National Institute for Health and Care Excellence

Final

Intrapartum care

[G] Evidence reviews for position for birth

NICE guideline NG235

Evidence reviews underpinning recommendations 1.6.30, 1.9.5 and 1.9.6 in the NICE guideline

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Final

These evidence reviews were developed by NICE

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Contents

Position for birth

Review questions

This evidence report contains information on 2 reviews relating to positions for birth:

- What is the most effective position for birth in women with an epidural in situ?
- What is the most effective position for birth in women without an epidural in situ?

Introduction

Women can adopt a variety of positions during labour and for a spontaneous vaginal birth – this can include remaining mobile and walking around, kneeling, squatting, sitting upright (for example on a bed, beanbag or birthing chair), semi-reclined / semi-supine in a chair or bed or fully recumbent positions such as lying supine on their back or on their side. Different positions can have variable effects on the position of the pelvis which may result in birth being easier in some positions compared to others.

In women with an epidural in situ, remaining mobile may be more difficult, and there may be less urge to push, and reduced effectiveness of pushing. In women without an epidural, all positions are more likely to be possible.

The aim of this review was to identify the position that led to a safer birth for the woman and her baby with the need for fewer interventions, and the best birth experience.

Summary of the protocol

See Table 1 and Table 2 for a summary of the Population, Intervention, Comparison and Outcome (PICO) characteristics of these reviews.

Table 1: Summary of the protocol (PICO table) – effective position for birth with an epidural

Population	• Women in the second stage of labour with an epidural in situ who are pregnant with a single baby, who go into labour at term (37 to 42 weeks of pregnancy) and who do not have any pre-existing medical conditions or antenatal conditions that predispose to a higher risk birth • Women who have received any kind of epidural analgesia • Women in labour whose baby has not been identified before labour to be at high risk of adverse outcome • Singleton babies born at term (37 to 42 weeks of pregnancy) with no previously identified problems (for example congenital malformations, genetic anomalies, intrauterine growth restriction, placental problems)
Intervention	Maternal use of any upright position during the second stage of labour, including: • kneeling • walking/ mobilisation • squatting • standing • sitting upright (throne position)
Comparison	Maternal use of any recumbent position during the second stage of labour including: • lying on back • lying on side, left or right lateral • semi-recumbent
Outcome	**Critical:** For the woman: • Mode of birth (for example, spontaneous vaginal, instrumental vaginal, caesarean birth) • Duration of active second stage (as defined by author) • Genital tract trauma (episiotomy performed or perineal tear) **Important:** For the woman: • Women's experience of labour and birth • Long-term incontinence, including urinary and bowel (time-points as reported by authors) For the baby: • Apgar score below 7 at five minutes • Abnormal fetal heart rate needing intervention

Table 2: Summary of the protocol (PICO table) – effective position for birth without an epidural

Population	• Women in the second stage of labour without an epidural in situ who are pregnant with a single baby, who go into labour at term (37 to 42 weeks of pregnancy) and who do not have any pre-existing medical conditions or antenatal conditions that predispose to a higher risk birth • Women in labour whose baby has not been identified before labour to be at high risk of adverse outcome • Singleton babies born at term (37 to 42 weeks of pregnancy) with no previously identified problems (for example congenital malformations, genetic anomalies, intrauterine growth restriction, placental problems)
Intervention	Maternal use of any upright position during the second stage of labour, including: • kneeling • walking/mobilisation • squatting • standing • sitting upright (throne position) • use of birthing pool during labour and/ or birth (upright position) – note that it is not possible to use epidurals in water birthing pools
Comparison	Maternal use of any recumbent position during the second stage of labour including: • lying on back • lying on side, left or right lateral • semi-recumbent • water birthing pool during labour and/ or birth (recumbent position) – note that it is not possible to use epidurals in water birthing pools
Outcome	**Critical:** For the woman: • Mode of birth (for example, spontaneous vaginal, instrumental vaginal, caesarean birth) • Duration of active second stage (as defined by author) • Genital tract trauma (episiotomy performed or perineal tear) **Important:** For the woman: • Women's experience of labour and birth • Long-term incontinence, including urinary and bowel (time-points as reported by authors) For the baby: • Apgar score below 7 at five minutes • Abnormal fetal heart rate needing intervention

For further details see the review protocols in appendix A.

Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A and the methods document (supplementary document 1).

The two review questions for position for birth in women with and without an epidural in situ, respectively, are presented in this evidence report as two separate analyses. Evidence for position for birth in women with unknown use of epidural analgesia (as use of epidural

analgesia was not reported or not clear in the article) is also presented in this evidence report as a separate analysis. Studies which included women both with and without an epidural in situ and did not conduct sub-group analyses were considered for inclusion in the review if the proportion of women with and without an epidural was reported: for the review of women without an epidural in situ the study was included if the proportion of women with an epidural in situ was less than a third; for the review of women with an epidural in situ, the study was included if the proportion of women without an epidural in situ was less than a third, as per the protocol.

The committee agreed that only studies conducted in high-income countries (as defined by the Organisation for Economic Co-operation and Development [OECD]) should be considered for inclusion because it was anticipated that enough direct evidence from high-income countries will be found and some low and middle income countries use pushing techniques that are not part of clinical practice in the UK and may increase the proportion of adverse outcomes.

Declarations of interest were recorded according to NICE's conflicts of interest policy.

Effectiveness evidence

Included studies

Women with an epidural in situ

Two randomised controlled trials (RCTs) were included for the review on position for birth in women with an epidural in situ (BUMPES 2017 and Golara 2002). Both RCTs were conducted in the UK.

Both RCTs compared upright positions to recumbent positions in the second stage of labour in women with a low dose infusion epidural bupivacaine and fentanyl mix. Both RCTs included only nulliparous women, who had a singleton pregnancy and were expecting an uncomplicated spontaneous vaginal birth at term. In 1 RCT, women in the upright group were encouraged to adopt any upright positions during the passive and active phases of the 2nd stage of labour and women in the recumbent group were encouraged to lie on their side (left or right lateral) during 2nd stage of labour until birth (BUMPES 2017); in the other RCT, women in the upright group were encouraged to remain ambulatory during the passive 2nd stage of labour and women in the recumbent group were asked to remain in bed or in a chair during as much of the passive 2nd stage as possible. This study only studied the passive not active second stage (Golara 2002).

The included studies are summarised in Table 3.

Women without an epidural in situ

Seven RCTs were included for the review on position for birth of women without an epidural in situ (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986; Waldenstrom 1991). These RCTs were conducted in: Ireland (Crowley 1991); England (Gardosi 1989a, Gardosi 1989b; Stewart 1989; Turner 1986); Scotland (Stewart 1983); and Sweden (Waldenstrom 1991).

All RCTs compared upright positions to recumbent positions in the second stage of labour. All RCTs included only women who had a singleton pregnancy and were expecting an uncomplicated spontaneous vaginal birth (women had no obstetric risk factors and/or history of caesarean birth). Four RCTs excluded the use of epidural and 3 RCTs were included in which the proportion of women receiving epidural was less than a third (Stewart 1983; Turner 1986; Waldenstrom 1991). Three RCTs included only nulliparous women (Crowley 1991; Gardosi 1989a; Gardosi 1989b) and 4 RCTs included women of any parity (Stewart 1983; Stewart 1989; Turner 1986; Waldenstrom 1991). In terms of position for birth, in 2 RCTs,

women in the upright group were encouraged to adopt kneeling, squatting or sitting positions (Gardosi 1989a; Gardosi 1989b); in 4 RCTs, women used a birthing chair to adopt a sitting upright position (Crowley 1991; Stewart 1983; Stewart 1989; Turner 1986); and in 1 RCT, women used a birthing stool (Waldenstom 1991). In all RCTs, women allocated to the upright arm were encouraged to maintain the upright position for the duration of the second stage.

The included studies are summarised in Table 4.

Unknown use of epidural

One additional RCT conducted in Finland was included which did not report on the use of epidural analgesia (Marttilla 1983).

This RCT compared a half-sitting position to a supine position in the second stage of labour. Women of any parity who had a singleton pregnancy and were expecting an uncomplicated spontaneous vaginal birth were included.

This included study is summarised in Table 5.

There were no differences in pushing techniques between intervention and control groups in any of the included RCTs.

Studies not included in this review are listed, and reasons for their exclusion are provided in appendix J.

Summary of included studies

Summaries of the studies that were included in this review are presented in Table 3, Table 4 and Table 5.

Table 3: Summary of included studies for position for birth in women with an epidural in situ

Study	Population	Intervention	Comparison	Outcomes	Comments
BUMPES 2017 Randomised controlled trial UK	N=3093 Gestational age: ≥37 weeks Parity: nulliparous All women had a low-dose infusion epidural (majority of women had a bupivacaine and fentanyl mix)	<u>Upright position</u> Women encouraged to adopt upright positions during 2nd stage of labour until birth (walking, standing, sitting out of bed, kneeling, upright in bed, other upright positions)	<u>Recumbent position</u> Women adopted lying-down positions during 2nd stage of labour until birth (left or right lateral) with 30 degree inclination of the bed	• Mode of birth • Duration of active 2nd stage • Genital tract trauma (episiotomy and perineal tear) • Women's experience of labour and birth • Long term incontinence	Adherence: 72.5% in upright group; 63.7% in recumbent group % of women induced before onset of active labour > 1/3 (relevant outcomes downgraded for indirectness)
Golara 2002 Randomised controlled trial England	N=66 Gestational age: ≥37 weeks	<u>Ambulatory position</u> Women encouraged to remain ambulatory (standing or	<u>Recumbent position</u> Women asked to remain in bed or in a chair during for as much of	• Mode of birth • Genital tract trauma (episiotomy and perineal tear)	Women choose preferred position for birth for the active 2nd stage

Study	Population	Intervention	Comparison	Outcomes	Comments
	Parity: nulliparous All women had a low-dose infusion epidural of bupivacaine and fentanyl	walking) for as much of the passive 2nd stage as possible	the passive 2nd stage as possible		Adherence: 88% in ambulatory group; 85% in recumbent group (including use of chair)

Table 4: Summary of included studies for position for birth in women without an epidural in situ

Study	Population	Intervention	Comparison	Outcomes	Comments
Crowley 1991 Randomised controlled trial Ireland	N=1250 Gestational age: ≥34 weeks Parity: nulliparous	<u>Birthing chair</u> Women used a birthing chair (height and angle of the chair adjusted according to the preference of the midwife and the woman) for 2nd and 3rd stages of labour	<u>Recumbent position</u> Use of a birthing bed, adopting any of the following positions: recumbent, semi-recumbent, dorsal, or left lateral for 2nd and 3rd stages of labour	• Mode of birth • Duration of active 2nd stage • Genital tract trauma (episiotomy and perineal tear) • Women's experience of labour and birth • Apgar score ≤ 7 at 5 minutes • Abnormal fetal heart rate needing intervention	Adherence: 65% in birthing chair group; 97% in recumbent group
Gardosi 1989a Randomised controlled trial England	N=427 Gestational age: ≥37 weeks Parity: nulliparous	<u>Upright position</u> Women adopted squatting position using a birthing cushion placed on the bed or floor	<u>Recumbent position</u> Women adopted a conventional recumbent (back support at 30 degrees) or lateral position	• Mode of birth • Duration of active 2nd stage • Genital tract trauma (episiotomy and perineal tear)	Women could be ambulatory during the 1st stage of labour and were free to change position in 2nd stage Adherence: 82% in upright group; 89% in recumbent group
Gardosi 1989b Randomised controlled trial	N=151 Gestational age: ≥37 weeks	<u>Upright position</u> Women adopted squatting,	<u>Recumbent position</u> Women adopted a conventional	• Mode of birth • Duration of active 2nd stage	Women could be ambulatory during the 1st stage of

Study	Population	Intervention	Comparison	Outcomes	Comments
England	Parity: nulliparous	kneeling (including hands and knees) and sitting positions	recumbent (back support at 30 degrees) or lateral position	• Genital tract trauma (episiotomy and perineal tear) • Apgar score ≤ 7 at 5 minutes	labour and were free to change position in 2nd stage Adherence: 74% in upright group; 81% in recumbent group
Stewart 1983 Randomised controlled trial Scotland	N= 189 Gestational age: 37 to 42 weeks Parity: mixed parity	Birth chair Women used a 'Birth E-Z' chair (backrest inclination at 15 to 20 degrees from vertical) for 2nd stage	Recumbent position Use of a birthing bed (backrest inclination at maximum of 20 degrees from horizontal) for 2nd stage	• Mode of birth • Duration of active 2nd stage • Genital tract trauma (episiotomy and perineal tear)	% of women induced before onset of active labour > 1/3 (duration of active 2nd stage outcome downgraded for indirectness)
Stewart 1989 Randomised controlled trial England	N=304 Gestational age: ≥37 weeks Parity: mixed parity	Birthing chair Women encouraged to use obstetric chair at 15-20 degree recline, with head-rest and side supports	Supine position Women adopted a supine position, described as a 'wedged' dorsal position	• Mode of birth • Duration of active 2nd stage • Genital tract trauma (episiotomy and perineal tear) • Women's experience of labour and birth	All women were allowed to be ambulant during the 1st stage Adherence: 86% in birthing chair group; 100% in supine group
Turner 1986 Randomised controlled trial England	N=318 Gestational age: >36 weeks Parity: mixed parity	Birthing chair Women used a 'Birth EZ' chair with adjustable height and angle of backrest for 2nd stage	Supine position Women adopted a supine position in a bed	• Mode of birth • Duration of active 2nd stage (insufficient data reported to include in meta-analysis) • Genital tract trauma (episiotomy and perineal tear) • Apgar score ≤ 7 at 5 minutes	26.4% of women used epidural analgesia (no significant difference between groups) Adherence: 71% in birthing chair group; 100% in supine group
Waldenstrom 1991	N=294	Birthing stool Women were encouraged to	Semi-recumbent position	• Duration of active 2nd stage	6.9% of women in birth stool

Study	Population	Intervention	Comparison	Outcomes	Comments
Randomised controlled trial Sweden	Gestational age: not reported Parity: mixed parity	sit on the birthing stool in a squatting position during the 2nd stage	Women were encouraged to adopt a semi-recumbent position during the 2nd stage	• Genital tract trauma (episiotomy) • Women's experience of labour and birth	group and 3.5% women in semi-recumbent used epidural analgesia Adherence: 49% in the birthing stool group; 68% in the semi-recumbent group

Table 5: Summary of included studies for position for birth in women with unknown use of epidural

Study	Population	Intervention	Comparison	Outcomes	Comments
Marttila 1983 Randomised controlled trial Finland	N=100 Gestational age: 38- 42 weeks Parity: mixed parity	<u>Half-sitting birthing chair group</u> Women used a birthing chair constructed from birthing beds to adopt a 'half-sitting' position at 50 degrees	<u>Supine position group</u> Women adopted a supine position on a birthing bed	• Mode of birth • Duration of active 2nd stage • Women's experience of labour and birth • Abnormal fetal heart rate needing intervention	All women were supine during the 1st stage All women delivered vaginally (unclear if women who had a caesarean birth were excluded)

See the full evidence tables in appendix D and the forest plots in appendix E.

Summary of the evidence

Women with an epidural in situ

Two studies (Bolara 2017 and Golara 2002) were included in this comparison. The studies were analysed separately due to differences in categorisation of positions of birth.

Evidence from BUMPES 2017 suggested there was no evidence of an important difference for the critical outcomes of instrumental birth and episiotomy; and no important difference for spontaneous vaginal birth, caesarean birth, perineal tear (grade 2 or higher) and duration of active 2nd stage between upright and recumbent position groups. In terms of important outcomes, there was no important difference between upright and recumbent position groups for women's experience and long-term incontinence (bowel and urinary) between upright and recumbent positions. The quality of the evidence for these outcomes ranged between very low to high.

Evidence from Golara 2002 suggested there was no evidence of an important difference for the critical outcomes of spontaneous vaginal birth, instrumental birth, caesarean birth, episiotomy; and no important difference for perineal tear (grade 2 or higher) between upright

and recumbent position groups. The quality of the evidence for these outcomes ranged between low to very low.

No evidence was found for the remaining important outcomes: Apgar score <7 at 5 minutes and abnormal fetal heart rate needing intervention.

Women without an epidural in situ

For the critical outcome of spontaneous vaginal birth, there was no evidence of an important difference between upright and recumbent position groups for all women (when data pooled from all studies, regardless of parity) or nulliparous women. For multiparous women, there was no important difference between upright and recumbent position groups for spontaneous vaginal birth. For the critical outcomes of instrumental birth or caesarean birth there was no evidence of an important difference between groups for all women, nulliparous women or multiparous women. There was no important difference between groups regardless of parity for the critical outcome of duration of active 2nd stage. For the final critical outcome of genital tract trauma, there was no evidence of an important difference between groups for episiotomy and perineal tears (grade 2 or higher) in all women and in nulliparous women. There was an important benefit in terms of episiotomy for multiparous women or women adhering to the allocated position favouring the upright position group. For perineal tears, there was an important harm for multiparous women in the upright position group.

For important outcomes, 3 studies reported on women's experience of labour and birth (Crowley 1991; Stewart 1989; Waldenstrom 1991). From 1 study including only nulliparous women (Crowley 1991), there were no important differences between groups for several maternal-reported outcomes (women who agreed they "could move freely"; women who agreed they "felt in control"; women who agreed labour was "unpleasant") and no evidence of important difference for the maternal-reported outcome, women who reported "severe" pain. In two smaller studies, important benefits were seen for women in the upright position group, with fewer women reporting that they were "uncomfortable" during 2nd stage (Stewart 1989) and more women reporting their experience of birthing position as "excellent" (Waldenstrom 1991). In terms of Apgar score <7 at 5 minutes, there was no evidence of important difference between groups for all women or nulliparous women. There were fewer nulliparous women in the upright group with abnormal fetal heart rate needing intervention compared to recumbent position group, this was considered to be an important benefit.

The quality of the evidence for these outcomes ranged between very low and high quality. No evidence was found for the important outcome long-term incontinence.

Unknown use of epidural

In terms of mode of birth, there was no important difference and no evidence of important difference between upright and recumbent position groups for spontaneous vaginal birth and instrumental birth, respectively. The study reported that all women had a vaginal birth, but it was not clear whether women who had a caesarean birth were excluded, so this outcome was not included in the analysis. In terms of duration of active 2nd stage, there was no important difference between groups for nulliparous or multiparous women.

In terms of women's experience of labour and birth, there were fewer women in the upright position group who reported ''intolerable'' pain compared to recumbent group, this was considered to be an important benefit. There was no evidence of important difference between upright and recumbent position groups for women who agreed the experience was "unpleasant". There was no important difference between upright and recumbent position groups for women who wished to use the half-sitting upright position for their next birth.

There was no evidence of important difference between groups in terms of abnormal fetal heart rate needing intervention.

