly MA, Beimer HL, Burpo RH, Garcia MA, et al. Lack of effect of walking on labor and delivery. *New England Journal of Medicine* 1998;**339**(2):76-9.

Goer H. Does walking enhance labor progress?. *Birth* 1999;**26**(2):127-9.

Boyle 2002 *{published data only}*

Boyle S, Entwistle F, Hamilton C, Kulinska E. A randomised controlled trial examining the effect of ambulation on labour outcome in women who choose a Combined Spinal Epidural for pain relief in labour. International Confederation of Midwives. Midwives and women working together for the family of the world: ICM Proceedings; 2002; Vienna, Austria. 2002.

Bundsen 1982 *{published data only}*

Bundsen P, Lundberg J, Peterson LE. Telemetric versus conventional fetal monitoring in labour - a prospective randomized study [abstract]. Proceedings of 8th European Congress of Perinatal Medicine; 1982 Sept 7-10; Brussels, Belgium. 1982:Abstract no: 256.

Calvert 1982 *{published data only}*

Calvert JP, Newcombe RG, Hibbard BM. An assessment of radiotelemetry in the monitoring of labour. *British Journal of Obstetrics and Gynaecology* 1982;**89**:285-91.

Chan 1963 *{published data only}*

Chan DPC. Positions during labour. *British Medical Journal* 1963;**1**:100-2.

Chen 1987 *{published data only}*

Chen SZ, Aisaka K, Mori H, Kigawa T. Effects of sitting position on uterine activity during labor. *Obstetrics & Gynecology* 1987;**69**(1):67-73.

Collis 1999 *{published data only}*

Collis R, Harding S, Davies L, Moore C, Baxendall M, Morgan B. Ambulation in labour with an epidural: the effect on analgesic requirements, outcome of labour and maternal satisfaction [abstract]. *International Journal of Obstetric Anesthesia* 1994;**3**:109.

* Collis RE, Harding SA, Morgan BM. Effect of maternal ambulation on labour with low-dose combined spinal-epidural analgesia. *Anaesthesia* 1999;**54**(6):535-9.

Fernando 1994 *{published data only}*

Fernando R, Bonello E, Gill P, Urquhart J, Morgan B, Reynolds F. Placental and maternal plasma concentrations of fentanyl and bupivacaine after ambulatory combined spinal epidural (CSE) analgesia during labour. *International Journal of Obstetric Anesthesia* 1995;**4**:178-89.

* Fernando R, Gill P, Urquhart J, Morgan BM. Neurobehavioural changes in neonates after ambulatory combined spinal epidural (CSE) analgesia during labour. *International Journal of Obstetric Anesthesia* 1994;**3**:174.

Flynn 1978 *{published data only}*

Broadhurst A, Flynn AM, Kelly J, Lynch PF. The effect of ambulation in labour on maternal satisfaction, analgesia and lactation. Proceedings of 5th International Congress on Psychosomatic Medicine in Obstetrics and Gynaecology, "Emotion and Reproduction";1977 Nov 13-19; Rome, Italy. 1979:943-6.

Flynn AM, Hollins G, Kelly J, Lynch PF. The effect of ambulation in labour on uterine action, analgesia and fetal well-being. Proceedings of 6th European Congress of Perinatal Medicine; 1978 Aug 29-Sept 1; Vienna, Austria. 1978:Abstract no: 344.

* Flynn AM, Kelly J, Hollins G, Lynch PF. Ambulation in labour. *British Medical Journal* 1978;**2**:591-3.

Frenea 2004 *{published data only}*

Frenea S, Chirossel C, Rodriguez R, Baguet JP, Racinet C, Payen JF. The effects of prolonged ambulation on labor with epidural analgesia. *Anesthesia & Analgesia* 2004;**98**(1):224-9.

Gau 2011 *{published data only}*

Gau ML, Chang CY, Tian SH, Lin KC. Effects of birth ball exercise on pain and self-efficacy during childbirth: a randomised controlled trial in Taiwan. *Midwifery* 2011;**27**(6):e293-300.

Haukkama 1982 *{published data only}*

Haukkama M, Purhonen M, Teramo K. The monitoring of labor by telemetry. *Journal of Perinatal Medicine* 1982;**10**:17-21.

Karraz 2003 *{published data only}*

Karraz MA. Ambulatory epidural anaesthesia and the duration of labor. *International Journal of Gynecology & Obstetrics* 2003;**80**:117-22.

MacLennan 1994 *{published data only}*

MacLennan AH, Crowther C, Derham R. Does the option to ambulate during spontaneous labour confer any advantage or disadvantage?. *Journal of Maternal-Fetal Medicine* 1994;**3**:43-8.

Mathew 2012 *{published data only}*

Mathew A, Nayak S, Vandana K. A comparative study on effect of ambulation and birthing ball on maternal and newborn outcome among primigravida mothers in selected hospitals in Mangalore. *Nitte University Journal of Health Science* 2012;**2**(2):2-5.

McManus 1978 *{published data only}*

McManus TJ, Calder AA. Upright posture and the efficiency of labour. *Lancet* 1978;**1**(8055):72-4.

Miquelutti 2007 *{published data only}*

Miquelutti MA, Cecatti JG, Makuch MY. Upright position during the first stage of labor: a randomised controlled trial. *Acta Obstetricia et Gynecologica Scandinavica* 2007;**86**(5):553-8.

Mitre 1974 *{published data only}*

Mitre IN. The influence of maternal position on duration of the active phase of labor. *International Journal of Gynecology & Obstetrics* 1974;**12**(5):181-3.

Nageotte 1997 *{published data only}*

Nageotte M, Larson D, Rumney P, Sidhu M, Hollenback K. A prospective randomized study of intrapartum epidural vs combination intrathecal/epidural anesthesia with or without ambulation. *American Journal of Obstetrics and Gynecology* 1997;**176**(1 Pt 2):S22.

* Nageotte MP, Larson D, Rumney PJ, Sidhu M, Hollenbach K. Epidural analgesia compared with combined spinal-epidural analgesia during labor in nulliparous women. *New England Journal of Medicine* 1997;**337**(24):1715-9.

Phumdoung 2007 *{published data only}*

Phumdoung S, Youngvanichsate S, Jongpaiboonpatana W, Leetanaporn R. The effects of the PSU Cat position and music on length of time in the active phase of labor and labor pain. *Thai Journal of Nursing Research* 2007;**11**(2):96-105.

Taavoni 2011 *{published data only}*

Taavoni S, Abdolahian S, Haghani H. Effect of birth ball on active phase of physiologic labor: randomized control trial study [Abstract]. *International Journal of Medicine* 2010;**40**(Suppl 1):171.

Taavoni S, Abdolahian S, Haghani H, Neisani L. Effect of pelvic tilt by using birth ball on active phase of physiologic labor: A randomized control trial study. *International Journal of Gynecology and Obstetrics* 2012;**119**(Suppl 3):S496.

* Taavoni S, Abdolahian S, Haghani H, Neysani L. Effect of birth ball usage on pain in the active phase of labor: a randomized controlled trial. *Journal of Midwifery & Women's Health* 2011;**56**(2):137-40.

Vallejo 2001 *{published data only}*

Vallejo M, Firestone L, Mandell G, Jaime F, Makishima S, Ramanathan S. The effect of sitting and ambulating on labor duration and maternal outcome [abstract]. *Anesthesiology* 2001;**94**(1A):Abstract no: A7.

Vallejo M, Mandell G, Jaime F, Ramanathan S. Ropivacaine for walking epidural analgesia during labor. *Regional Anesthesia and Pain Medicine* 1999;**24**(3 Suppl):74.

* Vallejo MC, Firestone LL, Mandell GL, Jaime F, Makishima S, Ramanathan S. Effect of epidural analgesia with ambulation on labor duration. *Anesthesiology* 2001;**95**(4):857-61.

Vallejo MC, Mandell GL, Jaime F, Makishima S, Ramanathan S. Walking epidural analgesia: the effect of ambulation on labor duration and maternal outcome [abstract]. *Anesthesiology* 2000;**93**(3A):Abstract no: A1069.

Williams 1980 *{published data only}*

Williams RM, Thom MH, Studd JWW. A study of the benefits and acceptability of ambulation in spontaneous labour. *British Journal of Obstetrics and Gynaecology* 1980;**87**:122-6.

References to studies excluded from this review

Ahmed 1985 *{published data only}*

Ahmed LT, Bouchetara K. The influence of maternal position on duration of labor [abstract]. *Archives of Gynecology* 1985;**237 Suppl**:9.

Allahbadia 1992 *{published data only}*

Allahbadia GN, Vaidya PR. Why deliver in the supine position?. *Australian and New Zealand Journal of Obstetrics and Gynaecology* 1992;**32**(2):104-6.

Asselineau 1996 *{published data only}*

Asselineau D. Does ambulation under epidural analgesia during labour modify foetal extraction conditions? [La deambulation sous peridurale lors du travail modifie-t-elle les conditions d'extraction foetale?]. *Contraception, Fertilité, Sexualité* 1996;**24**(6):505-8.

Caldeyro-Barcia 1960 *{published data only}*

Caldeyro-Barcia R, Noriega-Guerra L, Cibils LA, Alvarez H, Poseiro JJ, Pose SV, et al. Effect of position changes on the intensity and frequency of uterine contractions during labor. *American Journal of Obstetrics and Gynecology* 1960;**80**(2):284-90.

Cobo 1968 *{published data only}*

Cobo E, De Bernal MM, Quintero CA, Cuadrado E. Neurohypophyseal hormone release in the human. III. Experimental study during labor. *American Journal of Obstetrics and Gynecology* 1968;**101**:479-89.

Cohen 2002 *{published data only}*

Cohen S, Ayers C, Zada Y, Trnovski S, Burley E, Maestrado P. A comparison of continuous epidural-PCA analgesia for labor pain with or without maternal ambulation [abstract]. *Anesthesia & Analgesia* 2002;**94**(2S):Abstract no: S195.

COMET 2001 *{published data only}*

COMET Study Group. The comparative obstetric mobile epidural trial (C.O.M.E.T.). Ambulatory epidural analgesia, delivery mode and pain relief: a randomized controlled trial. The C.O.M.E.T.

Study Group. [abstract]. *European Journal of Anaesthesiology* 2000;**17**:782-3.

COMET Study Group. The comparative obstetric mobile epidural trial. Ambulatory epidural analgesia, delivery mode and pain relief: a randomised controlled trial [abstract]. *Anesthesiology* 2000;**92 Suppl**:Abstract no: A21.

COMET Study Group, Wilson MJ. A randomised controlled trial comparing traditional with two "mobile" epidural techniques: effect on urinary catheterisation in labor [abstract]. *Anesthesiology* 2002;**96**(Suppl 1):Abstract no: Z2.

* Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK. Effect of low-dose mobile versus traditional epidural techniques on mode of delivery: a randomised controlled trial. *Lancet* 2001;**358**(9275):19-23.

Cooper GM, MacArthur C, Wilson MJ, Moore PA, Shennan A, on behalf of the COMET Study Group UK. Satisfaction, control and pain relief: short- and long-term assessments in a randomised controlled trial of low-dose and traditional epidurals and a non-epidural comparison group. *International Journal of Obstetric Anesthesia* 2010;**19**(1):31-7.

Duhig K, MacArthur C, Shennan AH, The COMET Study Group. The hypotensive and fetal heart rate response to low dose epidurals: analysis of an RCT data set [abstract]. *Journal of Obstetrics and Gynaecology* 2007;**27**(Suppl 1):S63-S64.

Elton C, Bharmal S, May AE, COMET Study Group. Does walking in labour with regional blockade affect the mode of delivery? [abstract]. *International Journal of Obstetric Anesthesia* 2002;**11 Suppl**:33.

Hussain for the COMET Study Group. Haemodynamic changes with 'mobile' epidurals in labour: is it safe for women to ambulate? [abstract]. *Anesthesiology* 2001;**94**(1A):Abstract no: A63.

Shennan AH, COMET Study Group. The effect of low-dose 'mobile' compared with traditional epidural techniques on mode of delivery: a randomised controlled trial [abstract]. *Journal of Obstetrics and Gynaecology* 2001;**21 Suppl 1**:S19.

Wilson MJ, COMET Study Group. The comparative obstetric mobile epidural trial (C.O.M.E.T.). A randomized controlled trial [abstract]. *British Journal of Anaesthesia* 2001;**87**(4):659P.

Wilson MJ, Cooper G, MacArthur C, Shennan A, Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK. Randomized controlled trial comparing traditional with two "mobile" epidural techniques: anesthetic and analgesic efficacy. *Anesthesiology* 2002;**97**(6):1567-75.

Wilson MJ, MacArthur C, Cooper GM, Bick D, Moore PA, Shennan A, et al. Epidural analgesia and breastfeeding: a randomised controlled trial of epidural techniques with and without fentanyl and a non-epidural comparison group. *Anaesthesia* 2010;**65**(2):145-53.

Wilson MJ, MacArthur C, Cooper GM, Shennan A, for the COMET Study Group UK. Ambulation in labour and delivery mode: a randomised controlled trial of high-dose vs mobile epidural analgesia. *Anaesthesia* 2009; **64**(3):266-72.

Wilson MJ, Macarthur C, Shennan A, on behalf of the COMET Study Group (UK). Urinary catheterization in labour with high-dose vs mobile epidural analgesia: a randomized controlled trial. *British Journal of Anaesthesia* 2009;**102**(1):97-103.

Danilenko-Dixon 1996 *{published data only}*

Danilenko-Dixon DR, Tefft L, Cohen RA, Haydon B, Carpenter MW. Positional effects on maternal cardiac output during labor with epidural analgesia. *American Journal of Obstetrics and Gynecology* 1996;**175**:867-72.

Delgado-Garcia 2012 *{published data only}*

Delgado-Garcia BE, Orts-Cortes MI, Poveda-Bernabeu A, Caballero-Perez P. [Randomised controlled clinical trial to determine the effects of the use of birth balls during labour]. [Spanish]. *Enfermeria Clinica* 2012;**22**(1):35-40.

Diaz 1980 *{published data only}*

Diaz AG, Schwarcz R, Fescina R, Caldeyro-Barcia R. Vertical position during the first stage of the course of labor, and neonatal outcome. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 1980;**11**(1):1-7.

Divon 1985 *{published data only}*

Divon MY, Mushkat Y, Sarna Z, Zimmer EZ, Vilensky A, Paldi E. The association between fetal heart rate patterns and maternal posture during labor. *Archives of Gynecology* 1985;**237**(Suppl 1):89.

Ducloy-Bouthors 2006 *{published data only}*

Ducloy-Bouthors AS, De Gasquet B, Davette M, Cuisse M. Maternal postures and epidural analgesia during labour [Postures maternelles pendant le travail: description et interference avec l'analgesie peridurale]. *Annales Françaises d'Anesthesie et de Reanimation* 2006;**25**(6):605-8.

Hemminki 1983 *{published data only}*

Hemminki E, Saarikoski S. Ambulation and delayed amniotomy in the first stage of labor. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 1983;**15**:129-39.

Hemminki 1985 *{published data only}*

Hemminki E, Lenck M, Saarikoski S, Henriksson L. Ambulation versus oxytocin in protracted labour: a pilot study. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 1985;**20**:199-208.

Hodnett 1982 *{published data only}*

Hodnett ED. Patient control during labor: effects of two types of fetal monitors. *Journal of Obstetric, Gynecologic and Neonatal Nursing* 1982;**2**:94-9.

Li 2010 *{published data only}*

Li J, Ma QL, Chen RX, Li HN, Zhang HY. Effect of different pre-labor positions for premature rupture of membranes with vertex and engaged presentation on the maternal and neonatal outcomes. *Chinese Journal of Evidence-Based Medicine* 2010;**10**(12):1415-8.

Liu 1989 *{published data only}*

Liu, Y. The effects of the upright position during childbirth. *Image: Journal of Nursing Scholarship* 1989;**21**(1):14-8.

McCormick 2007 *{published data only}*

McCormick C. A randomised controlled trial of the effect of ambulation in the first stage of labour in terms of duration of labour of women with a previous caesarean section. controlled-trials.com (accessed 21 June 2007).

Melzack 1991 *{published data only}*

Melzack R, Belanger E, Lacroix R. Labor pain: effect of maternal position on front and back pain. *Journal of Pain and Symptom Management* 1991;**6**(8):476-80.

Molina 1997 *{published data only}*

Molina FJ, Sola PA, Lopez E, Pires C. Pain in the first stage of labor: relationship with the patient's position. *Journal of Pain and Symptom Management* 1997;**13**:98-103.

Radkey 1991 *{published data only}*

Radkey AL, Liston RM, Scott KE, Young C. Squatting: preventive medicine in childbirth?. Proceedings of Annual Meeting of Society of Obstetricians and Gynaecologists of Canada; 1991; Toronto, Ontario, Canada. 1991:76.

Read 1981 *{published data only}*

Read JA, Miller FC, Paul RH. Randomized trial of ambulation vs oxytocin for labor enhancement: a preliminary report. *American Journal of Obstetrics and Gynecology* 1981;**139**:669-72.

Roberts 1984 *{published data only}*

Roberts JE, Mendez-Bauer C, Blackwell J, Carpenter ME, Marchese T. Effects of lateral recumbency and sitting on the first stage of labor. *Journal of Reproductive Medicine* 1984;**29**(7):477-81.

Schmidt 2001 *{published data only}*

Schmidt S, Sierra F, Hess C, Neubauer S, Kuhnert M, Heller G. Effect of modified labor posture on oxygenation of the fetus--a pulse oximetry study. *Zeitschrift fur Geburtshilfe und Neonatologie* 2001;**205**:49-53.

Schneider-Affeld 1982 *{published data only}*

Schneider-Affeld F, Martin K. Delivery from a sitting position. *Journal of Perinatal Medicine* 1982;**2 Suppl**:70-1.

Selby 2012 *{published data only}*

Selby C, Valencia S, Garcia L, Keep D, Overcash J, Jackson J. Activity level during a one-hour labor check evaluation: walking versus bed rest. *MCN, American Journal of Maternal Child Nursing* 2012;**37**(2):101-7.

Solano 1982 *{published data only}*

Solano F, Gallo M, Llamas C, Requena F, Arbues J. Perinatal effects of the maternal vertical position during dilatation period of the delivery. Effects on the mother-child couple [Efectos perinatales de la posición vertical materna durante el período de dilatación de parto. Efectos sobre el binomio madre-hijo]. *Acta Obstétrica y Ginecológica Hispano-Lusitana* 1982;**30**:81-104.

Stewart 1983 *{published data only}*

Hillan EM. The birthing chair trial. Research and the Midwife Conference; 1984; Manchester, UK. 1984:22-37.

Stewart P, Hillan E, Calder A. A study of the benefits of maternal ambulation during labour and the use of a birth chair for delivery. Proceedings of 8th European Congress of Perinatal Medicine; 1982 Sept 7-10; Brussels, Belgium. 1982:113.

* Stewart P, Hillan E, Calder AA. A randomised trial to evaluate the use of a birth chair for delivery. Lancet 1983; Vol. 1:1296-8.

Tussey 2011 *{published data only}*

Tussey C, Botsios E. Use of a labor ball to decrease the length of labor in patients who receive an epidural. *JOGNN: Journal of Obstetric, Gynecologic & Neonatal Nursing* 2011;**40**:S105-6.

Weiniger 2009 *{published data only}*

Weiniger CF, Yaghmour H, Nadjari M, Einav S, Elchalal U, Ginosar Y, et al. Walking reduces the post-void residual volume in parturients with epidural analgesia for labor: a randomized-controlled study. *Acta Anaesthesiologica Scandinavica* 2009;**53**(5):665-72.

Wilson 2011 *{published data only}*

Wilson MJA, Moore PAS, Shennan A, Lancashire RJ, MacArthur C. Long-term effects of epidural analgesia in labor: a randomized controlled trial comparing high dose with two mobile techniques. *Birth* 2011;**38**(2):105-10.

Wu 2001 *{published data only}*

Wu X, Fan L, Wang Q. Correction of occipito-posterior by maternal postures during the process of labor. [Chinese]. *Chung-Hua Fu Chan Ko Tsa Chih [Chinese Journal of Obstetrics & Gynecology]* 2001;**36**(8):468-9.

Additional references

Abitbol 1985

Abitbol MM. Supine position in labor and associated fetal heart rate changes. *Obstetrics and Gynecology* 1985;**65**(4):481-6.

Albers 1997

Albers LL, Anderson D, Cragin L, Daniels SM, Hunter C, Sedler KD, et al. The relationship of ambulation in labor to operative delivery. *Journal of Nurse Midwifery* 1997;**42**(1):4-8.

Anim-Somuah 2011

Anim-Somuah M, Smyth RMD, Jones L. Epidural versus non-epidural or no analgesia in labour. *Cochrane Database of Systematic Reviews* 2011, Issue 12. [DOI: 10.1002/14651858.CD000331.pub3]

Boyle 2000

Boyle M. Childbirth in bed: the historical perspective. *Practising Midwife* 2000;**3**(11):21-4.

Broadhurst 1979

Broadhurst A, Flynn AM, Kelly J, Lynch PF. The effect of ambulation in labour on maternal satisfaction, analgesia and lactation. Proceedings of 5th International Congress

on Psychosomatic Medicine in Obstetrics and Gynaecology, "Emotion and Reproduction";1977 Nov 13-19; Rome, Italy. 1979:943-6.

Carlson 1986

Carlson JM, Diehl JA, Sachtleben-Murray M, McRae M, Fenwick L, Friedman EA. Maternal position during parturition in normal labor. *Obstetrics & Gynecology* 1986;**68**(4):443-7.

Cluett 2009

Cluett ER, Burns E. Immersion in water in labour and birth. *Cochrane Database of Systematic Reviews* 2009, Issue 2. [DOI: 10.1002/14651858.CD000111.pub3]

Cyna 2006

Cyna AM, Andrew M, Emmett RS, Middleton P, Simmons SW. Techniques for preventing hypotension during spinal anaesthesia for caesarean section. *Cochrane Database of Systematic Reviews* 2006, Issue 4. [DOI: 10.1002/14651858.CD002251.pub2]

Fenwick 1987

Fenwick L, Simkin P. Maternal positioning to prevent or alleviate dystocia in labor. *Clinical Obstetrics and Gynecology* 1987;**30**(1):83-9.

Gates 2005

Gates S. Methodological Guidelines. In: The Editorial Team. Pregnancy and Childbirth Group. About the Cochrane Collaboration (Collaborative Review Groups (CRGs)) 2005, Issue 2.

Goer 1999

Goer H. Does walking enhance labor progress?. *Birth* 1999;**26**(2):127-9.

Gupta 2000

Gupta JK, Nikoderm C. Maternal posture in labour. *European Journal of Obstetrics, Gynecology and Reproductive Biology* 2000;**92**(2):273-7.

Gupta 2012

Gupta JK, Hofmeyr GJ, Shehmar M. Position in the second stage of labour for women without epidural anaesthesia. *Cochrane Database of Systematic Reviews* 2012, Issue 5. [DOI: 10.1002/14651858.CD002006.pub3]

Higgins 2011

Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated 2011]. The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org.

Hodnett 2012

Hodnett ED, Gates S, Hofmeyr GJ, Sakala C. Continuous support for women during childbirth. *Cochrane Database of Systematic Reviews* 2012, Issue 10. [DOI: 10.1002/14651858.CD003766.pub4]

Hollins Martin 2013

Hollins Martin CJ, Martin CR. A narrative review of maternal physical activity during labour and its effects upon length of first stage. *Complementary Therapies in Clinical Practice* 2013;**19**:44-9.

Hunter 2007

Hunter S, Hofmeyr GJ, Kullier R. Hands and knees posture in late pregnancy or labour for fetal malpresentation (lateral or posterior). *Cochrane Database of Systematic Reviews* 2007, Issue 3. [DOI: 10.1002/14651858.CD001063.pub3]

Huovinen 1979

Huovinen K, Teramo K. Effect of maternal position on fetal heart rate during extradural analgesia. *British Journal of Anaesthesia* 1979;**51**(8):767-73.

Jones 2012

Jones L, Othman M, Dowswell T, Alfirevic Z, Gates S, Newburn M, et al. Pain management for women in labour: an overview of systematic reviews. *Cochrane Database of Systematic Reviews* 2012, Issue 3. [DOI: 10.1002/14651858.CD009234.pub2]

Kemp 2013

Kemp E, Kingswood CJ, Kibuka M, Thornton JG. Position in the second stage of labour for women with epidural anaesthesia. *Cochrane Database of Systematic Reviews* 2013, Issue 1. [DOI: 10.1002/14651858.CD008070.pub2]

Lupe 1986

Lupe PJ, Gross TL. Maternal upright posture and mobility in labor: a review. *Obstetrics & Gynecology* 1986;**67**(5):727-34.

Marx 1982

Marx G. Hazards of the supine position in pregnancy. *Clinics in Obstetrics and Gynaecology* 1982;**9**(2):255-71.

McNabb 1989

McNabb M. The science of Labour?. *Nursing Times* 1989;**85**(9):58-9.

Mendez-Bauer 1980

Mendez-Bauer C, Arroyo J, Freese U, Garcia-Ramos C, Hundsdorfer P, Izquierdo F, et al. The dynamics of labor in different positions. 7th European Congress Perinatal Medicine; 1980 Sept 14-17; Barcelona, Spain. 1980.

RevMan 2008 [Computer program]

The Cochrane Collaboration. Review Manager (RevMan). Version 5.0. Copenhagen, The Nordic Cochrane Centre: The Cochrane Collaboration, 2008.

RevMan 2012 [Computer program]

The Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager (RevMan). Version 5.2. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2012.

Roberts 1980

Roberts JE, Mendez-Bauer C. A perspective of maternal position during labor. *Journal of Perinatal Medcine* 1980;**8**:255-64.

Roberts 1983

Roberts JE, Mendez-Bauer C, Wodell DA. The effects of maternal position on uterine contractility and efficiency. *Birth* 1983;**10**(4):243-9.

Roberts 1989

Roberts J. Maternal position during the first stage of labour. In: Chalmers I, Enkin M, Keirse MJN editor(s). Effective Care in Pregnancy and Childbirth. Vol. **2**, Oxford: Oxford University Press, 1989:883-92.

Rooks 1999

Rooks JP. Evidence-based practice and its application to childbirth care for low-risk women. *Journal of Nurse Midwifery* 1999;**44**(4):355-69.

Simkin 1989

Simkin P. Non-pharmacological methods of pain relief during labour. In: Chalmers I, Enkin M, Keirse MJN editor(s). Effective Care in Pregnancy and Childbirth. Vol. **2**, Oxford: Oxford University Press, 1989:893-911.

Simkin 2002

Simkin P, Hara M. Nonpharmacological relief of pain during labor: systematic reviews of five methods. *American Journal of Obstetrics and Gynecology* 2002;**186**(5):5131-59.

Simmons 2012

Simmons SW, Taghizadeh N, Dennis AT, Hughes D, Cyna AM. Combined spinal-epidural versus epidural analgesia in labour. *Cochrane Database of Systematic Reviews* 2012, Issue 10. [DOI: 10.1002/14651858.CD003401.pub3]

Stacey 2011

Stacey T, Thompson JMD, Mitchell EA, Ekeroma AJ, Zuccollo JM, McCowan LME. Association between maternal sleep practices and risk of late stillbirth: a case-control study. *BMJ* 2011;**342**:d3403.

Stewart 1989

Stewart P, Spilby H. Posture in labour. *British Journal of Obstetrics and Gynaecology* 1989;**96**:1258-60.

Ueland 1969

Ueland K. Maternal cardiovascular dynamics. II posture and uterine contractions. *American Journal of Obstetrics and Gynecology* 1969;**103**:1-8.

Walsh 2000

Walsh D. Part five: why we should reject the 'bed birth' myth. *British Journal of Midwifery* 2000;**8**(9):554-8.

References to other published versions of this review

Lawrence 2009

Lawrence A, Lewis L, Hofmeyr GJ, Dowswell T, Styles C. Maternal positions and mobility during first stage labour. *Cochrane Database of Systematic Reviews* 2009, Issue 2. [DOI: 10.1002/14651858.CD003934.pub2]

Lewis 2002

Lewis L, Webster J, Carter A, McVeigh CCM, Devenish-Meares PPDM. Maternal positions and mobility during first stage labour. *Cochrane Database of Systematic Reviews* 2002, Issue 4. [DOI: 10.1002/14651858.CD003934]

* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Andrews 1990

Methods	Randomised trial: using a convenience sample over a 3-month period.
Participants	40 women, Cleveland, U.S.A. • 20 study participants: nulliparous • 20 control participants nulliparous Inclusion Criteria: *Parity:* nulliparous, *Plurality:* single vertex fetus in an anterior position, *Gestation:* 38 to 42 weeks *Onset of labour:* spontaneous *Other:* medically uncomplicated pregnancies; adequate pelvic measurements; intact amniotic membranes at the beginning of the maximum slope in their labour (4 to 9 cm dilatation).

Andrews 1990 *(Continued)*

Interventions	**Study group:** • 20 women - upright: standing, ambulating, sitting, squatting, or kneeling. 15 women chose to lie down after receiving medication for rest: 5 of these women immediately returned to the upright position, stating that the contractions were more painful when they were lying down. The remaining 10 chose the lateral position to rest for up to 1 hour during the study period. **Control group:** • 20 women - recumbent: supine, lateral, or prone - hands and knees. All women: - position assumed when cervical dilatation was from 4 to 9 cm, - were free to choose several variations within each position group. - were free to assume positions from the other group for routines of care or rest, these activities were documented.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Maternal Comfort. 3. Analgesia amount. **Neonatal Outcomes:** Nil
Notes	1. The length of maximum slope in labour was recorded. This is a subdivision of the first stage of labour, during which rapid cervical dilatation takes place (from 4 to 9 cm). The duration of the first stage was determined by the first recorded time that cervical dilatation was assessed to be 4 cm and on the first recorded time that dilatation was assessed to be 9 cm. 2. The Maternal Comfort Assessment Tool was used. The tool estimates the level of maternal comfort by measuring focus of attention; eye contact during contractions; breathing pattern and vocal behaviour during contractions; muscle tension and activity during contractions; and verbalisations regarding ability to continue with labour. In addition, vital signs; degree of cervical dilatation; duration, frequency, and intensity of contractions; medications; and use of monitoring apparatus were recorded. When the scores for each category of observable behaviour in the tool are added, the highest possible comfort score for each contraction was 14 and the lowest was 0. Comfort scores for a series of 3 contractions were recorded on an hourly basis during the phase of maximum slope, and averaged for mean hourly comfort scores. Hourly comfort scores where then average to obtain an overall mean comfort score for each woman. 3. The amount of narcotic and other analgesia. The randomisation method is unclear. Women in the recumbent position were monitored externally more often (n = 13) than women in the upright position (n = 1), which may have been an additional source of discomfort for women in the recumbent group. Apgar scores were not included as outcome measures because only a mean Apgar at 1 minute for each group was provided.

Risk of bias

Bias	Authors' judgement	Support for judgement

Andrews 1990 *(Continued)*

Random sequence generation (selection bias)	Unclear risk	Described as 'randomly assigned'.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Ben Regaya 2010

Methods	Randomised trial
Participants	200 women, Sousse, Tunisia. • 100 study participants: nulliparous • 100 control participants: nulliparous Inclusion Criteria: *Parity:* nulliparous, *Pluralty:* singleton, *Gestation:* term, *Onset of labour:* spontaneous *Other:* less than 4 cm dilatation; cephalic presentation; no pathological antecedents; absence of fetal compromise; normal maternal examination; eligible for vaginal birth; consenting to participate.
Interventions	**Study group:** • 100 women - authorised to ambulate until 6 cm of cervical dilatation. **Control group:** • 100 women - confined to bed in dorsal or lateral recumbence
Outcomes	**Maternal Outcomes:** 1. Duration of first stage labour.

Ben Regaya 2010 *(Continued)*

	2. Mode of birth. 3. Maternal pain. 4. Duration of second stage labour. 5. Estimated blood loss > 500 mL. 6. Perineal trauma. **Neonatal Outcomes:** 1. Admission to NICU
Notes	1. Duration of first stage of labour: no standard deviation reported. Standard deviation calculated using the weighted average standard deviation reported for nulliparous women. Unable to extract data for oxytocic use or Apgar scores - only mean scores provided.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not stated.
Allocation concealment (selection bias)	Low risk	Sequentially numbered sealed envelopes.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Bloom 1998

Methods	Randomised trial: over a 12-month period.
Participants	1067 women, Dallas, U.S.A. • 536 study participants: 272 primigravidae, 264 multigravida • 531 control participants: 272 primigravidae, 259 multigravida Inclusion Criteria: *Parity:* mixed,

Bloom 1998 *(Continued)*

	Plurality: not stated, *Gestation:* between 36 and 41 weeks, *Onset of labour:* spontaneous, *Other:* cervical dilatation of 3 to 5 cm; in active labour; fetuses in cephalic presentation; uncomplicated pregnancies.
Interventions	**Study group:** • 536 women assigned to walking (walking as desired). Women were encouraged to walk but were instructed to return to their beds when they needed intravenous or epidural analgesia or when the second stage of labour began. Nurses recorded the number of minutes spent walking. If continuous electronic fetal heart rate monitoring was required, further walking was prohibited. Of the 536 women assigned to the walking group: 380 actually walked; 30 had incomplete walking records; 8 had advanced cervical dilatation at the time of randomisation; and 2 had a fetus with unrecognised breech presentation. **Control group:** • 531 women assigned to labour in bed (usual care - confined to a labour bed). Women were permitted to assume their choice of supine, lateral or sitting positions during labour. All women: - routine surveillance using handheld a Doppler device was conducted every 30 mins. - continuous electronic fetal heart rate monitoring was used for: fetal heart-rate abnormalities; meconium in the amniotic fluid; women in whom labour was augmented by the administration of oxytocin. - pelvic examinations were performed approximately every 3 hours: ineffective labour was suspected if the cervix did not dilate progressively during the first two hours after admission. - amniotomy was performed if the fetal membranes were intact, - labour was augmented by intravenous oxytocin (initial dose 6 mU per min, increased every 40 mins by 6 mU per min to a maximum of 42 mU per min if a woman had hypotonic uterine contractions, and no further cervical dilatation after an additional 2-3 hours. - Dystocia was diagnosed if labour had not progressed in 2-4 hours. - positions permitted during birth included the lateral (Sims') position and the dorsal-lithotomy position, with or without obstetrical stirrups. - all women wore pedometers
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Maternal pain. 4. Analgesia type. 5. Duration of second stage of labour. 6. Augmentation of labour using oxytocin. 7. Perineal trauma. **Neonatal Outcomes:** 1. Fetal distress.

Bloom 1998 *(Continued)*

2. Use of neonatal mechanical ventilation.
3. Apgar scores.
4. Perinatal mortality.

Notes	Limitations of the protocol: inability to mask walking; inability to extrapolate results to women with pregnancy complications, higher rates of caesarean birth or epidural analgesia; lack of objective methods to gauge maternal satisfaction with either walking or lying down during labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Described as 'randomly assigned'.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear

Boyle 2002

Methods	Randomisation was achieved by the use of sequentially numbered sealed envelopes. A computer-generated random number sequence was used.
Participants	409 women, Hertfordshire, U.K. • 199 study participants:145 primigravidae, 54 multigravida • 210 control participants:151 primigravidae, 59 multigravida Inclusion Criteria: *Parity:* mixed, *Pluralty:* not stated, *Gestation:* greater than 34 weeks, *Onset of labour:* spontaneous and induction of labour,

Boyle 2002 *(Continued)*

	Other: cervical dilatation of 3 to 5 cm; in active labour; fetuses in cephalic presentation; uncomplicated pregnancies; women who chose to use a CSE between August 1st 1999 to December 31st 2000. Exclusion Criteria: women who were physically unable to ambulate or could not understand English.
Interventions	**Study group:** • 199 women were assigned to the ambulant group Women in the experimental group were encouraged to ambulate for at least 15 mins in each hour. Midwives used a modified Bromage scale in order to assess maternal mobility after the CSE had been cited and prior to ambulation. The mean time of ambulation in the ambulant group was only 8.74 to 9.55 mins. 69 out of 199 women (34%) underwent induction of labour. **Control group:** • 210 women were assigned to the non-ambulant group Women in the control group received normal care in labour. 51 out of 210 (24%) women underwent induction of labour. All women: - pain was assessed with a visual analogue pain score.
Outcomes	**Maternal Outcomes:** 1. Mode of Birth 2. Analgesia Amount **Neonatal Outcomes:** Nil
Notes	No durations of labour times, but author stated "there was no difference". Mode of birth data totals differ from demographic data totals. Apgar scores reported as means, therefore unable to be used. Pooled data used from nulliparous and multiparous total dose of analgesia.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random number sequence.
Allocation concealment (selection bias)	Low risk	Sequentially numbered sealed envelopes.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias)	High risk	Not feasible.