The quality of the evidence for these outcomes ranged between very low and moderate. Apgar score <7 at 5 minutes, genital tract trauma and long-term incontinence were not reported.

See appendix F for full GRADE tables.

Economic evidence

Included studies

Women with an epidural in situ

One economic study was identified which was relevant to this question (Bick 2017).

See the literature search strategy in appendix B and economic study selection flow chart in appendix G.

Women without an epidural in situ

A systematic review of the economic literature was conducted but no economic studies were identified which were applicable to this review question.

See the literature search strategy in appendix B and economic study selection flow chart in appendix G.

Excluded studies

Economic studies not included in this review are listed, and reasons for their exclusion are provided in appendix J.

Summary of included economic evidence

See Table 6 for the economic evidence profile of the included study.

Table 6: Economic evidence profile of a systematic review of economic evaluations of the most effective position for birth in women with an epidural in situ

Study	Limitations	Applicability	Other comments	Incremental			Uncertainty
				Costs	Effect	Cost effectivenss	
Bick 2017 Upright birth position versus lying down birth position	Minor limitations[1,2]	Directly applicable[1]	Economic evaluation alongside a randomised controlled trial	-£42	-0.059 SVB	£722 per additional SVB gained from lying down position	No statistical difference in overall costs at 12 months Difference in SVB was statistically significant

SVB = spontaneous vaginal birth

[1] The original analysis intended to use QALYs however this approach was abandoned due to difficulties in obtaining HRQoL data at randomisation. Therefore, the authors decided to adopt a cost-consequence approach

as their primary analysis. A secondary CEA was conducted using spontaneous vaginal births as the measure of effect.
[2] Differences in spontaneous vaginal birth could be expected to lead to differences in QALYs and cost-effectiveness threshold for NHS for an additional spontaneous vaginal birth is not known.

Economic model

No economic modelling was undertaken for these reviews because the committee agreed that other topics were higher priorities for economic evaluation as there are no or negligible differences in intervention costs arising from birth position.

Evidence statements

Economic evidence statement

One cost-effectiveness analysis found no statistically significant difference in maternal and infant costs at 12 months between an upright birth position and a lying down position. This analysis was assessed as partially applicable to the NHS decision making context and characterised by minor limitations.

The committee's discussion and interpretation of the evidence

The outcomes that matter most

The committee agreed that mode of birth was a critical outcome for these reviews to determine whether upright or recumbent positions impacted the proportion of spontaneous vaginal births, births with forceps or ventouse and caesarean births. They agreed duration of the active second stage of labour was a critical outcome as certain positions of the pelvis can lengthen the time between the start of pushing and birth, with adverse effects on the woman and baby. The committee wanted to know whether upright or recumbent positions were associated with more or less episiotomies and perineal tears and chose genital tract trauma as a critical outcome.

The committee also chose important outcomes for these reviews. They agreed women's experience of labour and birth should be included as an important outcome as determining any differences in women's comfort or satisfaction, for example, between upright and recumbent positions, would help to inform the acceptability of any recommendations made on position for birth. The committee recognised the great importance of women's experience of labour and birth, but they were aware that data on this outcome was likely to be sparse and unlikely to inform decision-making in a meaningful way, so they prioritised this as an important outcome rather than a critical outcome. The committee agreed that long-term urinary and bowel incontinence should be included as an important outcome as it could impact the women's quality of life after birth. The committee chose Apgar score <7 at 5 minutes and abnormal fetal heart rate needing intervention as important outcomes to capture any differential harm to the baby associated with upright or recumbent positions.

The quality of the evidence

Women with an epidural in situ

The quality of the evidence ranged from high to very low. The main issues were around indirectness of the evidence, risk of bias and imprecision. One study (Golara 2002) used low dose anaesthetic-opioid combination with either epidural or combined spinal-epidural, outcomes from this study, hence it was downgraded for indirectness. As participants and personnel could not be blinded to intervention allocation (in both BUMPES 2017 and Golara 2002), subjective outcomes were downgraded for risk of bias. There were concerns for some

outcomes around the imprecision of the estimate of effect. The committee took into account the quality of the evidence, including the uncertainty in their interpretation of the evidence.

Women without an epidural in situ

The quality of the evidence ranged from high to very low, with most of the evidence being of very low quality. The main issues were risk of bias and imprecision. In terms of risk of bias, there were some concerns of selection bias as either insufficient detail was given on allocation concealment, or a quasi-randomised method was used for intervention allocation. There were also concerns on adherence to the intervention, where adherence was unbalanced between groups and the effect of adhering to the intervention was not examined. Several outcomes were downgraded for imprecision due to wide confidence intervals around effect estimates.

Benefits and harms

The committee discussed the evidence on the benefits and harms associated with upright positions for women with an epidural in situ and women without an epidural in situ.

Women with an epidural in situ

The committee noted that the majority of the evidence for women with an epidural in situ was from one large multicentre trial of nulliparous women (BUMPES 2017) comparing upright positions (walking, standing, sitting out of bed, supported kneeling, bolt upright in an obstetric bed, or any other upright position for as much of the second stage as possible) to recumbent (left or right lateral) positions. The smaller study (Golara 2002) compared upright positions (either standing or walking) to recumbent positions (spending as much time as possible in bed or in a chair during the passive phase). This study did not consider position of birth in the active pushing phase of the second stage. Due to the heterogeneity in positions of birth, the two studies were analysed separately.

The committee discussed that there was a statistically significant increase in spontaneous vaginal births for nulliparous women who were in recumbent positions (left or right lateral) compared to upright positions during the second stage of labour (BUMPES 2017), although the effect estimates showed no important difference with respect to the minimally important differences used to interpret the evidence. However, the committee agreed that women should be informed of this result, so they could take this into consideration when deciding on their position of birth.

There was evidence showing no difference for any of the outcomes from the second study (Golara 2002) and so overall, the committee agreed that there was no evidence of important benefits or harms associated with upright or recumbent positions for any of the critical or important outcomes.

The committee discussed the lack of clarification around the classification of semi-recumbent positions within the BUMPES study, given that it is a commonly used position for birth and in their experience, the plane of the pelvis in this position could be either more vertical or horizontal depending on both the inclination of the headrest and how the woman was lying in the bed, but judgement of this was largely subjective. The committee were concerned that semi-recumbent positions may have been adopted in the recumbent group and this may have confounded the results as the pelvis could be in either a vertical or horizontal plane.

The committee also discussed that the study by Golara 2002 terminated early due to “movement of staff” and did not manage to recruit the estimated number of women needed to detect differences between groups.

The committee agreed that, in their experience, upright positions and left or right lateral recumbent positions were routinely used during the second stage of labour in women with epidurals in situ and were safe for birth. The committee were aware that women with an

epidural in situ may need more assistance to mobilise and find a comfortable position. Hence based on the evidence and their knowledge and experience, they agreed that women may choose to lie on their side but could adopt a position which was comfortable for them during the second stage of labour.

However, the committee were aware that adopting a supine position during late pregnancy or labour can lead to supine hypotensive syndrome or aortocaval compression, due to the pressure from the uterus compressing the aorta and inferior vena cava. This leads to decreased blood pressure and can limit blood flow to the placenta. The committee also highlighted that epidural analgesia accentuates the effects of aortocaval compression and therefore supine positions should be particularly avoided in women with epidurals. The committee noted that while supine positions are rarely used in routine practice, their recommendations should include advice to women that lying flat on their back may lead to these problems.

The committee noted that mobilisation is possible for women with a low-dose epidural, but that they may require assistance to move as their legs may feel heavier than usual and they may have some degree of motor block. The committee added advice about this to the recommendations on regional analgesia.

Women without an epidural in situ

The committee discussed the evidence of a benefit of upright positions for multiparous women in terms of episiotomies and the evidence of a harm in terms of perineal tears. They agreed this may have been due to a bias in favour of performing fewer episiotomies in the upright position and in multiparous women, which in turn resulted in more perineal tears.

Based on their experience and expertise, the committee agreed that the benefit associated with fewer episiotomies outweighed the harm of more perineal tears, as often women find that episiotomies are more painful and slower to heal than perineal tears. However, the committee noted that, as per the protocol, the evidence did not specify the severity of the tear and they discussed that this may shift the balance of benefits and harms. The committee were informed that the included studies did not stratify by severity of tear, with most studies reporting second degree tears only or not specifying severity. The committee noted that the evidence for these outcomes dated from 1983 to 1989 and therefore the way perineal tears are categorised may have changed since. In their experience and expertise, rates of episiotomy in all women, and especially in multiparous women had also decreased, meaning a benefit on episiotomy may not be detected in contemporary studies where it is likely fewer episiotomies would be performed. For nulliparous women, there was no evidence of an important difference between upright and recumbent positions in terms of episiotomy and perineal tears. The committee discussed that the rate of episiotomies and births with forceps or ventouse in nulliparous women are around 40% (unpublished data), and that positions such as lithotomy increase the number of tears because of an increased pressure in the perineum. Based on their experience and the evidence of a decreased risk of episiotomies for multiparous women who adopted upright positions, the committee agreed to recommend upright positions and mobilisation for women without an epidural in situ. Furthermore, the committee noted that mobilisation could help prevent complications such as deep vein thrombosis.

The committee discussed the evidence of benefits in terms of women's experience of labour and birth associated with upright positions. They agreed that as there was no difference for some of the measures of women's experience, and improved satisfaction for the upright position for some other measures this strengthened the rationale for a recommendation for women to have a choice in adopting a position they found most comfortable during labour, including upright positions.

As with the recommendations for women with an epidural in situ, the committee included advice for women that lying flat on their back, may lead to aortocaval compression and

effects on blood pressure. The committee noted that the risks of lying flat without an epidural are less than for women with an epidural in situ.

The committee noted the evidence of a benefit of upright positions in terms of abnormal fetal heart rate needing intervention and agreed this further supported their recommendation on encouraging upright positions during the second stage of labour for women without an epidural in situ.

Cost effectiveness and resource use

A published UK study (Bick 2017), an economic evaluation, alongside the BUMPES study, found no difference in intervention related maternal and infant costs at 12 months from labour in nulliparous women with low-dose epidural in the 2nd stage of labour, giving birth in an upright position, compared to women giving birth in a lying down position (difference -£42; 95% CI -£254 to £169). The study reported that an upright position resulted in a significantly lower number of spontaneous vaginal births (difference -0.059; standard error 0.02). The results showed that women in the lying down position incurred significantly less resources during their original hospital stay due to the higher rate of spontaneous vaginal births, but there was no significant difference in costs at 12-months follow-up as higher, albeit non-significant, costs observed for babies in the lying down group during follow-up offset the lower maternal costs from trial entry to hospital discharge.

The authors reported that the incremental cost effectiveness ratio (ICER) of a lying down birth position relative to an upright position was £722 per additional spontaneous vaginal birth (95% confidence interval -£2,986 to £6,358) but there is no cost-effectiveness threshold for this ICER on which to assess whether this might be considered good value for the NHS. Furthermore, there is considerable uncertainty around the ICER, particularly relating to costs, with the ICER confidence intervals suggesting that a null hypothesis of cost neutrality cannot be rejected. As the committee were not persuaded that there was any evidence of clinical benefits or harms (see Benefits and harms) from an upright birth position, they concluded that the evidence on cost effectiveness was inconclusive and therefore they considered that birth position should be a matter for the woman's personal preference.

Recommendations supported by this evidence review

This evidence review supports recommendations 1.6.30, 1.9.5 and 1.9.6.

References – included studies

Effectiveness

Included studies for review question: What is the most effective position for birth in women with an epidural in situ?

BUMPES 2017

BUMPES (2017) Upright versus lying down position in second stage of labour in nulliparous women with low dose epidural: BUMPES randomised controlled trial. BMJ (Clinical research ed.) 359: j4471

Golara 2002

Golara, M.; Plaat, F.; Shennan, A. H. (2002) Upright versus recumbent position in the second stage of labour in women with combined spinal-epidural analgesia. International journal of obstetric anesthesia 11(1): 19-22

Included studies for review question: What is the most effective position for birth in women without an epidural in situ?

Crowley 1991

Crowley, P., Elbourne, D., Ashurst, H. et al. (1991) Delivery in an obstetric birth chair: A randomized controlled trial. British Journal of Obstetrics and Gynaecology 98(7): 667-674

Gardosi 1989a

Gardosi, J.; Hutson, N.; B-Lynch, C. (1989) Randomised, controlled trial of squatting in the second stage of labour. Lancet (London, England) 2(8654): 74-7

Gardosi 1989b

Gardosi, J.; Sylvester, S.; B-Lynch, C. (1989) Alternative positions in the second stage of labour: a randomized controlled trial. British journal of obstetrics and gynaecology 96(11): 1290-6

Marttila 1983

Marttila, M.; Kajanoja, P.; Ylikorkala, O. (1983) Maternal half-sitting position in the second stage of labor. Journal of perinatal medicine 11(6): 286-9

Stewart 1989

Stewart, P. and Spiby, H. (1989) A randomized study of the sitting position for delivery using a newly designed obstetric chair. British journal of obstetrics and gynaecology 96(3): 327-33

Turner 1986

Turner, MJ, Romney, Mona L, Webb, JB et al. (1986) The birthing chair: an obstetric hazard?. Journal of Obstetrics and Gynaecology 6(4): 232-235

Waldenstrom 1991

Waldenstrom, U. and Gottvall, K. (1991) A randomized trial of birthing stool or conventional semirecumbent position for second-stage labor. Birth (Berkeley, Calif.) 18(1): 5-10

Economic

Bick 2017

Bick, D.; Briley A.; Brocklehurst P. et al. A multicentre, randomised controlled trial of position during the late stages of labour in nulliparous women with an epidural: clinical effectiveness and an economic evaluation (BUMPES). Health Technology Assessment 2017;21(65).

Appendices

Appendix A Review protocols

Review protocol for review question: What is the most effective position for birth in women with an epidural in situ?

Table 7: Review protocol

Field	Content
PROSPERO registration number	CRD42021277530
Review title	The effectiveness of positions for birth in women with an epidural in situ
Review question	What is the most effective position for birth in women with an epidural in situ?
Objective	To update the recommendations in CG190 (2014) for the most effective position for birth. Surveillance has identified that the optimal position of the woman during the second stage of labour depends on whether she has an epidural. For women with epidural, findings suggest that upright positions significantly increase the chance of operative births (driven by an increase in caesarean births).
Searches	The following databases will be searched: • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Embase • MEDLINE & MEDLINE In-Process • International Health Technology Assessment (IHTA) database Searches will be restricted by: • Date (1994-) • English language studies • Human studies

Field	Content
	Other searches: • Inclusion lists of systematic reviews The full search strategies for the MEDLINE database will be published in the final review. For each search, the principal database search strategy is quality assured by a second information scientist using an adaptation of the PRESS 2015 Guideline Evidence-Based Checklist.
Condition or domain being studied	Labour and birth
Population	• Women in the second stage of labour with an epidural in situ who are pregnant with a single baby, who go into labour at term (37 to 42 weeks of pregnancy) and who do not have any pre-existing medical conditions or antenatal conditions that predispose to a higher risk birth • Women who have received any kind of epidural analgesia • Women in labour whose baby has not been identified before labour to be at high risk of adverse outcome • Singleton babies born at term (37 to 42 weeks of pregnancy) with no previously identified problems (for example congenital malformations, genetic anomalies, intrauterine growth restriction, placental problems)
Intervention	Maternal use of any upright position during the second stage of labour including: • kneeling • walking/ mobilisation • squatting • standing • sitting upright (throne position)
Comparator	• Maternal use of any recumbent position during the second stage of labour including: • lying on back • lying on side, left or right lateral • semi-recumbent
Types of study to be included	Include published full-text papers: • Systematic reviews of RCTs

Field	Content
	• Parallel RCTs (individual, cluster) Conference abstracts will not be included because these do not typically have sufficient information to allow full critical appraisal.
Other exclusion criteria	Population: • Women in labour who are identified before labour to be at high risk, or whose baby is at high risk, of complications or adverse outcomes • Women with non-cephalic presentation • Women in preterm labour • Women with an intrauterine fetal death • Women with multi-fetal pregnancies • Women who are having their labour induced (until active labour is established) • Women who have had a previous caesarean birth or who are having a planned caesarean birth Setting: • Countries other than high income countries (as defined by the OECD) If any study or systematic review includes <1/3 of women with the above characteristics/ who received care in the above setting, it will be considered for inclusion but, if included, the evidence will be downgraded for indirectness.
Context	This guideline will partly update the following: Intrapartum care for healthy women and babies (CG190)
Primary outcomes (critical outcomes)	For the woman: • Mode of birth (for example, spontaneous vaginal, instrumental vaginal, caesarean birth) • Duration of active second stage (as defined by author) • Genital tract trauma (episiotomy performed or perineal tear)
Secondary outcomes (important outcomes)	For the woman:

Field	Content
	• Women's experience of labour and birth • Long-term incontinence, including urinary and bowel (time-points as reported by authors) For the baby: • Apgar score below 7 at five minutes • Abnormal fetal heart rate needing intervention **Amendment:** A change to the outcome Apgar score was made to more accurately reflect measures of poor outcome. Previous measurement: Apgar score below 6 at 5 minutes
Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into EPPI and de-duplicated. Titles and abstracts of the retrieved citations will be screened to identify studies that potentially meet the inclusion criteria outlined in the review protocol. Duplicate screening will not be undertaken for this question. Full versions of the selected studies will be obtained for assessment. Studies that fail to meet the inclusion criteria once the full version has been checked will be excluded at this stage. Each study excluded after checking the full version will be listed, along with the reason for its exclusion. A standardised form will be used to extract data from studies. The following data will be extracted: study details (reference, country where study was carried out, type and dates), participant characteristics, inclusion and exclusion criteria, details of the interventions if relevant, setting and follow-up, relevant outcome data and source of funding. One reviewer will extract relevant data into a standardised form, and this will be quality assessed by a senior reviewer.
Risk of bias (quality) assessment	Quality assessment of individual studies will be performed using the following checklists: • ROBIS tool for systematic reviews • Cochrane RoB tool v.2 for RCTs • Cochrane RoB tool v.2 for cluster randomised trials The quality assessment will be performed by one reviewer and this will be quality assessed by a senior reviewer.
Strategy for data synthesis	Quantitative findings will be formally summarised in the review. Where multiple studies report on the same outcome for the same comparison, meta-analyses will be conducted using Cochrane Review Manager software.