Boyle 2002 *(Continued)*

Clinical staff		
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Bundsen 1982

Methods	Randomised trial of women undergoing induction of labour.
Participants	60 women, Goteborg, Sweden. • 40 study participants: mixed parity • 20 control participants: mixed parity Inclusion Criteria: *Parity:* mixed, *Pluralty:* not stated, *Gestation:* not stated, *Onset of labour:* induced, *Other:* nil stated.
Interventions	**Study group:** • 40 women were assigned to ambulation (telemetry). 20 women were assigned to receive telemetry and transcutaneous electrical nerve stimulation (TNS), and 20 women were assigned to receive telemetry without TNS. **Control group:** • 20 women were assigned to bed care, with conventional monitoring in bed. All women: - primary amniotomy, - internal monitoring.
Outcomes	**Maternal Outcomes:** 1. Mode of birth. 2. Artificial rupture of membranes **Neonatal Outcomes:** Nil

Bundsen 1982 *(Continued)*

Notes	Insufficient data to include total duration of labour (reported as 8 hours for primiparae and 4 hours for multipara in the study group; and 10 hours for primiparae and 6 hours for multipara in the control group).

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Described as 'randomisation to three groups'.
Allocation concealment (selection bias)	Unclear risk	Not stated
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No stated losses to follow-up.
Selective reporting (reporting bias)	High risk	Claimed evidence of an outcome with little or no data to support it.

Calvert 1982

Methods	Quasi-randomised trial. Patients were randomly allocated based on whether the final digit of their hospital number was odd or even.
Participants	200 women, Cardiff, U.K. • 100 study participants: 56 primigravidae, 44 multigravida • 100 control participants: 50 primigravidae, 50 multigravida Inclusion Criteria: *Parity:* mixed, *Pluralty:* singleton, *Gestation:* term (at least 37 weeks' gestation), *Onset of labour:* spontaneous, *Other:* vertex presentation; uterine contractions occurring at least every 10 mins; cervix at least 2.5 cm dilated; no contraindication to vaginal birth.

Calvert 1982 *(Continued)*

	Exclusion criteria - women who had previously suffered a stillbirth or neonatal death or who had undergone a caesarean birth.
Interventions	**Study group:** • 100 women were assigned to telemetry Women were advised that they could get of bed to walk, sit in an easy chair or use the day room. Only 45 women actually got out of bed. They remained out of bed between 3 mins, and 4 hours and 20 mins. The average time out of bed was 1 hour and 44 mins. 34 of those who left their beds initially, elected to stay in bed by the time they reached a cervical dilatation of 7 cm. **Control group:** • 100 women were assigned to bed care and conventional bedside cardiotocography. All patients in bed were nursed in the lateral position or with a lateral tilt.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Maternal pain. 4. Maternal anxiety. 5. Analgesia type. 6. Duration of second stage. **Neonatal Outcomes:** 1. Apgar scores.
Notes	3. Within 24 hours of birth all patients were asked to complete a questionnaire to express their experience of pain, anxiety, comfort and restriction of mobility during the first stage of labour and the degree of induced anxiety or reassurance attributed to the monitor. Assessment was based on linear analogue scales. A score of 0 indicated nil and the score 100 indicated the maximum imaginable. 5. Duration of second stage only given for those who delivered spontaneously.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Described as 'Final digit of hospital number (odd or even)'.
Allocation concealment (selection bias)	High risk	Described as 'Final digit of hospital number (odd or even)'.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.

Calvert 1982 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Chan 1963

Methods	Quasi-randomised trial.
Participants	200 women, Hong Kong. • 100 study participants: primigravidae. • 100 control participants: primigravidae. Inclusion Criteria: *Parity:* primigravidae, *Pluralty:* not stated, *Gestation:* not stated, *Onset of labour:* not stated, *Other:* nil stated. Exclusion criteria - planned elective caesarean birth.
Interventions	**Study group:** • 100 women were kept in the erect position (sit or walk). **Control group:** • 100 women were kept in a supine or lateral position.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Maternal pain. 4. Analgesia type. 5. Duration of second stage of labour. **Neonatal Outcomes:** 1. Fetal distress. 2. Perinatal mortality.
Notes	1. Duration of first stage of labour: no standard deviation or P values reported. Standard deviation calculated using the weighted average standard deviation reported for nulliparous women. Summary totals exclude number of L.S.C.S. cases. 2. Assisted breech births (2 upright, 4 recumbent) not included in spontaneous vaginal, operative vaginal or caesarean birth summary totals.

Chan 1963 *(Continued)*

5. Duration of second stage of labour: no standard deviation or P values reported. Standard deviation calculated using the weighted average standard deviation reported. Summary totals exclude number of L.S.C.S. cases.

6. The summary total included one set of twins.

7. The summary total included one set of twins.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Alternate group allocation.
Allocation concealment (selection bias)	High risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Chen 1987

Methods	Quasi-randomised trial: over a 2.5 year period.
Participants	185 women, Oita, Japan. • 61 study participants: 33 primigravidae, 28 multigravida • 124 control participants: 68 primigravidae, 56 multigravida Inclusion Criteria: *Parity:* mixed, *Pluralty:* singleton, *Gestation:* full term, *Onset of labour:* spontaneous, *Other:* cephalic presentation; uneventful pregnancies.

Chen 1987 *(Continued)*

	Exclusion criteria - women received oxytocin augmentation; caesarean birth due to cephalo-pelvic disproportion or fetal distress; women requested and received epidural anaesthesia; child with congenital anomalies; tococardiogram records were unsuitable for reading (n = 67 exclusions after group allocation).
Interventions	**Study group:** • 41 women were free to assume any comfortable position in home-like part of obstetric unit (furnished with desk, chair, sofa but no bed)(sitting) . Most sat on a sofa (back of sofa at 65 degree angle from horizontal) with their knees flexed. When each woman's cervix became fully dilated, she was transferred to a birthing chair. There were 20 post-randomisation exclusions from the study group. Reasons for exclusion included: oxytocin augmentation (n = 2); caesarean birth due to CPD (n = 2); caesarean birth due to fetal distress (n=3); epidural anaesthesia (n = 3); fetal anomaly (n = 1); unsatisfactory TCG record (n = 9). **Control group:** • 75 women were assigned to maintain a dorsal or lateral recumbent position (supine): 32 women were assigned to a supine position in the first stage of labour and the birthing chair in the second stage of labour; 43 women were allocated to maintain a supine position throughout labour. There were 49 post-randomisation exclusions from the control group: Reasons for exclusion included: oxytocin augmentation (n = 13); caesarean birth due to CPD (n = 8); caesarean birth due to fetal distress (n = 2); epidural anaesthesia (n = 9); fetal anomaly (n = 3); unsatisfactory TCG record (n = 14). All women: - no analgesia or anaesthesia was used except for pudendal nerve block or perineal infiltration of xylocaine. - amniotomy was performed when cervical dilatation reached 3 to 4 cm.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Analgesia type. 4. Duration of second stage of labour. 5. Augmentation of labour using oxytocin. 6. Artificial rupture of membranes. **Neonatal Outcomes:** 1. Fetal distress requiring immediate birth.
Notes	1. Duration recorded from 5 to 10 cm dilation only. Pooled data used from nulliparous and multiparous durations of first stage labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Described as 'Allocated following the order of their admission into the study'.
Allocation concealment (selection bias)	High risk	

Chen 1987 *(Continued)*

Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	High risk	67 participants were excluded after group allocation (37%). Some of the reasons for exclusion are unlikely to have related to the intervention (e.g. children born with congenital abnormalities) but other reasons may have related to group allocation (e.g. oxytocin augmentation, caesarean for fetal distress).
Selective reporting (reporting bias)	Unclear risk	Unclear

Collis 1999

Methods	Randomised trial of women receiving a CSE
Participants	229 women, London, U.K. • 110 study participants: nulliparous • 119 control participants: nulliparous Inclusion Criteria: *Parity:* nulliparous, *Pluralty:* singleton, *Gestation:* 36 to 42 weeks, *Onset of labour:* spontaneous or induced, *Other:* cephalic presentation; requested regional analgesia (given CSE); no other pregnancy complications.
Interventions	**Study group:** • 110 women were encouraged to spend at least 20 mins of each hour out of bed - walking, standing, sitting in a rocking chair. 51 women achieved at least 30% of time out of bed, 15 women spent no time out of bed, 44 spent 1 to 29%, 32 spent 30% to 59% and 19 women spent > 60% of time out of bed. Reasons for not ambulating: 16 women developed motor block, 25 mothers were fatigued, 10 women were following instructions of the midwife. **Control group:** • 119 women were encouraged to stay in bed - sitting up in bed or lying on either side. 16 women got out of bed: 15 between 1% to 29% of the time and 1 between 30% to 59% of the time. Reasons for ambulating: to pass urine.

Collis 1999 *(Continued)*

	All women: - continuous fetal monitoring, - 500-1000 mL Hartmann's solution infused as a preload, - CSE - 27-G Becton-Dickinson Whitacre 119 mm spinal needle and 16-G Tuohy needle' - long spinal needle inserted through Tuohy needle into cerebrospinal fluid (needle-through-needle CSE), - Subarachnoid injection of 25 g fentanyl and 2.5 mg bupivacaine - Labours were managed according to the department's standard practice (cervical dilatation was assessed every 3 hours and if dilatation had not increased by 2 cm, amniotomy was performed. If the membranes were intact, this was followed 2 hours later (if progress of labour was still inadequate) by augmentation of labour with oxytocin. If the membranes were ruptured and inadequate progress of labour was noted, then oxytocin was started without waiting for another 2 hours. - The mothers were allowed up to 2 hours in the second stage of labour. If at the end of the second hour, birth was not imminent, instrumental birth was performed.
Outcomes	**Maternal Outcomes:** 1. Mode of birth. 2. Analgesia amount. 3. Augmentation of labour using oxytocin. **Neonatal Outcomes:** 1. Apgar scores.
Notes	Duration was recorded as the time between epidural insertion (highly variable) and birth (end of second stage). It was therefore not used as a comparable duration of first stage of labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not stated.
Allocation concealment (selection bias)	Low risk	Described as 'sealed opaque numbered envelopes'.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	Unclear risk	Described as 'Obstetrician was not aware which group the mother was in'.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.

Collis 1999 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	Unclear.

Fernando 1994

Methods	Randomised trial of women receiving a CSE.
Participants	40 women, London, U.K. • 20 study participants: nulliparous • 20 control participants: nulliparous Inclusion Criteria: *Parity:* nulliparous, *Plurality:* not stated, *Gestation:* not stated, *Onset of labour:* not stated, *Other:* requesting regional analgesia.
Interventions	**Study group:** • 20 women were allocated to be out of bed (sitting in rocking chair, stand by bed, walk about). **Control group:** • 20 women were allocated to staying in bed. All women: - spinal injection of bupivacaine 2.5 mg and fentanyl 25 g using a 27 gauge, 1119 mm Becton-Dickinson Whitacre spinal needle through a 16-gauge Braun Tuohy needle, followed by epidural top ups of 10 mg bupivacaine in 10 mL with 2 g/mL of fentanyl.
Outcomes	**Maternal Outcomes:** Nil **Neonatal Outcomes:** 1. Apgar scores.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Described as 'randomly allocated'.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias)	High risk	Not feasible.

Fernando 1994 *(Continued)*

Women		
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	High risk	No maternal outcomes reported.

Flynn 1978

Methods	Randomised trial of patients who expressed an interest in ambulation when they were admitted in labour. During the antenatal period they had been informed that a certain number of patients could walk around while being continuously monitored in labour.
Participants	68 women, Birmingham, U.K. • 34 study participants:17 primigravidae, 17 multigravida • 34 control participants:17 primigravidae, 17 multigravida Inclusion Criteria: *Parity:* mixed, *Plurality:* not stated, *Gestation:* not stated, *Onset of labour:* spontaneous, *Other:* expressing an interest in ambulation.
Interventions	**Study group:** • 34 women were allowed to walk around while being continuously monitored by telemetry. When intravenous treatment was necessary (e.g. because of ketonuria or delay in labour) the women returned to bed. **Control group:** • 34 women were nursed in the lateral position (recumbent) with conventional bedside monitoring of fetal heart and intrauterine pressure. All women: - were nursed in bed during the second and third stages of labour. - Dilatation of the cervix and station of the presenting part were assessed at the start of monitoring and every two to three hours during labour. - Analgesia was administered when the midwife thought the woman was becoming distressed with pain. - Augmentation in labour with oxytocin or prostaglandin was given when indicated by delay in labour.

Flynn 1978 *(Continued)*

	There was 33 cephalic and 1 breech presentation in each group.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Maternal pain. 4. Analgesia type. 5. Augmentation of labour using oxytocin. **Neonatal Outcomes:** 1. Fetal distress requiring immediate birth.
Notes	Assisted breech births (1 upright, 1 recumbent) not included as spontaneous vaginal, operative vaginal or caesarean births.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Described as 'randomised prospective'.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Frenea 2004

Methods	Randomised trial of women requesting epidural anaesthesia.
Participants	61 women, Grenoble, France. • 30 study participants: 18 primigravidae, 12 multigravida • 31 control participants: 18 primigravidae, 13 multigravida Inclusion Criteria:

Frenea 2004 *(Continued)*

	Parity: mixed, *Plurality:* singleton, *Gestation:* 37 to 42 weeks, *Onset of labour:* spontaneous or admitted for elective induction, *Other:* fixed cephalic uncomplicated presentation; 3 to 5 cm cervical dilatation at the time of epidural insertion; uncomplicated pregnancy; a normal fetal heart rate pattern. Exclusion criteria - unfixed cephalic presentation, cervical dilatation more than 5 cm, a contraindication to epidural analgesia, or a systolic arterial blood pressure < 100 mmHg before epidural insertion, twin pregnancy, history of caesarean birth, and any known complications of pregnancy including breech presentation.
Interventions	**Study group:** • 30 women were randomised to ambulation Women were asked to walk at least 15 mins of each hour or for 25% of the duration of the first stage of labour. Ambulation was permitted 15 to 20 mins after the initial injection, provided there was no postural hypotension, no motor block in lower limbs, no proprioception impairment and no fetal heart rate decelerations. The women were asked to return to bed when they requested an epidural top-up or if they experienced weakness or sensory changes. Walking ended when examination by a midwife revealed full cervical dilatation. **Control group:** • 31 women were allocated to be recumbent Confined to bed in dorsal or lateral recumbent position. Monitoring of labour was as for the ambulatory group, but without telemetry. Epidural analgesia of intermittent administrations of 0.08% bupivacaine-epinephrine plus 1 g/mL of sufentanil.
Outcomes	**Maternal Outcomes:** 1. Mode of birth. 2. Analgesia amount. 3. Augmentation of labour using oxytocin. 4. Hypotension requiring intervention. **Neonatal Outcomes:** 1. Apgar scores.
Notes	Duration was recorded as the time between epidural insertion (highly variable) and complete cervical dilatation. It was therefore not used as a comparable duration of first stage of labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not stated.
Allocation concealment (selection bias)	Low risk	Described as 'sealed numbered envelopes'.

Frenea 2004 *(Continued)*

Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Gau 2011

Methods	Randomised trial.
Participants	188 women, Taiwan, Republic of China. • 94 study participants:33 primigravidae, 15 multigravida, 46 mixed parity. • 94 control participants: 22 primigravidae, 17 multigravida, 55 mixed parity. Inclusion Criteria: *Parity:* mixed, *Plurality:* singleton, Gestation: unclear, *Onset of labour:* spontaneous or admitted for elective induction, *Other:* older than 18 years of age; no major obstetric or medical pregnancy complications; normal extremities and ability to undertake activities; a partner who was to be present during labour; and the ability to speak; read and write Chinese.
Interventions	**Study group:** • 48 women were randomised to the birth ball exercise group The birth ball exercise programme consisted of a 26 page booklet and a 19-minute videotape, with periodic follow-ups during prenatal checks. All women were asked to practise the exercises and positions at home for at least 20 mins three times a week for a period of 6-8 weeks. During labour, women in the study group were given a birth ball for use during labour and encouraged every hour to choose the most comfortable positions, movements and exercises. There were 46 post-randomisation exclusions from the study group: Reasons for exclusion included: did not follow protocol (n = 3); epidural anaesthesia (n = 16); emergency caesarean (n = 18); preterm labour (n = 6); delivery at other hospital (n = 3). **Control group:** • 39 women were randomised to the control group

Gau 2011 *(Continued)*

	There were 55 post-randomisation exclusions from the control group: Reasons for exclusion included: epidural anaesthesia (n = 25); emergency caesarean (n = 22); preterm labour (n = 6); delivery at other hospital (n = 2).
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Analgesia type. 4. Maternal pain. 5. Duration of second stage of labour. **Neonatal Outcomes:** 1. Apgar scores.
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	A computer-generated block randomisation list (with block-sizes of four and eight varied randomly) was independently prepared by a statistician.
Allocation concealment (selection bias)	Low risk	Sequentially numbered, sealed opaque envelopes contained allocation to the appropriate group.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	High risk	There was an attrition rate of 53.7%. The reasons 101 women were removed from the study included: emergency caesarean; epidural anaesthesia; preterm labour; delivery at other hospital; not following the protocol. All outcome data for women excluded from the study were not included in the results.
Selective reporting (reporting bias)	High risk	Study analysis which included the participants who did not follow the study protocol was repeated as ITT analysis. The authors stated there was no significant differences in effects based on ITT, but the outcome data for those and other excluded participants were not reported.

Haukkama 1982

Methods	Quasi-randomised trial.
Participants	60 women, Helsinki, Finland.

Haukkama 1982 *(Continued)*

- 31 study participants:13 primigravidae, 18 multigravida
- 29 control participants: 12 primigravidae, 17 multigravida

Inclusion Criteria:

Parity: mixed,

Plurality: not stated,

Gestation: between 38 and 42 weeks,

Onset of labour: not stated,

Other: healthy, uneventful pregnancy.

Interventions	**Study group:** • 31 women having cardiotocography by telemetry (upright). Telemetry women were encouraged to sit or walk during the opening phase of labour. **Control group:** • 29 women were randomised to have conventional cardiotocography (bed care). All women: - nitrous oxide-oxygen, pethidine (usual dose 75 mg given once or twice) or epidural block were used for analgesia when needed.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Maternal pain. 4. Analgesia type. 5. Augmentation of labour using oxytocin. 6. Artificial rupture of membranes. **Neonatal Outcomes:** 1. Apgar scores. 2. Perinatal mortality.
Notes	Pooled data used from nulliparous and multiparous durations of first stage labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Described as matched pairs 'allocated at random' to one of two groups. Patients were matched for age, parity and duration of pregnancy.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.

Haukkama 1982 *(Continued)*

Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Karraz 2003

Methods	Randomised trial.
Participants	221 women, Evry, France • 144 study participants: 97 primigravidae, 47 multigravida • 77 control participants: 47 primigravidae, 30 multigravida Inclusion Criteria: *Parity:* mixed, *Plurality:* singleton, *Gestation:* between 36 and 42 weeks, *Onset of labour:* spontaneous or scheduled for induced labour, *Other:* uncomplicated pregnancies. Exclusion criteria - women with pre-eclampsia or previous caesarean.
Interventions	**Study group:** • 144 women were assigned to the ambulatory group Women could walk, sit in a chair or reclined in a semi-supine position (n = 141), as long as they demonstrated: acceptable analgesia; acceptable systolic blood pressure and ability to stand on one leg. 3 women in this group were excluded because they had a fast birth. **Control group:** • 77 women were allocated to the non-ambulatory group Women were not allowed to sit, walk or go to the toilet, they had to remain in the supine position or to lie in a semi-supine or lateral position (n = 74). 2 women in this group were excluded because they had a fast birth, and another 1 woman was excluded because of inadvertent dural puncture. All women: - Study conducted in daytime only (as women in labour at night are less inclined to walk).

Karraz 2003 *(Continued)*

	- Received intermittent epidural injection of 0.1% ropivacaine with 0.6 µg/mL sufentanil. - Repeat injections were given when the women requested additional pain relief.
Outcomes	**Maternal Outcomes:** 1. Mode of birth. 2. Maternal pain. 3. Analgesia amount. 4. Augmentation using oxytocin. **Neonatal Outcomes:** Nil
Notes	Duration was recorded as the time between epidural insertion (highly variable) and birth (end of second stage). It was therefore not used as a comparable duration of first stage of labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	'Randomly divided' in a 2:1 ratio.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	High risk	6 women were excluded after randomisation.
Selective reporting (reporting bias)	Unclear risk	Unclear.

MacLennan 1994

Methods	Randomised trial.
Participants	196 women, Adelaide, Australia. • 96 study participants: 49 primigravidae, 47 multigravida • 100 control participants: 43 primigravidae, 57 multigravida Inclusion Criteria:

MacLennan 1994 *(Continued)*

	Parity: mixed, *Plurality:* singleton, *Gestation:* between 37 and 42 weeks, *Onset of labour:* spontaneous, *Other:* cephalic presentation; in established labour (presence of regular contractions less than 10 mins apart and cervical dilatation of 3 cm or more); able to ambulate in labour. Exclusion criteria: women undergoing intravenous therapy, with hypertension (> 90 mmHg diastolic blood pressure), epidural or narcotic analgesia at or before entry to trial, evidence of possible fetal distress, previous prostaglandin treatment, induced labour and a physical inability to ambulate.
Interventions	**Study group:** • 96 women were randomised to ambulate with fetal heart radiotelemetry Women were encouraged to ambulate but were also given the option of sitting or lying down when they wished. Only 37 women actually chose to ambulate for half an hour or more. The mean time they spent upright was 1.8 hrs, and the mean time they spent recumbent was 4.5 hrs. **Control group:** • 100 women were randomised to recumbence with conventional fixed electronic fetal heart rate monitoring. Most women chose a semi-recumbent posture with the head end of the bed at 45 degrees but they could also be on their side with lower elevation of the head. All women: After entry to the trial, all women had an artificial rupture of the membranes if they had not already spontaneously ruptured.
Outcomes	**Maternal Outcomes:** 1. Mode of birth. 2. Analgesia type. 3. Augmentation of labour using oxytocin. **Neonatal Outcomes:** 1. Apgar scores. 2. Admission to NICU. 3. Perinatal mortality.
Notes	Duration was recorded as the time between entry (highly variable) and birth (end of second stage). It was therefore not used as a comparable duration of first stage of labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Described as 'Balanced variable blocks with stratification by parity'.
Allocation concealment (selection bias)	Low risk	Opaque, sealed envelopes.

MacLennan 1994 *(Continued)*

Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Mathew 2012

Methods	Randomised controlled trial approach with post test control group design.
Participants	60 women, Magalore, India. • 40 study participants: nulliparous • 20 control participants: nulliparous Inclusion Criteria: *Parity:* nulliparous, *Pluralty:* not stated, *Gestation:* not stated, *Onset of labour:* not stated, *Other:* Nil stated.
Interventions	**Study group:** • 20 women were asked to ambulate • 20 women were given a birthing ball and asked to use it **Control group:** • 20 women were confined to bed in dorsal or lateral recumbence.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth 3. Duration of second stage of labour. **Neonatal Outcomes:** Nil.

Mathew 2012 *(Continued)*

Notes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Purposive sampling technique was used for the selection of samples.
Allocation concealment (selection bias)	Unclear risk	Random allocation of 20 samples to each of the three groups was achieved using a lottery method.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	High risk	There was missing data for the duration for 1st and 2nd stage labour: ambulation (n = 2), control (n = 4), but no missing data from the birthing ball group. There was no explanation to explain the missing data. In one table, 2 out of 24 women in the ambulation group are reported as having had a caesarean birth, but this is contradictory to the other reported data of zero caesarean births from 20 participants in the ambulation group.
Selective reporting (reporting bias)	High risk	All methods of birth outcome data were reported, but not all durations of birth data were reported.

McManus 1978

Methods	Randomised trial of women undergoing induction of labour.
Participants	40 women, Glasgow, U.K. • 20 study participants: 10 primigravidae, 10 multigravida • 20 control participants: 10 primigravidae, 10 multigravida Inclusion Criteria: *Parity:* mixed, *Plurality:* singleton, *Gestation:* 38 weeks or more, *Onset of labour:* induced, *Other:* cervical score 6 or greater. Exclusion criteria - multiple pregnancies or breech presentations.

McManus 1978 *(Continued)*

Interventions	**Study group:** • 20 women were allocated to an upright group. Women were encouraged to "be up and about". If woman wished to go to bed, she was nursed in a sitting position with the aid of pillows. **Control group:** • 20 women were allocated to a recumbent group. Women were nursed in the lateral position. All women: Labour was induced by forewater amniotomy and 0.5 mg PGE2 immediately after amniotomy and hourly thereafter until labour was considered to be established. If labour was not established an hour after the 6th PGE2 tablet (i.e. 6 hours after amniotomy), intravenous oxytocin was given.
Outcomes	**Maternal Outcomes:** 1. Mode of birth. 2. Analgesia type. 3. Augmentation of labour using oxytocin. 4. Artificial Rupture of Membranes. 5. Estimated Blood loss > 500 mL. **Neonatal Outcomes:** 1. Fetal distress (requiring immediate birth). 2. Use of neonatal mechanical ventilation 3. Apgar scores.
Notes	Duration was recorded as the time between induction (highly variable) and birth (end of second stage). It was therefore not used as a comparable duration of first stage of labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Described as 'randomised prospective study'.
Allocation concealment (selection bias)	Low risk	Described as 'randomly allocated according to the contents of a plain envelope'.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.

McManus 1978 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Miquelutti 2007

Methods	Randomised trial.
Participants	107 women, Campinas, Brazil • 54 study participants: nulliparous • 53 control participants: nulliparous Inclusion Criteria: *Parity:* nulliparous, *Pluralty:* singleton, *Gestation:* term, *Onset of labour:* spontaneous, *Other:* cephalic presentation; cervical dilation between 3 cm and 5 cm; in labour; low risk; aged 16 to 40 years. Exclusion criteria - contraindications to upright position or booked for elective caesarean birth.
Interventions	**Study group:** • 54 women were encouraged to adopt upright positions. Women received written information/education involving the use of models on the benefits of maintaining an upright position and encouraged to stand, walk, sit, crouch or kneel. If women remained supine for more than 30 mins they were encouraged to return to an upright position. Women remained upright for 57% of the time. **Control group:** • 53 women were allocated to routine care group Women remained upright for 28% of the time. Women were not encouraged to adopt upright positions but were allowed to move around and adopt any position they chose.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Maternal satisfaction. 4. Maternal pain. 5. Duration of second stage of labour. 6. Augmentation of labour using oxytocin. 7. Perineal trauma.

Miquelutti 2007 *(Continued)*

	Neonatal Outcomes: 1. Apgar scores.
Notes	1. Duration of first stage labour only reported as median and P value. Symmetrical distribution assumed. Median value used as a mean to calculate standard deviation and utilise data. 2. No data for numbers of operative vaginal birth or caesarean births.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated.
Allocation concealment (selection bias)	Low risk	Sealed, opaque envelopes opened sequentially.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Few women lost to follow-up but no data for numbers of operative vaginal birth or caesarean births.
Selective reporting (reporting bias)	High risk	Reported data for the number of women having spontaneous vaginal birth, but not for operative births or caesarean births.

Mitre 1974

Methods	Randomised trial.
Participants	100 women, Terre Haute, U.S.A. • 50 study participants: nulliparous • 50 control participants: nulliparous Inclusion Criteria: *Parity:* nulliparous, *Plurality:* not stated, *Gestation:* term, *Onset of labour:* spontaneous,

Mitre 1974 *(Continued)*

	Other: cephalic presentation; latent phase of labour or the active phase with the cervix between 1 cm and 3 cm; admitted to the labour room; no evidence of cephalopelvic disproportion; no history of surgery or trauma to the cervix; normal prenatal course.
Interventions	**Study group:** • 50 women were randomised the sitting group. All women were allowed to sit up after the amniotomy had been performed and the presenting part was engaged. The women were allowed to lie down from time to time, if they desired. **Control group:** • 50 women were allocated to the supine group. Women were placed in the supine position and allowed to turn on their sides. Direct fetal and maternal monitoring was performed randomly on several women in both groups, using a choriometric unit.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. **Neonatal Outcomes:** Nil
Notes	1. SD's from the mean time in active labour (time to birth) used for the active 'phase' of labour duration times. Apgar scores only provided as a mean value. It is not clear if all women in both groups had routine amniotomy.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Described as 'divided randomly into two groups'.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.

Mitre 1974 *(Continued)*

Selective reporting (reporting bias)	High risk	Claimed evidence of an outcome with little or no data to support it.

Nageotte 1997

Methods	Randomised trial.
Participants	761 women, California, U.S.A. • 253 study participants: nulliparous • 252 control participants:nulliparous • 256 participants not used for this review because they received a different epidural intervention: nulliparous. Inclusion Criteria: *Parity:* nulliparous, *Pluralty:* not stated, *Gestation:* 36 weeks or more, *Onset of labour:* spontaneous or induced for spontaneous rupture of membranes at 36 weeks or more, *Other:* fetus in the vertex position; requesting epidural analgesia.
Interventions	**Study group:** • 253 women were encouraged to ambulate (n = 253). Ambulation was defined as a minimum of five mins of walking per hour. **Control group:** • 252 women were discouraged to ambulate. All women: - had CSE. - received a minimum of 1000 mL of lactated Ringer's solution intravenously during the 30 mins preceding the placement of the epidural needle. CSE - intrathecal narcotic with a continuous low-dose epidural infusion. After the location of the epidural space with an 18-gauge Tuohy needle, a 11.9 cm 27-gauge Whitacre spinal needle was passed through the epidural needle into the subarachnoid space. Then 10 g of sufentanil in 2 mL of normal saline was infused and the spinal needle removed. An epidural catheter was advanced 3 cm into the epidural space and a continuous infusion of 0.0625 % bupivacaine with 2 g of fentanyl per millilitre was given at a rate of 12 mL per hour. - Subsequent bolus doses of epidural solution were given as requested (12 mL of 0.0625% bupivacaine).
Outcomes	**Maternal Outcomes:** 1. Mode of birth. 2. Maternal pain. 3. Hypotension requiring intervention. **Neonatal Outcomes:** 1. Apgar scores.

Nageotte 1997 *(Continued)*

Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Described as 'randomly assigned'.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Phumdoung 2007

Methods	Randomised trial. Randomised in blocks.
Participants	204 women, Southern Thailand. • 40 study participants: primiparous • 43 control participants: primiparous • 121 participants not used for this review: primiparous Inclusion Criteria: *Parity:* nulliparous, *Pluralty:* singleton, *Gestation:* 38 - 42 weeks, *Onset of labour:* spontaneous, *Other:* cephalic presentation; in latent phase for > 10 hours; married; aged 18 - 35 years; fetal weight 2500 - 4000 g. Exclusion criteria: had analgesia before recruitment; induced labour; membrane rupture > 20 hours previously; psychiatric problem; infection; asthma or objection to intervention.

Phumdoung 2007 *(Continued)*

	5 separate intervention groups (described below). In this review we have included data from two groups:
Interventions	**Study group:** • 40 women were allocated to use the CAT position alternating half hourly with head high position (CAT position = facing towards bed head at 45 degrees with knees bent, taking weight on knees and elbows; head high position = lying at a 45-degree angle) (n = 40). **Control group:** • 43 women were assigned to remain supine in bed.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. **Neonatal Outcomes:** Nil.
Notes	Complicated study design with five study groups: 1. CAT position alternating with head-high position with music (n = 40). 2. CAT position alternating with head-high position (n = 40). 3. CAT position alternating with supine position (n = 40). 4. Head-high position (lying in bed on back at 45 degrees) (n = 41). 5. Supine in bed (n = 43). In this review we have used data for groups 2 and 5 in the analyses. (It was not clear what 'CAT' signified)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No information.
Allocation concealment (selection bias)	Unclear risk	Described as 'random block design'.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	Three women were lost to follow-up as they had caesarean births during the first stage of labour. It was not clear whether this was before randomisation. No other loss to follow-up was apparent.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Taavoni 2011

Methods	Randomised trial.
Participants	62 women, Tehran, Iran. • 31 study participants: nulliparous • 31 control participants: nulliparous Inclusion Criteria: *Parity:* nulliparous, *Pluralty:* singleton, *Gestation:* 38 - 40 weeks, *Onset of labour:* spontaneous, *Other:* cephalic presentation; cervical dilatation between 4 to 8 cm; anticipation of a normal birth; no history of infertility; aged 18 to 25 years.
Interventions	**Study group:** • 29 women were allocated to use a birth ball There were two post randomisation exclusions from the study group. Reasons included: dissatisfied with sitting on the ball during birth ball movements (n = 1); caesarean birth because of lack of descent of the fetal head (n = 1). **Control group:** • 31 women were allocated to usual care. Routine care consists of the parturient lying on the bed without ambulating or any intervention.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage labour. 2. Mode of birth 3. Maternal pain **Neonatal Outcomes:** Nil.
Notes	1. Duration of first stage labour reported as duration of active phase. 2. No mode of birth outcomes for vaginal birth or operative vaginal birth were given. If there was a need for analgesic medication, or if obstetric complications occurred, the participant was immediately referred to an obstetrician and other professionals as needed, then excluded from the study.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	60 volunteer women (convenience sample) were randomly allocated using a table of random numbers.

Taavoni 2011 *(Continued)*

Allocation concealment (selection bias)	High risk	If the number was even, women were assigned to the birth ball group, if the number was odd, women were assigned to control group.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Low risk	The individual responsible for data analysis was masked to the study purposes to minimise any bias that might arise from knowledge about the participants.
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	There were two post randomisation exclusions reported: dissatisfied with sitting on the ball during birth ball movements (n = 1); caesarean birth because of lack of descent of the fetal head (n = 1). The total number of participants included for duration of labour and maternal pain data is not clearly stated. It is unclear if the number includes totals before or after exclusions. It is also not clear if the group numbers were even before or after the exclusions.
Selective reporting (reporting bias)	Unclear risk	Unclear.