Field	Content
	A fixed effect meta-analysis will be conducted and data will be presented as risk ratios if possible or odds ratios when required (for example, if only available in this form in included studies) for dichotomous outcomes, and mean differences or standardised mean differences for continuous outcomes. Heterogeneity in the effect estimates of the individual studies will be assessed using the I2 statistic. Alongside visual inspection of the point estimates and confidence intervals, I2 values of greater than 50% and 80% will be considered as significant and very significant heterogeneity, respectively. Heterogeneity will be explored as appropriate using sensitivity analyses and pre-specified subgroup analyses. If heterogeneity cannot be explained through subgroup analysis then a random effects model will be used for meta-analysis, or the data will not be pooled. The confidence in the findings across all available evidence will be evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group: http://www.gradeworkinggroup.org/ Minimally important differences: • Validated scales/continuous outcomes: published MIDs where available • All other outcomes & where published MIDs are not available: 0.8 and 1.25 for all relative dichotomous outcomes ; +/- 0.5x control group SD for continuous outcomes

Analysis of subgroups	Evidence will be stratified by:
	• Adherence to intervention
	  ○ women who remain in the position allocated
	  ○ women who change position
	• Parity
	  ○ nulliparous
	  ○ multiparous
	• Type of epidural
	  ○ Low dose/ infusion epidural
	  ○ Standard epidural
	• Drugs used for epidural analgesia
	  ○ bupivacaine and fentanyl mix
	  ○ other mixes

Field	Content

	• Fetal position
	  ○ occiput anterior
	  ○ right or left occiput anterior
	  ○ right or left occiput transverse
	  ○ occiput posterior
	  ○ right or left occiput posterior
	• Woman's mobility
	  ○ women with reduced mobility
	  ○ women without reduced mobility
	• BMI thresholds on booking:
	  ○ Underweight range: <18.5 kg/m2
	  ○ Healthy weight range: 18.5 to 24.9 kg/m2
	  ○ Overweight range: 25 to 29.99 kg/m2
	  ○ Obesity 1: 30 to 34.99 kg/m2
	  ○ Obesity 2: 35 to 39.99 kg/m2
	
	Stratifications will be dealt with in a hierarchy (this is, where possible, stratify first by adherence to intervention, then by parity, then by type of epidural, then by drugs used for epidural analgesia, then by fetal position, then by woman's mobility, and then by BMI thresholds on booking).
	Evidence will be subgrouped by the following only in the event that there is significant heterogeneity in outcomes:
	• Age of woman (<35 vs >/= 35)
	• Ethnicity
	  ○ White
	  ○ Asian/Asian British
	  ○ Black/African/Caribbean/Black British
	  ○ Mixed/Multiple ethnic groups
	  ○ Other ethnic group
	• Women with disability vs not
	• Deprived socioeconomic group vs not

Field	Content	
	Where evidence is stratified or subgrouped the committee will consider on a case by case basis if separate recommendations should be made for distinct groups. Separate recommendations may be made where there is evidence of a differential effect of interventions in distinct groups. If there is a lack of evidence in one group, the committee will consider, based on their experience, whether it is reasonable to extrapolate and assume the interventions will have similar effects in that group compared with others.	
Type and method of review	☒	Intervention
	☐	Diagnostic
	☐	Prognostic
	☐	Qualitative
	☐	Epidemiologic
	☐	Service Delivery
	☐	Other (please specify)
Language	English	
Country	England	
Anticipated or actual start date	15/09/2021	
Anticipated completion date	22/09/2023	
Named contact	5a. Named contact Guideline Development Team National Guideline Alliance (NGA) 5b. Named contact e-mail IPCupdate@nice.org.uk 5c. Organisational affiliation of the review Guideline Development Team NGA, Centre for Guidelines, National Institute for Health and Care Excellence (NICE)	

Field	Content
Review team members	From the Guideline Development Team NGA: • Senior Systematic Reviewer • Systematic Reviewer
Funding sources/sponsor	This systematic review is being completed by the Guideline Development Team NGA, Centre for Guidelines, which is part of the National Institute for Health and Care Excellence (NICE).
Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.
Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website
Other registration details	None
URL for published protocol	https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=277530
Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication • publicising the guideline through NICE's newsletter and alerts • issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.
Keywords	Position for birth, upright, epidural
Details of existing review of same topic by same authors	Not applicable
Additional information	None
Details of final publication	www.nice.org.uk

CDSR: Cochrane Database of Systematic Reviews; CENTRAL: Cochrane Central Register of Controlled Trials; DARE: Database of Abstracts of Reviews of Effects; GRADE: Grading of Recommendations Assessment, Development and Evaluation; HTA: Health Technology Assessment; MID: minimally important difference; NGA: National Guideline Alliance; NHS: National health service; NICE: National Institute for Health and Care Excellence; OECD: Organisation for Economic Co-operation and Development; PRESS: peer review of electronic search strategies; RCT: randomised controlled trial; RoB(IS): risk of bias (in systematic reviews); SD: standard deviation

Review protocol for review question: What is the most effective position for birth in women without an epidural in situ?

Table 8: Review protocol

Field	Content
PROSPERO registration number	CRD42021277538
Review title	The effectiveness of positions for birth in women without an epidural
Review question	What is the most effective position for birth in women without an epidural in situ?
Objective	To update the recommendations in CG190 (2014) for the most effective position for birth. Surveillance has identified that the optimal position of the woman during the second stage of labour depends on whether she has an epidural. For women without epidural, there is some indication that upright positions are associated with a reduction in episiotomies and fewer abnormal fetal heart rate problems.
Searches	The following databases will be searched: • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Embase • MEDLINE & MEDLINE In-Process • International Health Technology Assessment (IHTA) database Searches will be restricted by: • English language studies • Human studies • Other searches: • Inclusion lists of systematic reviews

Field	Content
	The full search strategies for the MEDLINE database will be published in the final review. For each search, the principal database search strategy is quality assured by a second information scientist using an adaptation of the PRESS 2015 Guideline Evidence-Based Checklist.
Condition or domain being studied	Labour and birth
Population	Women in the second stage of labour without an epidural in situ who are pregnant with a single baby, who go into labour at term (37 to 42 weeks of pregnancy) and who do not have any pre-existing medical conditions or antenatal conditions that predispose to a higher risk birth Women in labour whose baby has not been identified before labour to be at high risk of adverse outcome Singleton babies born at term (37 to 42 weeks of pregnancy) with no previously identified problems (for example congenital malformations, genetic anomalies, intrauterine growth restriction, placental problems
Intervention	Maternal use of any upright position during the second stage of labour, including: • kneeling • walking/ mobilisation • squatting • standing • sitting upright (throne position) • use of birthing pool during labour and/ or birth (upright position) – note that it is not possible to use epidurals in water birthing pools
Comparator	Maternal use of any recumbent position during the second stage of labour including: • lying on back • lying on side, left or right lateral • semi-recumbent • water birthing pool during labour and/ or birth (recumbent position) – note that it is not possible to use epidurals in water birthing pools
Types of study to be included	Include published full-text papers:

Field	Content
	• Systematic reviews of RCTs • Parallel RCTs (individual, cluster) Conference abstracts will not be included because these do not typically have sufficient information to allow full critical appraisal.
Other exclusion criteria	Population: • Women in labour who are identified before labour to be at high risk, or whose baby is at high risk, of complications or adverse outcomes • Women with breech presentation • Women in preterm labour • Women with an intrauterine fetal death • Women pregnant with multiple-fetal pregnancies • Women who are having their labour induced (until active labour is established) • Women who have had a previous caesarean birth or who are having a planned caesarean birth • Women who have received any kind of epidural analgesia Setting: Countries other than high income countries (as defined by the OECD) If any study or systematic review includes <1/3 of women with the above characteristics/ who received care in the above setting, it will be considered for inclusion but, if included, the evidence will be downgraded for indirectness.
Context	This guideline will partly update the following: Intrapartum care for healthy women and babies (CG190)
Primary outcomes (critical outcomes)	For the woman: • Mode of birth (for example, spontaneous vaginal, instrumental vaginal, caesarean birth) • Duration of active second stage(as defined by author) • Genital tract trauma (episiotomy performed or perineal tear)

Field	Content
Secondary outcomes (important outcomes)	For the woman: • Women's experience of labour and birth • Long-term incontinence, including urinary and bowel (time-points as reported by authors) For the baby: • Apgar score below 7 at five minutes • Abnormal fetal heart rate needing intervention **Amendment:** A change to the outcome Apgar score was made to more accurately reflect measures of poor outcome. Previous measurement: Apgar score below 6 at 5 minutes
Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into EPPI and de-duplicated. Titles and abstracts of the retrieved citations will be screened to identify studies that potentially meet the inclusion criteria outlined in the review protocol. Duplicate screening will not be undertaken for this question. Full versions of the selected studies will be obtained for assessment. Studies that fail to meet the inclusion criteria once the full version has been checked will be excluded at this stage. Each study excluded after checking the full version will be listed, along with the reason for its exclusion. A standardised form will be used to extract data from studies. The following data will be extracted: study details (reference, country where study was carried out, type and dates), participant characteristics, inclusion and exclusion criteria, details of the interventions if relevant, setting and follow-up, relevant outcome data and source of funding. One reviewer will extract relevant data into a standardised form, and this will be quality assessed by a senior reviewer.
Risk of bias (quality) assessment	Quality assessment of individual studies will be performed using the following checklists: • ROBIS tool for systematic reviews • Cochrane RoB tool v.2 for RCTs • Cochrane RoB tool for cluster randomised trials The quality assessment will be performed by one reviewer and this will be quality assessed by a senior reviewer.
Strategy for data synthesis	Quantitative findings will be formally summarised in the review. Where multiple studies report on the same outcome for the same comparison, meta-analyses will be conducted using Cochrane Review Manager software.

Field	Content
	A fixed effect meta-analysis will be conducted and data will be presented as risk ratios if possible or odds ratios when required (for example, if only available in this form in included studies) for dichotomous outcomes, and mean differences or standardised mean differences for continuous outcomes. Heterogeneity in the effect estimates of the individual studies will be assessed using the I2 statistic. Alongside visual inspection of the point estimates and confidence intervals, I2 values of greater than 50% and 80% will be considered as significant and very significant heterogeneity, respectively. Heterogeneity will be explored as appropriate using sensitivity analyses and pre-specified subgroup analyses. If heterogeneity cannot be explained through subgroup analysis then a random effects model will be used for meta-analysis, or the data will not be pooled. The confidence in the findings across all available evidence will be evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group: http://www.gradeworkinggroup.org/ Minimally important differences: • Validated scales/continuous outcomes: published MIDs where available • All other outcomes & where published MIDs are not available: 0.8 and 1.25 for all relative dichotomous outcomes ; +/- 0.5x control group SD for continuous outcomes

Analysis of subgroups	Evidence will be stratified by:
	
	• Adherence to intervention
	  ○ women who remain in the position allocated
	  ○ women who change position
	
	• Parity
	  ○ nulliparous
	  ○ multiparous
	
	• Fetal position
	  ○ occiput anterior
	  ○ right or left occiput anterior

Field	Content
	○ right or left occiput transverse ○ occiput posterior ○ right or left occiput posterior • Woman's mobility ○ women with reduced mobility ○ women without reduced mobility • BMI thresholds on booking: ○ Underweight range: <18.5 kg/m2 ○ Healthy weight range: 18.5 to 24.9 kg/m2 ○ Overweight range: 25 to 29.99 kg/m2 ○ Obesity 1: 30 to 34.99 kg/m2 ○ Obesity 2: 35 to 39.99 kg/m2 Stratifications will be dealt with in a hierarchy (this is, where possible, stratify first by adherence to intervention, then by parity, then by fetal position, then by woman's mobility, and then by BMI thresholds on booking). Evidence will be subgrouped by the following only in the event that there is significant heterogeneity in outcomes: • Age of woman (<35 vs >/= 35) • Ethnicity ○ White ○ Asian/Asian British ○ Black/African/Caribbean/Black British ○ Mixed/Multiple ethnic groups ○ Other ethnic group • Women with disability vs not • Deprived socioeconomic group vs not

Field	Content	
	Where evidence is stratified or subgrouped the committee will consider on a case by case basis if separate recommendations should be made for distinct groups. Separate recommendations may be made where there is evidence of a differential effect of interventions in distinct groups. If there is a lack of evidence in one group, the committee will consider, based on their experience, whether it is reasonable to extrapolate and assume the interventions will have similar effects in that group compared with others.	
Type and method of review	☒	Intervention
	☐	Diagnostic
	☐	Prognostic
	☐	Qualitative
	☐	Epidemiologic
	☐	Service Delivery
	☐	Other (please specify)
Language	English	
Country	England	
Anticipated or actual start date	15/09/2021	
Anticipated completion date	22/03/2023	
Named contact	5a. Named contact Guideline Development Team National Guideline Alliance (NGA) 5b. Named contact e-mail IPCupdate@nice.org.uk 5c. Organisational affiliation of the review Guideline Development Team NGA, Centre for Guidelines, National Institute for Health and Care Excellence (NICE)	
Review team members	From the National Guideline Alliance: • NGA Senior Systematic Reviewer	

Field	Content
	• NGA Systematic Reviewer
Funding sources/sponsor	This systematic review is being completed by the Guideline Development Team NGA, Centre for Guidelines, which is part of the National Institute for Health and Care Excellence (NICE).
Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.
Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website
Other registration details	None
URL for published protocol	https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=277538
Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication • publicising the guideline through NICE's newsletter and alerts • issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.
Keywords	Position for birth, recumbent
Details of existing review of same topic by same authors	Not applicable
Additional information	None
Details of final publication	www.nice.org.uk

CDSR: Cochrane Database of Systematic Reviews; CENTRAL: Cochrane Central Register of Controlled Trials; DARE: Database of Abstracts of Reviews of Effects; GRADE: Grading of Recommendations Assessment, Development and Evaluation; HTA: Health Technology Assessment; MID: minimally important difference; NGA: National Guideline

Field	Content
Alliance; NHS: National health service; NICE: National Institute for Health and Care Excellence; OECD: Organisation for Economic Co-operation and Developmentl; PRESS: peer review of electronic search strategies; RCT: randomised controlled trial; RoB(IS): risk of bias (in systematic reviews); SD: standard deviation	

Appendix B Literature search strategies

Literature search strategies for review question: What is the most effective position for birth in women with an epidural in situ?

Review question search strategies

Database: Medline – OVID interface

Date of last search: 07/12/2022

#	Searches
1	PARTURITION/
2	exp LABOR, OBSTETRIC/
3	exp DELIVERY, OBSTETRIC/
4	OBSTETRIC LABOR, PREMATURE/
5	(labo?r? or childbirth$ or partu$ or intra?part$ or peri?part$).ti,ab.
6	((during or giving or give) adj5 (birth$ or deliver$)).ti,ab.
7	or/1-6
8	PATIENT POSITIONING/
9	POSTURE/
10	or/8-9
11	7 and 10
12	STANDING POSITION/
13	SITTING POSITION/
14	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand? or standing or sit or sits or sitting or throne position* or birthing stool? or birthing chair? or (hands adj3 knees adj3 position*) or birthing ball position* or lunging position* or stair-climb* position*).ti,ab.
15	or/12-14
16	SUPINE POSITION/
17	(recumbent* or semi-recumbent* or lying or lye or laid or left lateral* or right lateral* or lateral position* or Sim* position* or supine* or semi-supine* or lithotomy position* or Trendelenburg* position* or dorsal position* or stirrup? or McRoberts* position*).ti,ab.
18	or/16-17
19	7 and 15 and 18
20	((birth* or labo?r?) adj3 position*).ti,ab.
21	11 or 19 or 20
22	limit 21 to english language
23	limit 22 to yr="1994 -Current"
24	LETTER/
25	EDITORIAL/
26	NEWS/
27	exp HISTORICAL ARTICLE/
28	ANECDOTES AS TOPIC/
29	COMMENT/
30	CASE REPORT/
31	(letter or comment*).ti.
32	or/24-31
33	RANDOMIZED CONTROLLED TRIAL/ or random*.ti,ab.
34	32 not 33
35	ANIMALS/ not HUMANS/
36	exp ANIMALS, LABORATORY/
37	exp ANIMAL EXPERIMENTATION/
38	exp MODELS, ANIMAL/
39	exp RODENTIA/
40	(rat or rats or mouse or mice).ti.
41	or/34-40
42	23 not 41
43	META-ANALYSIS/
44	META-ANALYSIS AS TOPIC/
45	(meta analy* or metanaly* or metaanaly*).ti,ab.
46	((systematic* or evidence*) adj2 (review* or overview*)).ti,ab.
47	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
48	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
49	(search* adj4 literature).ab.

#	Searches
50	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
51	cochrane.jw.
52	or/43-51
53	randomized controlled trial.pt.
54	controlled clinical trial.pt.
55	pragmatic clinical trial.pt.
56	randomi#ed.ab.
57	placebo.ab.
58	randomly.ab.
59	CLINICAL TRIALS AS TOPIC/
60	trial.ti.
61	or/53-60
62	42 and 52
63	42 and 61
64	or/62-63

Database: Embase – OVID interface

Date of last search: 07/12/2022

#	Searches
1	*PERINATAL PERIOD/
2	exp *BIRTH/
3	exp *LABOR/
4	*PREMATURE LABOR/
5	*INTRAPARTUM CARE/
6	(labo?r? or childbirth$ or partu$ or intra?part$ or peri?part$).ti,ab.
7	((during or giving or give) adj5 (birth$ or deliver$)).ti,ab.
8	or/1-7
9	PATIENT POSITIONING/
10	BODY POSITION/
11	or/9-10
12	8 and 11
13	exp STANDING/
14	SITTING/
15	"SQUATTING (POSITION)"/
16	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand? or standing or sit or sits or sitting or throne position* or birthing stool? or birthing chair? or (hands adj3 knees adj3 position*) or birthing ball position* or lunging position* or stair-climb* position*).ti,ab.
17	or/13-16
18	RECUMBENCY/
19	SUPINE POSITION/
20	LITHOTOMY POSITION/
21	TRENDELENBERG POSITION/
22	(recumbent* or semi-recumbent* or lying or lye or laid or left lateral* or right lateral* or lateral position* or Sim* position* or supine* or semi-supine* or lithotomy position* or Trendelenburg* position* or dorsal position* or stirrup? or McRoberts* position*).ti,ab.
23	or/18-22
24	8 and 17 and 23
25	BIRTHING POSITION/
26	((birth* or labo?r?) adj3 position*).ti,ab.
27	or/25-26
28	12 or 24 or 27
29	limit 28 to english language
30	limit 29 to yr="1994 -Current"
31	letter.pt. or LETTER/
32	note.pt.
33	editorial.pt.
34	CASE REPORT/ or CASE STUDY/
35	(letter or comment*).ti.
36	or/31-35
37	RANDOMIZED CONTROLLED TRIAL/ or random*.ti,ab.
38	36 not 37
39	ANIMAL/ not HUMAN/
40	NONHUMAN/
41	exp ANIMAL EXPERIMENT/

#	Searches
42	exp EXPERIMENTAL ANIMAL/
43	ANIMAL MODEL/
44	exp RODENT/
45	(rat or rats or mouse or mice).ti.
46	or/38-45
47	30 not 46
48	SYSTEMATIC REVIEW/
49	META-ANALYSIS/
50	(meta analy* or metanaly* or metaanaly*).ti,ab.
51	((systematic or evidence) adj2 (review* or overview*)).ti,ab.
52	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
53	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
54	(search* adj4 literature).ab.
55	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
56	((pool* or combined) adj2 (data or trials or studies or results)).ab.
57	cochrane.jw.
58	or/48-57
59	random*.ti,ab.
60	factorial*.ti,ab.
61	(crossover* or cross over*).ti,ab.
62	((doubl* or singl*) adj blind*).ti,ab.
63	(assign* or allocat* or volunteer* or placebo*).ti,ab.
64	CROSSOVER PROCEDURE/
65	SINGLE BLIND PROCEDURE/
66	RANDOMIZED CONTROLLED TRIAL/
67	DOUBLE BLIND PROCEDURE/
68	or/59-67
69	47 and 58
70	47 and 68
71	or/69-70

Databases: Cochrane Central Register of Controlled Trials; and Cochrane Database of Systematic Reviews – Wiley interface

Date of last search: 07/12/2022

#	Searches
#1	MeSH descriptor: [Parturition] this term only
#2	MeSH descriptor: [Labor, Obstetric] explode all trees
#3	MeSH descriptor: [Delivery, Obstetric] explode all trees
#4	MeSH descriptor: [Obstetric Labor, Premature] this term only
#5	(labor* or labour* or childbirth* or partu* or intrapart* or intra-part* or peripart* or peri-part*):ti,ab
#6	((during or giving or give) near/5 (birth* or deliver*)):ti,ab
#7	#1 or #2 or #3 or #4 or #5 or #6
#8	MeSH descriptor: [Patient Positioning] this term only
#9	MeSH descriptor: [Posture] this term only
#10	#8 or #9
#11	#7 and #10
#12	MeSH descriptor: [Standing Position] this term only
#13	MeSH descriptor: [Sitting Position] this term only
#14	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand or stands or standing or sit or sits or sitting or "throne position*" or "birthing stool*" or "birthing chair*" or (hands near/3 knees near/3 position*) or "birthing ball position*" or "lunging position*" or "stair-climb* position*"):ti,ab
#15	#12 or #13 or #14
#16	MeSH descriptor: [Supine Position] this term only
#17	(recumbent* or "semi-recumbent*" or lying or lye or laid or "left lateral*" or "right lateral*" or "lateral position*" or "Sim* position*" or supine* or "semi-supine*" or "lithotomy position*" or "Trendelenburg* position*" or "dorsal position*" or stirrup* or "McRoberts* position*"):ti,ab
#18	#16 or #17
#19	#7 and #15 and #18
#20	((birth* or labor* or labour*) near/3 position*):ti,ab
#21	#11 or #19 or #20
#22	#11 or #19 or #20 with Cochrane Library publication date Between Jan 1994 and Nov 2021, in Cochrane Reviews
#23	#11 or #19 or #20 with Publication Year from 1994 to 2021, in Trials

Database: International Health Technology Assessment

Date of last search: 07/12/2022

#	Searches
	All: (labor or labour or childbirth or parturition or intrapartum or peripartum)
	AND All: (position or positioning or posture or upright or kneel or kneeling or walk or walking or mobilisation or mobilization or squat or squats or squatting or stand or stands or standing or sit or sits or sitting or "birthing stool" or "birthing stools" or "birthing chair" or "birthing chairs" or "birthing pool" or "birthing pools" or "water births")

Health economics search strategies

Database: Medline – OVID interface

Date of last search: 07/12/2022

#	Searches
1	PARTURITION/
2	exp LABOR, OBSTETRIC/
3	exp DELIVERY, OBSTETRIC/
4	OBSTETRIC LABOR, PREMATURE/
5	(labo?r? or childbirth$ or partu$ or intra?part$ or peri?part$).ti,ab.
6	((during or giving or give) adj5 (birth$ or deliver$)).ti,ab.
7	or/1-6
8	PATIENT POSITIONING/
9	POSTURE/
10	or/8-9
11	7 and 10
12	STANDING POSITION/
13	SITTING POSITION/
14	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand? or standing or sit or sits or sitting or throne position* or birthing stool? or birthing chair? or (hands adj3 knees adj3 position*) or birthing ball position* or lunging position* or stair-climb* position*).ti,ab.
15	or/12-14
16	SUPINE POSITION/
17	(recumbent* or semi-recumbent* or lying or lye or laid or left lateral* or right lateral* or lateral position* or Sim* position* or supine* or semi-supine* or lithotomy position* or Trendelenburg* position* or dorsal position* or stirrup? or McRoberts* position*).ti,ab.
18	or/16-17
19	7 and 15 and 18
20	((birth* or labo?r?) adj3 position*).ti,ab.
21	11 or 19 or 20
22	limit 21 to english language
23	limit 22 to yr="1994 -Current"
24	LETTER/
25	EDITORIAL/
26	NEWS/
27	exp HISTORICAL ARTICLE/
28	ANECDOTES AS TOPIC/
29	COMMENT/
30	CASE REPORT/
31	(letter or comment*).ti.
32	or/24-31
33	RANDOMIZED CONTROLLED TRIAL/ or random*.ti,ab.
34	32 not 33
35	ANIMALS/ not HUMANS/
36	exp ANIMALS, LABORATORY/
37	exp ANIMAL EXPERIMENTATION/
38	exp MODELS, ANIMAL/
39	exp RODENTIA/
40	(rat or rats or mouse or mice).ti.
41	or/34-40
42	23 not 41
43	ECONOMICS/
44	VALUE OF LIFE/
45	exp "COSTS AND COST ANALYSIS"/
46	exp ECONOMICS, HOSPITAL/

#	Searches
47	exp ECONOMICS, MEDICAL/
48	exp RESOURCE ALLOCATION/
49	ECONOMICS, NURSING/
50	ECONOMICS, PHARMACEUTICAL/
51	exp "FEES AND CHARGES"/
52	exp BUDGETS/
53	budget*.ti,ab.
54	cost*.ti,ab.
55	(economic* or pharmaco?economic*).ti,ab.
56	(price* or pricing*).ti,ab.
57	(financ* or fee or fees or expenditure* or saving*).ti,ab.
58	(value adj2 (money or monetary)).ti,ab.
59	resourc* allocat*.ti,ab.
60	(fund or funds or funding* or funded).ti,ab.
61	(ration or rations or rationing* or rationed).ti,ab.
62	ec.fs.
63	or/43-62
64	42 and 63

Database: Embase – OVID interface

Date of last search: 07/12/2022

#	Searches
1	*PERINATAL PERIOD/
2	exp *BIRTH/
3	exp *LABOR/
4	*PREMATURE LABOR/
5	*INTRAPARTUM CARE/
6	(labo?r? or childbirth$ or partu$ or intra?part$ or peri?part$).ti,ab.
7	((during or giving or give) adj5 (birth$ or deliver$)).ti,ab.
8	or/1-7
9	PATIENT POSITIONING/
10	BODY POSITION/
11	or/9-10
12	8 and 11
13	exp STANDING/
14	SITTING/
15	"SQUATTING (POSITION)"/
16	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand? or standing or sit or sits or sitting or throne position* or birthing stool? or birthing chair? or (hands adj3 knees adj3 position*) or birthing ball position* or lunging position* or stair-climb* position*).ti,ab.
17	or/13-16
18	RECUMBENCY/
19	SUPINE POSITION/
20	LITHOTOMY POSITION/
21	TRENDELENBERG POSITION/
22	(recumbent* or semi-recumbent* or lying or lye or laid or left lateral* or right lateral* or lateral position* or Sim* position* or supine* or semi-supine* or lithotomy position* or Trendelenburg* position* or dorsal position* or stirrup? or McRoberts* position*).ti,ab.
23	or/18-22
24	8 and 17 and 23
25	BIRTHING POSITION/
26	((birth* or labo?r?) adj3 position*).ti,ab.
27	or/25-26
28	12 or 24 or 27
29	limit 28 to english language
30	limit 29 to yr="1994 -Current"
31	letter.pt. or LETTER/
32	note.pt.
33	editorial.pt.
34	CASE REPORT/ or CASE STUDY/
35	(letter or comment*).ti.
36	or/31-35
37	RANDOMIZED CONTROLLED TRIAL/ or random*.ti,ab.
38	36 not 37
39	ANIMAL/ not HUMAN/

#	Searches
40	NONHUMAN/
41	exp ANIMAL EXPERIMENT/
42	exp EXPERIMENTAL ANIMAL/
43	ANIMAL MODEL/
44	exp RODENT/
45	(rat or rats or mouse or mice).ti.
46	or/38-45
47	30 not 46
48	HEALTH ECONOMICS/
49	exp ECONOMIC EVALUATION/
50	exp HEALTH CARE COST/
51	exp FEE/
52	BUDGET/
53	FUNDING/
54	RESOURCE ALLOCATION/
55	budget*.ti,ab.
56	cost*.ti,ab.
57	(economic* or pharmaco?economic*).ti,ab.
58	(price* or pricing*).ti,ab.
59	(financ* or fee or fees or expenditure* or saving*).ti,ab.
60	(value adj2 (money or monetary)).ti,ab.
61	resourc* allocat*.ti,ab.
62	(fund or funds or funding* or funded).ti,ab.
63	(ration or rations or rationing* or rationed).ti,ab.
64	or/48-63
65	47 and 64

Database: Cochrane Central Register of Controlled Trials – Wiley interface

Date of last search: 07/12/2022

#	Searches
#1	MeSH descriptor: [Parturition] this term only
#2	MeSH descriptor: [Labor, Obstetric] explode all trees
#3	MeSH descriptor: [Delivery, Obstetric] explode all trees
#4	MeSH descriptor: [Obstetric Labor, Premature] this term only
#5	(labor* or labour* or childbirth* or partu* or intrapart* or intra-part* or peripart* or peri-part*):ti,ab
#6	((during or giving or give) near/5 (birth* or deliver*)):ti,ab
#7	#1 or #2 or #3 or #4 or #5 or #6
#8	MeSH descriptor: [Patient Positioning] this term only
#9	MeSH descriptor: [Posture] this term only
#10	#8 or #9
#11	#7 and #10
#12	MeSH descriptor: [Standing Position] this term only
#13	MeSH descriptor: [Sitting Position] this term only
#14	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand or stands or standing or sit or sits or sitting or "throne position*" or "birthing stool*" or "birthing chair*" or (hands near/3 knees near/3 position*) or "birthing ball position*" or "lunging position*" or "stair-climb* position*"):ti,ab
#15	#12 or #13 or #14
#16	MeSH descriptor: [Supine Position] this term only
#17	(recumbent* or "semi-recumbent*" or lying or lye or laid or "left lateral*" or "right lateral*" or "lateral position*" or "Sim* position*" or supine* or "semi-supine*" or "lithotomy position*" or "Trendelenburg* position*" or "dorsal position*" or stirrup* or "McRoberts* position*"):ti,ab
#18	#16 or #17
#19	#7 and #15 and #18
#20	((birth* or labor* or labour*) near/3 position*):ti,ab
#21	#11 or #19 or #20
#22	#11 or #19 or #20 with Cochrane Library publication date Between Jan 1994 and Nov 2021, in Cochrane Reviews
#23	#11 or #19 or #20 with Publication Year from 1994 to 2021, in Trials
#24	MeSH descriptor: [Economics] this term only
#25	MeSH descriptor: [Value of Life] this term only
#26	MeSH descriptor: [Costs and Cost Analysis] explode all trees
#27	MeSH descriptor: [Economics, Hospital] explode all trees
#28	MeSH descriptor: [Economics, Medical] explode all trees
#29	MeSH descriptor: [Resource Allocation] explode all trees

#	Searches
#30	MeSH descriptor: [Economics, Nursing] this term only
#31	MeSH descriptor: [Economics, Pharmaceutical] this term only
#32	MeSH descriptor: [Fees and Charges] explode all trees
#33	MeSH descriptor: [Budgets] explode all trees
#34	budget*:ti,ab
#35	cost*:ti,ab
#36	(economic* or pharmaco?economic*):ti,ab
#37	(price* or pricing*):ti,ab
#38	(financ* or fee or fees or expenditure* or saving*):ti,ab
#39	(value near/2 (money or monetary)):ti,ab
#40	resourc* allocat*:ti,ab
#41	(fund or funds or funding* or funded):ti,ab
#42	(ration or rations or rationing* or rationed):ti,ab
#43	#24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42
#44	#23 and #43

Database: International Health Technology Assessment

Date of last search: 07/12/2022

#	Searches
	All: (labor or labour or childbirth or parturition or intrapartum or peripartum)
	AND All: (position or positioning or posture or upright or kneel or kneeling or walk or walking or mobilisation or mobilization or squat or squats or squatting or stand or stands or standing or sit or sits or sitting or "birthing stool" or "birthing stools" or "birthing chair" or "birthing chairs" or "birthing pool" or "birthing pools" or "water births")

Literature search strategies for review question: What is the most effective position for birth in women without an epidural in situ?

Review question search strategies

Database: Medline – OVID interface

Date of last search: 07/12/2022

#	Searches
1	PARTURITION/
2	exp LABOR, OBSTETRIC/
3	exp DELIVERY, OBSTETRIC/
4	OBSTETRIC LABOR, PREMATURE/
5	(labo?r? or childbirth$ or partu$ or intra?part$ or peri?part$).ti,ab.
6	((during or giving or give) adj5 (birth$ or deliver$)).ti,ab.
7	or/1-6
8	PATIENT POSITIONING/
9	POSTURE/
10	or/8-9
11	7 and 10
12	STANDING POSITION/
13	SITTING POSITION/
14	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand? or standing or sit or sits or sitting or throne position* or birthing stool? or birthing chair? or (hands adj3 knees adj3 position*) or birthing ball position* or lunging position* or stair-climb* position*).ti,ab.
15	or/12-14
16	SUPINE POSITION/
17	(recumbent* or semi-recumbent* or lying or lye or laid or left lateral* or right lateral* or lateral position* or Sim* position* or supine* or semi-supine* or lithotomy position* or Trendelenburg* position* or dorsal position* or stirrup? or McRoberts* position*).ti,ab.
18	or/16-17
19	7 and 15 and 18

#	Searches
20	(birth* adj3 pool?).ti,ab.
21	water birth*.ti,ab.
22	or/20-21
23	7 and 22
24	((birth* or labo?r?) adj3 position*).ti,ab.
25	11 or 19 or 23 or 24
26	limit 25 to english language
27	LETTER/
28	EDITORIAL/
29	NEWS/
30	exp HISTORICAL ARTICLE/
31	ANECDOTES AS TOPIC/
32	COMMENT/
33	CASE REPORT/
34	(letter or comment*).ti.
35	or/27-34
36	RANDOMIZED CONTROLLED TRIAL/ or random*.ti,ab.
37	35 not 36
38	ANIMALS/ not HUMANS/
39	exp ANIMALS, LABORATORY/
40	exp ANIMAL EXPERIMENTATION/
41	exp MODELS, ANIMAL/
42	exp RODENTIA/
43	(rat or rats or mouse or mice).ti.
44	or/37-43
45	26 not 44
46	META-ANALYSIS/
47	META-ANALYSIS AS TOPIC/
48	(meta analy* or metanaly* or metaanaly*).ti,ab.
49	((systematic* or evidence*) adj2 (review* or overview*)).ti,ab.
50	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
51	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
52	(search* adj4 literature).ab.
53	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
54	cochrane.jw.
55	or/46-54
56	randomized controlled trial.pt.
57	controlled clinical trial.pt.
58	pragmatic clinical trial.pt.
59	randomi#ed.ab.
60	placebo.ab.
61	randomly.ab.
62	CLINICAL TRIALS AS TOPIC/
63	trial.ti.
64	or/56-63
65	45 and 55
66	45 and 64
67	or/65-66

Database: Embase – OVID interface

Date of last search: 07/12/2022

#	Searches
1	*PERINATAL PERIOD/
2	exp *BIRTH/
3	exp *LABOR/
4	*PREMATURE LABOR/
5	*INTRAPARTUM CARE/
6	(labo?r? or childbirth$ or partu$ or intra?part$ or peri?part$).ti,ab.
7	((during or giving or give) adj5 (birth$ or deliver$)).ti,ab.
8	or/1-7
9	PATIENT POSITIONING/
10	BODY POSITION/
11	or/9-10
12	8 and 11

#	Searches
13	exp STANDING/
14	SITTING/
15	"SQUATTING (POSITION)"/
16	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand? or standing or sit or sits or sitting or throne position* or birthing stool? or birthing chair? or (hands adj3 knees adj3 position*) or birthing ball position* or lunging position* or stair-climb* position*).ti,ab.
17	or/13-16
18	RECUMBENCY/
19	SUPINE POSITION/
20	LITHOTOMY POSITION/
21	TRENDELENBERG POSITION/
22	(recumbent* or semi-recumbent* or lying or lye or laid or left lateral* or right lateral* or lateral position* or Sim* position* or supine* or semi-supine* or lithotomy position* or Trendelenburg* position* or dorsal position* or stirrup? or McRoberts* position*).ti,ab.
23	or/18-22
24	8 and 17 and 23
25	BIRTHING POOL/
26	WATER BIRTH/
27	(birth* adj3 pool?).ti,ab.
28	water birth*.ti,ab.
29	or/25-28
30	8 and 29
31	BIRTHING POSITION/
32	((birth* or labo?r?) adj3 position*).ti,ab.
33	or/31-32
34	12 or 24 or 30 or 33
35	limit 34 to english language
36	letter.pt. or LETTER/
37	note.pt.
38	editorial.pt.
39	CASE REPORT/ or CASE STUDY/
40	(letter or comment*).ti.
41	or/36-40
42	RANDOMIZED CONTROLLED TRIAL/ or random*.ti,ab.
43	41 not 42
44	ANIMAL/ not HUMAN/
45	NONHUMAN/
46	exp ANIMAL EXPERIMENT/
47	exp EXPERIMENTAL ANIMAL/
48	ANIMAL MODEL/
49	exp RODENT/
50	(rat or rats or mouse or mice).ti.
51	or/43-50
52	35 not 51
53	SYSTEMATIC REVIEW/
54	META-ANALYSIS/
55	(meta analy* or metanaly* or metaanaly*).ti,ab.
56	((systematic or evidence) adj2 (review* or overview*)).ti,ab.
57	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
58	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
59	(search* adj4 literature).ab.
60	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
61	((pool* or combined) adj2 (data or trials or studies or results)).ab.
62	cochrane.jw.
63	or/53-62
64	random*.ti,ab.
65	factorial*.ti,ab.
66	(crossover* or cross over*).ti,ab.
67	((doubl* or singl*) adj blind*).ti,ab.
68	(assign* or allocat* or volunteer* or placebo*).ti,ab.
69	CROSSOVER PROCEDURE/
70	SINGLE BLIND PROCEDURE/
71	RANDOMIZED CONTROLLED TRIAL/
72	DOUBLE BLIND PROCEDURE/
73	or/64-72
74	52 and 63
75	52 and 73
76	or/74-75