Vallejo 2001

Methods	Randomised trial.
Participants	160 women, Pennsylvania, U.S.A. • 75 study participants: nulliparous • 76 control participants nulliparous Inclusion Criteria: *Parity:* nulliparous, *Pluralty:* singleton, *Gestation:* 36 - 42 weeks, *Onset of labour:* spontaneous or induction of labour, *Other:* vertex position; 3-5 cm cervical dilatation at the time of epidural insertion; uncomplicated pregnancies. Exclusion criteria - pre-eclampsia, diabetes mellitus, preterm gestation (< 36 weeks) and post-term gestation (> 42 weeks).
Interventions	**Study group:** • 75 women were allocated to AEA with ambulation, sitting in a chair or both. After 1 hour, women with a modified Bromage score of 5 who could stand on one foot (right and left) without assistance (all women in this group were able to do this) and without hypotension (systolic blood pressure < 100 mmHg or a decrease of 20 mmHg), were encouraged to ambulate with a support

Vallejo 2001 *(Continued)*

	person (spouse or friend). If the woman could not comply with ambulation, she was encouraged to sit in a chair. Ambulation was defined as a minimum of 5 min of walking per hour. Women were not allowed to ambulate if there were persistent fetal decelerations and were not allowed to be out of bed in the second stage of labour when women were actively pushing. **Control group:** • 76 women were assigned to AEA without ambulation or sitting in a chair. Women were confined to bed, encouraged to stay recumbent in a lateral position, and were not allowed to raise the head of the bed more than 45 degrees from horizontal. All women: - AEA blocks initiated with 15 to 25 mL ropivacaine (0.07%) plus 100 g/mL fentanyl, no test dose, to achieve a T10 dermatome sensory level. After achieving adequate pain relief, a continuous infusion of 0.07% ropivacaine plus 2 g/mL fentanyl at 15 to 20 mL/hour was administered.
Outcomes	**Maternal Outcomes:** 1. Mode of birth. 2. Analgesia amount. 3. Duration of second stage of labour. 4. Augmentation of labour using oxytocin. **Neonatal Outcomes:** 1. Apgar scores.
Notes	Duration was recorded as the time between epidural insertion (highly variable) and complete cervical dilatation. It was therefore not used as a comparable duration of first stage of labour.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Described as 'random number computer-generated program'.
Allocation concealment (selection bias)	Unclear risk	Not stated.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	High risk	9 women were excluded.

Vallejo 2001 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	Unclear.

Williams 1980

Methods	Quasi-randomised trial.
Participants	300 women, London, U.K. • 48 study participants: 25 primigravidae, 23 multigravida • 55 control participants: 30 primigravidae, 25 multigravida • 197 participants were excluded: short first stage (n = 84); at risk pregnancy (n = 29); induction (n = 24); refused ambulation (n = 30), elective caesarean birth (n = 13); stillbirths (n = 5); meconium-stained liquor (n = 5); breech (n = 3); twin pregnancy (n = 2); birth before arrival (n = 2). Inclusion Criteria: *Parity:* mixed, *Pluralty:* singleton, *Gestation:* 36-42 weeks, *Onset of labour:* spontaneous, *Other:* nil stated.
Interventions	**Study group:** • 48 women were assigned to the ambulant group. Women were informed about the possible benefits of ambulation and were encouraged to walk about during the first stage of labour Women who refused ambulation or who requested to return to bed were allowed to do so. Any woman who developed abnormalities of the fetal heart rate or fresh meconium staining of the amniotic fluid was returned to bed Women who requested or who were advised to have an epidural also returned to bed but those requiring oxytocin augmentation of labour carried their intravenous infusions with them. **Control group:** • 55 women were allocated to the non ambulant group.
Outcomes	**Maternal Outcomes:** 1. Duration of first stage of labour. 2. Mode of birth. 3. Analgesia type. 4. Duration of second stage of labour. **Neonatal Outcomes:** 1. Apgar scores.
Notes	Pooled data used from nulliparous and multiparous durations of first stage labour.
Risk of bias	

Williams 1980 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Described as 'divided into two groups according to their hospital number'.
Allocation concealment (selection bias)	High risk	See above.
Blinding (performance bias and detection bias) Women	High risk	Not feasible.
Blinding (performance bias and detection bias) Clinical staff	High risk	Not feasible.
Blinding (performance bias and detection bias) Outcome assessor	Unclear risk	Not stated.
Incomplete outcome data (attrition bias) All outcomes	Low risk	No stated losses to follow-up.
Selective reporting (reporting bias)	Unclear risk	Unclear.

AEA: ambulatory epidural analgesia
CPD: cephalopelvic disproportion
CSE: combined spinal epidural
G: gauge
ITT: intention-to-treat
L.S.C.S.:lower segment caesarian section
mins: minutes
mU: milli-units
NICU: neonatal intensive care unit
PCE2: prostaglandin E2
SD: standard deviation

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Ahmed 1985	Brief abstract, data for the single result presented were not in a form we were able use in the review.
Allahbadia 1992	Not clear that this was an RCT. States that 'patients were selected at random' but it was not clear that allocation to experimental and control groups was random. All primigravidae in the control group were subjected to prophylactic episiotomies, not all primigravidae in the intervention group were subjected to prophylactic episiotomies.
Asselineau 1996	Not randomised.
Caldeyro-Barcia 1960	1. Observational - Not RCT. 2. Not all women were in the first stage of labour.

Study	Reason for exclusion
Cobo 1968	Intervention not relevant. Study examining lying on side versus lying on back.
Cohen 2002	The study group received a different amount of ropivacaine compared to the control group. No outcomes relevant to the review were reported.
COMET 2001	The trial compared low-dose combined spinal epidural and low-dose infusion techniques and traditional epidural techniques. Therefore the study group received a different epidural type compared with the control group.
Danilenko-Dixon 1996	The purpose of this study was to compare cardiac output after epidural analgesia in both left lateral and supine positions, which are both regarded as recumbent positions for the purposes of this review.
Delgado-Garcia 2012	The study compared using exercise ball or not using an exercise ball. It did not compare upright positions with recumbent positions. Control group was allowed freedom of movement.
Diaz 1980	This study uses quasi-randomised group allocation, but more than a third of the experimental group were excluded from the analysis; women that did not comply with the protocol were excluded post randomisation.
Divon 1985	No data were presented. No outcomes relevant to the review were reported. Outcomes - BP, uterine work and beat-to-beat variability.
Ducloy-Bouthors 2006	The purpose of the study was to compare epidural spread for supine compared with 3 hip-flexed postures. No outcomes relevant to the review were reported
Hemminki 1983	In this study the comparison was between two management policies rather than two different treatments. One group was nursed in bed and one group was encouraged to mobilise but there were also other differences in the treatment the two groups received which may have had an effect on outcomes. Women nursed in bed had routine amniotomy, women in the ambulant group did not; monitoring was also different in the two groups. These differences in management mean that it is not possible to assess the effect of position on outcomes.
Hemminki 1985	Compared ambulation with immediate oxytocin.
Hodnett 1982	All bed-care patients had an epidural and not all ambulant patients did.
Li 2010	Women were allocated to the treatment or control group according to personal preference. No other randomisation details were described.
Liu 1989	Compares semi-upright position with lying flat position, which are both recumbent positions for the purposes of this review.
McCormick 2007	Study not completed - no results reported.
Melzack 1991	Cross-over design - women alternated between vertical and horizontal positions, then rated their level of pain at the end of each 20-minute period.
Molina 1997	Cross-over design - women alternated between vertical and horizontal positions, then rated their level of pain at the end of each 15-minute period.
Radkey 1991	Study position, squatting, assumed in second stage of labour only.
Read 1981	Comparing ambulation with oxytocin.

Study	Reason for exclusion
Roberts 1984	Cross-over design - women alternated between sitting and lateral recumbence positions, every 30 minutes.
Schmidt 2001	Cross-over design - measures fetal oxygen saturations for different and successive maternal birth positions.
Schneider-Affeld 1982	No quantitative outcome data presented.
Selby 2012	The study participants were not in labour.
Solano 1982	Not randomised.
Stewart 1983	Compares positions used in the 2nd stage of labour.
Tussey 2011	The study did not compare upright positions with recumbent positions.
Weiniger 2009	Study compares walking to the toilet to void with using a bed pan in bed. No relevant outcomes are reported.
Wilson 2011	The trial compared low-dose combined spinal epidural and low-dose infusion techniques and traditional epidural techniques. Therefore the study group received a different epidural type compared with the control group.
Wu 2001	Intervention not relevant to review outcomes. Study examining lying on one side rather than the other to correct fetal malpresentation.

BP: blood pressure
RCT: randomised controlled trial

DATA AND ANALYSES

Comparison 1. Upright and ambulant positions versus recumbent positions and bed care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Duration of first stage labour (hours)	15	2503	Mean Difference (IV, Random, 95% CI)	-1.36 [-2.22, -0.51]
2 Duration of first stage labour (hours): subgroup analysis: parity	12		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 Nulliparous women	12	1486	Mean Difference (IV, Random, 95% CI)	-1.21 [-2.35, -0.07]
2.2 Multiparous women	4	662	Mean Difference (IV, Random, 95% CI)	-0.56 [-1.19, 0.06]
3 Duration of first stage labour (hours): subgroup analysis: onset of labour	11		Mean Difference (IV, Random, 95% CI)	Subtotals only
3.1 Spontaneous labour: all women	11	2114	Mean Difference (IV, Random, 95% CI)	-1.43 [-2.35, -0.50]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3.2 Induction of labour: all women	0	0	Mean Difference (IV, Random, 95% CI)	0.0 [0.0, 0.0]
4 Duration of first stage labour (hours): subgroup analysis: position types	15		Mean Difference (IV, Random, 95% CI)	Subtotals only
4.1 Sitting vs Recumbent / supine / lateral	3	252	Mean Difference (IV, Random, 95% CI)	-2.39 [-4.06, -0.72]
4.2 Walking vs Recumbent / supine / lateral	3	302	Mean Difference (IV, Random, 95% CI)	-3.96 [-5.36, -2.57]
4.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	3	311	Mean Difference (IV, Random, 95% CI)	-1.02 [-3.36, 1.33]
4.4 Sitting vs Bed care	1	60	Mean Difference (IV, Random, 95% CI)	0.11 [-0.29, 0.51]
4.5 Walking vs Bed care	2	1170	Mean Difference (IV, Random, 95% CI)	-0.03 [-0.44, 0.38]
4.6 Sitting, standing, squatting, kneeling or walking vs Bed care	4	424	Mean Difference (IV, Random, 95% CI)	-0.52 [-1.49, 0.45]
5 Duration of first stage labour (hours): subgroup analysis: position types	15		Mean Difference (IV, Random, 95% CI)	Subtotals only
5.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	8	849	Mean Difference (IV, Random, 95% CI)	-2.19 [-3.49, -0.89]
5.2 Sitting, standing, squatting, kneeling or walking vs Bed care	7	1654	Mean Difference (IV, Random, 95% CI)	-0.03 [-0.30, 0.25]
6 Duration of first stage labour (hours): subgroup analysis: position types	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
6.1 Sitting, standing, squatting, kneeling or walking vs supine only	2	183	Mean Difference (IV, Random, 95% CI)	-2.24 [-3.23, -1.26]
7 Duration of first stage labour (hours): sensitivity analysis - positions	3	364	Mean Difference (IV, Fixed, 95% CI)	-3.86 [-4.73, -2.99]
7.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	1	200	Mean Difference (IV, Fixed, 95% CI)	-3.00 [-6.05, -3.95]
7.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care	2	164	Mean Difference (IV, Fixed, 95% CI)	-1.33 [-2.89, 0.23]
8 Mode of birth: spontaneous vaginal	14	2626	Risk Ratio (M-H, Random, 95% CI)	1.05 [0.99, 1.11]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
9 Mode of birth: spontaneous vaginal: subgroup analysis: parity	8		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
9.1 Nulliparous women	8	1282	Risk Ratio (M-H, Random, 95% CI)	1.06 [0.96, 1.17]
9.2 Multiparous women	4	675	Risk Ratio (M-H, Random, 95% CI)	1.02 [0.99, 1.05]
10 Mode of birth: spontaneous vaginal: subgroup analysis: onset of labour	10		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
10.1 Spontaneous labour: all women	8	2124	Risk Ratio (M-H, Random, 95% CI)	1.04 [0.97, 1.12]
10.2 Induction of labour: all women	2	100	Risk Ratio (M-H, Random, 95% CI)	1.24 [0.98, 1.57]
11 Mode of birth: spontaneous vaginal: subgroup analysis: position types	14		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
11.1 Sitting vs Recumbent / supine / lateral	2	225	Risk Ratio (M-H, Random, 95% CI)	1.20 [0.88, 1.64]
11.2 Walking vs Recumbent / supine / lateral	3	306	Risk Ratio (M-H, Random, 95% CI)	1.26 [1.11, 1.42]
11.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	2	235	Risk Ratio (M-H, Random, 95% CI)	1.00 [0.85, 1.17]
11.4 Sitting vs Bed care	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
11.5 Walking vs Bed care	4	1426	Risk Ratio (M-H, Random, 95% CI)	1.01 [0.93, 1.11]
11.6 Sitting, standing, squatting, kneeling or walking vs Bed care	4	454	Risk Ratio (M-H, Random, 95% CI)	1.00 [0.92, 1.08]
12 Mode of birth: spontaneous vaginal: subgroup analysis: position types	14		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
12.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	6	746	Risk Ratio (M-H, Random, 95% CI)	1.14 [1.03, 1.26]
12.2 Sitting, standing, squatting, kneeling or walking vs Bed care	8	1880	Risk Ratio (M-H, Random, 95% CI)	1.00 [0.97, 1.04]
13 Mode of birth: spontaneous vaginal: subgroup analysis: position types	0		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
13.1 Sitting, standing, squatting, kneeling or walking vs supine only	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
14 Mode of birth: spontaneous vaginal: sensitivity analysis - positions	5	630	Risk Ratio (M-H, Fixed, 95% CI)	1.03 [0.94, 1.13]
14.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	2	240	Risk Ratio (M-H, Fixed, 95% CI)	1.2 [1.05, 1.38]
14.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care	3	390	Risk Ratio (M-H, Fixed, 95% CI)	0.93 [0.83, 1.05]
15 Mode of birth: operative vaginal: all women	13	2519	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.73, 1.14]
16 Mode of birth: operative vaginal: subgroup analysis: parity	7		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
16.1 Nulliparous women	7	1175	Risk Ratio (M-H, Fixed, 95% CI)	0.87 [0.65, 1.18]
16.2 Multiparous women	4	675	Risk Ratio (M-H, Fixed, 95% CI)	0.91 [0.24, 3.51]
17 Mode of birth: operative vaginal: subgroup analysis: onset of labour	9		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
17.1 Spontaneous labour: all women	7	2017	Risk Ratio (M-H, Random, 95% CI)	0.93 [0.62, 1.39]
17.2 Induction of labour: all women	2	100	Risk Ratio (M-H, Random, 95% CI)	0.61 [0.23, 1.58]
18 Mode of birth: operative vaginal: subgroup analysis: position types	13		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
18.1 Sitting vs Recumbent / supine / lateral	2	225	Risk Ratio (M-H, Fixed, 95% CI)	0.18 [0.04, 0.75]
18.2 Walking vs Recumbent / supine / lateral	3	306	Risk Ratio (M-H, Fixed, 95% CI)	0.5 [0.28, 0.89]
18.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / later	2	235	Risk Ratio (M-H, Fixed, 95% CI)	0.94 [0.58, 1.52]
18.4 Sitting vs Bed care	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
18.5 Walking vs Bed care	4	1426	Risk Ratio (M-H, Fixed, 95% CI)	1.19 [0.84, 1.68]
18.6 Sitting, standing, squatting, kneeling or walking vs Bed care	3	347	Risk Ratio (M-H, Fixed, 95% CI)	1.15 [0.67, 1.96]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
19 Mode of birth: operative vaginal: subgroup analysis: position types	13		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
19.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / later	6	746	Risk Ratio (M-H, Fixed, 95% CI)	0.62 [0.43, 0.89]
19.2 Sitting, standing, squatting, kneeling or walking vs Bed care	7	1773	Risk Ratio (M-H, Fixed, 95% CI)	1.17 [0.88, 1.57]
20 Mode of birth: operative vaginal: subgroup analysis: position types	0		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
20.1 Sitting, standing, squatting, kneeling or walking vs supine only	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
21 Mode of birth: operative vaginal: sensitivity analysis - positions	4	523	Risk Ratio (M-H, Fixed, 95% CI)	0.98 [0.67, 1.45]
21.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	2	240	Risk Ratio (M-H, Fixed, 95% CI)	0.67 [0.34, 1.31]
21.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care	2	283	Risk Ratio (M-H, Fixed, 95% CI)	1.22 [0.76, 1.97]
22 Mode of birth: caesarean birth	14	2682	Risk Ratio (M-H, Fixed, 95% CI)	0.71 [0.54, 0.94]
23 Mode of birth: caesarean birth: subgroup analysis: parity	8		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
23.1 Nulliparous women	8	1237	Risk Ratio (M-H, Fixed, 95% CI)	0.79 [0.52, 1.18]
23.2 Multiparous women	4	675	Risk Ratio (M-H, Fixed, 95% CI)	0.55 [0.22, 1.38]
24 Mode of birth: caesarean birth: subgroup analysis: onset of labour	10		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
24.1 Spontaneous labour: all women	8	2079	Risk Ratio (M-H, Random, 95% CI)	0.70 [0.49, 1.01]
24.2 Induction of labour: all women	2	100	Risk Ratio (M-H, Random, 95% CI)	0.29 [0.02, 3.86]
25 Mode of birth: caesarean birth: subgroup analysis: position types	14		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
25.1 Sitting vs Recumbent / supine / lateral	2	225	Risk Ratio (M-H, Fixed, 95% CI)	1.02 [0.36, 2.84]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
25.2 Walking vs Recumbent / supine / lateral	3	306	Risk Ratio (M-H, Fixed, 95% CI)	0.31 [0.12, 0.79]
25.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	2	235	Risk Ratio (M-H, Fixed, 95% CI)	1.30 [0.46, 3.63]
25.4 Sitting vs Bed care	1	62	Risk Ratio (M-H, Fixed, 95% CI)	3.0 [0.13, 70.92]
25.5 Walking vs Bed care	4	1426	Risk Ratio (M-H, Fixed, 95% CI)	0.70 [0.45, 1.09]
25.6 Sitting, standing, squatting, kneeling or walking vs Bed care	3	448	Risk Ratio (M-H, Fixed, 95% CI)	0.74 [0.46, 1.21]
26 Mode of birth: caesarean birth: subgroup analysis: position types	14		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
26.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	6	746	Risk Ratio (M-H, Fixed, 95% CI)	0.67 [0.39, 1.15]
26.2 Sitting, standing, squatting, kneeling or walking vs Bed care	8	1936	Risk Ratio (M-H, Fixed, 95% CI)	0.73 [0.53, 1.02]
27 Mode of birth: caesarean birth: subgroup analysis: position types	0		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
27.1 Sitting, standing, squatting, kneeling or walking vs supine only	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
28 Mode of birth: caesarean birth: sensitivity analysis - positions	4	624	Risk Ratio (M-H, Fixed, 95% CI)	0.72 [0.48, 1.09]
28.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent	2	240	Risk Ratio (M-H, Fixed, 95% CI)	0.35 [0.14, 0.86]
28.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care	2	384	Risk Ratio (M-H, Fixed, 95% CI)	0.94 [0.59, 1.52]
29 Analgesia type	10		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
29.1 Opioid	7	1831	Risk Ratio (M-H, Random, 95% CI)	0.99 [0.85, 1.15]
29.2 Epidural	9	2107	Risk Ratio (M-H, Random, 95% CI)	0.81 [0.66, 0.99]
29.3 Entonox	3	300	Risk Ratio (M-H, Random, 95% CI)	0.97 [0.72, 1.31]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
30 Maternal satisfaction	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
30.1 Satisfaction with position reported at 6 cm	1	107	Risk Ratio (M-H, Fixed, 95% CI)	1.31 [0.60, 2.85]
30.2 Preferred upright position	1	107	Risk Ratio (M-H, Fixed, 95% CI)	1.25 [0.97, 1.61]
31 Maternal comfort	1	40	Mean Difference (IV, Fixed, 95% CI)	0.74 [-0.27, 1.75]
31.1 Comfort score	1	40	Mean Difference (IV, Fixed, 95% CI)	0.74 [-0.27, 1.75]
32 Maternal pain	6		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
32.1 Complaints of discomfort/labour more uncomfortable	3	338	Risk Ratio (M-H, Random, 95% CI)	0.68 [0.12, 3.72]
32.2 Requiring analgesia	4	1536	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.84, 1.08]
33 Maternal pain	2	400	Mean Difference (IV, Fixed, 95% CI)	6.36 [-0.31, 13.03]
34 Maternal pain	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
34.1 Visual Analogue Scale (VAS) Score	1	60	Mean Difference (IV, Fixed, 95% CI)	-1.74 [-2.51, -0.97]
34.2 Visual Analogue Scale (VAS) Score @ 4 cm	1	87	Mean Difference (IV, Fixed, 95% CI)	-2.0 [-2.70, -1.30]
34.3 Visual Analogue Scale (VAS) Score @ 8 cm	1	87	Mean Difference (IV, Fixed, 95% CI)	-1.70 [-2.20, -1.20]
34.4 Verbal Response Scale (VRS) Score @ 4 cm	1	87	Mean Difference (IV, Fixed, 95% CI)	-10.40 [-13.27, -7.53]
34.5 Verbal Response Scale (VRS) Score@ 8 cm	1	87	Mean Difference (IV, Fixed, 95% CI)	-5.00 [-11.33, -2.67]
34.6 Present Pain Intensity Scale (PPI) @ 4 cm	1	87	Mean Difference (IV, Fixed, 95% CI)	-1.40 [-3.61, 0.81]
34.7 Present Pain Intensity Scale (PPI) @ 8 cm	1	87	Mean Difference (IV, Fixed, 95% CI)	-0.80 [-3.76, 2.16]
35 Maternal anxiety	1	200	Mean Difference (IV, Fixed, 95% CI)	8.0 [-0.19, 16.19]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
36 Analgesia amount	1	40	Mean Difference (IV, Fixed, 95% CI)	-17.5 [-36.89, 1.89]
36.1 Narcotics and other analgesia	1	40	Mean Difference (IV, Fixed, 95% CI)	-17.5 [-36.89, 1.89]
37 Duration of second stage of labour (minutes)	9	2077	Mean Difference (IV, Random, 95% CI)	-3.71 [-9.37, 1.94]
38 Augmentation of labour using oxytocin	8	1826	Risk Ratio (M-H, Fixed, 95% CI)	0.89 [0.76, 1.05]
39 Artificial rupture of membranes	4	276	Risk Ratio (M-H, Fixed, 95% CI)	1.02 [0.95, 1.10]
40 Hypotension requiring intervention	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
41 Estimated blood loss > 500 mL	2	240	Risk Ratio (M-H, Fixed, 95% CI)	0.71 [0.14, 3.55]
42 Perineal trauma	3		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
42.1 Episiotomy	3	1374	Risk Ratio (M-H, Fixed, 95% CI)	0.92 [0.82, 1.04]
42.2 Second-degree tears	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
42.3 Third-degree tears	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
43 Fetal distress (requiring immediate delivery)	6	1757	Risk Ratio (M-H, Fixed, 95% CI)	0.69 [0.35, 1.33]
44 Use of neonatal mechanical ventilation	2	1107	Risk Ratio (M-H, Fixed, 95% CI)	0.77 [0.19, 3.10]
44.1 Intubation in delivery room	2	1107	Risk Ratio (M-H, Fixed, 95% CI)	0.77 [0.19, 3.10]
45 Apgar scores	8		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
45.1 Apgar < 4 at birth	1	40	Risk Ratio (M-H, Fixed, 95% CI)	0.2 [0.01, 3.92]
45.2 Apgar < 7 at 1 min	6	706	Risk Ratio (M-H, Fixed, 95% CI)	0.84 [0.54, 1.31]
45.3 Apgar < 7 at 5 mins	4	466	Risk Ratio (M-H, Fixed, 95% CI)	3.27 [0.34, 31.05]

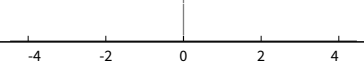
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
45.4 Apgar < 3 at 5 mins	1	1067	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
45.5 Apgar < 8 at 5 mins	1	87	Risk Ratio (M-H, Fixed, 95% CI)	0.12 [0.01, 2.19]
46 Admission to NICU	2	396	Risk Ratio (M-H, Fixed, 95% CI)	0.58 [0.25, 1.36]
46.1 Admission to NICU	1	200	Risk Ratio (M-H, Fixed, 95% CI)	0.2 [0.04, 0.89]
46.2 Admission to Level I or II nursery	1	196	Risk Ratio (M-H, Fixed, 95% CI)	1.56 [0.45, 5.37]
47 Perinatal mortality	5	1564	Risk Ratio (M-H, Fixed, 95% CI)	0.50 [0.05, 5.37]

Analysis 1.1. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 1 Duration of first stage labour (hours).

Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Andrews 1990	20	3.9 (1.5)	20	5.4 (1.5)		7.26%	-1.5[-2.43,-0.57]
Ben Regaya 2010	100	13.2 (2.8)	100	18.2 (3.6)		7.31%	-5[-5.89,-4.11]
Bloom 1998	536	6.1 (3.6)	531	6.1 (3.5)		7.79%	0[-0.43,0.43]
Calvert 1982	100	7 (3.3)	100	7.5 (4.4)		7.04%	-0.47[-1.55,0.61]
Chan 1963	93	8.4 (2.8)	95	7.1 (3.6)		7.27%	1.25[0.33,2.17]
Chen 1987	41	2.2 (1.5)	75	3.2 (1.8)		7.64%	-0.93[-1.54,-0.32]
Flynn 1978	34	4.1 (3.6)	34	6.7 (3.5)		6.06%	-2.6[-4.29,-0.91]
Gau 2011	48	6.3 (2.8)	39	8.1 (4.8)		6.05%	-1.76[-3.45,-0.07]
Haukkama 1982	31	7.9 (4.6)	29	7.8 (4.4)		5.1%	0.15[-2.11,2.41]
Mathew 2012	38	8.3 (1.7)	16	12.7 (2.5)		6.67%	-4.39[-5.72,-3.06]
Miquelutti 2007	35	6.5 (9)	42	5.4 (9)		2.88%	1.08[-2.93,5.09]
Mitre 1974	50	5.5 (1.7)	50	7.3 (1.6)		7.59%	-1.78[-2.44,-1.12]
Phumdoung 2007	40	3.5 (1.9)	43	6.3 (2.1)		7.35%	-2.79[-3.65,-1.93]
Taavoni 2011	29	1.8 (0.6)	31	1.7 (1)		7.81%	0.11[-0.29,0.51]
Williams 1980	48	7.1 (4.1)	55	7.6 (4.3)		6.17%	-0.45[-2.07,1.17]
Total ***	**1243**		**1260**			**100%**	**-1.36[-2.22,-0.51]**

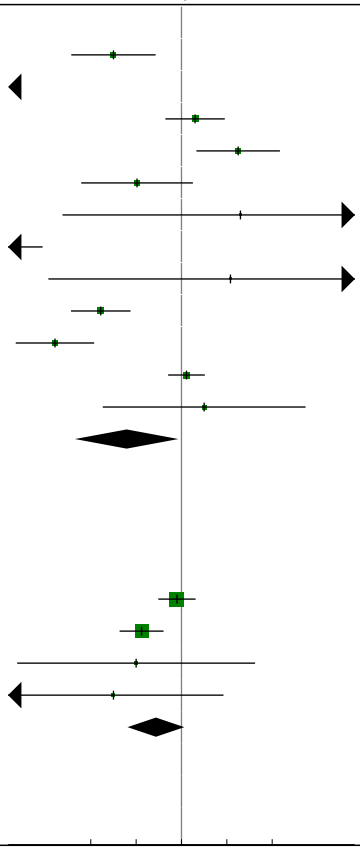
Heterogeneity: Tau^2=2.39; Chi^2=203.55, df=14(P<0.0001); I^2=93.12%

Test for overall effect: Z=3.13(P=0)



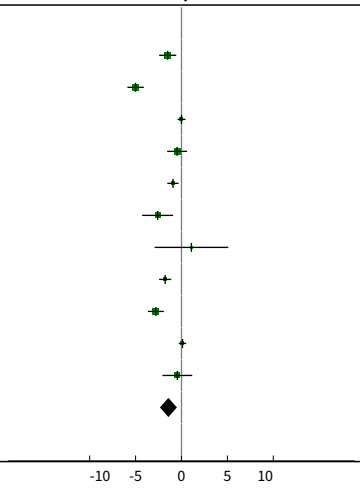
Analysis 1.2. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 2 Duration of first stage labour (hours): subgroup analysis: parity.

Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
1.2.1 Nulliparous women							
Andrews 1990	20	3.9 (1.5)	20	5.4 (1.5)		9.29%	-1.5[-2.43,-0.57]
Ben Regaya 2010	100	13.2 (2.8)	100	18.2 (3.6)		9.33%	-5[-5.89,-4.11]
Bloom 1998	272	7.6 (3.9)	272	7.3 (3.9)		9.58%	0.3[-0.36,0.96]
Chan 1963	93	8.4 (2.8)	95	7.1 (3.6)		9.3%	1.25[0.33,2.17]
Chen 1987	22	3.3 (2.3)	38	4.2 (2.5)		8.87%	-0.98[-2.21,0.25]
Haukkama 1982	13	10.2 (5.4)	12	8.9 (4.6)		4.56%	1.3[-2.62,5.22]
Mathew 2012	38	8.3 (1.7)	16	12.7 (2.5)		8.73%	-4.39[-5.72,-3.06]
Miquelutti 2007	35	6.5 (9)	42	5.4 (9)		4.45%	1.08[-2.93,5.09]
Mitre 1974	50	5.5 (1.7)	50	7.3 (1.6)		9.58%	-1.78[-2.44,-1.12]
Phumdoung 2007	40	3.5 (1.9)	43	6.3 (2.1)		9.36%	-2.79[-3.65,-1.93]
Taavoni 2011	29	1.8 (0.6)	31	1.7 (1)		9.78%	0.11[-0.29,0.51]
Williams 1980	25	7.9 (4.9)	30	7.4 (3.2)		7.17%	0.5[-1.74,2.74]
Subtotal ***	**737**		**749**			**100%**	**-1.21[-2.35,-0.07]**
Heterogeneity: Tau^2=3.42; Chi^2=195.59, df=11(P<0.0001); I^2=94.38%							
Test for overall effect: Z=2.08(P=0.04)							
1.2.2 Multiparous women							
Bloom 1998	264	4.6 (2.4)	259	4.7 (2.4)		46.07%	-0.1[-0.51,0.31]
Chen 1987	19	1.2 (0.8)	37	2.1 (1.1)		42.77%	-0.88[-1.36,-0.4]
Haukkama 1982	18	5.6 (3.8)	17	6.6 (4.1)		5.19%	-1[-3.62,1.62]
Williams 1980	23	6.3 (2.9)	25	7.8 (5.4)		5.97%	-1.5[-3.93,0.93]
Subtotal ***	**324**		**338**			**100%**	**-0.56[-1.19,0.06]**
Heterogeneity: Tau^2=0.18; Chi^2=6.69, df=3(P=0.08); I^2=55.18%							
Test for overall effect: Z=1.77(P=0.08)							
Test for subgroup differences: Chi^2=0.94, df=1 (P=0.33), I^2=0%							



Analysis 1.3. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 3 Duration of first stage labour (hours): subgroup analysis: onset of labour.

Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
1.3.1 Spontaneous labour: all women							
Andrews 1990	20	3.9 (1.5)	20	5.4 (1.5)		9.72%	-1.5[-2.43,-0.57]
Ben Regaya 2010	100	13.2 (2.8)	100	18.2 (3.6)		9.8%	-5[-5.89,-4.11]
Bloom 1998	536	6.1 (3.6)	531	6.1 (3.5)		10.54%	0[-0.43,0.43]
Calvert 1982	100	7 (3.3)	100	7.5 (4.4)		9.39%	-0.47[-1.55,0.61]
Chen 1987	41	2.2 (1.5)	75	3.2 (1.8)		10.29%	-0.93[-1.54,-0.32]
Flynn 1978	34	4.1 (3.6)	34	6.7 (3.5)		7.94%	-2.6[-4.29,-0.91]
Miquelutti 2007	35	6.5 (9)	42	5.4 (9)		3.57%	1.08[-2.93,5.09]
Mitre 1974	50	5.5 (1.7)	50	7.3 (1.6)		10.23%	-1.78[-2.44,-1.12]
Phumdoung 2007	40	3.5 (1.9)	43	6.3 (2.1)		9.85%	-2.79[-3.65,-1.93]
Taavoni 2011	29	1.8 (0.6)	31	1.7 (1)		10.56%	0.11[-0.29,0.51]
Williams 1980	48	7.1 (4.1)	55	7.6 (4.3)		8.1%	-0.45[-2.07,1.17]
Subtotal ***	**1033**		**1081**			**100%**	**-1.43[-2.35,-0.5]**
Heterogeneity: Tau^2=2.08; Chi^2=154.4, df=10(P<0.0001); I^2=93.52%							



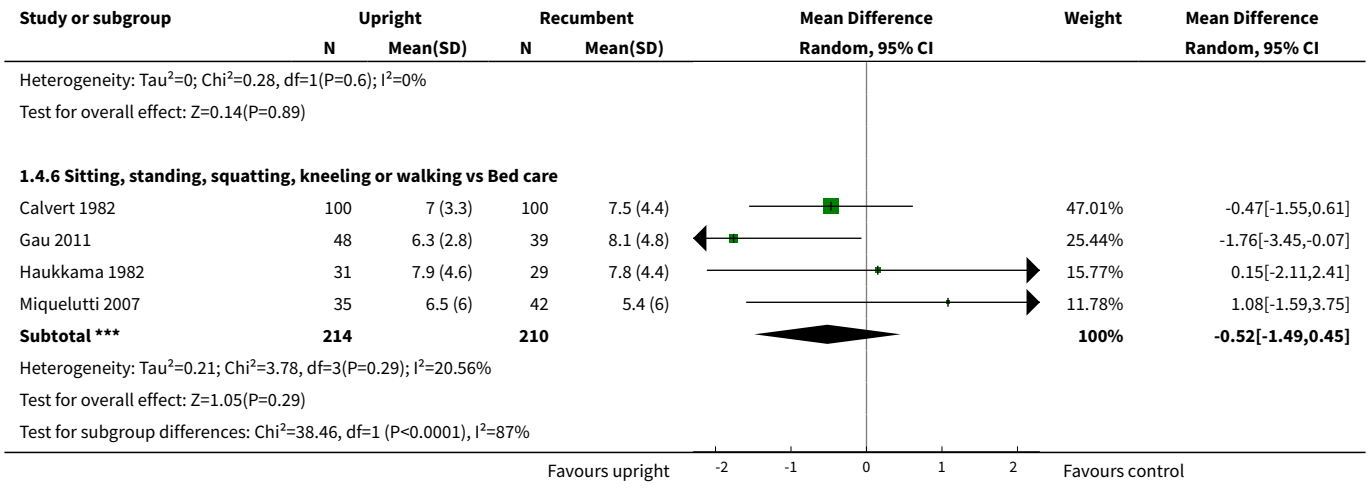
Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Test for overall effect: Z=3.01(P=0)							
1.3.2 Induction of labour: all women							
Subtotal ***	**0**		**0**				**Not estimable**
Heterogeneity: Not applicable							
Test for overall effect: Not applicable							
Test for subgroup differences: Not applicable							

Favours upright -10 -5 0 5 10 Favours recumbent

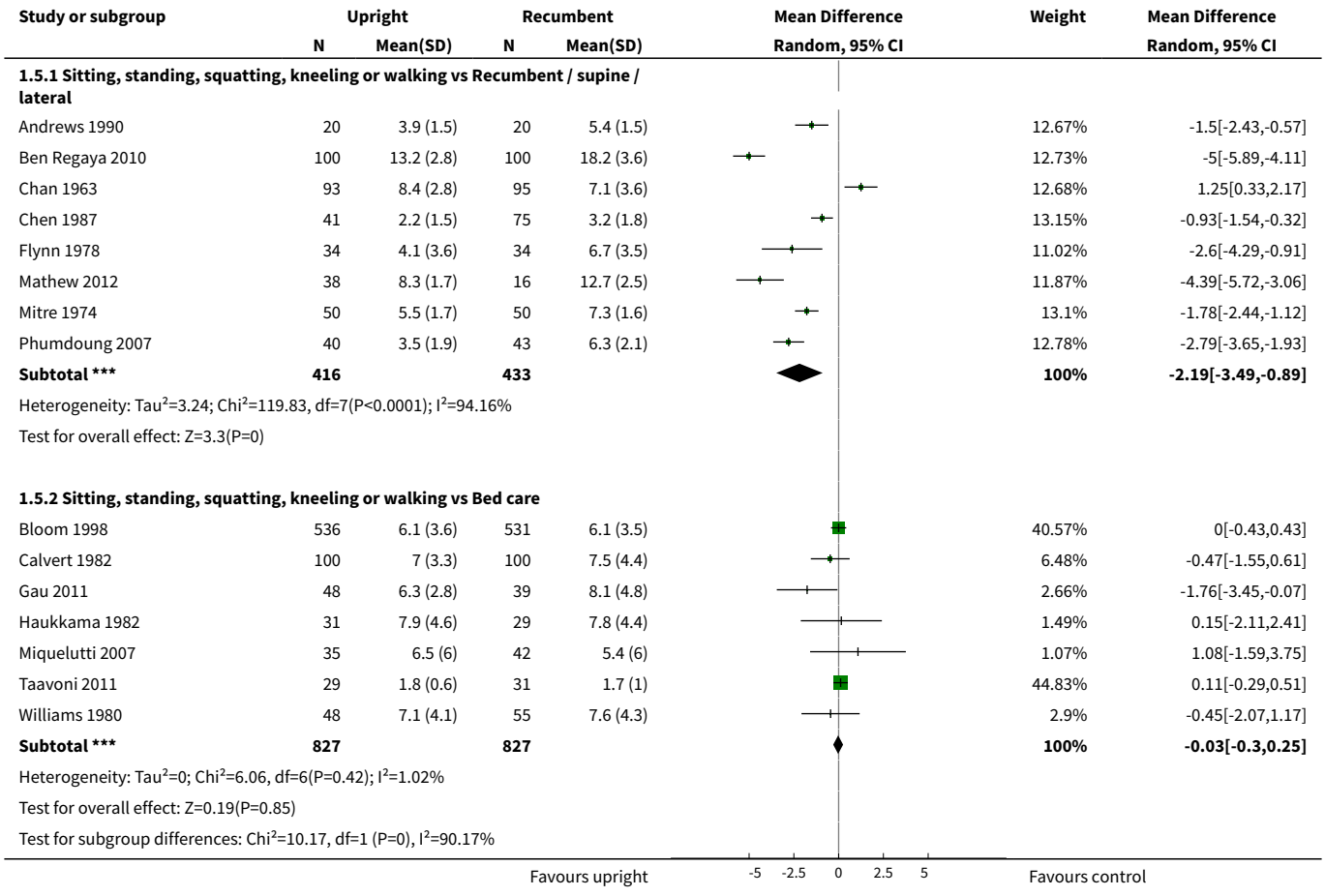
Analysis 1.4. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 4 Duration of first stage labour (hours): subgroup analysis: position types.

Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
1.4.1 Sitting vs Recumbent / supine / lateral							
Chen 1987	41	2.2 (1.5)	75	3.2 (1.8)		35.34%	-0.93[-1.54,-0.32]
Mathew 2012	20	7.9 (1.5)	16	12.7 (2.5)		29.57%	-4.86[-6.25,-3.47]
Mitre 1974	50	5.5 (1.7)	50	7.3 (1.6)		35.09%	-1.78[-2.44,-1.12]
Subtotal ***	**111**		**141**			**100%**	**-2.39[-4.06,-0.72]**
Heterogeneity: Tau^2=1.96; Chi^2=26.07, df=2(P<0.0001); I^2=92.33%							
Test for overall effect: Z=2.8(P=0.01)							
1.4.2 Walking vs Recumbent / supine / lateral							
Ben Regaya 2010	100	13.2 (2.8)	100	18.2 (3.6)		40.33%	-5[-5.89,-4.11]
Flynn 1978	34	4.1 (3.6)	34	6.7 (3.5)		28.23%	-2.6[-4.29,-0.91]
Mathew 2012	18	8.9 (1.8)	16	12.7 (2.5)		31.44%	-3.86[-5.33,-2.39]
Subtotal ***	**152**		**150**			**100%**	**-3.96[-5.36,-2.57]**
Heterogeneity: Tau^2=1.04; Chi^2=6.58, df=2(P=0.04); I^2=69.59%							
Test for overall effect: Z=5.58(P<0.0001)							
1.4.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral							
Andrews 1990	20	3.9 (1.5)	20	5.4 (1.5)		33.24%	-1.5[-2.43,-0.57]
Chan 1963	93	8.4 (2.8)	95	7.1 (3.6)		33.28%	1.25[0.33,2.17]
Phumdoung 2007	40	3.5 (1.9)	43	6.3 (2.1)		33.48%	-2.79[-3.65,-1.93]
Subtotal ***	**153**		**158**			**100%**	**-1.02[-3.36,1.33]**
Heterogeneity: Tau^2=4.09; Chi^2=40.39, df=2(P<0.0001); I^2=95.05%							
Test for overall effect: Z=0.85(P=0.4)							
1.4.4 Sitting vs Bed care							
Taavoni 2011	29	1.8 (0.6)	31	1.7 (1)		100%	0.11[-0.29,0.51]
Subtotal ***	**29**		**31**			**100%**	**0.11[-0.29,0.51]**
Heterogeneity: Tau^2=0; Chi^2=0, df=0(P<0.0001); I^2=100%							
Test for overall effect: Z=0.53(P=0.59)							
1.4.5 Walking vs Bed care							
Bloom 1998	536	6.1 (3.6)	531	6.1 (3.5)		93.56%	0[-0.43,0.43]
Williams 1980	48	7.1 (4.1)	55	7.6 (4.3)		6.44%	-0.45[-2.07,1.17]
Subtotal ***	**584**		**586**			**100%**	**-0.03[-0.44,0.38]**

Favours upright -2 -1 0 1 2 Favours control



Analysis 1.5. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 5 Duration of first stage labour (hours): subgroup analysis: position types.



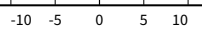
Analysis 1.6. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 6 Duration of first stage labour (hours): subgroup analysis: position types.

Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
1.6.1 Sitting, standing, squatting, kneeling or walking vs supine only							
Mitre 1974	50	5.5 (1.7)	50	7.3 (1.6)		54.04%	-1.78[-2.44,-1.12]
Phumdoung 2007	40	3.5 (1.9)	43	6.3 (2.1)		45.96%	-2.79[-3.65,-1.93]
Subtotal ***	**90**		**93**			**100%**	**-2.24[-3.23,-1.26]**
Heterogeneity: Tau²=0.36; Chi²=3.32, df=1(P=0.07); I²=69.9%							
Test for overall effect: Z=4.46(P<0.0001)							

Favours upright — Favours control

Analysis 1.7. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 7 Duration of first stage labour (hours): sensitivity analysis - positions.

Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
1.7.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral							
Ben Regaya 2010	100	13.2 (3.8)	100	18.2 (3.8)		68.93%	-5[-6.05,-3.95]
Subtotal ***	**100**		**100**			**68.93%**	**-5[-6.05,-3.95]**
Heterogeneity: Not applicable							
Test for overall effect: Z=9.35(P<0.0001)							
1.7.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care							
Gau 2011	48	6.3 (2.8)	39	8.1 (4.8)		26.38%	-1.76[-3.45,-0.07]
Miquelutti 2007	35	6.5 (9)	42	5.4 (9)		4.69%	1.08[-2.93,5.09]
Subtotal ***	**83**		**81**			**31.07%**	**-1.33[-2.89,0.23]**
Heterogeneity: Tau²=0; Chi²=1.63, df=1(P=0.2); I²=38.72%							
Test for overall effect: Z=1.67(P=0.09)							
Total ***	**183**		**181**			**100%**	**-3.86[-4.73,-2.99]**
Heterogeneity: Tau²=0; Chi²=16.27, df=2(P=0); I²=87.71%							
Test for overall effect: Z=8.7(P<0.0001)							
Test for subgroup differences: Chi²=14.64, df=1 (P=0), I²=93.17%							



Favours upright — Favours recumbent

Analysis 1.8. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 8 Mode of birth: spontaneous vaginal.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Ben Regaya 2010	87/100	71/100		8.73%	1.23[1.06,1.42]
Bloom 1998	490/536	483/531		20.1%	1.01[0.97,1.04]
Bundsen 1982	38/40	14/20		3.05%	1.36[1.01,1.82]
Calvert 1982	77/100	78/100		8.51%	0.99[0.85,1.15]
Chan 1963	71/99	70/96		7%	0.98[0.83,1.17]
Chen 1987	55/61	105/124		11.68%	1.06[0.95,1.19]

Favours recumbent — Favours upright

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Flynn 1978	31/33	22/33		3.88%	1.41[1.09,1.82]
Gau 2011	45/48	36/39		11.23%	1.02[0.9,1.14]
Haukkama 1982	27/31	24/29		5.16%	1.05[0.85,1.3]
MacLennan 1994	64/96	72/100		6.32%	0.93[0.77,1.12]
Mathew 2012	34/40	13/20		2.3%	1.31[0.92,1.85]
McManus 1978	15/20	14/20		1.93%	1.07[0.73,1.57]
Miquelutti 2007	31/54	36/53		3.06%	0.85[0.63,1.14]
Williams 1980	40/48	46/55		7.08%	1[0.84,1.18]
Total (95% CI)	**1306**	**1320**		**100%**	**1.05[0.99,1.11]**
Total events: 1105 (Upright), 1084 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=22.25, df=13(P=0.05); I^2=41.58%					
Test for overall effect: Z=1.69(P=0.09)					

Favours recumbent Favours upright

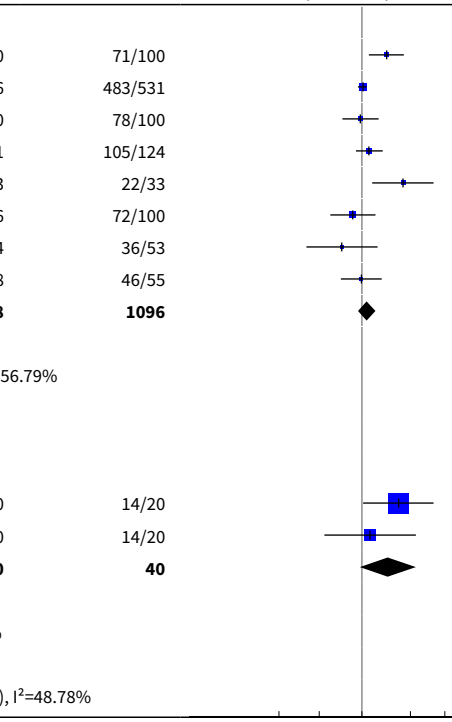
Analysis 1.9. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 9 Mode of birth: spontaneous vaginal: subgroup analysis: parity.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
1.9.1 Nulliparous women					
Ben Regaya 2010	87/100	71/100		18.51%	1.23[1.06,1.42]
Bloom 1998	232/272	236/272		27.84%	0.98[0.92,1.05]
Chan 1963	71/99	70/96		15.77%	0.98[0.83,1.17]
Chen 1987	30/33	53/68		16.48%	1.17[0.99,1.38]
Mathew 2012	34/40	13/20		6.24%	1.31[0.92,1.85]
McManus 1978	5/10	5/10		1.17%	1[0.42,2.4]
Miquelutti 2007	31/54	36/53		8.03%	0.85[0.63,1.14]
Williams 1980	17/25	21/30		5.96%	0.97[0.68,1.39]
Subtotal (95% CI)	**633**	**649**		**100%**	**1.06[0.96,1.17]**
Total events: 507 (Upright), 505 (Recumbent)					
Heterogeneity: Tau^2=0.01; Chi^2=13.31, df=7(P=0.06); I^2=47.39%					
Test for overall effect: Z=1.16(P=0.25)					
1.9.2 Multiparous women					
Bloom 1998	258/264	247/259		81.2%	1.02[0.99,1.06]
Chen 1987	25/28	52/56		3.96%	0.96[0.83,1.11]
McManus 1978	10/10	9/10		1.2%	1.11[0.85,1.44]
Williams 1980	23/23	25/25		13.64%	1[0.92,1.08]
Subtotal (95% CI)	**325**	**350**		**100%**	**1.02[0.99,1.05]**
Total events: 316 (Upright), 333 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=1.29, df=3(P=0.73); I^2=0%					
Test for overall effect: Z=1.3(P=0.19)					
Test for subgroup differences: Chi^2=0.53, df=1 (P=0.46), I^2=0%					

Favours recumbent Favours upright

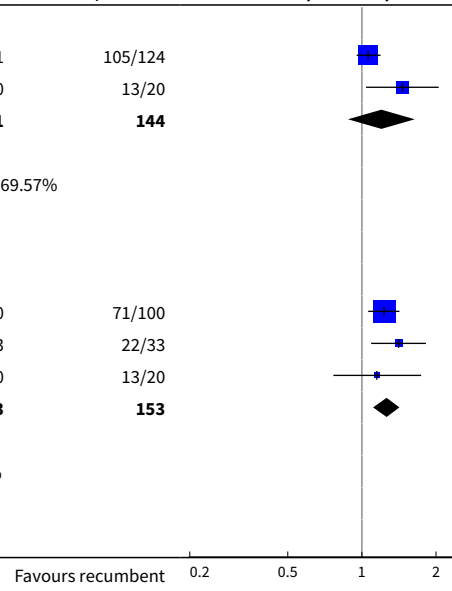
Analysis 1.10. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 10 Mode of birth: spontaneous vaginal: subgroup analysis: onset of labour.

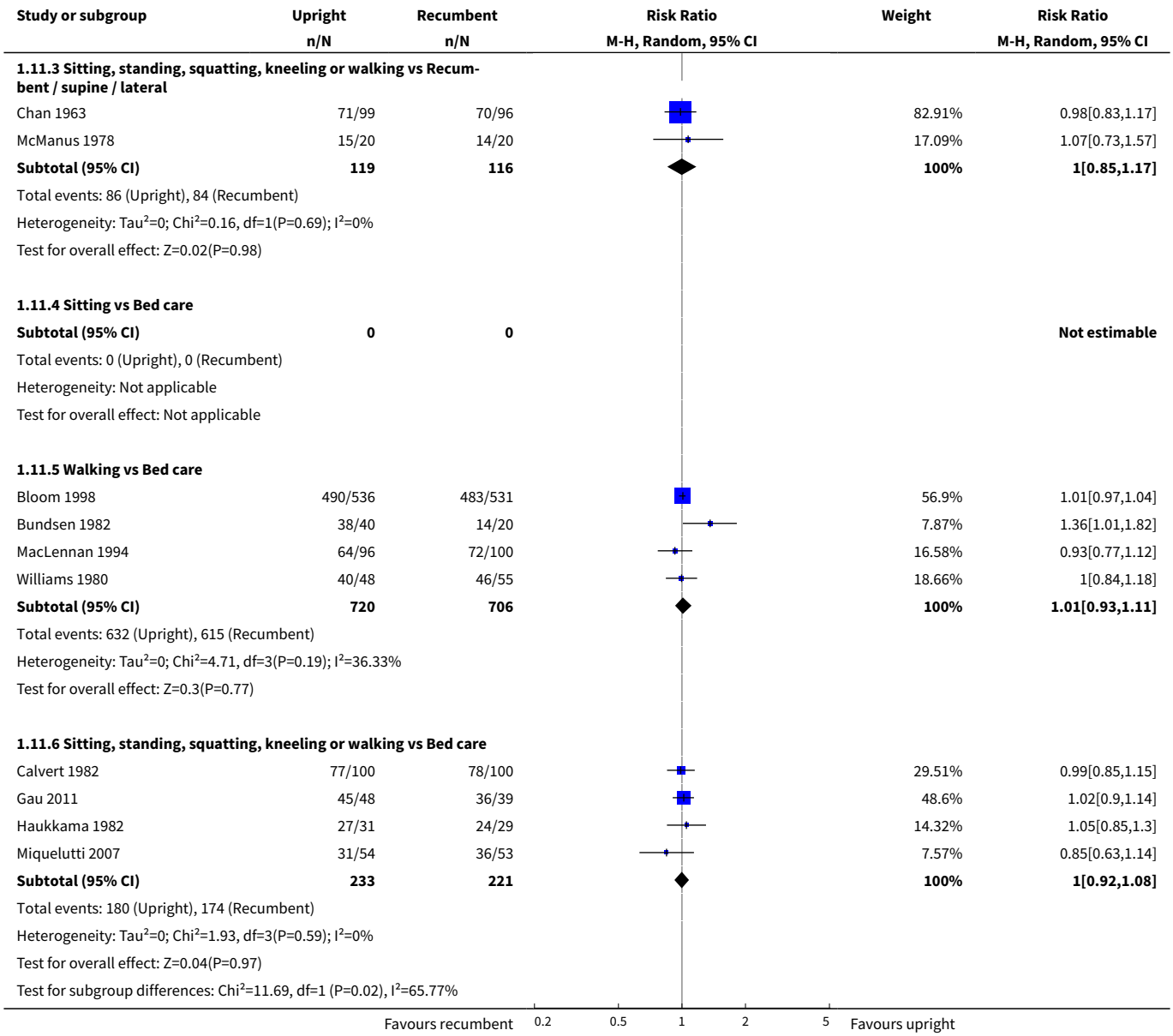
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
1.10.1 Spontaneous labour: all women					
Ben Regaya 2010	87/100	71/100		13.12%	1.23[1.06,1.42]
Bloom 1998	490/536	483/531		24.88%	1.01[0.97,1.04]
Calvert 1982	77/100	78/100		12.86%	0.99[0.85,1.15]
Chen 1987	55/61	105/124		16.64%	1.06[0.95,1.19]
Flynn 1978	31/33	22/33		6.42%	1.41[1.09,1.82]
MacLennan 1994	64/96	72/100		9.95%	0.93[0.77,1.12]
Miquelutti 2007	31/54	36/53		5.15%	0.85[0.63,1.14]
Williams 1980	40/48	46/55		10.99%	1[0.84,1.18]
Subtotal (95% CI)	**1028**	**1096**		**100%**	**1.04[0.97,1.12]**
Total events: 875 (Upright), 913 (Recumbent)					
Heterogeneity: Tau^2=0.01; Chi^2=16.2, df=7(P=0.02); I^2=56.79%					
Test for overall effect: Z=1.1(P=0.27)					
1.10.2 Induction of labour: all women					
Bundsen 1982	38/40	14/20		62.62%	1.36[1.01,1.82]
McManus 1978	15/20	14/20		37.38%	1.07[0.73,1.57]
Subtotal (95% CI)	**60**	**40**		**100%**	**1.24[0.98,1.57]**
Total events: 53 (Upright), 28 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.92, df=1(P=0.34); I^2=0%					
Test for overall effect: Z=1.82(P=0.07)					
Test for subgroup differences: Chi^2=1.95, df=1 (P=0.16), I^2=48.78%					



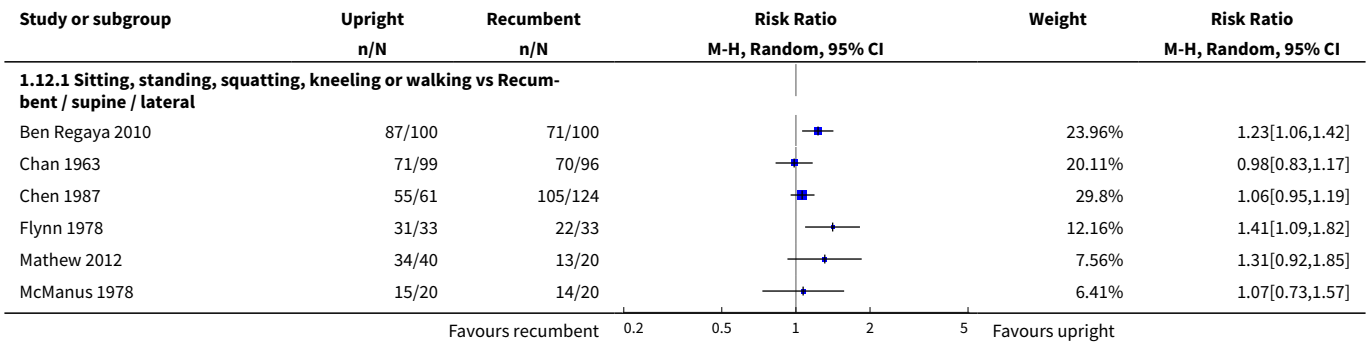
Analysis 1.11. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 11 Mode of birth: spontaneous vaginal: subgroup analysis: position types.

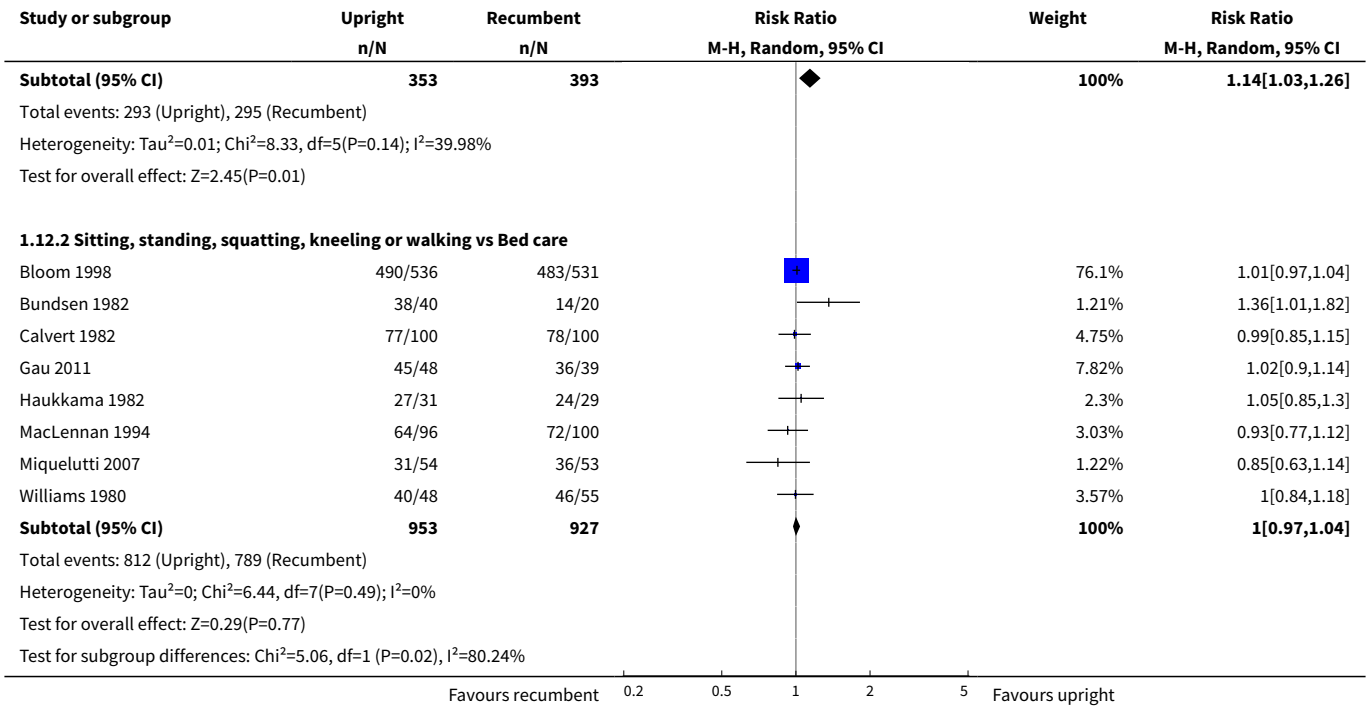
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
1.11.1 Sitting vs Recumbent / supine / lateral					
Chen 1987	55/61	105/124		62.2%	1.06[0.95,1.19]
Mathew 2012	19/20	13/20		37.8%	1.46[1.04,2.05]
Subtotal (95% CI)	**81**	**144**		**100%**	**1.2[0.88,1.64]**
Total events: 74 (Upright), 118 (Recumbent)					
Heterogeneity: Tau^2=0.04; Chi^2=3.29, df=1(P=0.07); I^2=69.57%					
Test for overall effect: Z=1.15(P=0.25)					
1.11.2 Walking vs Recumbent / supine / lateral					
Ben Regaya 2010	87/100	71/100		68.77%	1.23[1.06,1.42]
Flynn 1978	31/33	22/33		22.43%	1.41[1.09,1.82]
Mathew 2012	15/20	13/20		8.8%	1.15[0.77,1.74]
Subtotal (95% CI)	**153**	**153**		**100%**	**1.26[1.11,1.42]**
Total events: 133 (Upright), 106 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=1.05, df=2(P=0.59); I^2=0%					
Test for overall effect: Z=3.7(P=0)					



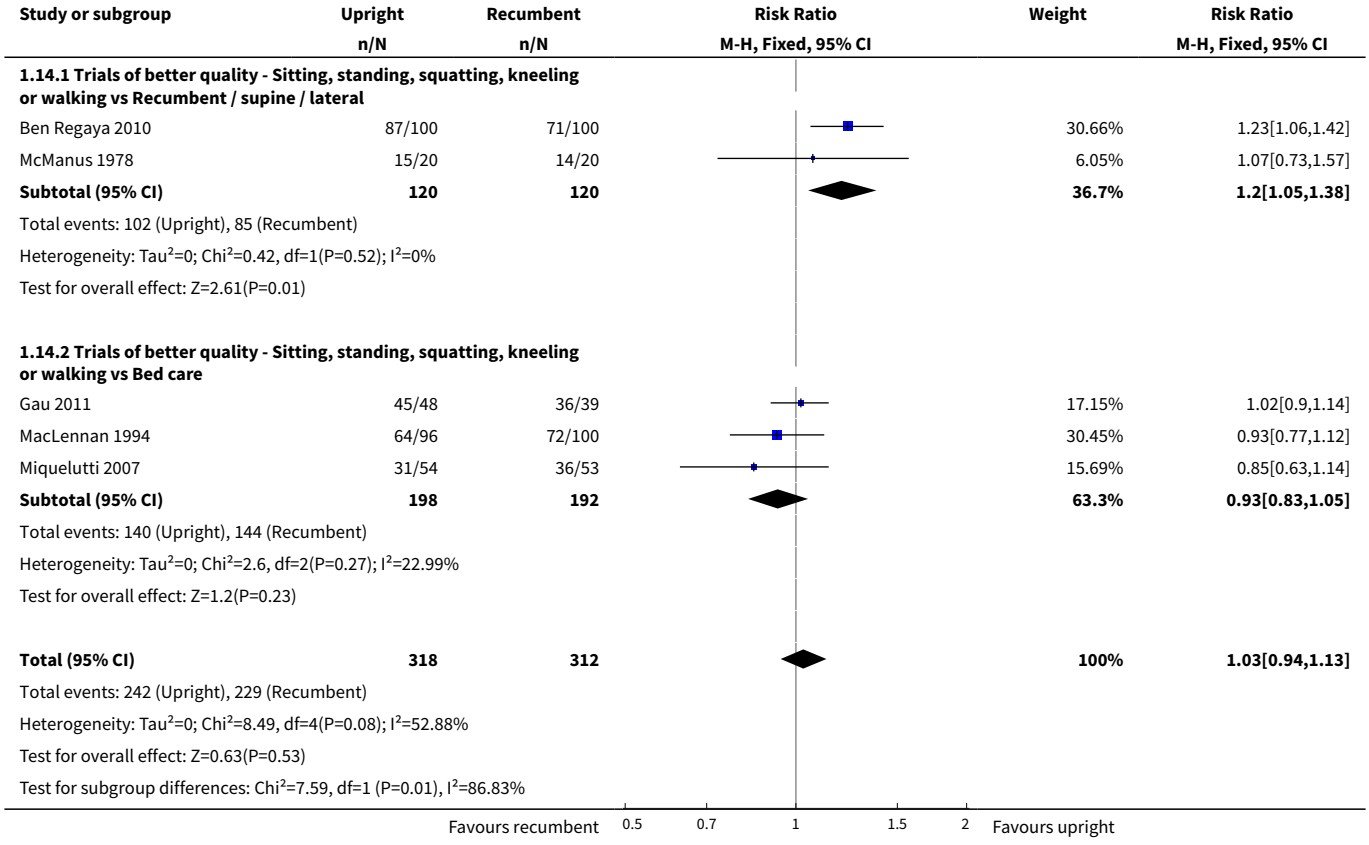


Analysis 1.12. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 12 Mode of birth: spontaneous vaginal: subgroup analysis: position types.



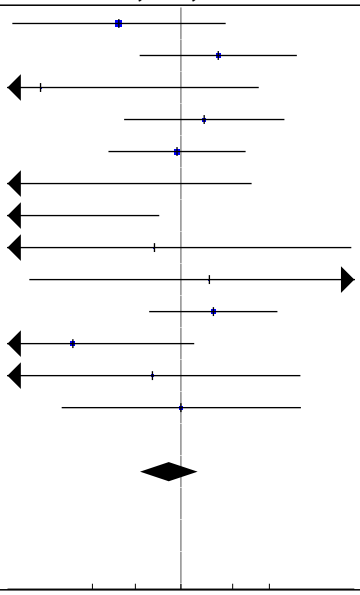


Analysis 1.14. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 14 Mode of birth: spontaneous vaginal: sensitivity analysis - positions.



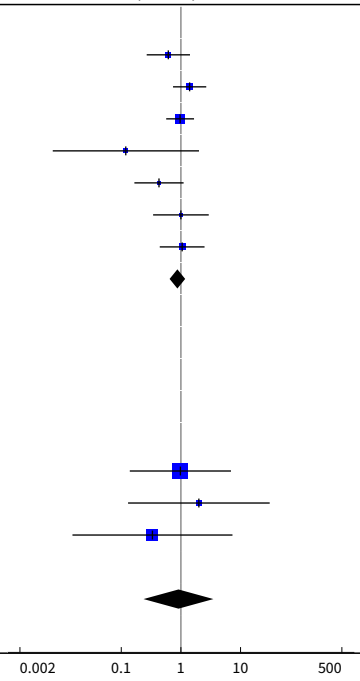
Analysis 1.15. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 15 Mode of birth: operative vaginal: all women.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Ben Regaya 2010	8/100	13/100		9.62%	0.62[0.27,1.42]
Bloom 1998	23/536	17/531		12.64%	1.34[0.72,2.48]
Bundsen 1982	2/40	3/20		2.96%	0.33[0.06,1.84]
Calvert 1982	18/100	15/100		11.1%	1.2[0.64,2.25]
Chan 1963	21/99	21/96		15.78%	0.97[0.57,1.66]
Chen 1987	1/61	9/124		4.39%	0.23[0.03,1.74]
Flynn 1978	2/33	10/33		7.4%	0.2[0.05,0.84]
Gau 2011	3/48	3/39		2.45%	0.81[0.17,3.8]
Haukkama 1982	4/31	3/29		2.29%	1.25[0.3,5.1]
MacLennan 1994	26/96	21/100		15.23%	1.29[0.78,2.13]
Mathew 2012	6/40	7/20		6.91%	0.43[0.17,1.11]
McManus 1978	4/20	5/20		3.7%	0.8[0.25,2.55]
Williams 1980	7/48	8/55		5.52%	1[0.39,2.56]
Total (95% CI)	**1252**	**1267**		**100%**	**0.91[0.73,1.14]**
Total events: 125 (Upright), 135 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=15.12, df=12(P=0.24); I^2=20.61%					
Test for overall effect: Z=0.83(P=0.4)					



Analysis 1.16. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 16 Mode of birth: operative vaginal: subgroup analysis: parity.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.16.1 Nulliparous women					
Ben Regaya 2010	8/100	13/100		17.21%	0.62[0.27,1.42]
Bloom 1998	21/272	15/272		19.86%	1.4[0.74,2.66]
Chan 1963	21/99	21/96		28.23%	0.97[0.57,1.66]
Chen 1987	0/33	8/68		7.43%	0.12[0.01,2.01]
Mathew 2012	6/40	7/20		12.36%	0.43[0.17,1.11]
McManus 1978	4/10	4/10		5.3%	1[0.34,2.93]
Williams 1980	7/25	8/30		9.63%	1.05[0.44,2.49]
Subtotal (95% CI)	**579**	**596**		**100%**	**0.87[0.65,1.18]**
Total events: 67 (Upright), 76 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=7.21, df=6(P=0.3); I^2=16.76%					
Test for overall effect: Z=0.88(P=0.38)					
1.16.2 Multiparous women					
Bloom 1998	2/264	2/259		48.24%	0.98[0.14,6.91]
Chen 1987	1/28	1/56		15.93%	2[0.13,30.8]
McManus 1978	0/10	1/10		35.84%	0.33[0.02,7.32]
Williams 1980	0/23	0/25			Not estimable
Subtotal (95% CI)	**325**	**350**		**100%**	**0.91[0.24,3.51]**
Total events: 3 (Upright), 4 (Recumbent)					



Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Heterogeneity: Tau²=0; Chi²=0.73, df=2(P=0.69); I²=0%					
Test for overall effect: Z=0.14(P=0.89)					
Test for subgroup differences: Chi²=0, df=1 (P=0.95), I²=0%					

Favours upright 0.002 0.1 1 10 500 Favours recumbent

Analysis 1.17. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 17 Mode of birth: operative vaginal: subgroup analysis: onset of labour.