Databases: Cochrane Central Register of Controlled Trials; and Cochrane Database of Systematic Reviews – Wiley interface

Date of last search: 07/12/2022

#	Searches
#1	MeSH descriptor: [Parturition] this term only
#2	MeSH descriptor: [Labor, Obstetric] explode all trees
#3	MeSH descriptor: [Delivery, Obstetric] explode all trees
#4	MeSH descriptor: [Obstetric Labor, Premature] this term only
#5	(labor* or labour* or childbirth* or partu* or intrapart* or intra-part* or peripart* or peri-part*):ti,ab
#6	((during or giving or give) near/5 (birth* or deliver*)):ti,ab
#7	#1 or #2 or #3 or #4 or #5 or #6
#8	MeSH descriptor: [Patient Positioning] this term only
#9	MeSH descriptor: [Posture] this term only
#10	#8 or #9
#11	#7 and #10
#12	MeSH descriptor: [Standing Position] this term only
#13	MeSH descriptor: [Sitting Position] this term only
#14	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand or stands or standing or sit or sits or sitting or "throne position*" or "birthing stool*" or "birthing chair*" or (hands near/3 knees near/3 position*) or "birthing ball position*" or "lunging position*" or "stair-climb* position*"):ti,ab
#15	#12 or #13 or #14
#16	MeSH descriptor: [Supine Position] this term only
#17	(recumbent* or "semi-recumbent*" or lying or lye or laid or "left lateral*" or "right lateral*" or "lateral position*" or "Sim* position*" or supine* or "semi-supine*" or "lithotomy position*" or "Trendelenburg* position*" or "dorsal position*" or stirrup* or "McRoberts* position*"):ti,ab
#18	#16 or #17
#19	#7 and #15 and #18
#20	(birth* near/3 pool*):ti,ab
#21	"water birth*":ti,ab
#22	#20 or #21
#23	#7 and #22
#24	((birth* or labor* or labour*) near/3 position*):ti,ab
#25	#11 or #19 or #23 or #24

Database: International Health Technology Assessment

Date of last search: 07/12/2022

#	Searches
	All: (labor or labour or childbirth or parturition or intrapartum or peripartum)
	AND All: (position or positioning or posture or upright or kneel or kneeling or walk or walking or mobilisation or mobilization or squat or squats or squatting or stand or stands or standing or sit or sits or sitting or "birthing stool" or "birthing stools" or "birthing chair" or "birthing chairs" or "birthing pool" or "birthing pools" or "water births")

Health economics search strategies

Database: Medline – OVID interface

Date of last search: 07/12/2022

#	Searches
1	PARTURITION/
2	exp LABOR, OBSTETRIC/
3	exp DELIVERY, OBSTETRIC/
4	OBSTETRIC LABOR, PREMATURE/
5	(labo?r? or childbirth$ or partu$ or intra?part$ or peri?part$).ti,ab.
6	((during or giving or give) adj5 (birth$ or deliver$)).ti,ab.
7	or/1-6

#	Searches
8	PATIENT POSITIONING/
9	POSTURE/
10	or/8-9
11	7 and 10
12	STANDING POSITION/
13	SITTING POSITION/
14	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand? or standing or sit or sits or sitting or throne position* or birthing stool? or birthing chair? or (hands adj3 knees adj3 position*) or birthing ball position* or lunging position* or stair-climb* position*).ti,ab.
15	or/12-14
16	SUPINE POSITION/
17	(recumbent* or semi-recumbent* or lying or lye or laid or left lateral* or right lateral* or lateral position* or Sim* position* or supine* or semi-supine* or lithotomy position* or Trendelenburg* position* or dorsal position* or stirrup? or McRoberts* position*).ti,ab.
18	or/16-17
19	7 and 15 and 18
20	(birth* adj3 pool?).ti,ab.
21	water birth*.ti,ab.
22	or/20-21
23	7 and 22
24	((birth* or labo?r?) adj3 position*).ti,ab.
25	11 or 19 or 23 or 24
26	limit 25 to english language
27	LETTER/
28	EDITORIAL/
29	NEWS/
30	exp HISTORICAL ARTICLE/
31	ANECDOTES AS TOPIC/
32	COMMENT/
33	CASE REPORT/
34	(letter or comment*).ti.
35	or/27-34
36	RANDOMIZED CONTROLLED TRIAL/ or random*.ti,ab.
37	35 not 36
38	ANIMALS/ not HUMANS/
39	exp ANIMALS, LABORATORY/
40	exp ANIMAL EXPERIMENTATION/
41	exp MODELS, ANIMAL/
42	exp RODENTIA/
43	(rat or rats or mouse or mice).ti.
44	or/37-43
45	26 not 44
46	ECONOMICS/
47	VALUE OF LIFE/
48	exp "COSTS AND COST ANALYSIS"/
49	exp ECONOMICS, HOSPITAL/
50	exp ECONOMICS, MEDICAL/
51	exp RESOURCE ALLOCATION/
52	ECONOMICS, NURSING/
53	ECONOMICS, PHARMACEUTICAL/
54	exp "FEES AND CHARGES"/
55	exp BUDGETS/
56	budget*.ti,ab.
57	cost*.ti,ab.
58	(economic* or pharmaco?economic*).ti,ab.
59	(price* or pricing*).ti,ab.
60	(financ* or fee or fees or expenditure* or saving*).ti,ab.
61	(value adj2 (money or monetary)).ti,ab.
62	resourc* allocat*.ti,ab.
63	(fund or funds or funding* or funded).ti,ab.
64	(ration or rations or rationing* or rationed).ti,ab.
65	ec.fs.
66	or/46-65
67	45 and 66

Database: Embase – OVID interface

Date of last search: 07/12/2022

#	Searches
1	*PERINATAL PERIOD/
2	exp *BIRTH/
3	exp *LABOR/
4	*PREMATURE LABOR/
5	*INTRAPARTUM CARE/
6	(labo?r? or childbirth$ or partu$ or intra?part$ or peri?part$).ti,ab.
7	((during or giving or give) adj5 (birth$ or deliver$)).ti,ab.
8	or/1-7
9	PATIENT POSITIONING/
10	BODY POSITION/
11	or/9-10
12	8 and 11
13	exp STANDING/
14	SITTING/
15	"SQUATTING (POSITION)"/
16	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand? or standing or sit or sits or sitting or throne position* or birthing stool? or birthing chair? or (hands adj3 knees adj3 position*) or birthing ball position* or lunging position* or stair-climb* position*).ti,ab.
17	or/13-16
18	RECUMBENCY/
19	SUPINE POSITION/
20	LITHOTOMY POSITION/
21	TRENDELENBERG POSITION/
22	(recumbent* or semi-recumbent* or lying or lye or laid or left lateral* or right lateral* or lateral position* or Sim* position* or supine* or semi-supine* or lithotomy position* or Trendelenburg* position* or dorsal position* or stirrup? or McRoberts* position*).ti,ab.
23	or/18-22
24	8 and 17 and 23
25	BIRTHING POOL/
26	WATER BIRTH/
27	(birth* adj3 pool?).ti,ab.
28	water birth*.ti,ab.
29	or/25-28
30	8 and 29
31	BIRTHING POSITION/
32	((birth* or labo?r?) adj3 position*).ti,ab.
33	or/31-32
34	12 or 24 or 30 or 33
35	limit 34 to english language
36	letter.pt. or LETTER/
37	note.pt.
38	editorial.pt.
39	CASE REPORT/ or CASE STUDY/
40	(letter or comment*).ti.
41	or/36-40
42	RANDOMIZED CONTROLLED TRIAL/ or random*.ti,ab.
43	41 not 42
44	ANIMAL/ not HUMAN/
45	NONHUMAN/
46	exp ANIMAL EXPERIMENT/
47	exp EXPERIMENTAL ANIMAL/
48	ANIMAL MODEL/
49	exp RODENT/
50	(rat or rats or mouse or mice).ti.
51	or/43-50
52	35 not 51
53	HEALTH ECONOMICS/
54	exp ECONOMIC EVALUATION/
55	exp HEALTH CARE COST/
56	exp FEE/
57	BUDGET/
58	FUNDING/
59	RESOURCE ALLOCATION/
60	budget*.ti,ab.
61	cost*.ti,ab.
62	(economic* or pharmaco?economic*).ti,ab.
63	(price* or pricing*).ti,ab.
64	(financ* or fee or fees or expenditure* or saving*).ti,ab.

#	Searches
65	(value adj2 (money or monetary)).ti,ab.
66	resourc* allocat*.ti,ab.
67	(fund or funds or funding* or funded).ti,ab.
68	(ration or rations or rationing* or rationed).ti,ab.
69	or/53-68
70	52 and 69

Database: Cochrane Central Register of Controlled Trials – Wiley interface

Date of last search: 07/12/2022

#	Searches
#1	MeSH descriptor: [Parturition] this term only
#2	MeSH descriptor: [Labor, Obstetric] explode all trees
#3	MeSH descriptor: [Delivery, Obstetric] explode all trees
#4	MeSH descriptor: [Obstetric Labor, Premature] this term only
#5	(labor* or labour* or childbirth* or partu* or intrapart* or intra-part* or peripart* or peri-part*):ti,ab
#6	((during or giving or give) near/5 (birth* or deliver*)):ti,ab
#7	#1 or #2 or #3 or #4 or #5 or #6
#8	MeSH descriptor: [Patient Positioning] this term only
#9	MeSH descriptor: [Posture] this term only
#10	#8 or #9
#11	#7 and #10
#12	MeSH descriptor: [Standing Position] this term only
#13	MeSH descriptor: [Sitting Position] this term only
#14	(upright* or kneel* or walk* or mobilis* or mobiliz* or squat* or stand or stands or standing or sit or sits or sitting or "throne position*" or "birthing stool*" or "birthing chair*" or (hands near/3 knees near/3 position*) or "birthing ball position*" or "lunging position*" or "stair-climb* position*"):ti,ab
#15	#12 or #13 or #14
#16	MeSH descriptor: [Supine Position] this term only
#17	(recumbent* or "semi-recumbent*" or lying or lye or laid or "left lateral*" or "right lateral*" or "lateral position*" or "Sim* position*" or supine* or "semi-supine*" or "lithotomy position*" or "Trendelenburg* position*" or "dorsal position*" or stirrup* or "McRoberts* position*"):ti,ab
#18	#16 or #17
#19	#7 and #15 and #18
#20	(birth* near/3 pool*):ti,ab
#21	"water birth*":ti,ab
#22	#20 or #21
#23	#7 and #22
#24	((birth* or labor* or labour*) near/3 position*):ti,ab
#25	#11 or #19 or #23 or #24
#26	MeSH descriptor: [Economics] this term only
#27	MeSH descriptor: [Value of Life] this term only
#28	MeSH descriptor: [Costs and Cost Analysis] explode all trees
#29	MeSH descriptor: [Economics, Hospital] explode all trees
#30	MeSH descriptor: [Economics, Medical] explode all trees
#31	MeSH descriptor: [Resource Allocation] explode all trees
#32	MeSH descriptor: [Economics, Nursing] this term only
#33	MeSH descriptor: [Economics, Pharmaceutical] this term only
#34	MeSH descriptor: [Fees and Charges] explode all trees
#35	MeSH descriptor: [Budgets] explode all trees
#36	budget*:ti,ab
#37	cost*:ti,ab
#38	(economic* or pharmaco?economic*):ti,ab
#39	(price* or pricing*):ti,ab
#40	(financ* or fee or fees or expenditure* or saving*):ti,ab
#41	(value near/2 (money or monetary)):ti,ab
#42	resourc* allocat*:ti,ab
#43	(fund or funds or funding* or funded):ti,ab
#44	(ration or rations or rationing* or rationed):ti,ab
#45	#26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44
#46	#25 and #45

Database: International Health Technology Assessment

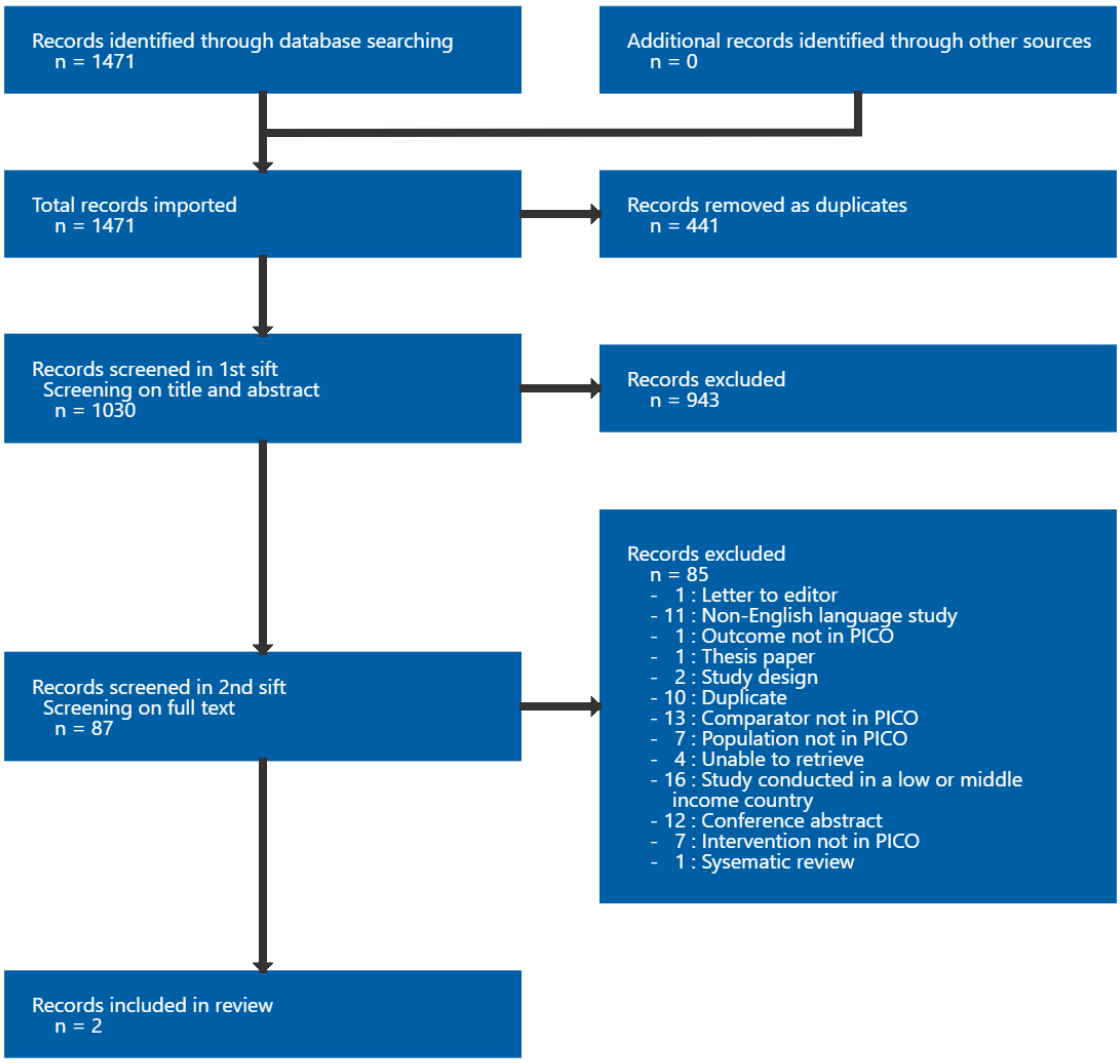
Date of last search: 07/12/2022

#	Searches
	All: (labor or labour or childbirth or parturition or intrapartum or peripartum)
	AND All: (position or positioning or posture or upright or kneel or kneeling or walk or walking or mobilisation or mobilization or squat or squats or squatting or stand or stands or standing or sit or sits or sitting or "birthing stool" or "birthing stools" or "birthing chair" or "birthing chairs" or "birthing pool" or "birthing pools" or "water births")

Appendix C Effectiveness evidence study selection

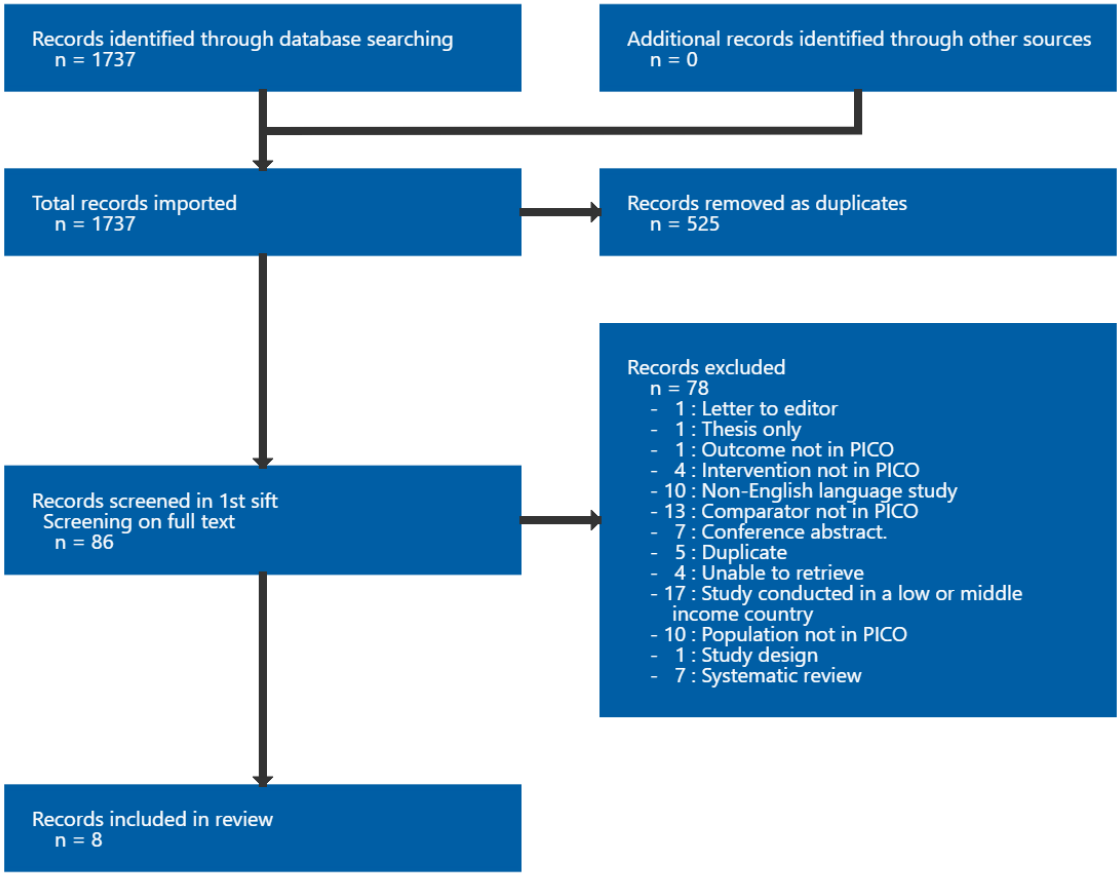
Study selection for: What is the most effective position for birth in women with an epidural in situ?

Figure 1: Study selection flow chart



Study selection for: What is the most effective position for birth in women without an epidural in situ?

Figure 2: Study selection flow chart



Appendix D Evidence tables

Evidence tables for review: What is the most effective position for birth in women with an epidural in situ?

BUMPES, 2017

Bibliographic Reference	Upright versus lying down position in second stage of labour in nulliparous women with low dose epidural: BUMPES randomised controlled trial; BMJ (Clinical research ed.); 2017; vol. 359; j4471

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	October 2010 and January 2014
Inclusion criteria	• Singleton pregnancy • GA: ≥37 weeks • Nulliparous • Expected spontaneous vaginal birth • Women in second stage of labour • Women with an effective low-dose mobile epidural in situ
Exclusion criteria	Not reported
Patient characteristics	Maternal age in years, mean (SD) • Upright positions: 28.4 (5.7) • Lying down: 28.4 (5.6) Gestational age, mean (SD) • Upright positions: 40.4 (1.2)

	• Lying down: 40.4 (1.2) BMI, mean (SD) • Upright positions: 25.5 (5.4) • Lying down: 25.2 (5.3) Parity • All nulliparous Induction of labour, n (%) • Upright positions: 613 (39.5) • Lying down: 632 (41.2) Cervical dilatation • Not reported (women randomised when 2nd stage of labour was confirmed, upon full cervical dilation of when presenting part visible) Type of epidural (epidural maintained with PCEA/ infusion), n (%) • Upright positions: 1224 (80.6) • Lying down: 1196 (79.9) Drugs used for epidural analgesia, n • Upright positions: Bupivacaine, 814; Lidocaine, 6; Ropivicaine, 2; Fentanyl, 809; Diamorphine, 4 • Lying down: Bupivacaine, 849; Lidocaine, 8; Ropivicaine, 1; Fentanyl, 840; Diamorphine, 1
Intervention(s)/control	Upright position

	• Women encouraged to adopt upright positions during 2nd stage of labour (active and passive) until birth (walking, standing, sitting out of bed, kneeling, upright in bed, other upright positions) Lying down position • Women adopted lying-down positions during 2nd stage of labour (active and passive) until birth (left or right lateral) with 30 degree inclination of the bed Women were free to change position at any stage
Duration of follow-up	1 year
Sample size	N= 3093 Upright position n = 1623 (n=67 excluded; consent, randomisation error e.g not in 2nd stage, epidural not in place) Lying down position n= 1613 (n=76 excluded)
Other information	Adherence Upright positions group: 745/1028 (72.5%) women reported being mostly upright in the active 2nd stage Lying down group: 652/1024 (63.7%) women reported being mostly lying down in the active2nd stage

Study arms

Upright position (N = 1623)

Lying down position (N = 1613)

Outcomes

Mode of birth

Outcome	Upright position, , N = 1556	Lying down position, , N = 1537
Spontaneous vaginal birth No of events	n = 548	n = 632
Spontaneous vaginal birth **Adjusted effect measure**	RR 0.86 (0.78 to 0.94)	NA
Adjusted* effect measure, RR (95% CI)	0.86 (0.79 to 0.94)	
Instrumental birth No of events	n = 849	n = 778
Instrumental birth **Adjusted effect measure**	RR 1.08 (0.99 to 1.18)	NA
Caesarean birth No of events	n = 158	n = 127
Caesarean birth **Adjusted effect measure**	RR 1.23 (0.92 to 1.64)	NA

* adjusted for age, ethnicity, diagnosis of delay, nature of the onset of labour

Duration of active 2nd stage

Outcome	Upright position, , N = 1556	Lying down position, , N = 1537
Duration of active 2nd stage Median (IQR)	94 (56 to 133)	88 (51 to 126)
Duration of active 2nd stage	7 (0 to 13)	-

Outcome	Upright position, , N = 1556	Lying down position, , N = 1537
Adjusted effect measure Median difference (IQR)		

Genital tract trauma

Outcome	Upright position, , N = 1556	Lying down position, , N = 1537
Episiotomy No of events	n = 914	n = 838
Episiotomy **Adjusted effect measure**	RR 1.07 (0.99 to 1.16)	NA
Perineal tear Grade 2 tear No of events	n = 563	n = 608
Perineal tear Grade 3-4 tears No of events	n = 104	n = 81

Women's experience of labour and birth (questionnaire outcomes)

Outcome	Upright position, , N = 1208	Lying down position, , N = 1165
Satisfaction with overall childbirth experience (strongly agree & agree) No of events	n = 963	n = 973
Involved in making decisions (strongly agree & agree) No of events	n = 1102	n = 1087

Outcome	Upright position, , N = 1208	Lying down position, , N = 1165
Treated with respect by all staff (strongly agree & agree) No of events	n = 1146	n = 1113
Expectations for labour & birth were met (strongly agree & agree) No of events	n = 803	n = 783
Felt safe at all times (strongly agree & agree) No of events	n = 1105	n = 1072
Good communication from staff (strongly agree & agree) No of events	n = 1135	n = 1094
Felt in control (strongly agree & agree) No of events	n = 824	n = 794
Able to move as much as wanted (strongly agree & agree) No of events	n = 568	n = 589
Satisfied with position before pushing (strongly agree & agree) No of events	n = 1050	n = 996
Satisfied with position while pushing (strongly agree & agree) No of events	n = 1038	n = 992

Long-term incontinence

Outcome	Upright position, , N = 950	Lying down position, , N = 942
Urinary incontinence Leakage in first 3 months No of events	n = 432	n = 426
Bowel incontinence No bowel control and/or soiling in first 3 months No of events	n = 101	n = 122

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Secure web-based randomisation service hosted by the National Perinatal Epidemiology Unit Clinical Trials Unit, University of Oxford. The randomisation schedule used random permuted blocks of sizes 2, 4, 6, 8, and 10, randomly selected according to the ratio specified by Pascals' triangle (1:4:6:8:10)).*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	Some concerns *(Adherence was similar in both groups (~ 70%); no analysis was performed to examine the effect of adhering to the intervention.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Data available for 95.6% of participants for episiotomy, perineal tear grade 2 and perineal tear grade 3-4. Data available for 73.3% of participants for Women's experience of labour and birth (questionnaire outcomes). Data available for 58.5% of participants for long term incontinence outcomes)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received. Active second stage assessed by time from pushing to delivery, women's experience of labour and birth assessed by VAS for pain)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(All outcomes reported as prespecified in the protocol)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable *(Proportion of women who had their labour induced >1/3 in both groups (study included due to large sample size)*)
Overall bias and Directness	Risk of bias variation across outcomes	Risk of recall bias for maternal self-reported questionnaire outcomes (women's experience) and risk of attrition bias for 1 year follow-up outcomes as loss-to-follow-up was high

Golara, 2002

Bibliographic Reference	Golara, M.; Plaat, F.; Shennan, A. H.; Upright versus recumbent position in the second stage of labour in women with combined spinal-epidural analgesia; International journal of obstetric anesthesia; 2002; vol. 11 (no. 1); 19-22

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	• Singleton pregnancy • GA ≥ 37 weeks • Epidural combined-spinal epidural in situ • Full dilatation • Adequate motor function • Vertex presentation • Nulliparous women

Exclusion criteria	• Inadequate motor function • Received pethidine within 4 hours of full dilatation
Patient characteristics	Maternal age in years, mean (SD) • Ambulatory: 30 (5) • Recumbent: 30 (6) Gestational age, mean (SD) • Not reported BMI, mean (SD) • Ambulatory: 27 (4) • Recumbent: 28 (3) Parity • All women were nulliparous Induction of labour, n (%) • Ambulatory: 7 (17) • Recumbent: 6 (24) Cervical dilatation at insertion of epidural catheter • Ambulatory: 4 cm • Recumbent: 4 cm Type of epidural

	• Low-dose infusion epidural Drugs used for epidural analgesia, n • All women received bupivacaine 2.5 mg with fentanyl 2.5 microgram; maintained by intermittent bolus injections of 10-15 mL bupivacaine 0.1% and fentanyl 2 microgram mL (administered half hourly, as required)
Intervention(s)/control	Ambulatory • Women encouraged to remain ambulatory (standing or walking) for as much of the passive 2nd stage as possible Recumbent • Women asked to remain in bed or in a chair during for as much of the passive 2nd stage as possible All women were allowed to choose their preferred position for birth for the active 2nd stage
Duration of follow-up	Duration of labour
Sources of funding	Not reported
Sample size	N= 66 Ambulatory n= 25 Recumbent n= 41
Other information	Positions were only maintained for the passive phase of the 2nd stage Adherence, % in position • Ambulatory: 8% in bed, 4% in chair, 88% mobilising • Recumbent: 65% in bed, 20% in chair, 15% mobilising

Study arms

Ambulatory (N = 25)

Recumbent (N = 41)

Outcomes

Mode of birth

Outcome	Ambulatory, , N = 25	Recumbent, , N = 41
Spontaneous vaginal birth No of events	n = 16	n = 19
Instrumental birth No of events	n = 9	n = 21
Caesarean birth No of events	n = 0	n = 1

Genital tract trauma

Outcome	Ambulatory, , N = 25	Recumbent, , N = 41
Episiotomy No of events	n = 11	n = 28
Perineal tear Grade 2 No of events	n = 5	n = 5
Perineal tear Grade 3	n = 0	n = 1

Outcome	Ambulatory, , N = 25	Recumbent, , N = 41
No of events		

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation was via computer generated random numbers and sealed brown envelopes. Baseline characteristics were balanced despite recumbent n= 41 and upright n= 25).*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	Some concerns *(Women were aware of their assigned intervention. Adherence was similar between groups (88% in ambulatory group, 80% in recumbent group) but no analysis carried out to estimate effect of adhering to intervention.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Data available for all participants (mode of birth). Data available for most participants (genital tract trauma)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Some concerns
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	None

RCT: randomised controlled trial; RoB: risk of bias

Evidence tables for review: What is the most effective position for birth in women without an epidural in situ?

Crowley, 1991

Bibliographic Reference	Crowley, P.; Elbourne, D.; Ashurst, H.; Garcia, J.; Murphy, D.; Duignan, N.; Delivery in an obstetric birth chair: A randomized controlled trial; British Journal of Obstetrics and Gynaecology; 1991; vol. 98 (no. 7); 667-674

Study details

Country/ies where study was carried out	Ireland
Study type	Randomised controlled trial (RCT)
Study dates	March 1984 to June 1985
Inclusion criteria	Nulliparous women who had reached 34 weeks completed gestation Singleton pregnancies Vertex presentation Induced and augmented women were included
Exclusion criteria	Epidural anaesthesia
Patient characteristics	Maternal age in years, mean (SD) Birthing chair group: 24.1 (4.1) Recumbent positions group: 24.3 (4.5) Gestational age in weeks, mean (SD) Upright group: 39.7 (1.3); 2.3% < 37 weeks Recumbent group: 39.7 (1.3); 2.2% < 37 weeks BMI

	Not reported Parity Only nulliparous women included Induction of labour , n (%) Upright group: 109 (17.2%) Recumbent group: 101 (16.9%)
Intervention(s)/control	Birthing chair use of a birthing chair (height and angle of the chair were adjusted according to the preference of the midwife and the woman) Recumbent positions use of a birthing bed, adopting any of the following positions: recumbent, semi-recumbent, dorsal, or left lateral
Duration of follow-up	Duration of labour
Sources of funding	Coombe Hospital Development Trust and by the Research Fund of the Royal College of Surgeons in Ireland.
Sample size	N= 1250 Intervention n= 634 Control n= 596
Other information	Adherence: women adhering to intended position, n (%) Birthing chair group: 413 (65%) Recumbent positions group: 576 (97%)

	Entry to trial delayed until vaginal birth was confidently expected to occur Larger proportion of birth in birthing chair group were carried out by senior midwives (and more medical students in the recumbent positions group).

Study arms

Birthing chair (N = 634)

Recumbent positions (N = 596)

Outcomes

Mode of birth

Outcome	Birthing chair, , N = 634	Recumbent positions, , N = 596
Spontaneous vaginal birth No of events	n = 554	n = 506
Instrumental birth No of events	n = 80	n = 89
Caesarean birth No of events	n = 0	n = 1

Duration of active second stage

Outcome	Birthing chair, , N = 634	Recumbent positions, , N = 596
Duration of second stage (Minutes)	31.7 (19.2)	31.2 (18.8)

Outcome	Birthing chair, , N = 634	Recumbent positions, , N = 596
Mean (SD)		

Genital tract trauma

Outcome	Birthing chair, , N = 634	Recumbent positions, , N = 597
Episiotomy No of events	n = 329	n = 350
Tear (and suture) No of events	n = 96	n = 62

Women's experience of labour and birth

Outcome	Birthing chair, , N = 263	Recumbent positions, , N = 289
Women who agreed they "could move freely" No of events	n = 175	n = 195
Women who agreed they "felt in control" No of events	n = 190	n = 209
Women who agreed labour was "very unpleasant" or "rather unpleasant" No of events	n = 111	n = 127
Women who reported "severe" pain No of events	n = 16	n = 14

Post-partum interviews were conducted during the first 8 months of the trial (follow up period not reported)

Apgar score

Outcome	Birthing chair, , N = 634	Recumbent positions, , N = 596
Apgar score ≤ 7 at 5 minutes No of events	n = 1	n = 4

Abnormal fetal heart rate needing intervention

Outcome	Birthing chair, , N = 634	Recumbent positions, , N = 596
Instrumental births due to fetal heart rate abnormalities No of events	n = 19	n = 36

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low (Randomisation was generated by a random number table and a sealed opaque envelope opened by the midwife)
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	High *(413/634 (65%) women in the birthing chair group adhered to the position and 576/596 (97%) women in the bed group; intention-to-treat analysis used but no method of estimating effect of adherence. More midwives were used to assist births in the birthing chair group and more medical students were used to assist births in the bed group.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns *(Women were excluded from analysis post-randomisation (7 from birthing chair group and 13 from bed group) and reasons not provided.)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Study states that there is a protocol but doesn't not provide a way of accessing it)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	None

Gardosi, 1989a

Bibliographic Reference	Gardosi, J.; Hutson, N.; B-Lynch, C.; Randomised, controlled trial of squatting in the second stage of labour; Lancet (London, England); 1989; vol. 2 (no. 8654); 74-7

Study details

Study dates	Not reported
Inclusion criteria	Singleton pregnancies Nulliparous GA: 37 weeks completed Expecting vaginal birth Vertex presentation No relevant risk factors Induced and spontaneous labours included

Exclusion criteria	Epidural anaesthesia
Patient characteristics	Maternal age in years, median (range) Upright group: 24.1 (4.3) Recumbent group: 24.4 (4.5) Gestational age in weeks, median (range) Upright group: 40.1 (1.3) Recumbent group: 39.8 (1.3) BMI, mean (SD) Not reported (height was similar between groups) Parity Only nulliparous women included Induction of labour , n (%) Upright group: 35 (16%) Recumbent group: 30 (14%)
Intervention(s)/control	Upright positions group: Women adopted squatting (using a birthing cushion with side handles), kneeling (including hands and knees position) and sitting positions (less than 30 degree from vertical) Recumbent positions group: Women adopted a conventional recumbent (back support at 30 degrees) or lateral position

	All women were allowed to be ambulatory during the first stage of labour. All women could decide to adopt another position (but women in recumbent position were not informed of the birthing cushion option)
Duration of follow-up	Duration of labour
Sources of funding	Oxford Regional Health Authority
Sample size	N= 427 Upright positions n= 218 Recumbent positions n= 209
Other information	Women were considered to have adopted an upright position if they were in that position for at least 50% of the active phase of the 2nd stage of labour Adherence Upright group: 39/218 women used a semi-recumbent position Recumbent group: 22/ 209 used an upright position

Study arms

Upright positions (N = 218)

Recumbent positions (N = 209)

Outcomes

Mode of birth

Outcome	Upright positions, , N = 218	Recumbent positions, , N = 209
Spontaneous vaginal birth No of events	n = 199	n = 173
Instrumental birth Forceps and Ventouse No of events	n = 19	n = 34
Caesarean birth No of events	n = 0	n = 2

Duration of active second stage

Outcome	Upright positions, , N = 218	Recumbent positions, , N = 209
Duration of active second stage (Minutes) Mean (SD)	39 (26)	50 (29)

Genital tract trauma

Outcome	Upright positions, , N = 218	Recumbent positions, , N = 209
Episiotomy No of events	n = 55	n = 53
Perineal tear 2nd degree No of events	n = 52	n = 64

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Randomisation method was quasi-random. Baseline characteristics of interest reported and do not indicate problem with randomisation.)*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	High *(In the upright group, 39/218 (18%) women used a semi-recumbent position and 22/209 (10.5%) used an upright position in the recumbent group)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low (*Data available for all participants*)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol unavailable, no evidence of selective reporting)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	None

Gardosi, 1989b

Bibliographic Reference	Gardosi, J.; Sylvester, S.; B-Lynch, C.; Alternative positions in the second stage of labour: a randomized controlled trial; British journal of obstetrics and gynaecology; 1989; vol. 96 (no. 11); 1290-6

Study details

Country/ies where study was carried out	England
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	Singleton pregnancies. GA: 37- 42 weeks full-term Nulliparous Maternal age: 16 to 35 years Expecting a vaginal birth Vertex presentation No relevant risk factors Induced and spontaneous labours included
Exclusion criteria	Epidural anaesthesia
Patient characteristics	Maternal age in years, mean (SD) Upright group: 24.5 (4.4) Recumbent group: 24.6 (4.3) Gestational age in weeks, median (range) Upright group: 40.1 (1.3) Recumbent group: 39.8 (1.3) BMI, mean (SD)

	Not reported (height was similar between groups) Parity Only nulliparous women included Induction of labour , n Upright group: 10 Recumbent group: 12
Intervention(s)/control	Upright positions group: Women adopted squatting (using a birthing cushion with side handles), kneeling (including hands and knees position) and sitting positions (less than 30 degree from vertical) Recumbent positions group: Women adopted a conventional recumbent (back support at 30 degrees) or lateral position All women were allowed to be ambulatory during the first stage of labour. All women could decide to adopt another position (but women in recumbent position were not informed of the birthing cushion option)
Duration of follow-up	Duration of labour
Sources of funding	Oxford Regional Health Authority
Sample size	N= 151 Upright group n= 73 Recumbent group n= 78