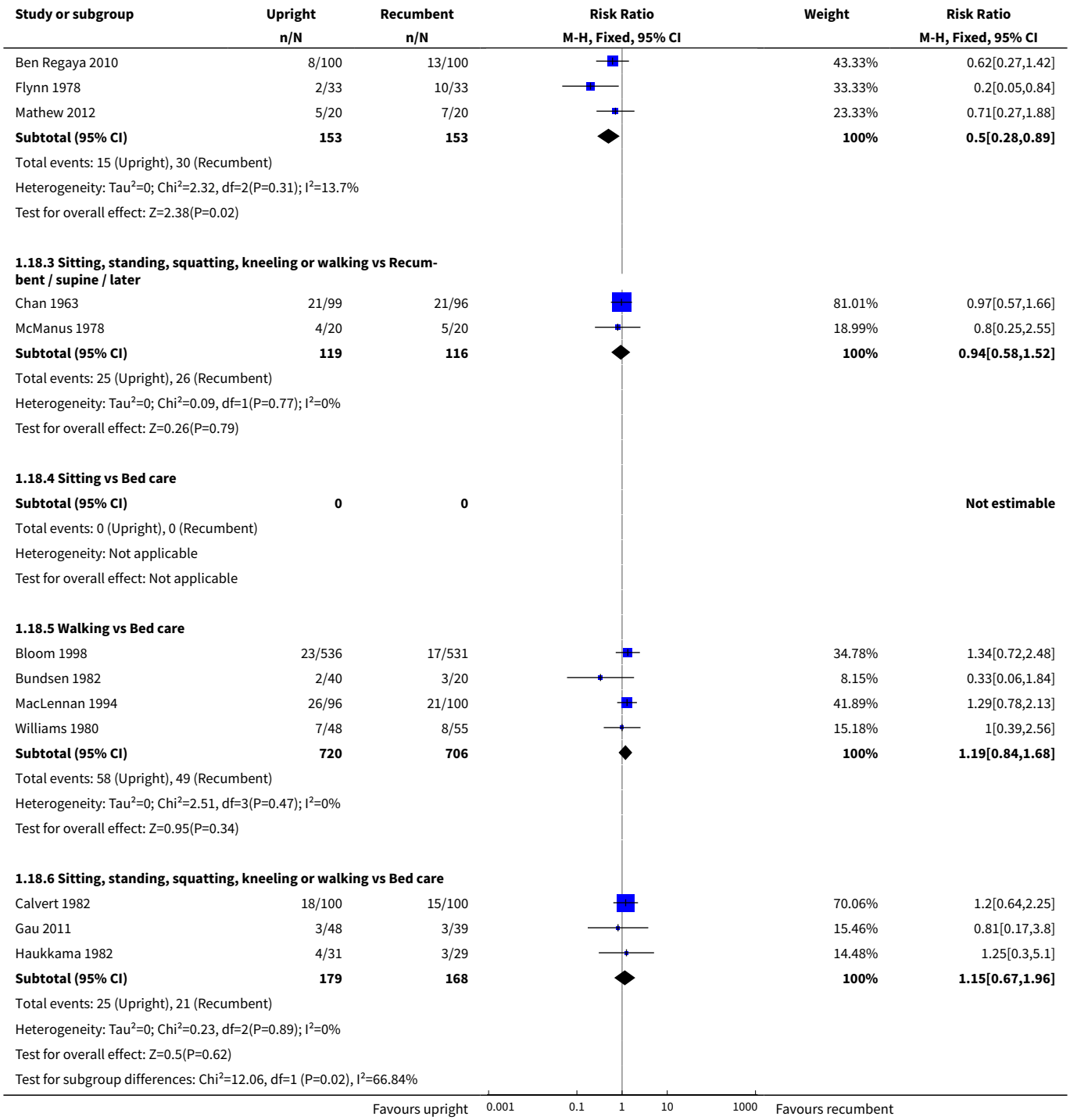
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
1.17.1 Spontaneous labour: all women					
Ben Regaya 2010	8/100	13/100		14.4%	0.62[0.27,1.42]
Bloom 1998	23/536	17/531		19.92%	1.34[0.72,2.48]
Calvert 1982	18/100	15/100		19.59%	1.2[0.64,2.25]
Chen 1987	1/61	9/124		3.59%	0.23[0.03,1.74]
Flynn 1978	2/33	10/33		6.58%	0.2[0.05,0.84]
MacLennan 1994	26/96	21/100		23.48%	1.29[0.78,2.13]
Williams 1980	7/48	8/55		12.45%	1[0.39,2.56]
Subtotal (95% CI)	**974**	**1043**		**100%**	**0.93[0.62,1.39]**
Total events: 85 (Upright), 93 (Recumbent)					
Heterogeneity: Tau²=0.12; Chi²=10.47, df=6(P=0.11); I²=42.69%					
Test for overall effect: Z=0.36(P=0.72)					
1.17.2 Induction of labour: all women					
Bundsen 1982	2/40	3/20		31.58%	0.33[0.06,1.84]
McManus 1978	4/20	5/20		68.42%	0.8[0.25,2.55]
Subtotal (95% CI)	**60**	**40**		**100%**	**0.61[0.23,1.58]**
Total events: 6 (Upright), 8 (Recumbent)					
Heterogeneity: Tau²=0; Chi²=0.69, df=1(P=0.4); I²=0%					
Test for overall effect: Z=1.02(P=0.31)					
Test for subgroup differences: Chi²=0.64, df=1 (P=0.42), I²=0%					

Favours upright 0.002 0.1 1 10 500 Favours recumbent

Analysis 1.18. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 18 Mode of birth: operative vaginal: subgroup analysis: position types.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.18.1 Sitting vs Recumbent / supine / lateral					
Chen 1987	1/61	9/124		45.88%	0.23[0.03,1.74]
Mathew 2012	1/20	7/20		54.12%	0.14[0.02,1.06]
Subtotal (95% CI)	**81**	**144**		**100%**	**0.18[0.04,0.75]**
Total events: 2 (Upright), 16 (Recumbent)					
Heterogeneity: Tau²=0; Chi²=0.1, df=1(P=0.75); I²=0%					
Test for overall effect: Z=2.36(P=0.02)					
1.18.2 Walking vs Recumbent / supine / lateral					

Favours upright 0.001 0.1 1 10 1000 Favours recumbent

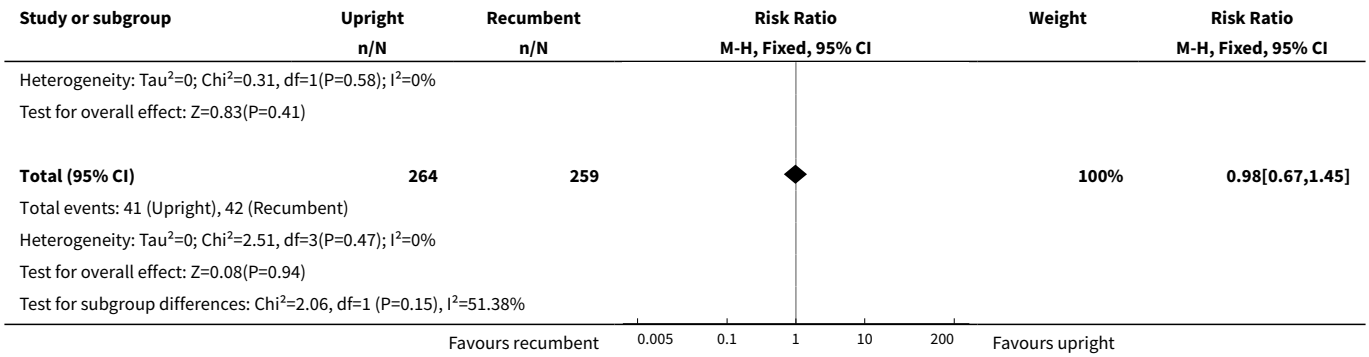


Analysis 1.19. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 19 Mode of birth: operative vaginal: subgroup analysis: position types.

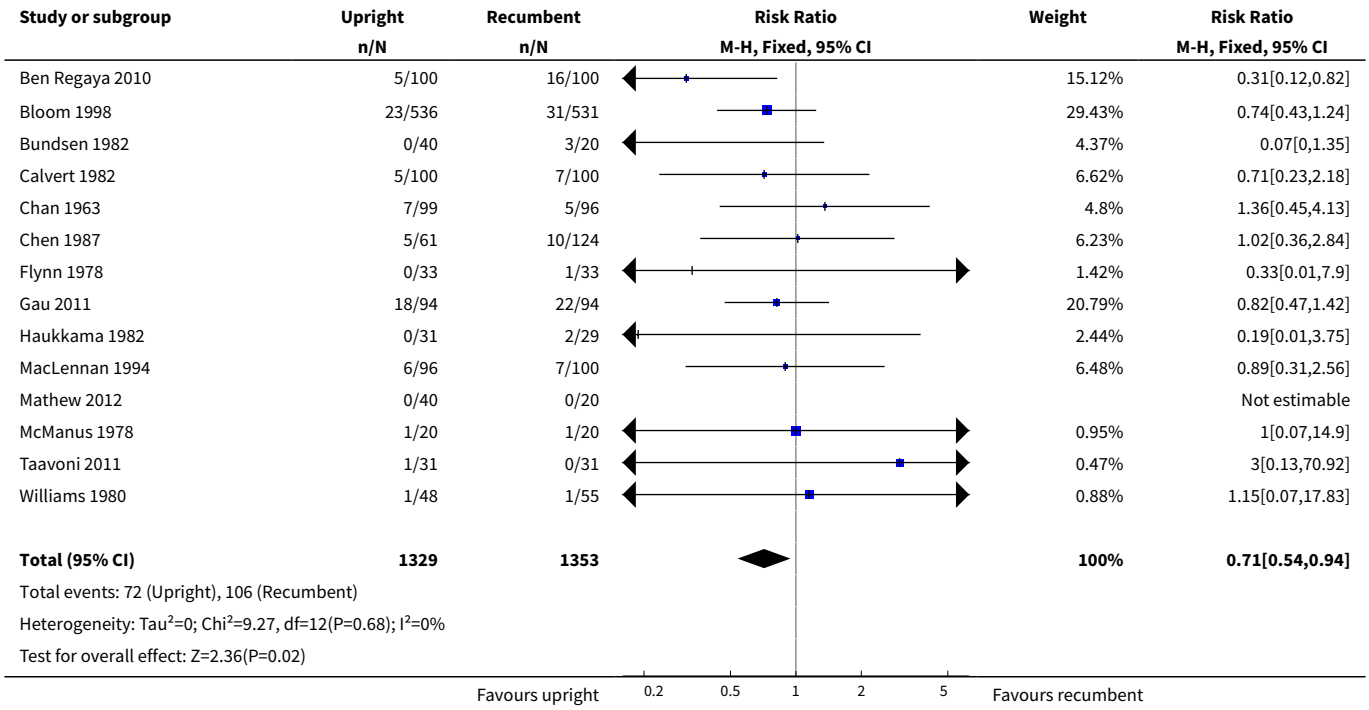
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.19.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / later					
Ben Regaya 2010	8/100	13/100		20.13%	0.62[0.27,1.42]
Chan 1963	21/99	21/96		33.01%	0.97[0.57,1.66]
Chen 1987	1/61	9/124		9.19%	0.23[0.03,1.74]
Flynn 1978	2/33	10/33		15.48%	0.2[0.05,0.84]
Mathew 2012	6/40	7/20		14.45%	0.43[0.17,1.11]
McManus 1978	4/20	5/20		7.74%	0.8[0.25,2.55]
Subtotal (95% CI)	**353**	**393**		**100%**	**0.62[0.43,0.89]**
Total events: 42 (Upright), 65 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=6.76, df=5(P=0.24); I^2=26.03%					
Test for overall effect: Z=2.61(P=0.01)					
1.19.2 Sitting, standing, squatting, kneeling or walking vs Bed care					
Bloom 1998	23/536	17/531		24.22%	1.34[0.72,2.48]
Bundsen 1982	2/40	3/20		5.67%	0.33[0.06,1.84]
Calvert 1982	18/100	15/100		21.27%	1.2[0.64,2.25]
Gau 2011	3/48	3/39		4.69%	0.81[0.17,3.8]
Haukkama 1982	4/31	3/29		4.4%	1.25[0.3,5.1]
MacLennan 1994	26/96	21/100		29.17%	1.29[0.78,2.13]
Williams 1980	7/48	8/55		10.57%	1[0.39,2.56]
Subtotal (95% CI)	**899**	**874**		**100%**	**1.17[0.88,1.57]**
Total events: 83 (Upright), 70 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=2.74, df=6(P=0.84); I^2=0%					
Test for overall effect: Z=1.07(P=0.28)					
Test for subgroup differences: Chi^2=7.29, df=1 (P=0.01), I^2=86.29%					

Analysis 1.21. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 21 Mode of birth: operative vaginal: sensitivity analysis - positions.

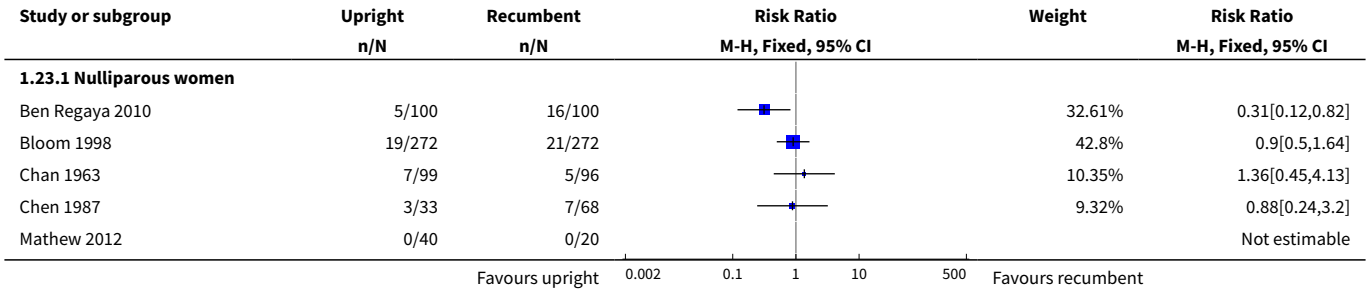
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.21.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral					
Ben Regaya 2010	8/100	13/100		31.04%	0.62[0.27,1.42]
McManus 1978	4/20	5/20		11.94%	0.8[0.25,2.55]
Subtotal (95% CI)	**120**	**120**		**42.98%**	**0.67[0.34,1.31]**
Total events: 12 (Upright), 18 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.13, df=1(P=0.72); I^2=0%					
Test for overall effect: Z=1.17(P=0.24)					
1.21.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care					
Gau 2011	3/48	3/39		7.9%	0.81[0.17,3.8]
MacLennan 1994	26/96	21/100		49.12%	1.29[0.78,2.13]
Subtotal (95% CI)	**144**	**139**		**57.02%**	**1.22[0.76,1.97]**
Total events: 29 (Upright), 24 (Recumbent)					

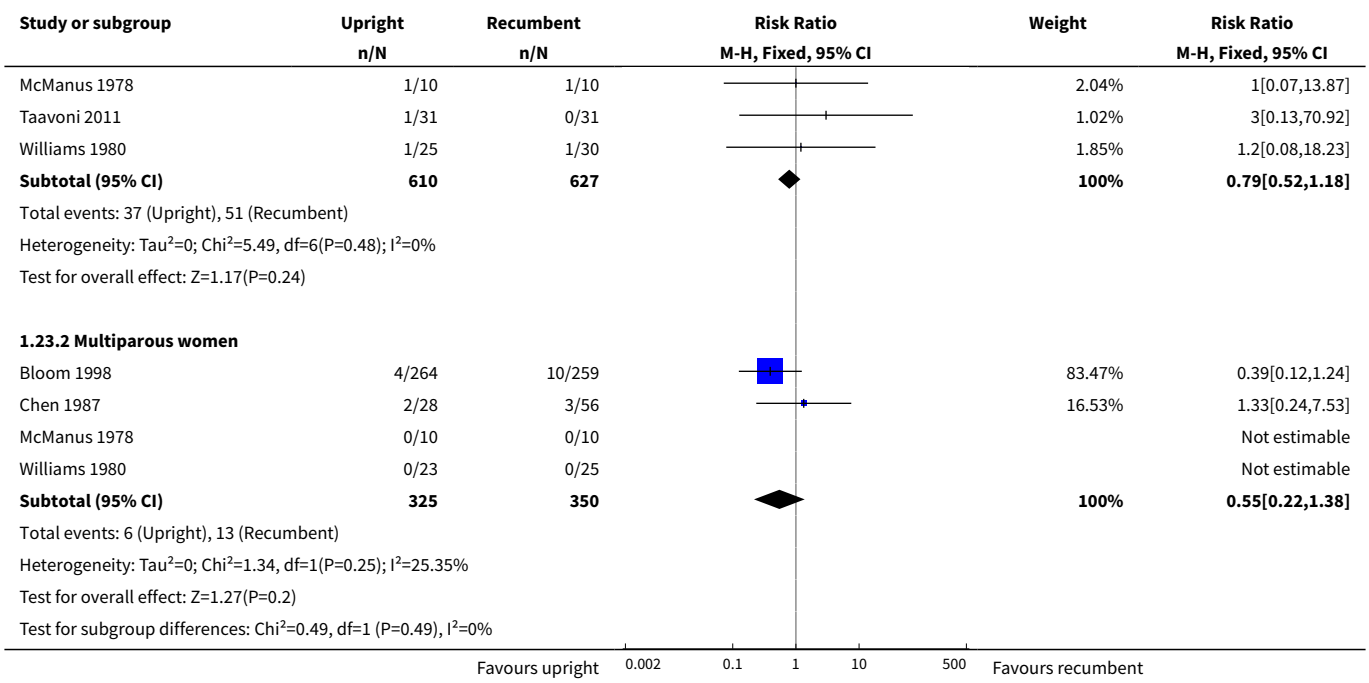


Analysis 1.22. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 22 Mode of birth: caesarean birth.

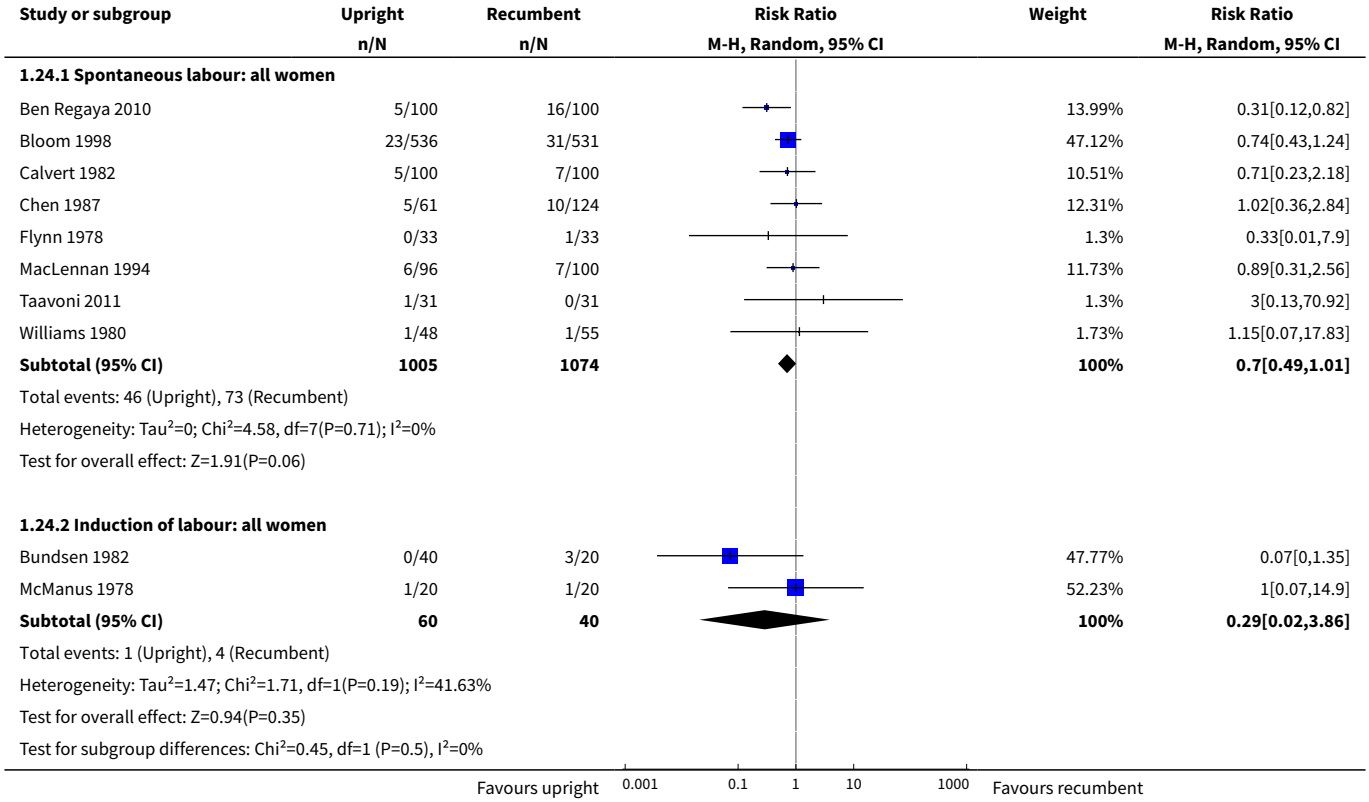


Analysis 1.23. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 23 Mode of birth: caesarean birth: subgroup analysis: parity.



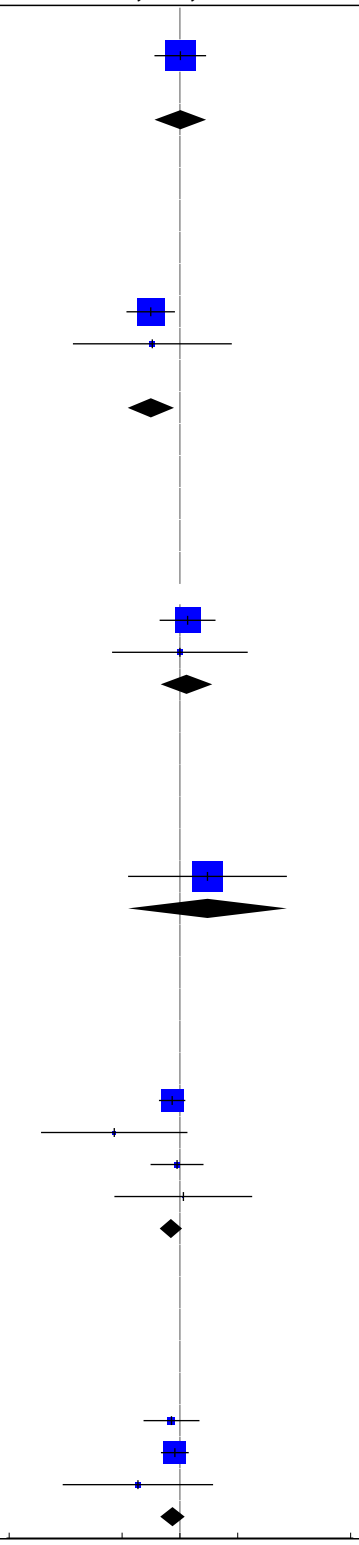


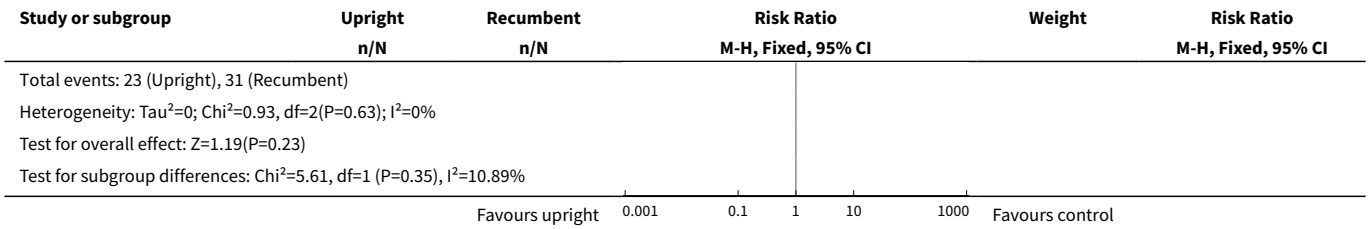
Analysis 1.24. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 24 Mode of birth: caesarean birth: subgroup analysis: onset of labour.



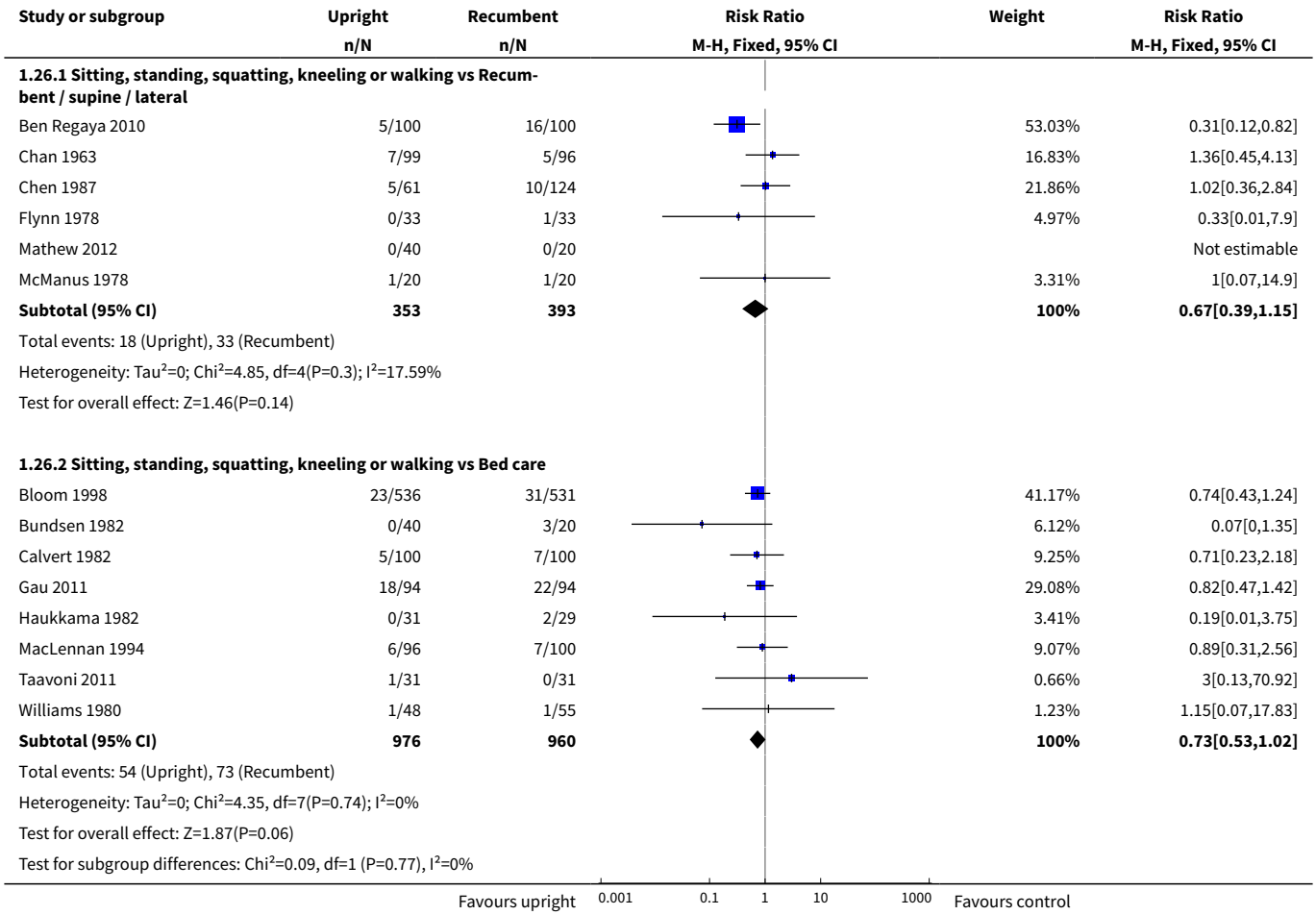
Analysis 1.25. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 25 Mode of birth: caesarean birth: subgroup analysis: position types.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.25.1 Sitting vs Recumbent / supine / lateral					
Chen 1987	5/61	10/124		100%	1.02[0.36,2.84]
Mathew 2012	0/20	0/20			Not estimable
Subtotal (95% CI)	**81**	**144**		**100%**	**1.02[0.36,2.84]**
Total events: 5 (Upright), 10 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.03(P=0.98)					
1.25.2 Walking vs Recumbent / supine / lateral					
Ben Regaya 2010	5/100	16/100		91.43%	0.31[0.12,0.82]
Flynn 1978	0/33	1/33		8.57%	0.33[0.01,7.9]
Mathew 2012	0/20	0/20			Not estimable
Subtotal (95% CI)	**153**	**153**		**100%**	**0.31[0.12,0.79]**
Total events: 5 (Upright), 17 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0, df=1(P=0.97); I^2=0%					
Test for overall effect: Z=2.46(P=0.01)					
1.25.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral					
Chan 1963	7/99	5/96		83.54%	1.36[0.45,4.13]
McManus 1978	1/20	1/20		16.46%	1[0.07,14.9]
Subtotal (95% CI)	**119**	**116**		**100%**	**1.3[0.46,3.63]**
Total events: 8 (Upright), 6 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.04, df=1(P=0.84); I^2=0%					
Test for overall effect: Z=0.5(P=0.62)					
1.25.4 Sitting vs Bed care					
Taavoni 2011	1/31	0/31		100%	3[0.13,70.92]
Subtotal (95% CI)	**31**	**31**		**100%**	**3[0.13,70.92]**
Total events: 1 (Upright), 0 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.68(P=0.5)					
1.25.5 Walking vs Bed care					
Bloom 1998	23/536	31/531		71.49%	0.74[0.43,1.24]
Bundsen 1982	0/40	3/20		10.63%	0.07[0,1.35]
MacLennan 1994	6/96	7/100		15.74%	0.89[0.31,2.56]
Williams 1980	1/48	1/55		2.14%	1.15[0.07,17.83]
Subtotal (95% CI)	**720**	**706**		**100%**	**0.7[0.45,1.09]**
Total events: 30 (Upright), 42 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=2.67, df=3(P=0.45); I^2=0%					
Test for overall effect: Z=1.57(P=0.12)					
1.25.6 Sitting, standing, squatting, kneeling or walking vs Bed care					
Calvert 1982	5/100	7/100		22.17%	0.71[0.23,2.18]
Gau 2011	18/94	22/94		69.66%	0.82[0.47,1.42]
Haukkama 1982	0/31	2/29		8.17%	0.19[0.01,3.75]
Subtotal (95% CI)	**225**	**223**		**100%**	**0.74[0.46,1.21]**

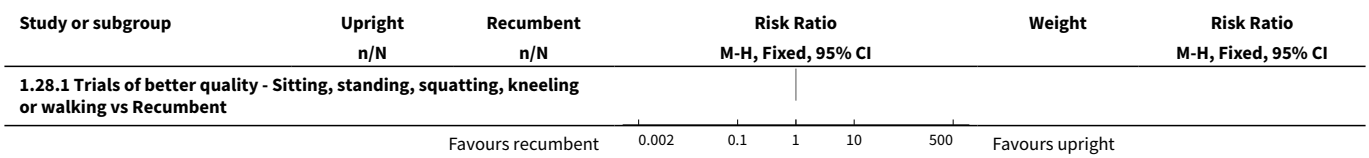


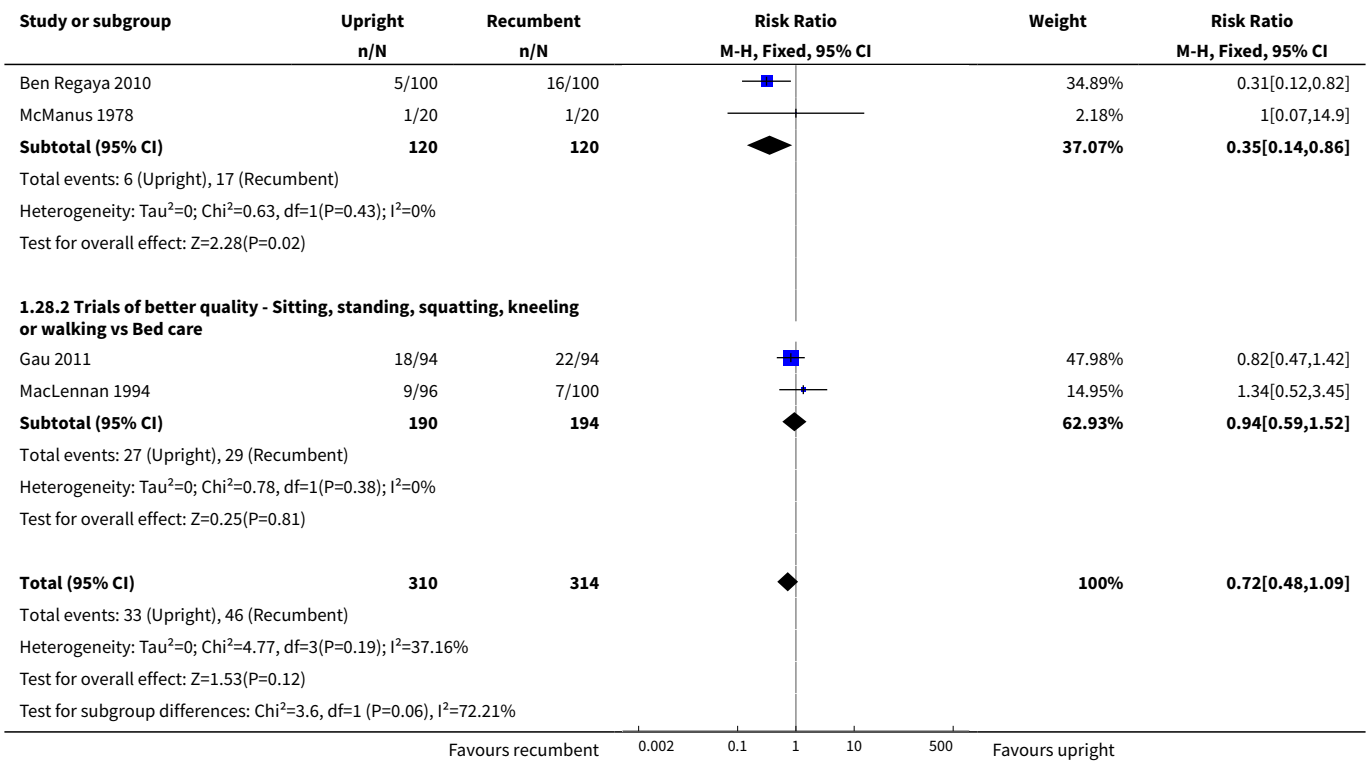


Analysis 1.26. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 26 Mode of birth: caesarean birth: subgroup analysis: position types.

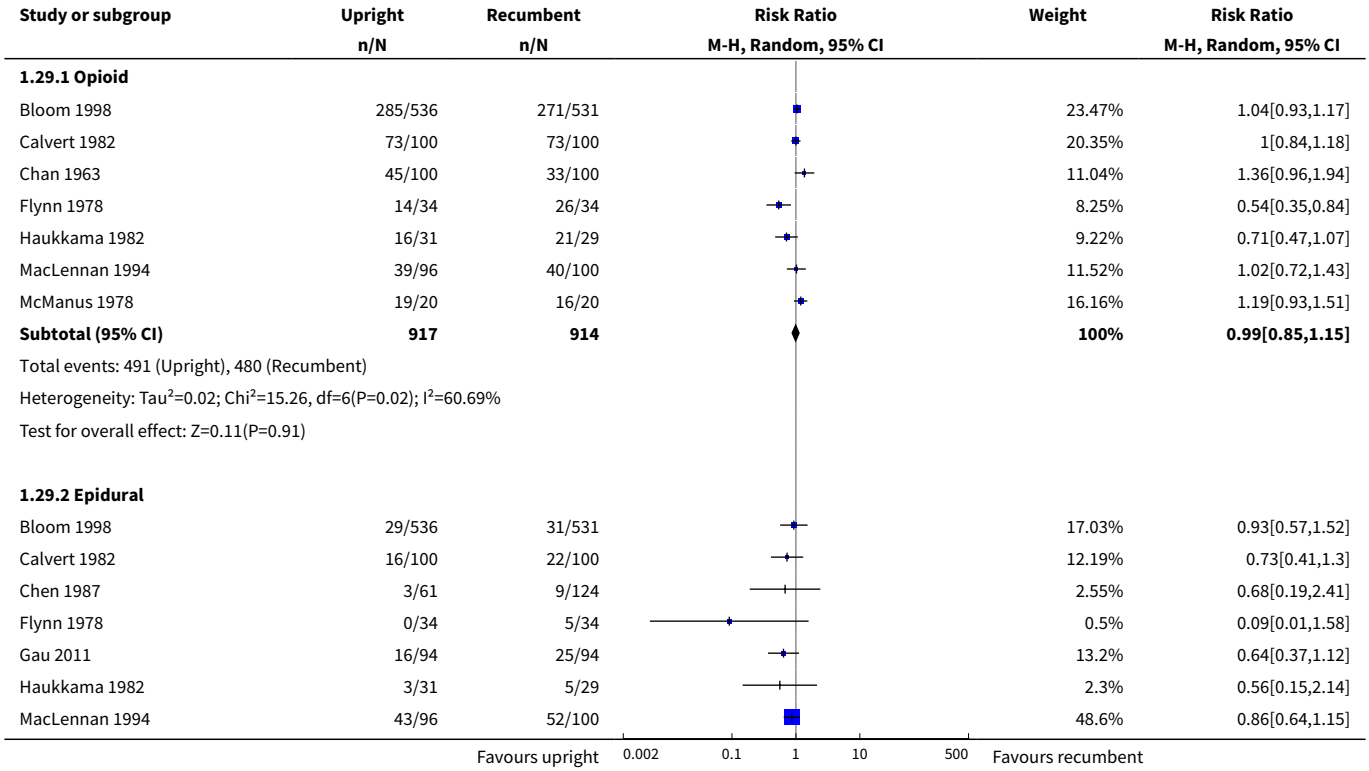


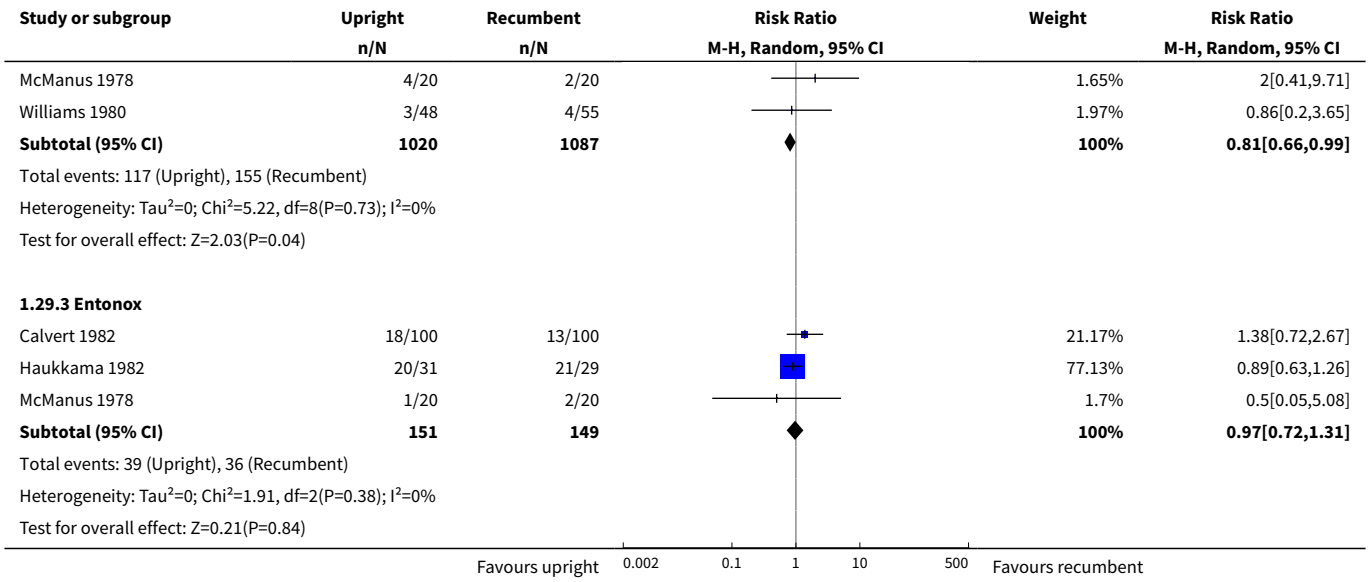
Analysis 1.28. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 28 Mode of birth: caesarean birth: sensitivity analysis - positions.