Other information	Women were considered to have adopted an upright position if they were in that position for at least 1/3 of the active phase of the 2nd stage of labour. Position for delivery was decided by the midwife. Adherence to intended position, n (%) Upright positions group: 54 (74) Recumbent positions group: 63 (81)

Study arms

Upright positions (N = 73)

Recumbent positions (N = 78)

Outcomes

Mode of birth

Outcome	Upright positions, , N = 73	Recumbent positions, , N = 78
Spontaneous vaginal birth No of events	n = 66	n = 66
Instrumental birth Forceps or Ventouse No of events	n = 7	n = 12
Caesarean birth	n = 0	n = 0

Outcome	Upright positions, , N = 73	Recumbent positions, , N = 78
No of events		

Duration of active second stage

Outcome	Upright positions, , N =	Recumbent positions, , N =
Duration of pushing (Minutes) Mean (SD)	48.8 (34.8)	47.1 (31.8)

Genital tract trauma

Outcome	Upright positions, , N = 73	Recumbent positions, , N = 78
Episiotomy No of events	n = 22	n = 30
Women adhering to position No of events	n = 11	n = 27
Perineal tear 2nd degree tear (2 women in recumbent position had a 3rd degree tear) No of events	n = 24	n = 26
Women adhering to position No of events	n = 19	n = 19

Apgar score

Outcome	Upright positions, , N = 73	Recumbent positions, , N = 78
Apgar score <7 at 5 min No of events	n = 1	n = 0

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Randomisation method was quasi-random; baseline characteristics of interest reported and do not indicate problem with randomisation.)*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	High *(Adherence to intended position was unbalanced between groups (74% in upright group and 81% in recumbent group). Effect of adhering to intervention not examined)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Data available for all participants for all outcomes)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Study mentions the protocol but it is unavailable)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	None

Stewart, 1983

Bibliographic Reference	Stewart, P.; Hillan, E.; Calder, A. A.; A randomised trial to evaluate the use of a birth chair for delivery; Lancet (London, England); 1983; vol. 1 (no. 8337); 1296-8

Study details

Country/ies where study was carried out	Scotland
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	• Singleton • Mixed parity • GA: 37 to 42 weeks • Expecting vaginal birth Cephalic presentation
Exclusion criteria	None reported
Patient characteristics	<u>Maternal age in years</u> • Not reported <u>Gestational age</u> • Not reported <u>BMI</u> • Not reported

	Parity, n • Birth chair group: nulliparous, 40; multiparous 59 • Recumbent group: nulliparous 36; multiparous 54 Induction of labour, n (%) • Birth chair group: nulliparous 17 (42); multiparous 28 (47) • Recumbent group: nulliparous 10 (27); multiparous 33 (61) Use of epidural analgesia, n • Birth chair group: nulliparous 23; multiparous 6 • Recumbent group: nulliparous 18; multiparous 7 Author reported no differences between groups in age, height, weight, parity, gestational age and social class
Intervention(s)/control	Birth chair group Use of a birthing chair 'Birth E-Z' chair (backrest inclination at 15 to 20 degrees from vertical) for 2nd stage Recumbent group Use of a birthing bed (backrest inclination at maximum of 20 degrees from horizontal) for 2nd stage
Duration of follow-up	Duration of labour
Sources of funding	Greater Glasgow Health Board Research Support Group
Sample size	N= 189
Other information	None

Study arms

Birthing chair (N = 99)

Recumbent position (N = 90)

Outcomes

Mode of birth

Outcome	Birthing chair, , N = 99	Recumbent position, , N = 90
Spontaneous vaginal birth No of events	n = 83	n = 77
Nulliparous women Chair n=38; recumbent n=36 No of events	n = 28	n = 24
Multiparous women Chair n=56; recumbent n=54 No of events	n = 55	n = 53
Instrumental birth No of events	n = 10	n = 12
Nulliparous women Chair n=38; recumbent n=36 No of events	n = 9	n = 1
Multiparous women Chair n=56; recumbent n=54 No of events	n = 11	n = 1

Outcome	Birthing chair, , N = 99	Recumbent position, , N = 90
Caesarean birth No of events	n = 1	n = 1
Nulliparous women Chair n=38; recumbent n=36 No of events	n = 1	n = 1
Multiparous women Chair n=56; recumbent n=54 No of events	n = 0	n = 0

Duration of active 2nd stage

Outcome	Birthing chair, , N = 99	Recumbent position, , N = 90
Nulliparous women Chair n=38; recumbent n=36 Mean (SD)	42 (27)	49 (28)
Multiparous women Chair n=56; recumbent n=54 Mean (SD)	17 (18)	21 (17)

Genital tract trauma

Outcome	Birthing chair, , N = 99	Recumbent position, , N = 90
Episiotomy No of events	n = 19	n = 39

Outcome	Birthing chair, , N = 99	Recumbent position, , N = 90
Nulliparous women Chair n=38; recumbent n=36 No of events	n = 12	n = 26
Multiparous women Chair n=56; recumbent n=54 No of events	n = 7	n = 13
Perineal tear Grade 2 or higher No of events	n = 14	n = 12
Nulliparous women Chair n=38; recumbent n=36 No of events	n = 5	n = 5
Multiparous women Chair n=56; recumbent n=54 No of events	n = 9	n = 7

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation was done by drawing a sealed envelope)*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	Some concerns *(Women were aware of their assigned intervention; adherence was not reported)*

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Outcome data available for all participants for mode of birth. Data available for most participants for genital tract trauma)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns *(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol unavailable, no evidence of selective reporting)*
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Indirectly applicable *(Women who received epidural and who were induced were included, but < 1/3)*
Overall bias and Directness	Risk of bias variation across outcomes	

Stewart, 1989

Bibliographic Reference	Stewart, P.; Spiby, H.; A randomized study of the sitting position for delivery using a newly designed obstetric chair; British journal of obstetrics and gynaecology; 1989; vol. 96 (no. 3); 327-33

Study details

Country/ies where study was carried out	England
Study dates	May 1984 to March 1986

Inclusion criteria	GA ≥ 37 weeks completed Singleton pregnancies Expecting uncomplicated vaginal birth. Cephalic presentation
Exclusion criteria	Augmentation Use of epidural analgesia
Patient characteristics	Maternal age in years, mean (SD) Birthing chair: multiparous 27.8 (4.0); nulliparous 24.5 (4.0) Supine: multiparous 27.3 (4.4); nulliparous 24.8 (4.3) Gestational age Birthing chair: multiparous 39.7 (1.3); nulliparous 39.8 (0.9) Supine: multiparous 39.5 (1.1); nulliparous 39.8 (1.1) BMI, mean (SD) Not reported, height and weight similar between groups Parity, n Birth stool group: multiparous 96; nulliparous 61 Semi-recumbent group: multiparous 91; nulliparous 56 Induction of labour, n (%) * Not reported * author reported groups were 'similar' in all measured baseline characteristics

Intervention(s)/control	Birthing chair group Women encouraged to use obstetric chair at 15-20 degree recline, with head-rest and side supports Supine/ dorsal group Supine position, described as a ‘wedged’ dorsal position All women were allowed to be ambulant during the first stage of labour and were randomised in late first stage
Duration of follow-up	Duration of labour
Sources of funding	Rocket Instruments of London
Sample size	N= 304 Birthing stool group n= 157 Supine group n= 147
Other information	Intention to treat analysis used 22 women in birthing chair group did not give birth in the chair

Study arms

Birthing chair (N = 157)

Supine (N = 147)

Outcomes

Mode of birth

Outcome	Birthing chair, , N = 157	Supine , , N = 147
Spontaneous vaginal birth No of events	n = 144	n = 139
Multiparous Birthing chair n= 96; bed n= 91 No of events	n = 96	n = 91
Nulliparous Birthing chair n= 61; bed n= 56 No of events	n = 48	n = 48
Instrumental Forceps or Ventouse delivery No of events	n = 13	n = 7
Multiparous Birthing chair n= 96; bed n= 91 No of events	n = 0	n = 0
Nulliparous Birthing chair n= 61; bed n= 56 No of events	n = 13	n = 7

Duration of active second stage

Outcome	Birthing chair, , N = 157	Supine , , N = 147
Duration of active pushing (Minutes) Mean (SD)	33 (24)	29.6 (25)
Multiparous Birthing chair n= 96; bed n= 91 Mean (SD)	16.8 (12.6)	15.9 (11.7)
Nulliparous Birthing chair n= 61; bed n= 56 Mean (SD)	58.1 (35)	52 (39.6)

Genital tract trauma

Outcome	Birthing chair, , N = 157	Supine , , N = 147
Episiotomy No of events	n = 36	n = 40
Multiparous Birthing chair n= 96; bed n= 91 No of events	n = 6	n = 15
Nulliparous Birthing chair n= 61; bed n= 56 No of events	n = 30	n = 25
Perineal tear 2nd degree tear	n = 41	n = 35

Outcome	Birthing chair, , N = 157	Supine , , N = 147
No of events		
Multiparous Birthing chair n= 96; bed n= 91 No of events	n = 29	n = 25
Nulliparous Birthing chair n= 61; bed n= 56 No of events	n = 12	n = 10

Women's experience of labour and birth

Outcome	Birthing chair, , N = 47	Supine , , N = 30
Women's comfort Women responded yes to 'Comfortable all of the time' (non-responders removed) Nominal	23	10

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation was done via sealed opaque envelopes)*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	Some concerns *(Women were aware of their assigned intervention. Authors reported 22 women in the chair group did not give birth in the chair (in 11 cases this was due to rapid progress of the 2nd stage; but 11 cases not accounted for). Authors reported that a secondary pre-protocol analysis did not show any differences with the primary intention-to-treat analysis.)*

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low (*Data available for all participants (mode of birth, duration of second stage and genital tract trauma). Data available for women's comfort (birthing chair n=47, supine n= 30*)
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low (P*rotocol unavailable, no evidence of selective reporting*)
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	None

Turner, 1986

Bibliographic Reference	Turner, MJ; Romney, Mona L; Webb, JB; Gordon, H; The birthing chair: an obstetric hazard?; Journal of Obstetrics and Gynaecology; 1986; vol. 6 (no. 4); 232-235

Study details

Country/ies where study was carried out	UK
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	• Singleton pregnancies

	• GA > 36 weeks • Cephalic presentation
Exclusion criteria	None reported
Patient characteristics	Maternal age in years, mean (SD) Authors reported no differences Gestational age in weeks, median (range) Authors reported no differences BMI, mean (SD) Not reported Parity, n Birthing chair group: nulliparous, 111; multiparous, 115 Supine group: nulliparous, 140; multiparous, 173 Induction of labour 33.8% (author reported similar between groups) Use of epidural analgesia 26.4% (author reporte1d similar between groups)
Intervention(s)/control	Birthing chair Women used the Birth EZ chair with adjustable height and angle of backrest (set at 40 degrees, with leg supports and foot-rests Women were transferred to the birthing chair upon full cervical dilatation or if vertex was visible

	Supine position Women adopted a supine position in a bed
Duration of follow-up	Duration of labour
Sources of funding	Not reported
Sample size	N= 318 Birthing chair group n= 226 (nulliparous n=111; multiparous n=140) Supine position group n= 313 (nulliparous n=115; multiparous n=173)
Other information	Active management was used for nulliparous women Vaginal assessment was carried out every 2 hours (nulliparous women) or 4 hours (multiparous women) Oxytocin for augmentation used only in nulliparous women Adherence Birthing chair group: 92/318 gave birth in the bed (40 women preferred the supine position, 32 women went into active labour too quickly to be moved to the birthing chair, 20 women had complications such as fetal distress) Per-protocol followed (authors report that mode of birth, duration of active second stage and perineal tears did not differ between ITT and PP)

Study arms

Birthing chair (N = 226)

Supine position (N = 313)

Outcomes

Mode of birth

Outcome	Birthing chair, N = 226	Supine position, N = 313
Spontaneous vaginal birth No of events	n = 194	n = 271
Nulliparous No of events	n = 87	n = 107
Multiparous No of events	n = 107	n = 164
Instrumental birth No of events	n = 28	n = 38
Nulliparous No of events	n = 22	n = 31
Multiparous No of events	n = 6	n = 7
Caesarean birth No of events	n = 4	n = 4

Outcome	Birthing chair, N = 226	Supine position, N = 313
Nulliparous No of events	n = 2	n = 2
Multiparous No of events	n = 2	n = 2

Genital tract trauma

Outcome	Birthing chair, N = 226	Supine position, N = 313
Episiotomy No of events	n = 73	n = 111
Nulliparous No of events	n = 57	n = 82
Multiparous No of events	n = 16	n = 29
Perineal tear Grades not specified No of events	n = 110	n = 107
Nulliparous No of events	n = 39	n = 26
Multiparous	n = 71	n = 81

Outcome	Birthing chair, N = 226	Supine position, N = 313
No of events		

Apgar score

Outcome	Birthing chair, N = 226	Supine position, N = 313
Apgar score ≤ 7 at 5 minutes No of events	n = 1	n = 2

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	High *(Risk is unclear as details of randomisation or allocation concealment not fully described. Significant difference in parity between groups and authors report "allocation was not always feasible" and women were able to switch between groups)*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	High *(Women were aware of their assigned intervention. Important co-interventions (position in first stage, augmentation of labour, vaginal assessment) were not reported or were not balanced between groups. Adherence was low as 92/318 women in the chair group gave birth in the bed (women's preference, rapid progress of 2nd stage, fetal complications); authors reported that mode of birth, duration of active second stage and perineal tears did not differ between ITT and PP)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Data available for all participants across all outcomes)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Not clear if outcome assessors were aware of the allocation, but unlikely that assessment was influenced by knowledge of intervention received)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol unavailable, no evidence of selective reporting)*
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Indirectly applicable *(Use of epidural included; use of induction before the onset of active labour included)*
Overall bias and Directness	Risk of bias variation across outcomes	None

Waldenstrom, 1991

Bibliographic Reference	Waldenstrom, U.; Gottvall, K.; A randomized trial of birthing stool or conventional semirecumbent position for second-stage labor; Birth (Berkeley, Calif.); 1991; vol. 18 (no. 1); 5-10

Study details

Country/ies where study was carried out	Sweden
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	Singleton and twin pregnancies Mixed parity GA: not reported Expecting vaginal birth

	Vertex and breech presentations included
Exclusion criteria	Fetal distress
Patient characteristics	Maternal age in years, mean Birth stool group: 28.4 Semi-recumbent group: 28.3 Gestational age Not reported BMI, mean (SD) Not reported Parity, primigravidas (%) Birth stool group: 52.1 Semi-recumbent group: 51.1 Induction of labour, n (%) * Not reported * author reported no significant difference in baseline characteristics
Intervention(s)/control	Birth stool group Women were encouraged to sit on the birthing stool in a squatting position with feet on the ground (height: 32 cm) during the second stage of labour Semi-recumbent group

	Women were encouraged to adopt a semi-recumbent position during the second stage of labour
Duration of follow-up	Two hours after birth
Sources of funding	Swedish Ministry of Health and Social Affairs, Commission for Social Research
Sample size	N= 294 Birth stool group n= 148 Semi-recumbent group n= 146
Other information	Intention-to-treat analysis used Birthing stool group: 73/148 used the birthing stool to give birth Semi-recumbent group: 100/146 used the semi-recumbent position Use of epidural, % Birthing stool group: 6.9% Semi-recumbent group: 3.5%

Study arms

Birthing stool (N = 148)

Semi-recumbent (N = 146)

Outcomes

Genital tract trauma

Outcome	Birthing stool, N = 148	Semi-recumbent, N = 146
Episiotomy No of events	% = 14	% = 18

Women's experience of labour and birth

Outcome	Birthing stool, N = 147	Semi-recumbent, N = 140
Mother's experience of birth position Women responded 'Excellent' No of events	n = 94	n = 65

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Low *(Randomisation via sealed opaque envelopes at end of first stage)*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	High *(High non-adherence in both groups (49.3 in birthing stool group and 68.5% in recumbent group) and unbalanced. Effect of adherence not sufficiently examined. Important non-protocol interventions (use of epidural) unbalanced between groups (6.9% in birthing stool group and 3.5% in semi-recumbent group).)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Data available for all participants (episiotomy). Data available for most participants (women's experience of labour and birth)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Not clear if outcome assessors were aware of the allocation, but unlikely that assessment was influenced by knowledge of intervention received)*

Section	Question	Answer
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol unavailable, no evidence of selective reporting)*
Overall bias and Directness	Risk of bias judgement	High *(Non-adherence was high and unbalanced between groups and not sufficiently examined)*
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Use of epidural includedUse of induction before the onset of active labour not reported

Table 8: Evidence tables

Marttila, 1983

Bibliographic Reference	Marttila, M.; Kajanoja, P.; Ylikorkala, O.; Maternal half-sitting position in the second stage of labor; Journal of perinatal medicine; 1983; vol. 11 (no. 6); 286-9

Study details

Country/ies where study was carried out	Finland
Study type	Randomised controlled trial (RCT)
Study dates	Not reported
Inclusion criteria	Singleton pregnancies GA: 38 to 42 weeks Nulliparous and multiparous Induced and augmented labours included
Exclusion criteria	Use of any analgesia

Patient characteristics	Maternal age in years, mean (SD) Half-sitting birthing chair group: 27.3 (4.2) Supine group: 28.8 (4.1) Gestational age in weeks, mean (SD) Half-sitting birthing chair group: 40.3 (1.0) Supine group: 40.4 (0.9) BMI Not reported Parity, n Half-sitting birthing chair group: nulliparous 30; multiparous 20 Supine group: nulliparous 30; multiparous 20 Induction of labour , n (%) 97/100 women had spontaneous onset of labour
Intervention(s)/control	Women remained in the supine position during the first stage of labour (except for 8 women who were ambulatory for a 'brief period') Randomisation occurred when the cervix was dilated 4-6 cm Half-sitting birthing chair group Women used a birthing chair constructed from birthing beds to adopt a 'half-sitting' position at 50 degrees

	Supine position group Women adopted a supine position on a birthing bed
Duration of follow-up	Duration of labour
Sources of funding	Not reported
Sample size	N=100 women Intervention n= 50 Control n= 50
Other information	All women delivered vaginally

Study arms

Half-sitting (N = 50)

Supine (N = 50)

Outcomes

Mode of birth

Outcome	**Half-sitting, N = 50**	**Supine, N = 50**
Spontaneous vaginal birth No of events	n = 48	n = 44

Outcome	Half-sitting, N = 50	Supine, N = 50
Instrumental birth vacuum extraction No of events	n = 2	n = 6

Duration of active second stage

Outcome	Half-sitting, N = 50	Supine, N = 50
Nulliparous Mean (SD)	21.8 (14.9)	25 (14.8)
Multiparous Mean (SD)	17.2 (22.1)	10.6 (16.2)

Women's experience of labour and birth

Outcome	Half-sitting, N = 50	Supine, N = 50
Women reporting "intolerable pain" No of events	n = 0	n = 4
Women who agreed the experience was "unpleasant" No of events	n = 5	n = 9
Women who wished to use half-sitting position for next birth No of events	n = 48	n = 43

Abnormal fetal heart rate

Outcome	Half-sitting, N = 50	Supine, N = 50
Abnormal fetal heart rate needing intervention No of events	n = 7	n = 11

Critical appraisal

Section	Question	Answer
Domain 1: Bias arising from the randomisation process	Risk of bias judgement for the randomisation process	Some concerns *(Risk is unclear as details of randomisation or allocation concealment not fully described; baseline characteristics of interest reported and do not indicate problem with randomisation.)*
Domain 2b: Risk of bias due to deviations from the intended interventions (effect of adhering to intervention)	Risk of bias judgement for deviations from the intended interventions (effect of adhering to intervention)	Some concerns *(Women were aware of their assigned intervention. Adherence was not reported.)*
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low *(Data available for all participants)*
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low *(Not clear if outcome assessors were aware of the allocation, but unlikely that assessment was influenced by knowledge of intervention received.)*
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low *(Protocol unavailable, no evidence of selective reporting)*
Overall bias and Directness	Risk of bias judgement	Some concerns

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	None

GA: Gestational age, SD: Standard deviation, BMI: body mass index, PCEA: Patient controlled epidural analgesia

Appendix E Forest plots

This section includes forest plots only for outcomes that are meta-analysed. Outcomes from single studies are not presented here; the quality assessment for such outcomes is provided in the GRADE profiles in appendix F.