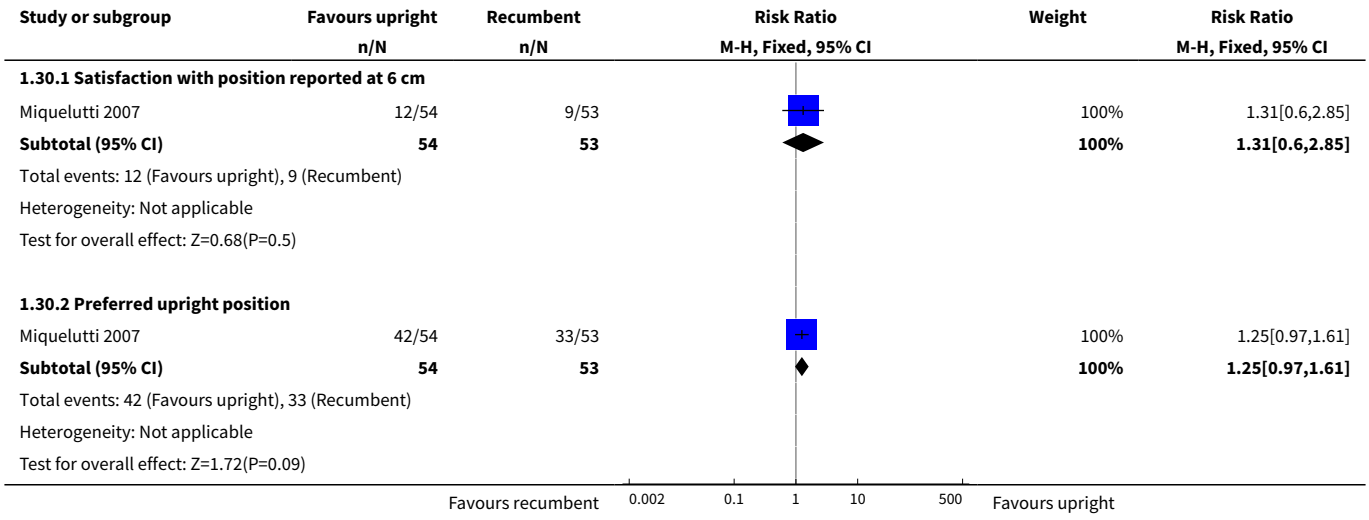


Analysis 1.29. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 29 Analgesia type.

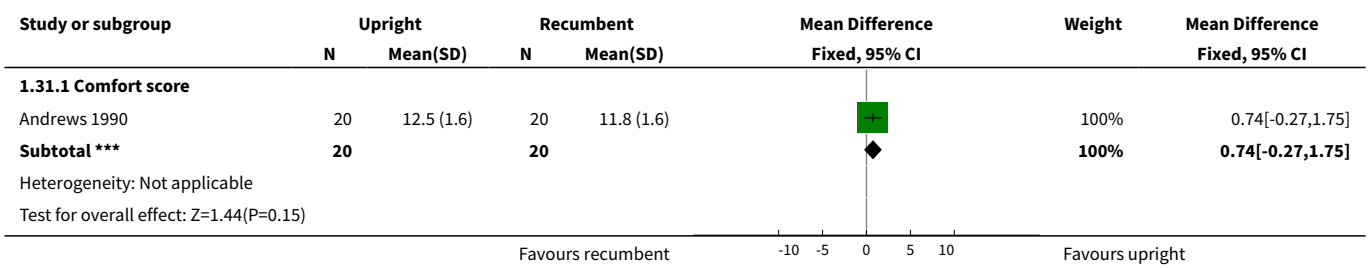


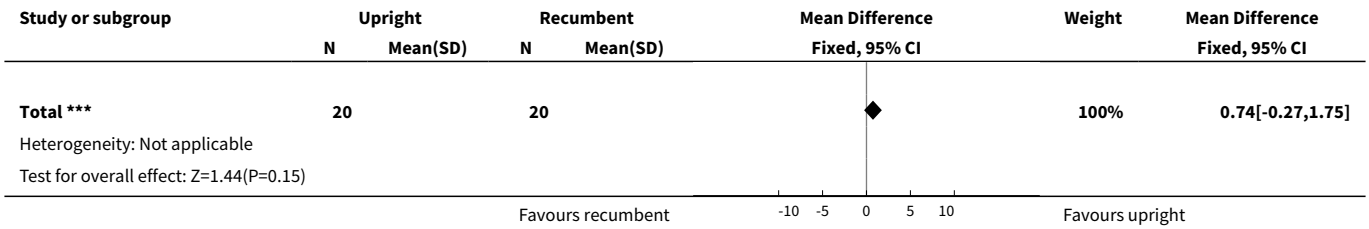


Analysis 1.30. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 30 Maternal satisfaction.

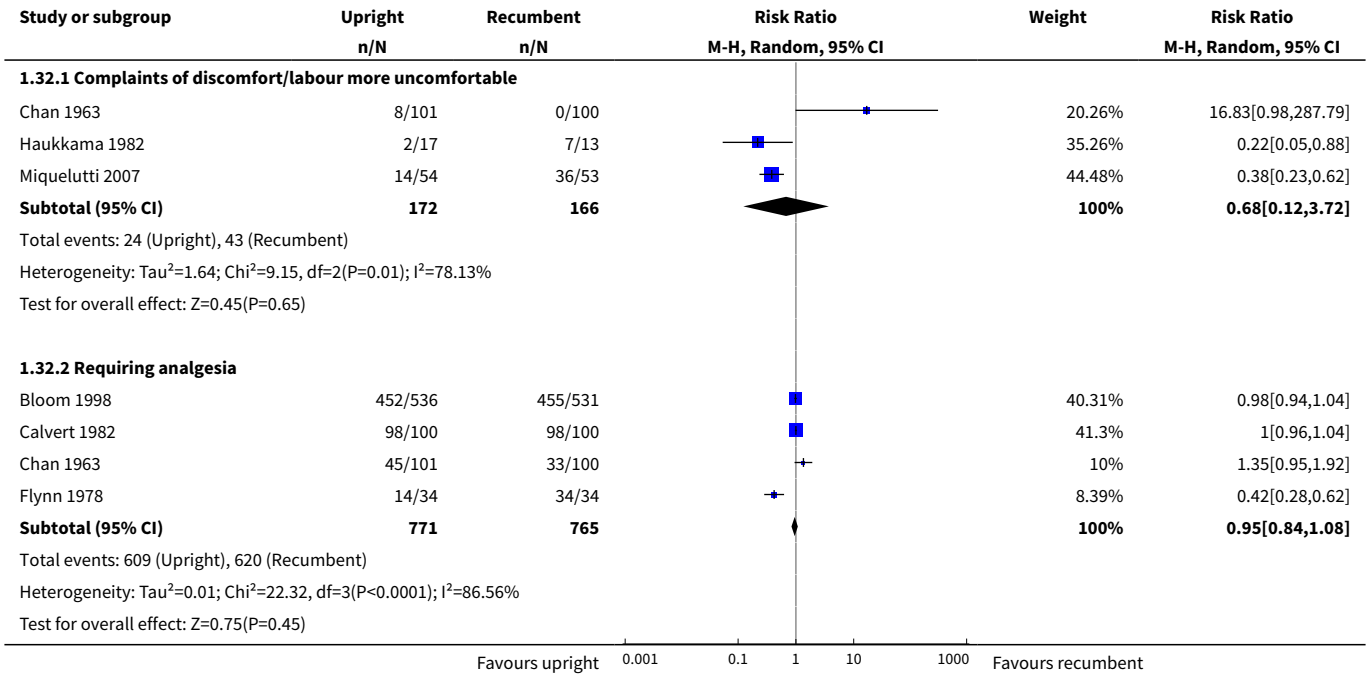


Analysis 1.31. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 31 Maternal comfort.

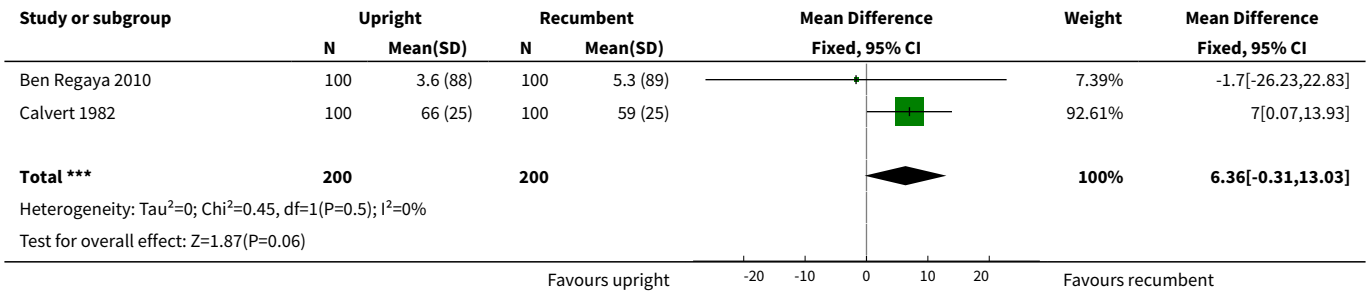




Analysis 1.32. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 32 Maternal pain.

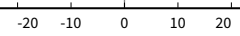


Analysis 1.33. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 33 Maternal pain.



Analysis 1.34. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 34 Maternal pain.

Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
1.34.1 Visual Analogue Scale (VAS) Score							
Taavoni 2011	29	7.2 (1.6)	31	8.9 (1.4)		100%	-1.74[-2.51,-0.97]
Subtotal ***	**29**		**31**			**100%**	**-1.74[-2.51,-0.97]**
Heterogeneity: Not applicable							
Test for overall effect: Z=4.41(P<0.0001)							
1.34.2 Visual Analogue Scale (VAS) Score @ 4 cm							
Gau 2011	48	4 (1.7)	39	6 (1.6)		100%	-2[-2.7,-1.3]
Subtotal ***	**48**		**39**			**100%**	**-2[-2.7,-1.3]**
Heterogeneity: Not applicable							
Test for overall effect: Z=5.64(P<0.0001)							
1.34.3 Visual Analogue Scale (VAS) Score @ 8 cm							
Gau 2011	48	6.5 (1.3)	39	8.2 (1.1)		100%	-1.7[-2.2,-1.2]
Subtotal ***	**48**		**39**			**100%**	**-1.7[-2.2,-1.2]**
Heterogeneity: Not applicable							
Test for overall effect: Z=6.61(P<0.0001)							
1.34.4 Verbal Response Scale (VRS) Score @ 4 cm							
Gau 2011	48	10.2 (5.3)	39	20.6 (7.8)		100%	-10.4[-13.27,-7.53]
Subtotal ***	**48**		**39**			**100%**	**-10.4[-13.27,-7.53]**
Heterogeneity: Not applicable							
Test for overall effect: Z=7.1(P<0.0001)							
1.34.5 Verbal Response Scale (VRS) Score@ 8 cm							
Gau 2011	48	22.3 (10.2)	39	29.3 (10.3)		100%	-7[-11.33,-2.67]
Subtotal ***	**48**		**39**			**100%**	**-7[-11.33,-2.67]**
Heterogeneity: Tau^2=0; Chi^2=0, df=0(P<0.0001); I^2=100%							
Test for overall effect: Z=3.17(P=0)							
1.34.6 Present Pain Intensity Scale (PPI) @ 4 cm							
Gau 2011	48	1.8 (0.9)	39	3.2 (7)		100%	-1.4[-3.61,0.81]
Subtotal ***	**48**		**39**			**100%**	**-1.4[-3.61,0.81]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.24(P=0.21)							
1.34.7 Present Pain Intensity Scale (PPI) @ 8 cm							
Gau 2011	48	3.2 (7)	39	4 (7)		100%	-0.8[-3.76,2.16]
Subtotal ***	**48**		**39**			**100%**	**-0.8[-3.76,2.16]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.53(P=0.6)							



Favours upright

Favours recumbent

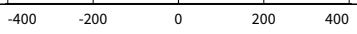
Analysis 1.35. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 35 Maternal anxiety.

Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
Calvert 1982	100	53 (31)	100	45 (28)		100%	8[-0.19,16.19]
Total ***	**100**		**100**			**100%**	**8[-0.19,16.19]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.92(P=0.06)							

Favours upright — Favours recumbent

Analysis 1.36. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 36 Analgesia amount.

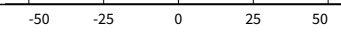
Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Fixed, 95% CI	Weight	Mean Difference Fixed, 95% CI
1.36.1 Narcotics and other analgesia							
Andrews 1990	20	21.3 (31.3)	20	38.8 (31.3)		100%	-17.5[-36.89,1.89]
Subtotal ***	**20**		**20**			**100%**	**-17.5[-36.89,1.89]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.77(P=0.08)							
Total ***	**20**		**20**			**100%**	**-17.5[-36.89,1.89]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.77(P=0.08)							



Favours upright — Favours recumbent

Analysis 1.37. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 37 Duration of second stage of labour (minutes).

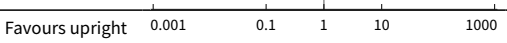
Study or subgroup	Upright N	Upright Mean(SD)	Recumbent N	Recumbent Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Ben Regaya 2010	100	18 (27)	100	18 (27)		12.49%	0[-7.48,7.48]
Bloom 1998	536	36 (47)	531	33 (42)		13.99%	3[-2.35,8.35]
Calvert 1982	77	31 (25)	78	26 (19)		12.85%	5[-2,12]
Chan 1963	93	29 (52)	95	33 (45)		8.12%	-4[-17.91,9.91]
Chen 1987	41	25 (21)	75	40 (43)		9.51%	-15[-26.66,-3.34]
Gau 2011	48	38 (28)	39	41 (17)		10.98%	-3[-12.55,6.55]
Mathew 2012	38	28 (13)	16	50 (18)		10.84%	-22[-31.74,-12.26]
Miquelutti 2007	54	31 (27)	53	36 (27)		10.49%	-5[-15.23,5.23]
Williams 1980	48	31 (29)	55	29 (21)		10.72%	2[-7.9,11.9]
Total ***	**1035**		**1042**			**100%**	**-3.71[-9.37,1.94]**
Heterogeneity: Tau^2=51.97; Chi^2=29.48, df=8(P=0); I^2=72.86%							
Test for overall effect: Z=1.29(P=0.2)							



Favours upright — Favours recumbent

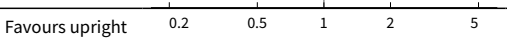
Analysis 1.38. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 38 Augmentation of labour using oxytocin.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Bloom 1998	122/536	137/531		61.46%	0.88[0.71,1.09]
Chen 1987	2/61	13/124		3.83%	0.31[0.07,1.34]
Flynn 1978	1/34	6/34		2.68%	0.17[0.02,1.31]
Haukkama 1982	20/31	19/29		8.77%	0.98[0.68,1.43]
MacLennan 1994	15/96	12/100		5.25%	1.3[0.64,2.64]
McManus 1978	2/20	4/20		1.79%	0.5[0.1,2.43]
Miquelutti 2007	25/54	24/53		10.82%	1.02[0.68,1.54]
Williams 1980	13/48	13/55		5.41%	1.15[0.59,2.23]
Total (95% CI)	**880**	**946**		**100%**	**0.89[0.76,1.05]**
Total events: 200 (Upright), 228 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=7.36, df=7(P=0.39); I^2=4.92%					
Test for overall effect: Z=1.35(P=0.18)					



Analysis 1.39. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 39 Artificial rupture of membranes.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Haukkama 1982	10/31	7/29		6.66%	1.34[0.59,3.04]
McManus 1978	20/20	20/20		18.88%	1[0.91,1.1]
Bundsen 1982	40/40	20/20		24.97%	1[0.93,1.08]
Chen 1987	41/41	75/75		49.49%	1[0.96,1.04]
Total (95% CI)	**132**	**144**		**100%**	**1.02[0.95,1.1]**
Total events: 111 (Upright), 122 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=2.27, df=3(P=0.52); I^2=0%					
Test for overall effect: Z=0.62(P=0.54)					

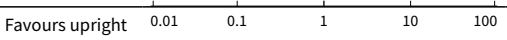


Analysis 1.41. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 41 Estimated blood loss > 500 mL.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
McManus 1978	0/20	1/20		42.86%	0.33[0.01,7.72]
Ben Regaya 2010	2/100	2/100		57.14%	1[0.14,6.96]
Total (95% CI)	**120**	**120**		**100%**	**0.71[0.14,3.55]**
Total events: 2 (Upright), 3 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.34, df=1(P=0.56); I^2=0%					
Test for overall effect: Z=0.41(P=0.68)					

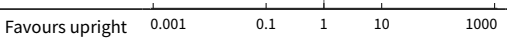
Analysis 1.42. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 42 Perineal trauma.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.42.1 Episiotomy					
Ben Regaya 2010	85/100	97/100		38.06%	0.88[0.8,0.96]
Bloom 1998	122/536	124/531		48.88%	0.97[0.78,1.21]
Miquelutti 2007	29/54	33/53		13.07%	0.86[0.62,1.19]
Subtotal (95% CI)	**690**	**684**		**100%**	**0.92[0.82,1.04]**
Total events: 236 (Upright), 254 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=1.68, df=2(P=0.43); I^2=0%					
Test for overall effect: Z=1.29(P=0.2)					
1.42.2 Second-degree tears					
Subtotal (95% CI)	**0**	**0**			**Not estimable**
Total events: 0 (Upright), 0 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Not applicable					
1.42.3 Third-degree tears					
Subtotal (95% CI)	**0**	**0**			**Not estimable**
Total events: 0 (Upright), 0 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Not applicable					
Test for subgroup differences: Not applicable					



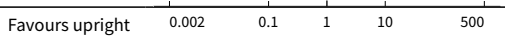
Analysis 1.43. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 43 Fetal distress (requiring immediate delivery).

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Bloom 1998	5/536	12/531		59.11%	0.41[0.15,1.16]
Chan 1963	4/101	4/100		19.71%	0.99[0.25,3.85]
Chen 1987	3/61	2/124		6.47%	3.05[0.52,17.77]
Flynn 1978	0/34	1/34		7.35%	0.33[0.01,7.91]
MacLennan 1994	0/96	0/100			Not estimable
McManus 1978	0/20	1/20		7.35%	0.33[0.01,7.72]
Total (95% CI)	**848**	**909**		**100%**	**0.69[0.35,1.33]**
Total events: 12 (Upright), 20 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=4.36, df=4(P=0.36); I^2=8.2%					
Test for overall effect: Z=1.12(P=0.26)					



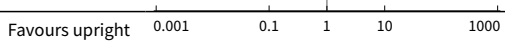
Analysis 1.44. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 44 Use of neonatal mechanical ventilation.

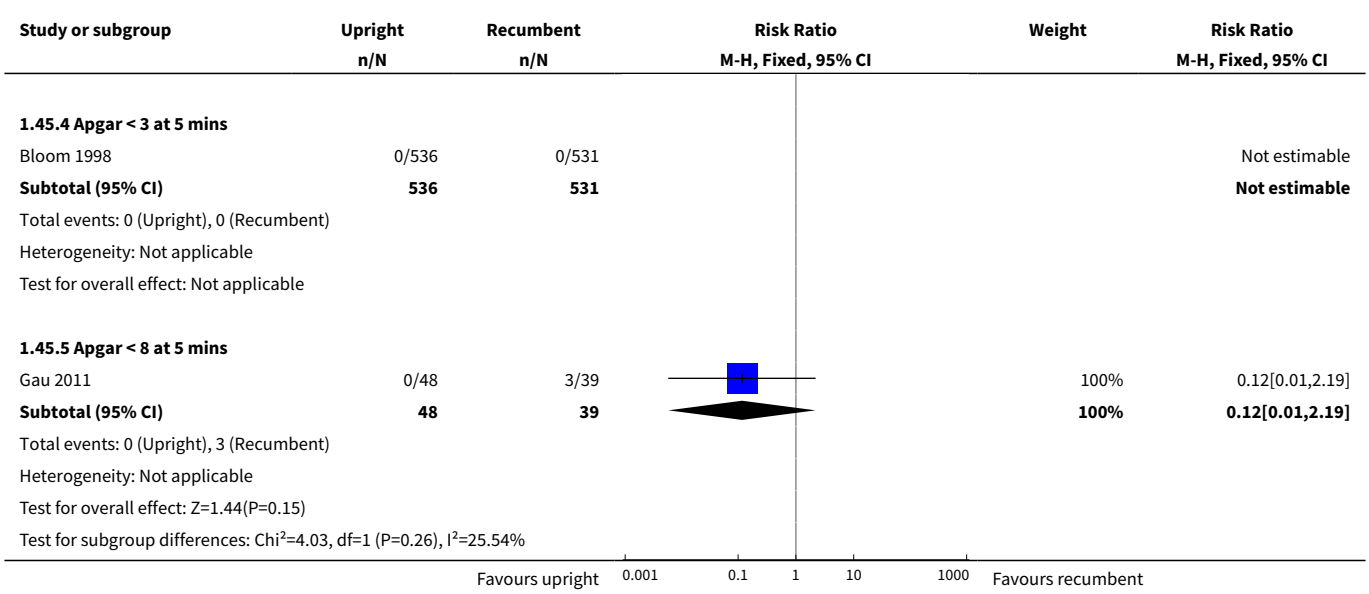
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.44.1 Intubation in delivery room					
McManus 1978	0/20	1/20		33.23%	0.33[0.01,7.72]
Bloom 1998	3/536	3/531		66.77%	0.99[0.2,4.89]
Subtotal (95% CI)	**556**	**551**		**100%**	**0.77[0.19,3.1]**
Total events: 3 (Upright), 4 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.37, df=1(P=0.54); I^2=0%					
Test for overall effect: Z=0.36(P=0.72)					
Total (95% CI)	**556**	**551**		**100%**	**0.77[0.19,3.1]**
Total events: 3 (Upright), 4 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.37, df=1(P=0.54); I^2=0%					
Test for overall effect: Z=0.36(P=0.72)					



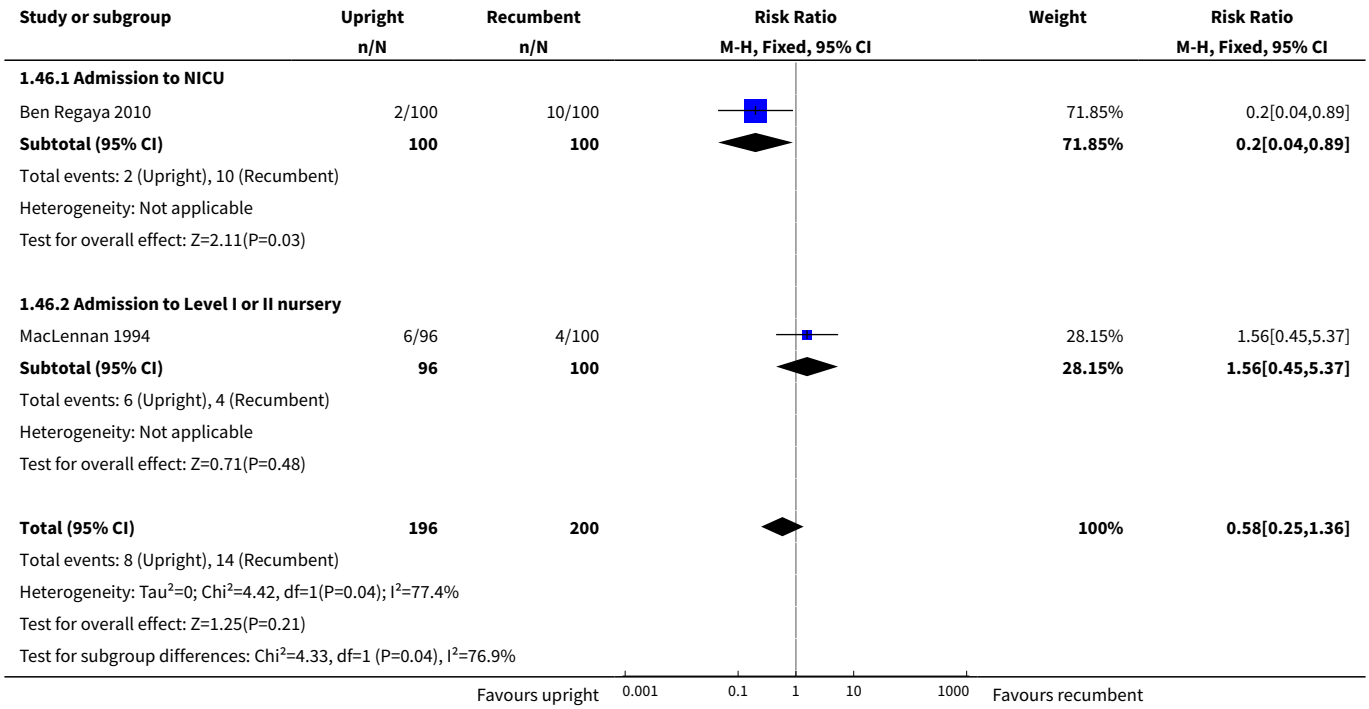
Analysis 1.45. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 45 Apgar scores.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
1.45.1 Apgar < 4 at birth					
McManus 1978	0/20	2/20		100%	0.2[0.01,3.92]
Subtotal (95% CI)	**20**	**20**		**100%**	**0.2[0.01,3.92]**
Total events: 0 (Upright), 2 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Z=1.06(P=0.29)					
1.45.2 Apgar < 7 at 1 min					
Calvert 1982	10/100	17/100		44.64%	0.59[0.28,1.22]
Haukkama 1982	0/31	0/29			Not estimable
MacLennan 1994	13/96	10/100		25.72%	1.35[0.62,2.94]
McManus 1978	0/20	1/20		3.94%	0.33[0.01,7.72]
Miquelutti 2007	3/54	6/53		15.9%	0.49[0.13,1.86]
Williams 1980	5/48	4/55		9.79%	1.43[0.41,5.03]
Subtotal (95% CI)	**349**	**357**		**100%**	**0.84[0.54,1.31]**
Total events: 31 (Upright), 38 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=4.02, df=4(P=0.4); I^2=0.49%					
Test for overall effect: Z=0.76(P=0.45)					
1.45.3 Apgar < 7 at 5 mins					
Haukkama 1982	0/31	0/29			Not estimable
MacLennan 1994	1/96	0/100		51.21%	3.12[0.13,75.75]
Miquelutti 2007	0/54	0/53			Not estimable
Williams 1980	1/48	0/55		48.79%	3.43[0.14,82.25]
Subtotal (95% CI)	**229**	**237**		**100%**	**3.27[0.34,31.05]**
Total events: 2 (Upright), 0 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0, df=1(P=0.97); I^2=0%					
Test for overall effect: Z=1.03(P=0.3)					

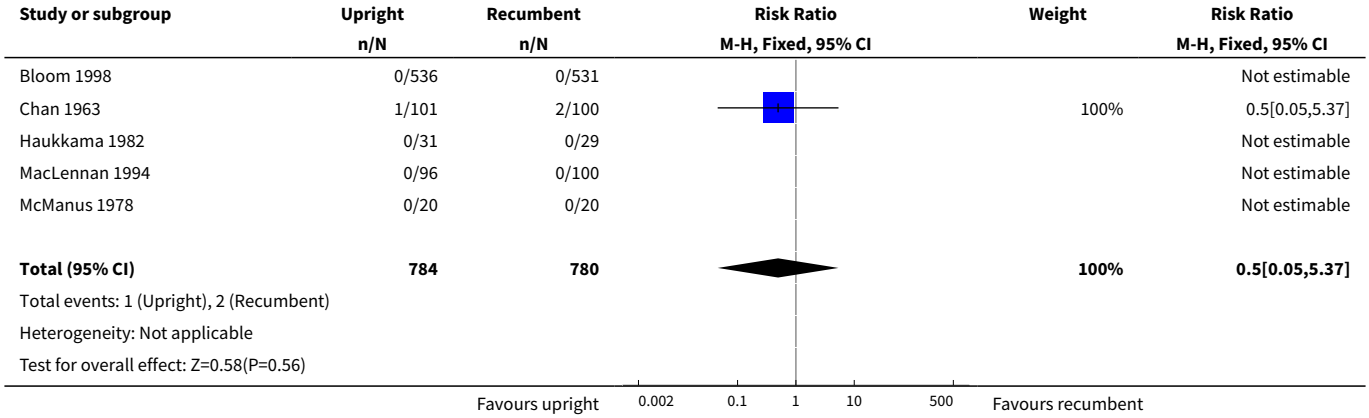




Analysis 1.46. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 46 Admission to NICU.



Analysis 1.47. Comparison 1 Upright and ambulant positions versus recumbent positions and bed care, Outcome 47 Perinatal mortality.



Comparison 2. Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Duration of first stage labour: (minutes)	0	0	Mean Difference (IV, Fixed, 95% CI)	0.0 [0.0, 0.0]
2 Mode of birth: spontaneous vaginal	6	1566	Risk Ratio (M-H, Fixed, 95% CI)	0.96 [0.89, 1.05]
3 Mode of birth: spontaneous vaginal: subgroup analysis: parity	4		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 Nulliparous women	4	1179	Risk Ratio (M-H, Fixed, 95% CI)	0.94 [0.84, 1.04]
3.2 Multiparous women	1	111	Risk Ratio (M-H, Fixed, 95% CI)	1.02 [0.81, 1.27]
4 Mode of birth: spontaneous vaginal: subgroup analysis: onset of labour	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
4.1 Spontaneous labour: all women	1	505	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.81, 1.09]
4.2 Induction of labour: all women	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
5 Mode of birth: spontaneous vaginal: subgroup analysis: position types	6		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
5.1 Sitting vs Recumbent / supine / lateral	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
5.2 Walking vs Recumbent / supine / lateral	2	276	Risk Ratio (M-H, Random, 95% CI)	1.02 [0.81, 1.28]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
5.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	1	151	Risk Ratio (M-H, Random, 95% CI)	0.92 [0.75, 1.13]
5.4 Sitting vs Bed care	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
5.5 Walking vs Bed care	2	910	Risk Ratio (M-H, Random, 95% CI)	0.93 [0.83, 1.06]
5.6 Sitting, standing, squatting, kneeling or walking vs Bed care	1	229	Risk Ratio (M-H, Random, 95% CI)	1.00 [0.78, 1.27]
6 Mode of birth: spontaneous vaginal: subgroup analysis: position types	6		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
6.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	3	427	Risk Ratio (M-H, Random, 95% CI)	0.99 [0.86, 1.15]
6.2 Sitting, standing, squatting, kneeling or walking vs Bed care	3	1139	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.85, 1.06]
7 Mode of birth: spontaneous vaginal: sensitivity analysis	3		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
7.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	1	61	Risk Ratio (M-H, Fixed, 95% CI)	0.85 [0.61, 1.20]
7.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care	2	634	Risk Ratio (M-H, Fixed, 95% CI)	0.95 [0.81, 1.11]
8 Mode of birth: operative vaginal	6	1566	Risk Ratio (M-H, Fixed, 95% CI)	1.06 [0.90, 1.25]
9 Mode of birth: operative vaginal: subgroup analysis: parity	4		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
9.1 Nulliparous women	4	1084	Risk Ratio (M-H, Random, 95% CI)	1.36 [0.95, 1.94]
9.2 Multiparous women	1	111	Risk Ratio (M-H, Random, 95% CI)	1.09 [0.49, 2.42]
10 Mode of birth: operative vaginal: subgroup analysis: onset of labour	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
10.1 Spontaneous labour: all women	1	505	Risk Ratio (M-H, Fixed, 95% CI)	1.18 [0.88, 1.59]
10.2 Induction of labour: all women	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
11 Mode of birth: operative vaginal: subgroup analysis: position types	6		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
11.1 Sitting vs Recumbent / supine / lateral	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
11.2 Walking vs Recumbent / supine / lateral	2	276	Risk Ratio (M-H, Random, 95% CI)	1.17 [0.56, 2.44]
11.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	1	151	Risk Ratio (M-H, Random, 95% CI)	2.03 [0.73, 5.65]
11.4 Sitting vs Bed care	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
11.5 Walking vs Bed care	2	910	Risk Ratio (M-H, Random, 95% CI)	1.03 [0.81, 1.31]
11.6 Sitting, standing, squatting, kneeling or walking vs Bed care	1	229	Risk Ratio (M-H, Random, 95% CI)	1.00 [0.69, 1.45]
12 Mode of birth: operative vaginal: subgroup analysis: position types	6		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
12.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	3	427	Risk Ratio (M-H, Random, 95% CI)	1.41 [0.77, 2.56]
12.2 Sitting, standing, squatting, kneeling or walking vs Bed care	3	1139	Risk Ratio (M-H, Random, 95% CI)	1.02 [0.86, 1.20]
13 Mode of birth: operative vaginal: sensitivity analysis	3		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
13.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	1	61	Risk Ratio (M-H, Fixed, 95% CI)	1.55 [0.49, 4.95]
13.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care	2	634	Risk Ratio (M-H, Fixed, 95% CI)	0.95 [0.77, 1.16]
14 Mode of birth: caesarean birth	6	1566	Risk Ratio (M-H, Fixed, 95% CI)	1.05 [0.83, 1.32]
15 Mode of birth: caesarean birth: subgroup analysis: parity	4		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
15.1 Nulliparous women	4	1084	Risk Ratio (M-H, Random, 95% CI)	1.14 [0.75, 1.73]
15.2 Multiparous women	1	206	Risk Ratio (M-H, Random, 95% CI)	1.31 [0.55, 3.09]

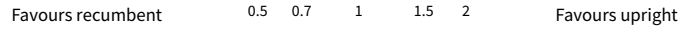
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
16 Mode of birth: caesarean birth: subgroup analysis: onset of labour	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
16.1 Spontaneous labour: all women	1	505	Risk Ratio (M-H, Fixed, 95% CI)	0.95 [0.64, 1.40]
16.2 Induction of labour: all women	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
17 Mode of birth: caesarean birth: subgroup analysis: position types	6		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
17.1 Sitting vs Recumbent / supine / lateral	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
17.2 Walking vs Recumbent / supine / lateral	2	276	Risk Ratio (M-H, Random, 95% CI)	0.74 [0.35, 1.56]
17.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	1	151	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.49, 1.82]
17.4 Sitting vs Bed care	0	0	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
17.5 Walking vs Bed care	2	910	Risk Ratio (M-H, Random, 95% CI)	1.20 [0.74, 1.94]
17.6 Sitting, standing, squatting, kneeling or walking vs Bed care	1	229	Risk Ratio (M-H, Random, 95% CI)	1.01 [0.53, 1.95]
18 Mode of birth: caesarean birth: subgroup analysis: position types	6		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
18.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	3	427	Risk Ratio (M-H, Random, 95% CI)	0.81 [0.52, 1.28]
18.2 Sitting, standing, squatting, kneeling or walking vs Bed care	3	1139	Risk Ratio (M-H, Random, 95% CI)	1.15 [0.83, 1.59]
19 Mode of birth: caesarean birth: sensitivity analysis	3		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
19.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral	1	61	Risk Ratio (M-H, Fixed, 95% CI)	1.29 [0.38, 4.35]
19.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care	2	634	Risk Ratio (M-H, Fixed, 95% CI)	1.35 [0.93, 1.96]
20 Maternal satisfaction	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
21 Maternal pain	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
21.1 Requiring additional Bupivocaine bolus doses	2	720	Risk Ratio (M-H, Random, 95% CI)	0.57 [0.22, 1.48]
22 Analgesia amount	5		Mean Difference (IV, Random, 95% CI)	Subtotals only
22.1 Bupivocaine	3	463	Mean Difference (IV, Random, 95% CI)	-0.24 [-2.32, 1.84]
22.2 Ropivacaine	1	151	Mean Difference (IV, Random, 95% CI)	19.70 [0.77, 38.63]
22.3 Fentanyl	1	229	Mean Difference (IV, Random, 95% CI)	-0.38 [-1.99, 1.23]
22.4 Bupivocaine & Fentanyl	1	409	Mean Difference (IV, Random, 95% CI)	-1.37 [-7.59, 4.85]
23 Duration of second stage of labour (minutes)	2	204	Mean Difference (IV, Fixed, 95% CI)	2.35 [-15.22, 19.91]
24 Augmentation of labour using oxytocin	5	1161	Risk Ratio (M-H, Fixed, 95% CI)	0.98 [0.90, 1.07]
25 Artificial rupture of membranes	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
26 Hypotension requiring intervention	3	781	Risk Ratio (M-H, Fixed, 95% CI)	1.12 [0.52, 2.45]
27 Estimated blood loss > 500 mL	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
28 Perineal trauma	0		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
28.1 Episiotomy	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
28.2 Second-degree tears	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
28.3 Third-degree tears	0		Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
29 Fetal distress (requiring immediate delivery)	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
30 Use of neonatal mechanical ventilation	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
31 Apgar scores	5		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
31.1 Apgar < 7 at 1 min	2	191	Risk Ratio (M-H, Fixed, 95% CI)	1.01 [0.37, 2.76]
31.2 Apgar < 7 at 5 mins	4	835	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [0.21, 5.05]
32 Admission to NICU	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]
33 Perinatal mortality	0	0	Risk Ratio (M-H, Fixed, 95% CI)	0.0 [0.0, 0.0]

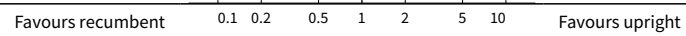
Analysis 2.2. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 2 Mode of birth: spontaneous vaginal.

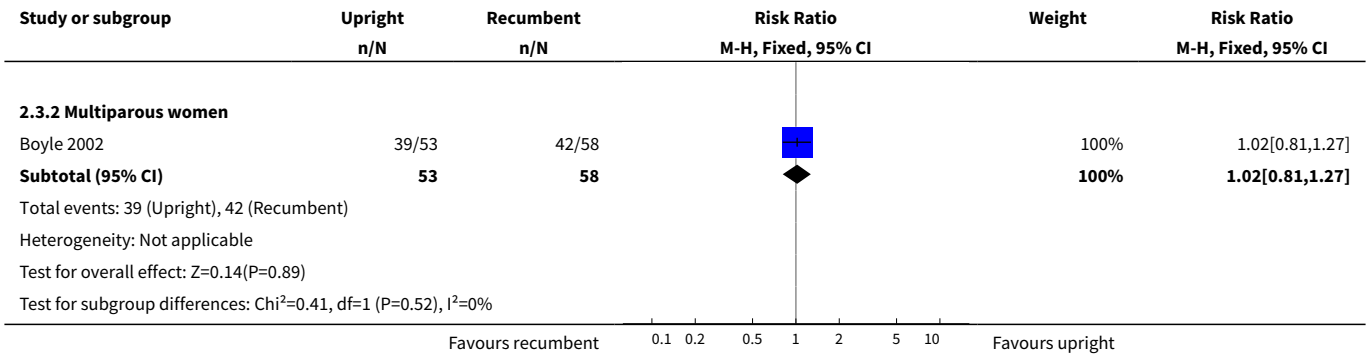
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Boyle 2002	87/199	98/206		20.95%	0.92[0.74,1.14]
Collis 1999	59/110	64/119		13.37%	1[0.78,1.27]
Frenea 2004	19/30	23/31		4.92%	0.85[0.61,1.2]
Karraz 2003	117/141	56/74		15.97%	1.1[0.94,1.27]
Nageotte 1997	142/253	150/252		32.69%	0.94[0.81,1.09]
Vallejo 2001	51/75	56/76		12.1%	0.92[0.75,1.13]
Total (95% CI)	**808**	**758**		**100%**	**0.96[0.89,1.05]**
Total events: 475 (Upright), 447 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=3.89, df=5(P=0.56); I^2=0%					
Test for overall effect: Z=0.9(P=0.37)					



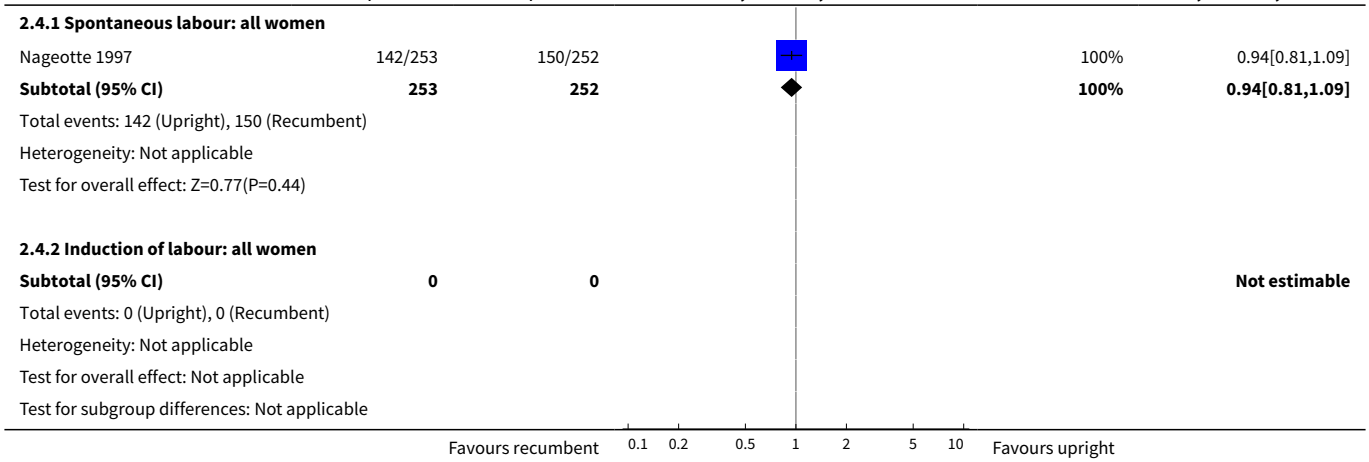
Analysis 2.3. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 3 Mode of birth: spontaneous vaginal: subgroup analysis: parity.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.3.1 Nulliparous women					
Boyle 2002	48/146	56/148		17.22%	0.87[0.64,1.19]
Collis 1999	59/110	64/119		19.03%	1[0.78,1.27]
Nageotte 1997	142/253	150/252		46.53%	0.94[0.81,1.09]
Vallejo 2001	51/75	56/76		17.22%	0.92[0.75,1.13]
Subtotal (95% CI)	**584**	**595**		**100%**	**0.94[0.84,1.04]**
Total events: 300 (Upright), 326 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.51, df=3(P=0.92); I^2=0%					
Test for overall effect: Z=1.22(P=0.22)					

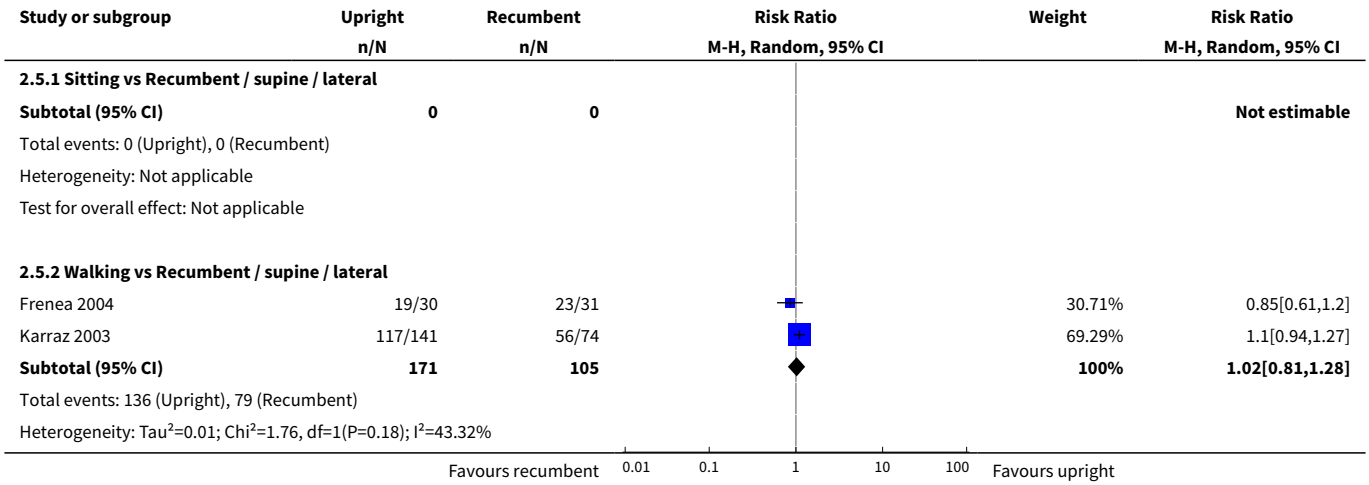


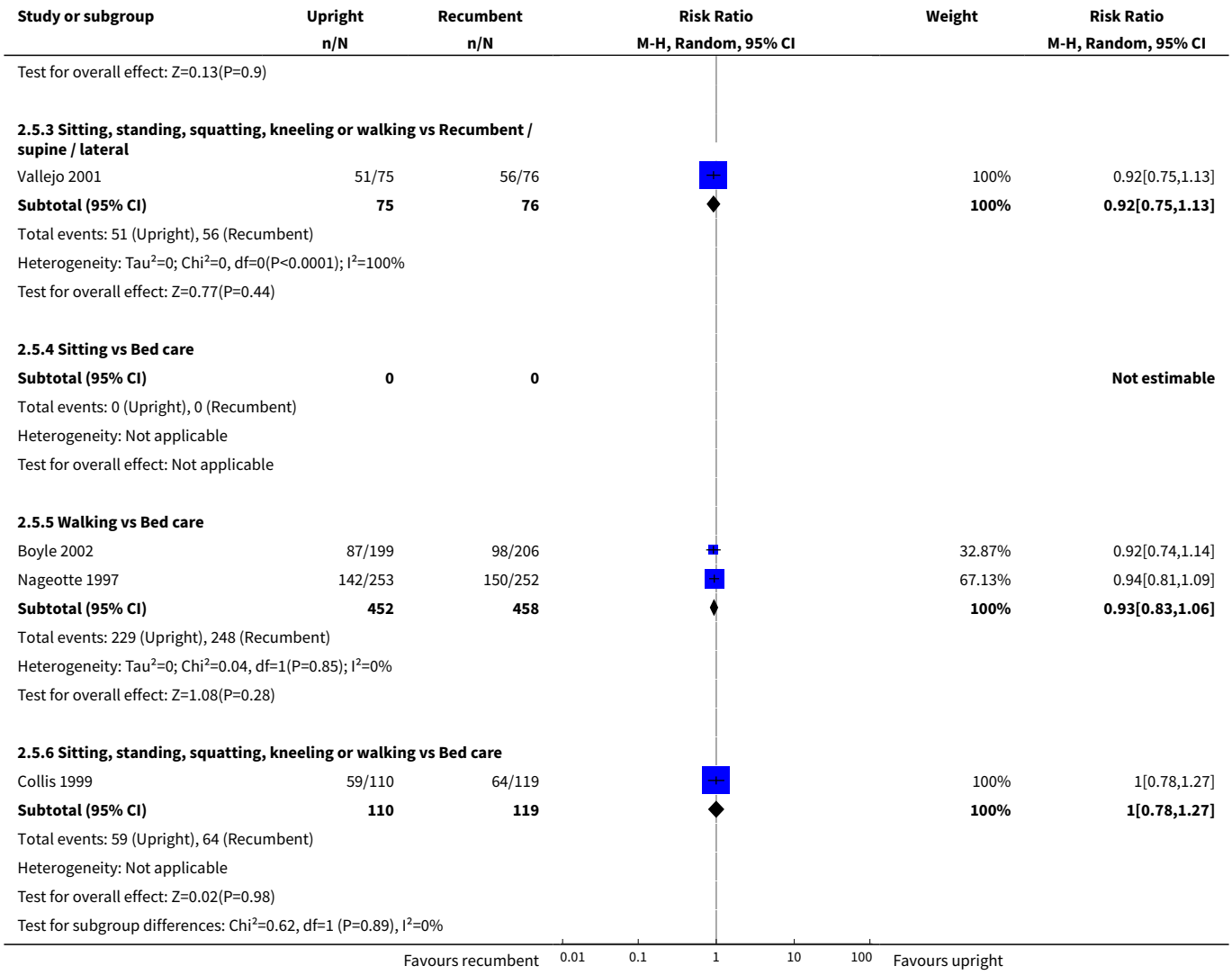


Analysis 2.4. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 4 Mode of birth: spontaneous vaginal: subgroup analysis: onset of labour.

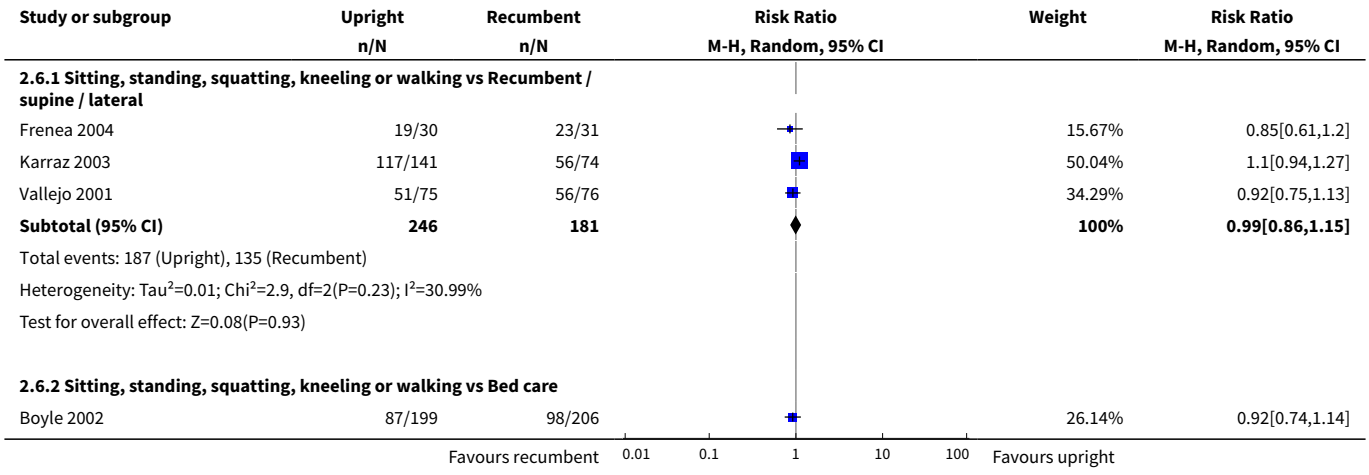


Analysis 2.5. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 5 Mode of birth: spontaneous vaginal: subgroup analysis: position types.





Analysis 2.6. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 6 Mode of birth: spontaneous vaginal: subgroup analysis: position types.

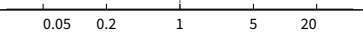


Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
Collis 1999	59/110	64/119		20.49%	1[0.78,1.27]
Nageotte 1997	142/253	150/252		53.37%	0.94[0.81,1.09]
Subtotal (95% CI)	**562**	**577**		**100%**	**0.95[0.85,1.06]**
Total events: 288 (Upright), 312 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.26, df=2(P=0.88); I^2=0%					
Test for overall effect: Z=0.97(P=0.33)					
Test for subgroup differences: Chi^2=0.26, df=1 (P=0.61), I^2=0%					

Favours recumbent — Favours upright

Analysis 2.7. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 7 Mode of birth: spontaneous vaginal: sensitivity analysis.

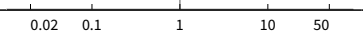
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.7.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral					
Frenea 2004	19/30	23/31		100%	0.85[0.61,1.2]
Subtotal (95% CI)	**30**	**31**		**100%**	**0.85[0.61,1.2]**
Total events: 19 (Upright), 23 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0, df=0(P<0.0001); I^2=100%					
Test for overall effect: Z=0.91(P=0.36)					
2.7.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care					
Boyle 2002	87/199	98/206		61.03%	0.92[0.74,1.14]
Collis 1999	59/110	64/119		38.97%	1[0.78,1.27]
Subtotal (95% CI)	**309**	**325**		**100%**	**0.95[0.81,1.11]**
Total events: 146 (Upright), 162 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.25, df=1(P=0.62); I^2=0%					
Test for overall effect: Z=0.63(P=0.53)					
Test for subgroup differences: Chi^2=0.3, df=1 (P=0.58), I^2=0%					



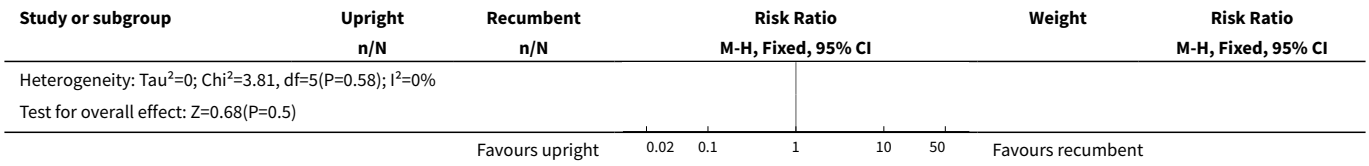
Favours recumbent — Favours upright

Analysis 2.8. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 8 Mode of birth: operative vaginal.

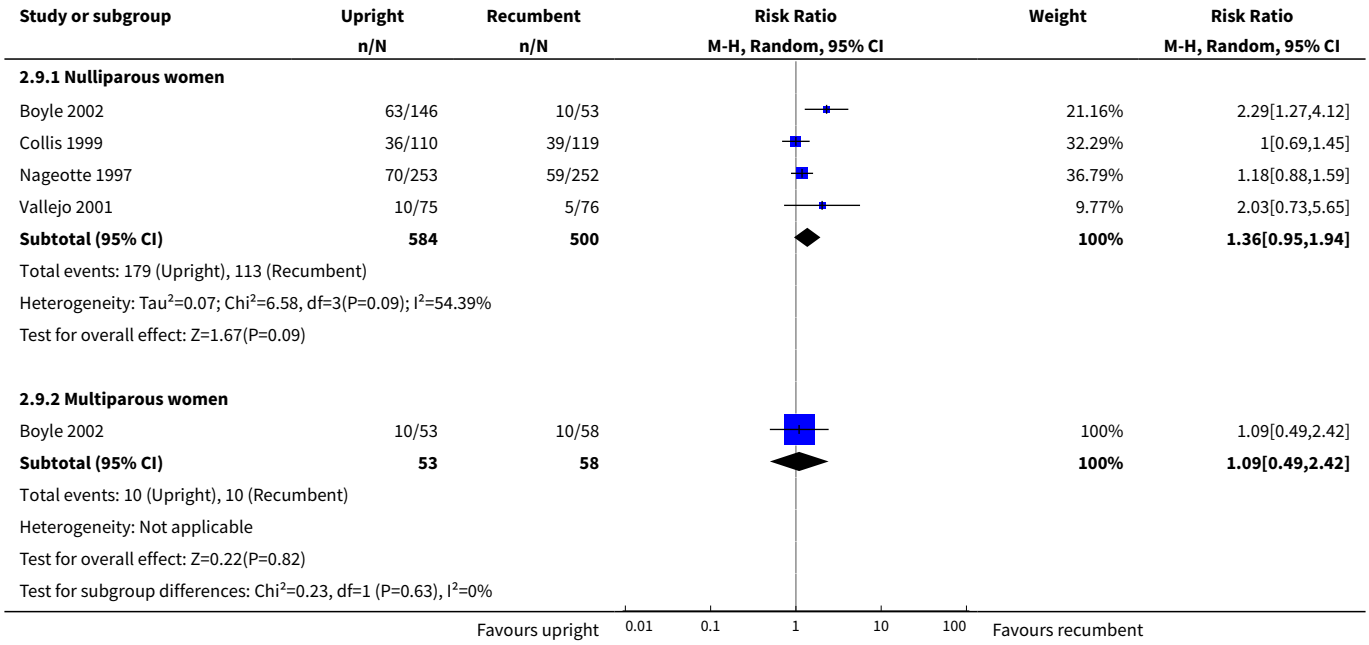
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Boyle 2002	73/199	82/206		41.55%	0.92[0.72,1.18]
Collis 1999	36/110	39/119		19.32%	1[0.69,1.45]
Frenea 2004	6/30	4/31		2.03%	1.55[0.49,4.95]
Karraz 2003	11/141	6/74		4.06%	0.96[0.37,2.5]
Nageotte 1997	70/253	59/252		30.48%	1.18[0.88,1.59]
Vallejo 2001	10/75	5/76		2.56%	2.03[0.73,5.65]
Total (95% CI)	**808**	**758**		**100%**	**1.06[0.9,1.25]**
Total events: 206 (Upright), 195 (Recumbent)					



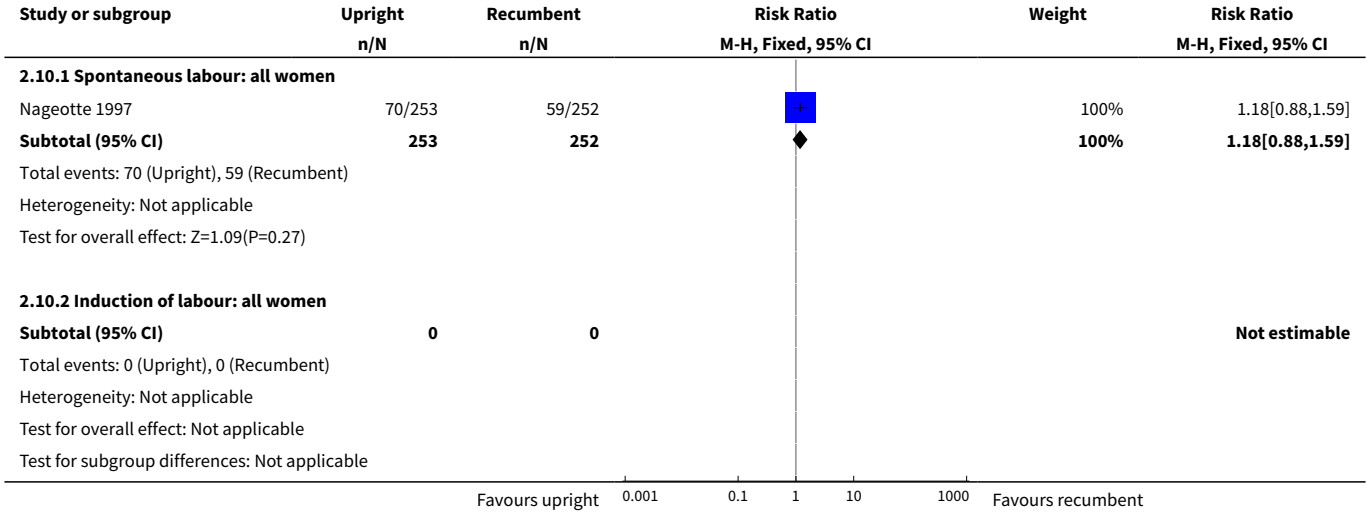
Favours upright — Favours recumbent



Analysis 2.9. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 9 Mode of birth: operative vaginal: subgroup analysis: parity.

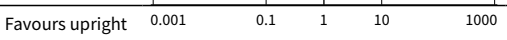


Analysis 2.10. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 10 Mode of birth: operative vaginal: subgroup analysis: onset of labour.



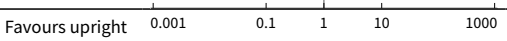
Analysis 2.11. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 11 Mode of birth: operative vaginal: subgroup analysis: position types.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
2.11.1 Sitting vs Recumbent / supine / lateral					
Subtotal (95% CI)	**0**	**0**			**Not estimable**
Total events: 0 (Upright), 0 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Not applicable					
2.11.2 Walking vs Recumbent / supine / lateral					
Frenea 2004	6/30	4/31		40.3%	1.55[0.49,4.95]
Karraz 2003	11/141	6/74		59.7%	0.96[0.37,2.5]
Subtotal (95% CI)	**171**	**105**		**100%**	**1.17[0.56,2.44]**
Total events: 17 (Upright), 10 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.39, df=1(P=0.53); I^2=0%					
Test for overall effect: Z=0.41(P=0.68)					
2.11.3 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral					
Vallejo 2001	10/75	5/76		100%	2.03[0.73,5.65]
Subtotal (95% CI)	**75**	**76**		**100%**	**2.03[0.73,5.65]**
Total events: 10 (Upright), 5 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Z=1.35(P=0.18)					
2.11.4 Sitting vs Bed care					
Subtotal (95% CI)	**0**	**0**			**Not estimable**
Total events: 0 (Upright), 0 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Not applicable					
2.11.5 Walking vs Bed care					
Boyle 2002	73/199	82/206		55.85%	0.92[0.72,1.18]
Nageotte 1997	70/253	59/252		44.15%	1.18[0.88,1.59]
Subtotal (95% CI)	**452**	**458**		**100%**	**1.03[0.81,1.31]**
Total events: 143 (Upright), 141 (Recumbent)					
Heterogeneity: Tau^2=0.01; Chi^2=1.59, df=1(P=0.21); I^2=36.98%					
Test for overall effect: Z=0.23(P=0.82)					
2.11.6 Sitting, standing, squatting, kneeling or walking vs Bed care					
Collis 1999	36/110	39/119		100%	1[0.69,1.45]
Subtotal (95% CI)	**110**	**119**		**100%**	**1[0.69,1.45]**
Total events: 36 (Upright), 39 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.01(P=0.99)					
Test for subgroup differences: Chi^2=1.76, df=1 (P=0.62), I^2=0%					



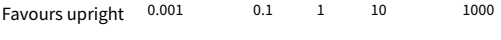
Analysis 2.12. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 12 Mode of birth: operative vaginal: subgroup analysis: position types.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
2.12.1 Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral					
Frenea 2004	6/30	4/31		26.56%	1.55[0.49,4.95]
Karraz 2003	11/141	6/74		39.35%	0.96[0.37,2.5]
Vallejo 2001	10/75	5/76		34.09%	2.03[0.73,5.65]
Subtotal (95% CI)	**246**	**181**		**100%**	**1.41[0.77,2.56]**
Total events: 27 (Upright), 15 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=1.12, df=2(P=0.57); I^2=0%					
Test for overall effect: Z=1.12(P=0.26)					
2.12.2 Sitting, standing, squatting, kneeling or walking vs Bed care					
Boyle 2002	73/199	82/206		46.89%	0.92[0.72,1.18]
Collis 1999	36/110	39/119		20.9%	1[0.69,1.45]
Nageotte 1997	70/253	59/252		32.21%	1.18[0.88,1.59]
Subtotal (95% CI)	**562**	**577**		**100%**	**1.02[0.86,1.2]**
Total events: 179 (Upright), 180 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=1.59, df=2(P=0.45); I^2=0%					
Test for overall effect: Z=0.18(P=0.86)					
Test for subgroup differences: Chi^2=1.06, df=1 (P=0.3), I^2=5.69%					



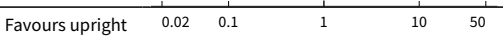
Analysis 2.13. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 13 Mode of birth: operative vaginal: sensitivity analysis.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.13.1 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Recumbent / supine / lateral					
Frenea 2004	6/30	4/31		100%	1.55[0.49,4.95]
Subtotal (95% CI)	**30**	**31**		**100%**	**1.55[0.49,4.95]**
Total events: 6 (Upright), 4 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.74(P=0.46)					
2.13.2 Trials of better quality - Sitting, standing, squatting, kneeling or walking vs Bed care					
Boyle 2002	73/199	82/206		68.26%	0.92[0.72,1.18]
Collis 1999	36/110	39/119		31.74%	1[0.69,1.45]
Subtotal (95% CI)	**309**	**325**		**100%**	**0.95[0.77,1.16]**
Total events: 109 (Upright), 121 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.12, df=1(P=0.72); I^2=0%					
Test for overall effect: Z=0.53(P=0.6)					
Test for subgroup differences: Chi^2=0.67, df=1 (P=0.41), I^2=0%					



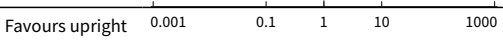
Analysis 2.14. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 14 Mode of birth: caesarean birth.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Boyle 2002	39/199	26/206		21.55%	1.55[0.98,2.45]
Collis 1999	15/110	16/119		12.96%	1.01[0.53,1.95]
Frenea 2004	5/30	4/31		3.32%	1.29[0.38,4.35]
Karraz 2003	13/141	12/74		13.27%	0.57[0.27,1.18]
Nageotte 1997	41/253	43/252		36.33%	0.95[0.64,1.4]
Vallejo 2001	14/75	15/76		12.57%	0.95[0.49,1.82]
Total (95% CI)	**808**	**758**		**100%**	**1.05[0.83,1.32]**
Total events: 127 (Upright), 116 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=5.99, df=5(P=0.31); I^2=16.53%					
Test for overall effect: Z=0.4(P=0.69)					



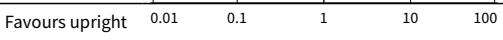
Analysis 2.15. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 15 Mode of birth: caesarean birth: subgroup analysis: parity.

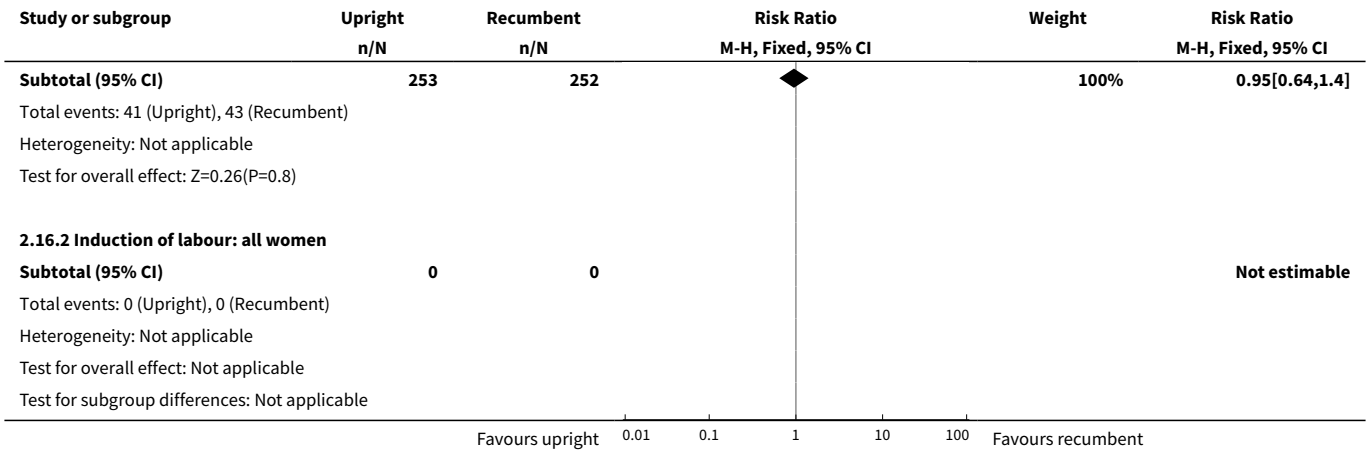
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Random, 95% CI	Weight	Risk Ratio M-H, Random, 95% CI
2.15.1 Nulliparous women					
Boyle 2002	35/146	4/53		13.74%	3.18[1.19,8.51]
Collis 1999	15/110	16/119		23.92%	1.01[0.53,1.95]
Nageotte 1997	41/253	43/252		38.41%	0.95[0.64,1.4]
Vallejo 2001	14/75	15/76		23.93%	0.95[0.49,1.82]
Subtotal (95% CI)	**584**	**500**		**100%**	**1.14[0.75,1.73]**
Total events: 105 (Upright), 78 (Recumbent)					
Heterogeneity: Tau^2=0.08; Chi^2=5.36, df=3(P=0.15); I^2=43.99%					
Test for overall effect: Z=0.6(P=0.55)					
2.15.2 Multiparous women					
Boyle 2002	20/148	6/58		100%	1.31[0.55,3.09]
Subtotal (95% CI)	**148**	**58**		**100%**	**1.31[0.55,3.09]**
Total events: 20 (Upright), 6 (Recumbent)					
Heterogeneity: Not applicable					
Test for overall effect: Z=0.61(P=0.54)					
Test for subgroup differences: Chi^2=0.08, df=1 (P=0.78), I^2=0%					



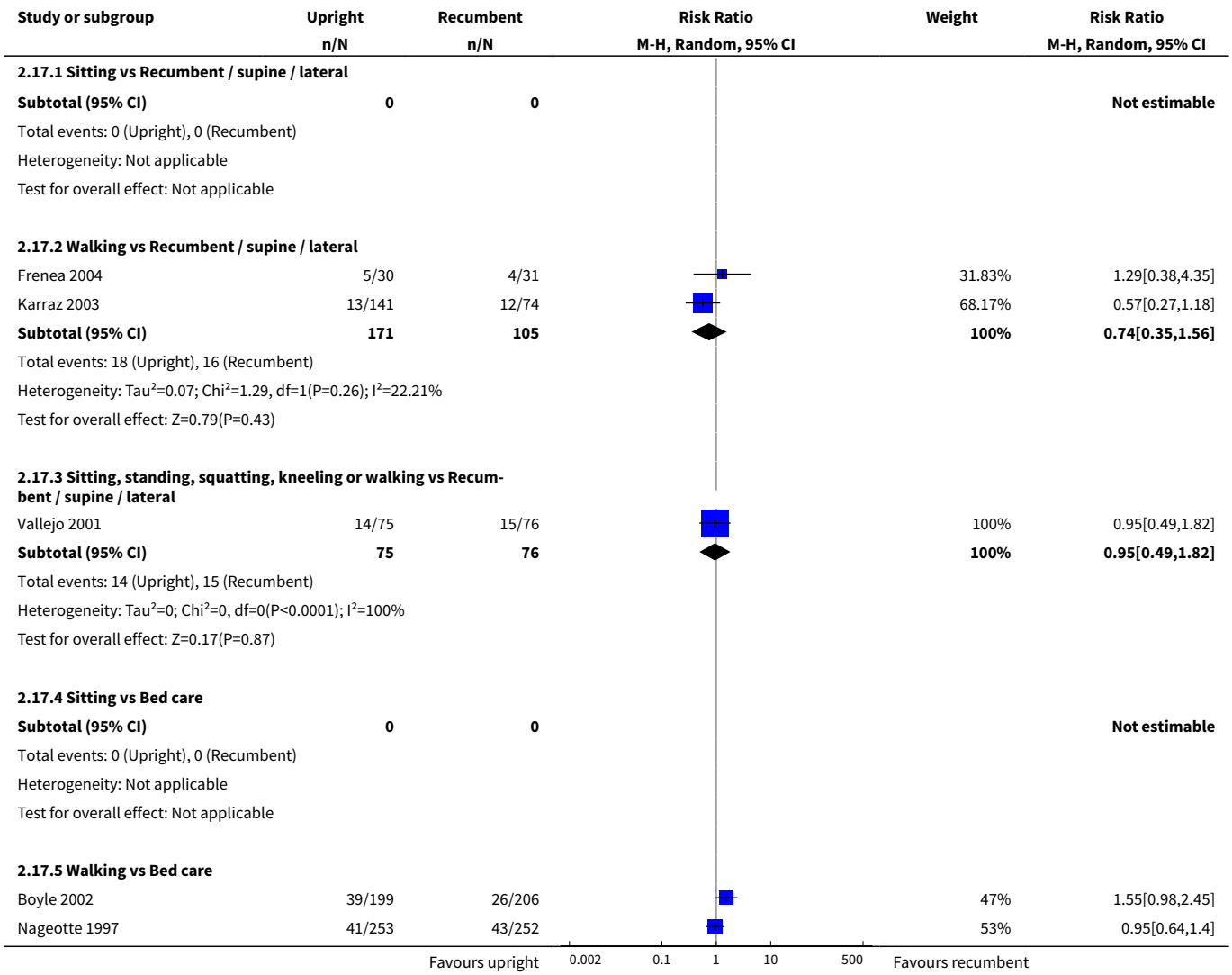
Analysis 2.16. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 16 Mode of birth: caesarean birth: subgroup analysis: onset of labour.

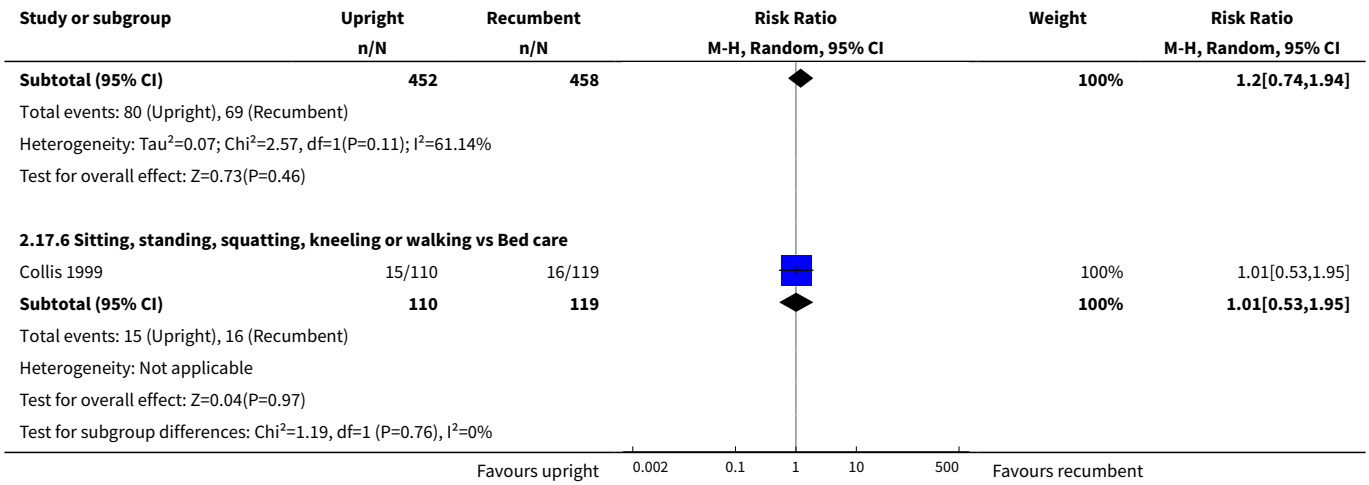
Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.16.1 Spontaneous labour: all women					
Nageotte 1997	41/253	43/252		100%	0.95[0.64,1.4]



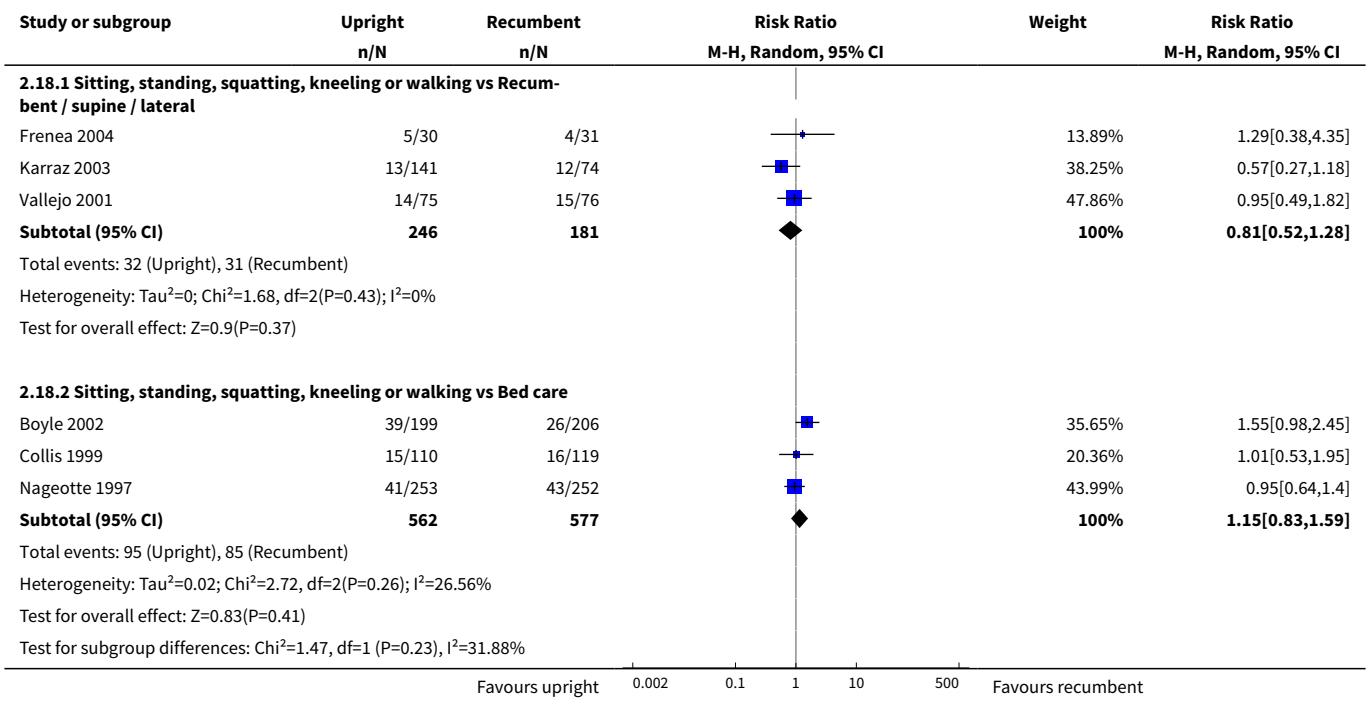


Analysis 2.17. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 17 Mode of birth: caesarean birth: subgroup analysis: position types.

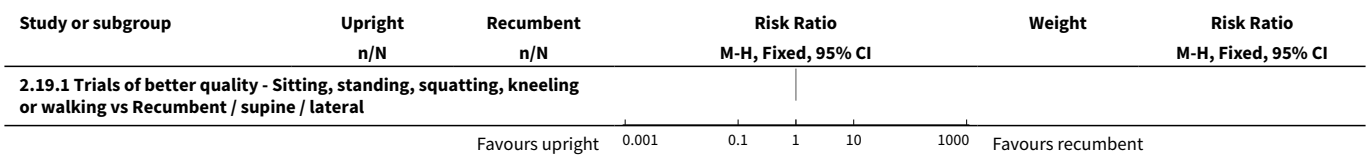


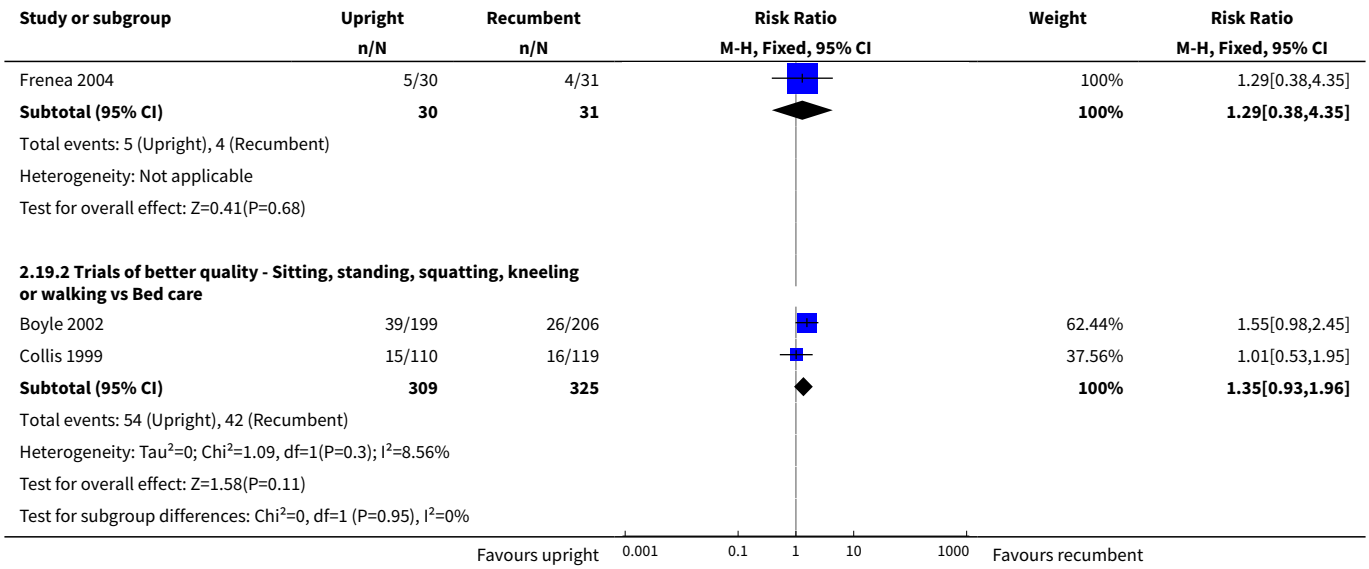


Analysis 2.18. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 18 Mode of birth: caesarean birth: subgroup analysis: position types.

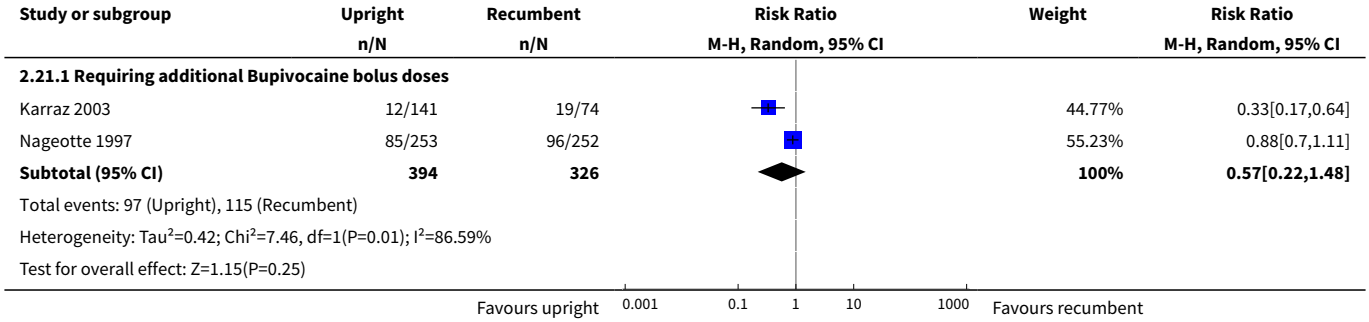


Analysis 2.19. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 19 Mode of birth: caesarean birth: sensitivity analysis.

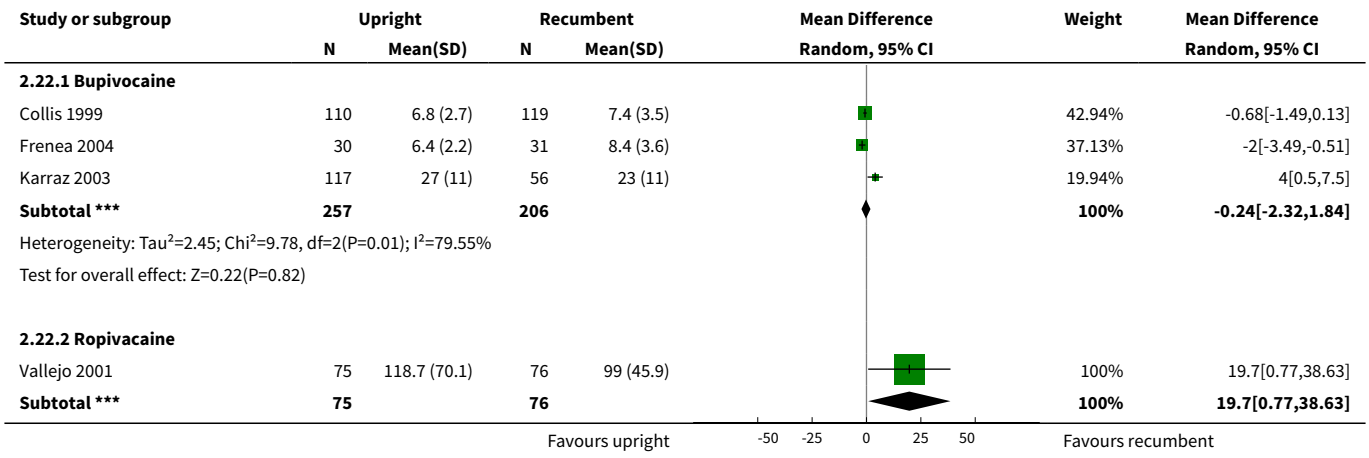


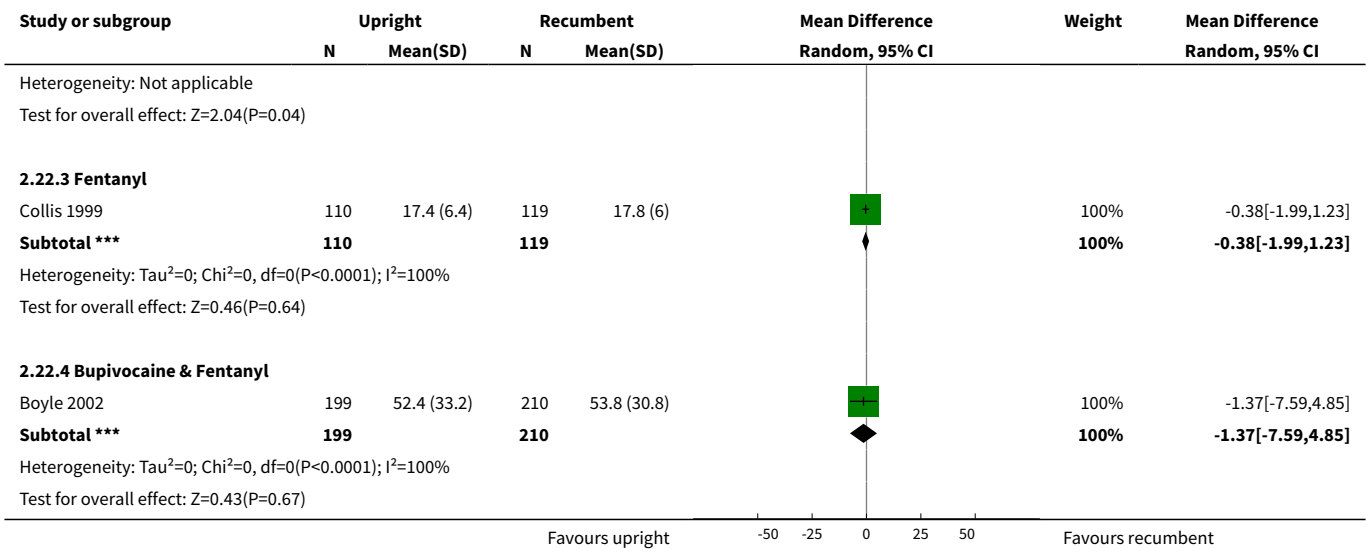


Analysis 2.21. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 21 Maternal pain.

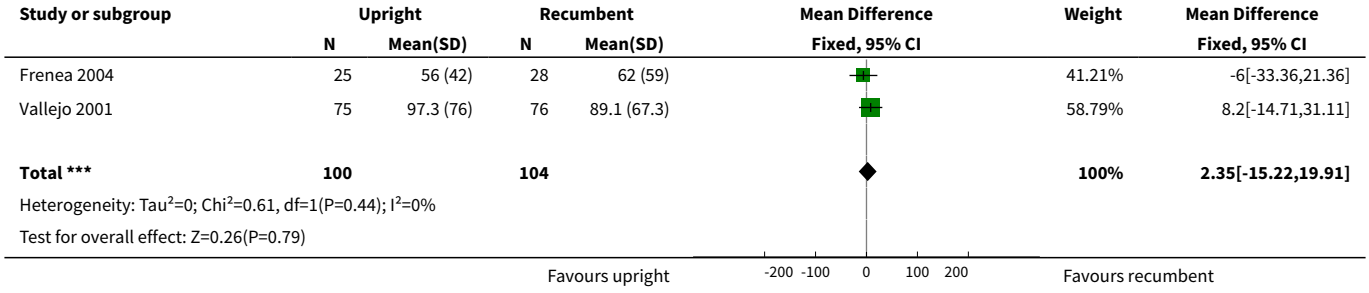


Analysis 2.22. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 22 Analgesia amount.

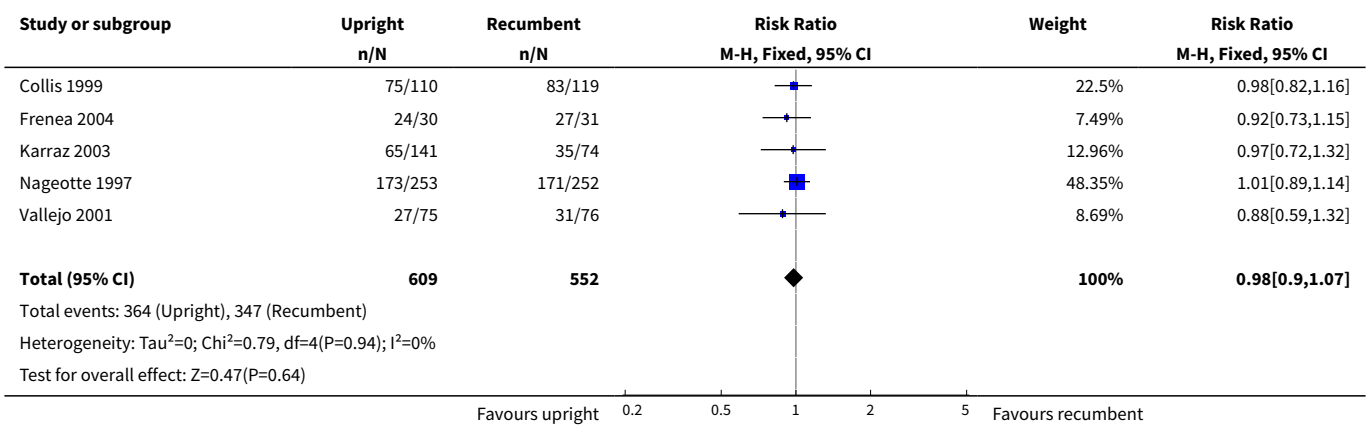




Analysis 2.23. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 23 Duration of second stage of labour (minutes).

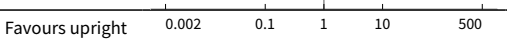


Analysis 2.24. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 24 Augmentation of labour using oxytocin.



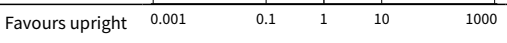
Analysis 2.26. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 26 Hypotension requiring intervention.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
Frenea 2004	9/30	6/31		59.56%	1.55[0.63,3.82]
Karraz 2003	0/141	0/74			Not estimable
Nageotte 1997	2/253	4/252		40.44%	0.5[0.09,2.69]
Total (95% CI)	**424**	**357**		**100%**	**1.12[0.52,2.45]**
Total events: 11 (Upright), 10 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=1.38, df=1(P=0.24); I^2=27.49%					
Test for overall effect: Z=0.3(P=0.77)					



Analysis 2.31. Comparison 2 Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women), Outcome 31 Apgar scores.

Study or subgroup	Upright n/N	Recumbent n/N	Risk Ratio M-H, Fixed, 95% CI	Weight	Risk Ratio M-H, Fixed, 95% CI
2.31.1 Apgar < 7 at 1 min					
Fernando 1994	2/20	2/20		28.71%	1[0.16,6.42]
Vallejo 2001	5/75	5/76		71.29%	1.01[0.31,3.36]
Subtotal (95% CI)	**95**	**96**		**100%**	**1.01[0.37,2.76]**
Total events: 7 (Upright), 7 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0, df=1(P=0.99); I^2=0%					
Test for overall effect: Z=0.02(P=0.99)					
2.31.2 Apgar < 7 at 5 mins					
Collis 1999	2/110	1/119		32.41%	2.16[0.2,23.53]
Fernando 1994	0/20	0/20			Not estimable
Frenea 2004	0/30	0/31			Not estimable
Nageotte 1997	1/253	2/252		67.59%	0.5[0.05,5.46]
Subtotal (95% CI)	**413**	**422**		**100%**	**1.04[0.21,5.05]**
Total events: 3 (Upright), 3 (Recumbent)					
Heterogeneity: Tau^2=0; Chi^2=0.73, df=1(P=0.39); I^2=0%					
Test for overall effect: Z=0.05(P=0.96)					
Test for subgroup differences: Chi^2=0, df=1 (P=0.98), I^2=0%					



ADDITIONAL TABLES

Table 1. Trial and participant numbers

Trial and participant numbers, grouped by comparison and sorted alphabetically

Comparison 1: Upright and ambulant positions versus recumbent positions and bed care				**Comparison 2:** Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women)			
No. of studies	Author	Year	No.	No. of studies	Author	Year	No.
1	Andrews	1990	40	1	Boyle	2002	409
2	Ben Regaya	2010	200	2	Collis	1999	229
3	Bloom	1998	1067	3	Fernando	1994	40
4	Bundsen	1982	60	4	Frenea	2004	61
5	Calvert	1982	200	5	Karraz	2003	221
6	Chan	1963	200	6	Nageotte	1997	761
7	Chen	1987	185	7	Vallejo	2001	160
8	Flynn	1978	68				
9	Gau	2011	188				
10	Haukkama	1982	60				
11	MacLennan	1994	196				
12	Mathew	2012	60				
13	McManus	1978	40				
14	Miquelutti	2007	107				
15	Mitre	1974	100				
16	Phumduong	2007	204				
17	Taavoni	2011	62				

Table 1. Trial and participant numbers *(Continued)*

18	Williams	1980	300			
18			3337	7		1881
Total number of studies for comparisons 1&2:					25	
Total number of participants for comparisons 1&2:					5218	

Table 2. Method of birth outcomes

Method of birth outcomes, grouped by comparison

	Comparison 1: Upright and ambulant positions versus recumbent positions and bed care							**Comparison 2:** Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women)						
	Upright			Recumbent			Comp. 1	Upright			Recumbent			Comp. 2
	n	total	%	n	total	%	Total	n	total	%	n	total	%	Total
Vaginal Birth	1105	1306	85%	1084	1320	82%	**83%**	475	808	59%	447	758	59%	**59%**
Operative Vaginal Birth	125	1252	10%	135	1267	11%	**10%**	206	808	25%	195	758	26%	**26%**
Caesarean Birth	72	1329	5%	106	1353	8%	**7%**	127	808	16%	116	758	15%	**16%**

Table 3. Characteristics of all studies

Characteristics of all studies, sorted by year of publication

Author	Year	Upright	Recumbent	Country	Parity	No.	All women: epidural	All women: other

Table 3. Characteristics of all studies *(Continued)*

1	Chan	1963	sit or walk	supine or lateral	Hong Kong	nulliparous	200		
2	Mitre	1974	sit	supine	U.S.A.	nulliparous	100		
3	Flynn	1978	walk	lateral	U.K.	mixed	68		External monitoring
4	McManus	1978	walk or sit	lateral	U.K.	mixed	40		Induction; Amniotomy
5	Williams	1980	walk	bed care	U.K.	mixed	300		
6	Bundsen	1982	walking	bed care	Sweden	mixed	60		Induction; Amniotomy; Internal Monitoring
7	Calvert	1982	walk or sit	bed care	U.K.	mixed	200		External monitoring
8	Haukkama	1982	sit or walk	bed care	Finland	mixed	60		External monitoring
9	Chen	1987	sit	dorsal or lateral	Japan	mixed	185		Amniotomy
10	Andrews	1990	standing, walking, sitting, squatting, kneeling	supine, lateral, prone	U.S.A.	nulliparous	40		
11	Fernando	1994	walking, standing, sitting	bed care	U.K.	nulliparous	40	Epidural	
12	MacLennan	1994	walk	bed care	Australia	mixed	196		External monitoring
13	Nageotte	1997	walk	bed care	U.S.A.	nulliparous	761	Epidural	
14	Bloom	1998	walking as desired	bed care	U.S.A.	mixed	1067		
15	Collis	1999	walking, standing, sitting	bed care	U.K.	nulliparous	229	Epidural	External Monitoring
16	Vallejo	2001	walk or sit	lateral	U.S.A.	nulliparous	160	Epidural	Induction; External Monitoring

Table 3. Characteristics of all studies *(Continued)*

17	Boyle	2002	walk	bed care	U.K.	mixed	409	Epidural	
18	Karraz	2003	walk	supine, semi supine or lateral	France	mixed	221	Epidural	Induction
19	Frenea	2004	ambulation	dorsal or lateral	France	mixed	61	Epidural	External Monitoring
20	Miquelutti	2007	stand, walk, sit, crouch, kneel	bed care	Brazil	nulliparous	107		
21	Phumduong	2007	kneeling	supine	Thailand	nulliparous	204		
22	Ben Regaya	2010	ambulation	dorsal or lateral	Tunisia, North Africa	nulliparous	200		
23	Gau	2011	sitting, standing, kneeling, squatting	bed care	Taiwan	mixed	188		External Monitoring
24	Taavoni	2011	sitting	bed care	Iran	nulliparous	62		
25	Mathew	2012	walk or sit	dorsal or lateral	India	nulliparous	60		

APPENDICES

Appendix 1. Data extraction and analysis - methods used in previous updates

We designed a form to extract data. At least two review authors extracted the data using the agreed form. We resolved discrepancies through discussion, or if required we consulted a third author. We entered data into Review Manager software (RevMan 2008), and checked for accuracy.

When information regarding any of the above was unclear, we attempted to contact authors of the original reports to provide further details.

Assessment of risk of bias in included studies

Two review authors independently assessed risk of bias for each study using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We resolved any disagreement by discussion or by involving a third assessor. Please see the 'Risk of bias' tables following the Characteristics of included studies tables for the assessment of bias for each study.

(1) Sequence generation (checking for possible selection bias)

We described for each included study the methods used to generate the allocation sequence to assess whether methods were truly random.

We assessed the methods as:

- adequate (e.g. random number table; computer random number generator);
- inadequate (odd or even date of birth; hospital or clinic record number);
- unclear.

(2) Allocation concealment (checking for possible selection bias)

We described for each included study the method used to conceal the allocation sequence in sufficient detail and determined whether group allocation could have been foreseen in advance of, or during, recruitment, or changed afterwards.

We have assessed the methods as:

- adequate (e.g. telephone or central randomisation; consecutively numbered sealed opaque envelopes);
- inadequate (open random allocation; unsealed or non-opaque envelopes, alternation; date of birth);
- unclear.

(3) Blinding (checking for possible performance bias)

We have described for each included study the methods used to blind study personnel from knowledge of which intervention a participant received. We have described where there was any attempt at partial blinding (e.g. of outcome assessors). It is important to note that with the types of interventions described in this review, blinding participants to group assignment is generally not feasible. Similarly, blinding staff providing care is very difficult, and this may have the effect of increasing co-interventions, which in turn may affect outcomes. The lack of blinding in these studies may be a source of bias, and this should be kept in mind in the interpretation of results.

We assessed the methods as:

- adequate, inadequate or unclear for participants;
- adequate, inadequate or unclear for personnel;
- adequate, inadequate or unclear for outcome assessors.

(4) Incomplete outcome data (checking for possible attrition bias through withdrawals, dropouts, protocol deviations)

We have described for each included study the completeness of outcome data, including attrition and exclusions from the analysis. We state whether attrition and exclusions were reported, the numbers (compared with the total randomised participants), reasons for attrition/exclusion where reported, and any re-inclusions in analyses which we have undertaken.

We assessed the methods as:

- adequate (e.g. where there was no missing data or low levels (less than 10%) and where reasons for missing data were balanced across groups);
- inadequate (e.g. where there were high levels of missing data (more than 10%);
- unclear (e.g. where there was insufficient reporting of attrition or exclusions to permit a judgement to be made).

(5) Other sources of bias and overall risk of bias

We described for each included study any important concerns we had about other possible sources of bias.

We have made explicit judgements about risk of bias for important outcomes both within and across studies. With reference to 1-4 above, we assessed the likely magnitude and direction of the bias and whether we considered it was likely to impact on the findings. We have explored the impact of risk of bias through undertaking sensitivity analyses; see sensitivity analysis below.

Measures of treatment effect

We carried out statistical analysis using the Review Manager software (RevMan 2008). We used fixed-effect meta-analysis for combining data in the absence of significant heterogeneity if trials were sufficiently similar. When significant heterogeneity was present, we used a random-effects meta-analysis.

Dichotomous data

For dichotomous data, we have presented results as summary risk ratio (RR) with 95% confidence intervals (CI).

Continuous data

For continuous data (e.g. maternal pain and satisfaction when measured as scores or on visual analogue scales) we used the mean difference (MD) if outcomes were measured in the same way between trials. We planned to use the standardised mean difference (SMD) to combine trials that measured the same outcome, but used different methods.

Unit of analysis issues

Cluster-randomised trials

We intended to include cluster-randomised trials in the analyses along with individually -randomised trials, and to adjust sample sizes using the methods described in Gates 2005 and Higgins 2011.

We identified no cluster-randomised trials in this version of the review, but if we identify such trials in future searches we will include them in updates.

Dealing with missing data

For included studies, we noted levels of attrition. Where data were not reported for some outcomes or groups, we attempted to contact the study authors for further information.

Intention-to-treat analysis (ITT)

We had intended to analyse data on all participants with available data in the group to which they were allocated, regardless of whether or not they received the allocated intervention. If in the original reports participants were not analysed in the group to which they were randomised, and there was sufficient information in the trial report, we attempted to restore them to the correct group (e.g. we did this for the data from the Calvert 1982 study).

Assessment of heterogeneity

We examined heterogeneity using the I^2 statistic. Where we identified high levels of heterogeneity among the trials (greater than 30%), we explored it by pre-specified subgroup analysis and by performing sensitivity analysis. A random-effects meta-analysis was used as an overall summary for these comparisons.

Subgroup analysis and investigation of heterogeneity

Where data were available, we had planned subgroup analyses by:

- nulliparous versus multiparous women;
- spontaneous labour versus induction of labour;
- sitting, walking or sitting, standing, squatting, kneeling or walking versus recumbent/supine/lateral or bedcare.

We had also planned subgroup analysis by:

- women with a low-risk pregnancy (no complications, greater than or equal to 37 weeks' gestation, singleton with a cephalic presentation) versus high-risk pregnancy.

Data were not available to carry out this analysis.

Sensitivity analysis

We carried out sensitivity analyses to explore the effect of trial quality for important outcomes in the review. Where there was risk of bias associated with a particular aspect of study quality (e.g. inadequate allocation concealment or high levels of attrition), we explored this by sensitivity analysis.

WHAT'S NEW

Date	Event	Description
23 September 2013	New citation required but conclusions have not changed	The comparisons in the main results of the abstract had been reported incorrectly in Issue 8, 2013. These have now been corrected.
23 September 2013	Amended	For Comparison 1: Upright and recumbent positions versus recumbent positions and bed care has been corrected to: Upright and ambulant positions versus recumbent positions and bed care. For Comparison 2: Upright and recumbent positions versus recumbent positions and bed care (with epidural: all women) has been corrected to: Upright and ambulant positions versus recumbent positions and bed care (with epidural: all women).

HISTORY

Protocol first published: Issue 4, 2002
Review first published: Issue 2, 2009

Date	Event	Description
18 April 2013	New citation required and conclusions have changed	With the addition of new trial data, there is now evidence to suggest that upright positions in the first stage of labour reduce the risk of caesarean birth.
31 January 2013	New search has been performed	Search updated. Five new trials included (Ben Regaya 2010; Boyle 2002; Gau 2011; Mathew 2012; Taavoni 2011). One trial previously included (Broadhurst 1979) recognised as an already included study (Flynn 1978).
1 March 2009	New search has been performed	Update work to include trials with missing data, Cochrane Review Workshop, Melbourne.
11 November 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

The review update has been conducted by Lucy Lewis and Annemarie Lawrence.

Data extraction and data entry for the review were carried out by Lucy Lewis and Annemarie Lawrence. The text of the review was drafted by Lucy Lewis and Annemarie Lawrence. Justus Hofmeyr and Cathy Styles commented on drafts.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- Griffith University, School of Nursing, Queensland, Australia.
- Centre for Clinical Studies - Women's and Children's Health, Mater Hospital, Queensland, Australia.
- The University of Liverpool, UK.
- University of Adelaide, Australian Research Centre for Health of Women and Babies, South Australia, Australia.
- James Cook University, School of Midwifery and Nutrition, Queensland, Australia.
- University of Queensland, School of Nursing and Midwifery, Royal Brisbane and Women's Hospital, Queensland, Australia.
- Institute of Women's and Children's Health, The Townsville Hospital, Queensland, Australia.
- Tropical Health Research Unit for Nursing and Midwifery Practice (THRU), Queensland, Australia.

External sources

- Department of Health and Ageing, Commonwealth Government, Australia.
- National institute for Health Research, UK.
- Monash Institute of Helath Services Research, Australia.
- Australasian Cochrane Centre, Australia.
- Tropical Health Research Unit for Nursing and Midwifery Practice (THRU), Queensland, Australia.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The methods section has been updated to reflect changes in methods and software. Perinatal death was not an outcome prespecified in the protocol. Subgroup and sensitivity analyses have been performed according to the updated methods.

INDEX TERMS

Medical Subject Headings (MeSH)

Anesthesia, Obstetrical [statistics & numerical data]; Cesarean Section [statistics & numerical data]; Labor Stage, First [*physiology]; Patient Positioning [*methods]; Posture [*physiology]; Randomized Controlled Trials as Topic; Supine Position [physiology]; Time Factors; Walking [*physiology]

MeSH check words

Female; Humans; Pregnancy