Forest plots for review: What is the most effective position for birth in women with an epidural in situ?

No meta-analysis was conducted for this review question and so there are no forest plots.

Forest plots for review: What is the most effective position for birth in women without an epidural in situ?

Comparison 2. Upright versus recumbent positions in women without an epidural in situ

Figure 3: Spontaneous vaginal birth

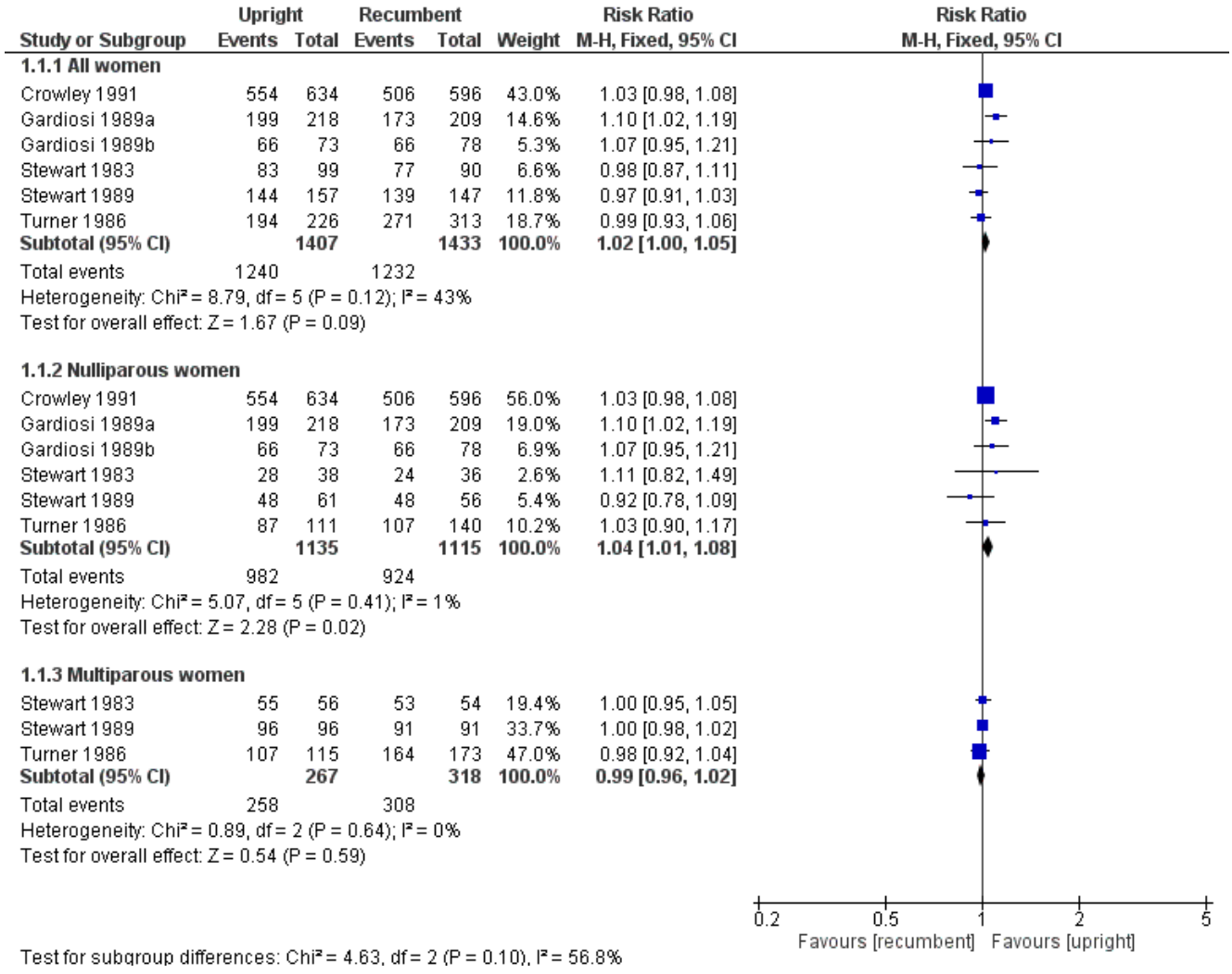


Figure 4: Instrumental birth

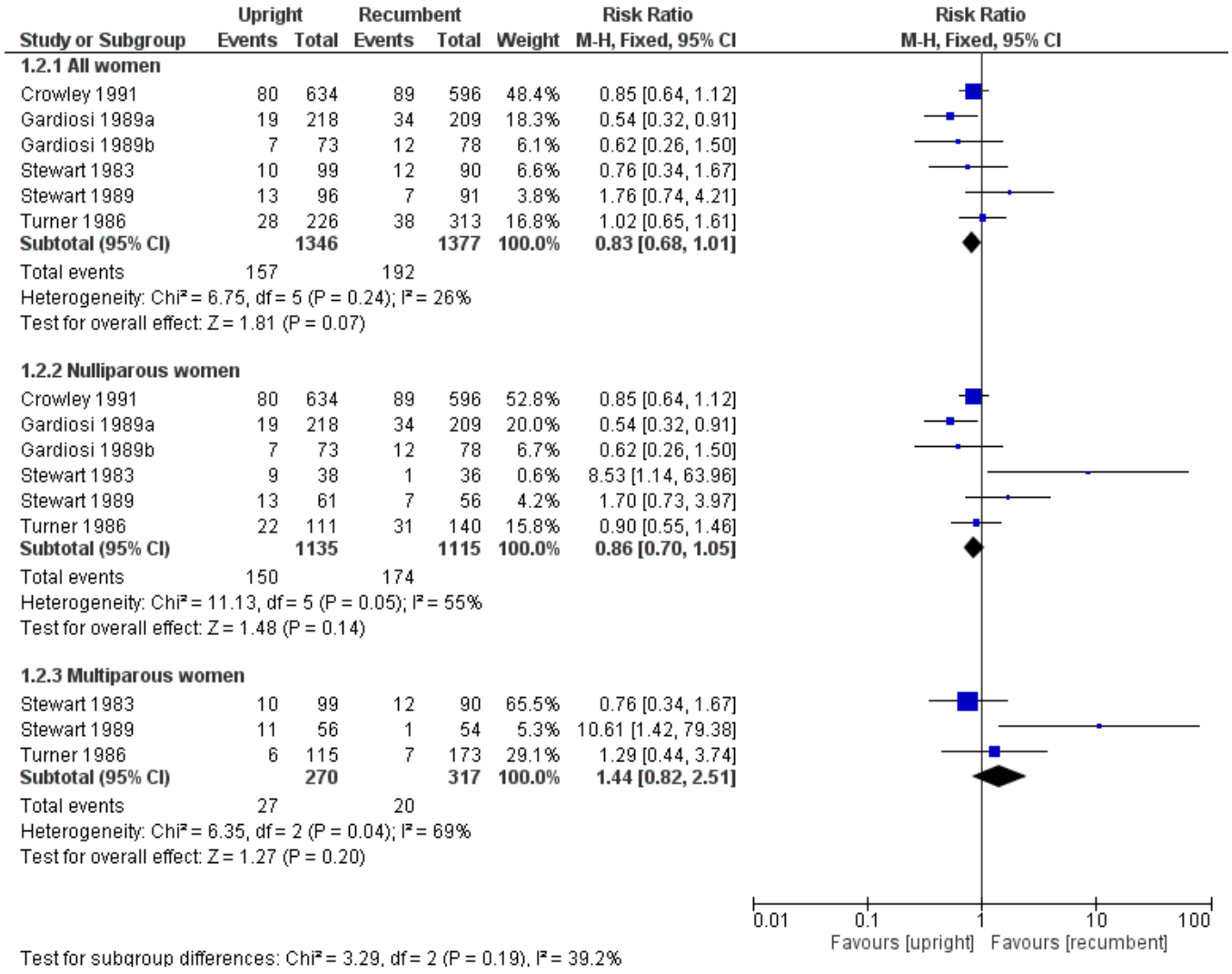

Upright
Recumbent
Risk Ratio
Risk Ratio
Study or Subgroup Events Total Events Total Weight M-H, Fixed, 95% CI
M-H, Fixed, 95% CI
1.2.1 All women
Crowley 1991 80 634 89 596 48.4% 0.85 [0.64, 1.12]
Gardiosi 1989a 19 218 34 209 18.3% 0.54 [0.32, 0.91]
Gardiosi 1989b 7 73 12 78 6.1% 0.62 [0.26, 1.50]
Stewart 1983 10 99 12 90 6.6% 0.76 [0.34, 1.67]
Stewart 1989 13 96 7 91 3.8% 1.76 [0.74, 4.21]
Turner 1986 28 226 38 313 16.8% 1.02 [0.65, 1.61]
Subtotal (95% CI) 1346 1377 100.0% 0.83 [0.68, 1.01]
Total events 157 192
Heterogeneity: Chi² = 6.75, df = 5 (P = 0.24); I² = 26%
Test for overall effect: Z = 1.81 (P = 0.07)
1.2.2 Nulliparous women
Crowley 1991 80 634 89 596 52.8% 0.85 [0.64, 1.12]
Gardiosi 1989a 19 218 34 209 20.0% 0.54 [0.32, 0.91]
Gardiosi 1989b 7 73 12 78 6.7% 0.62 [0.26, 1.50]
Stewart 1983 9 38 1 36 0.6% 8.53 [1.14, 63.96]
Stewart 1989 13 61 7 56 4.2% 1.70 [0.73, 3.97]
Turner 1986 22 111 31 140 15.8% 0.90 [0.55, 1.46]
Subtotal (95% CI) 1135 1115 100.0% 0.86 [0.70, 1.05]
Total events 150 174
Heterogeneity: Chi² = 11.13, df = 5 (P = 0.05); I² = 55%
Test for overall effect: Z = 1.48 (P = 0.14)
1.2.3 Multiparous women
Stewart 1983 10 99 12 90 65.5% 0.76 [0.34, 1.67]
Stewart 1989 11 56 1 54 5.3% 10.61 [1.42, 79.38]
Turner 1986 6 115 7 173 29.1% 1.29 [0.44, 3.74]
Subtotal (95% CI) 270 317 100.0% 1.44 [0.82, 2.51]
Total events 27 20
Heterogeneity: Chi² = 6.35, df = 2 (P = 0.04); I² = 69%
Test for overall effect: Z = 1.27 (P = 0.20)
Test for subgroup differences: Chi² = 3.29, df = 2 (P = 0.19), I² = 39.2%
0.01
0.1
1
10
100
Favours [upright]
Favours [recumbent]

Figure 5: Caesarean birth

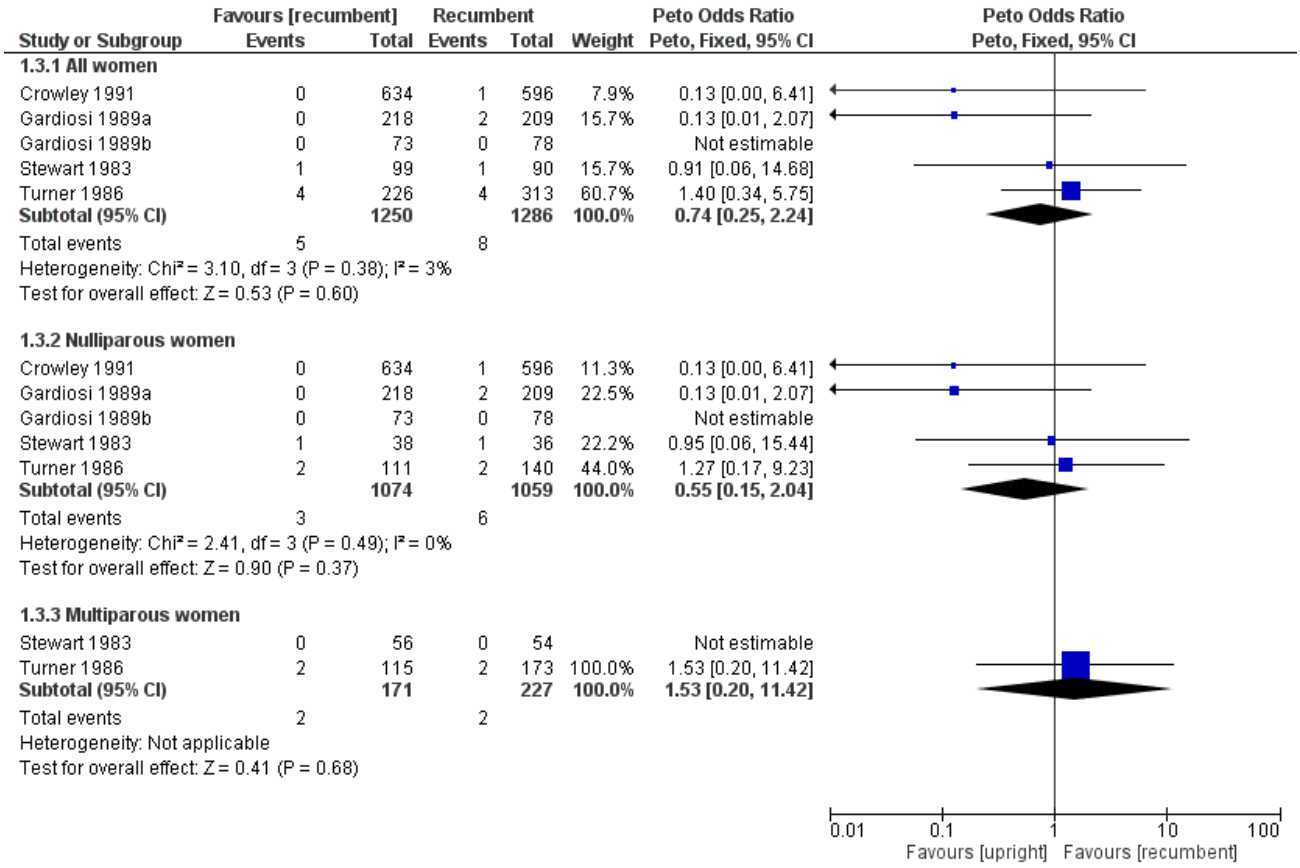


Figure 6: Duration of active 2nd stage

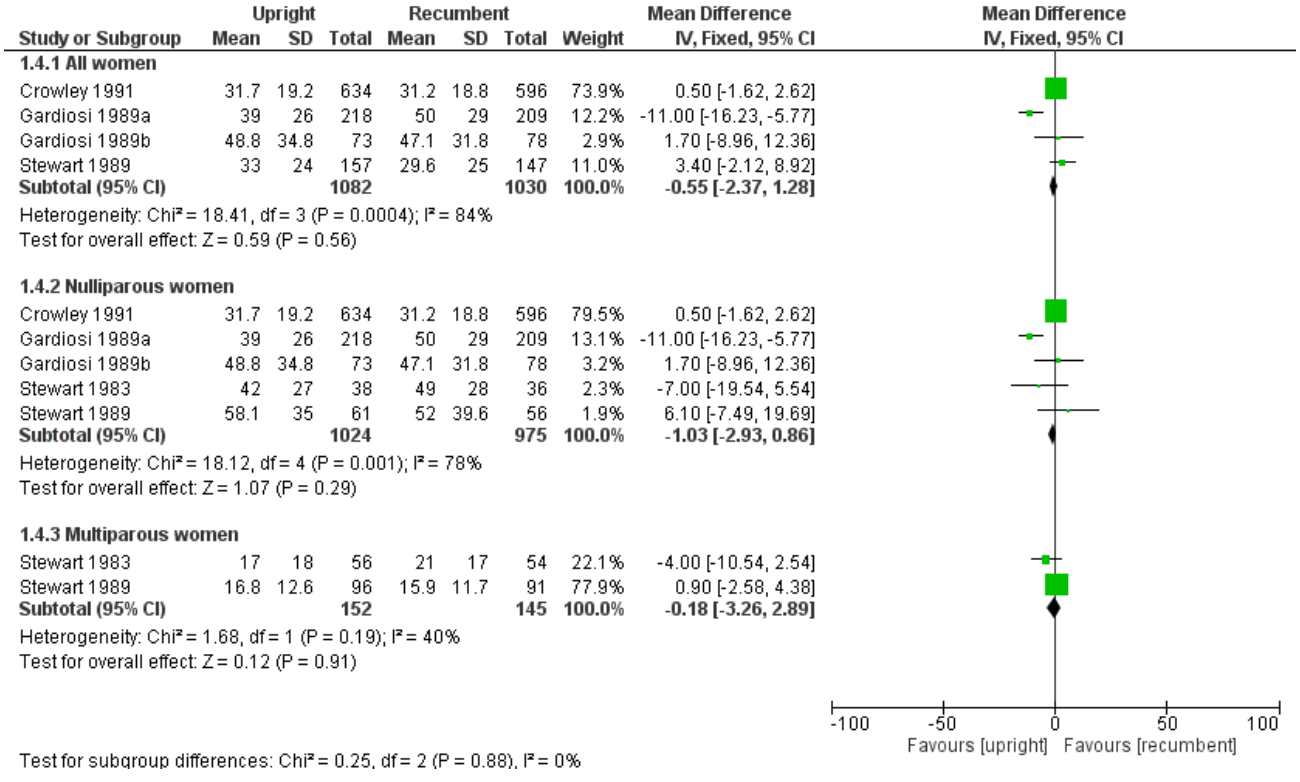


Figure 7: Genital tract trauma – episiotomy

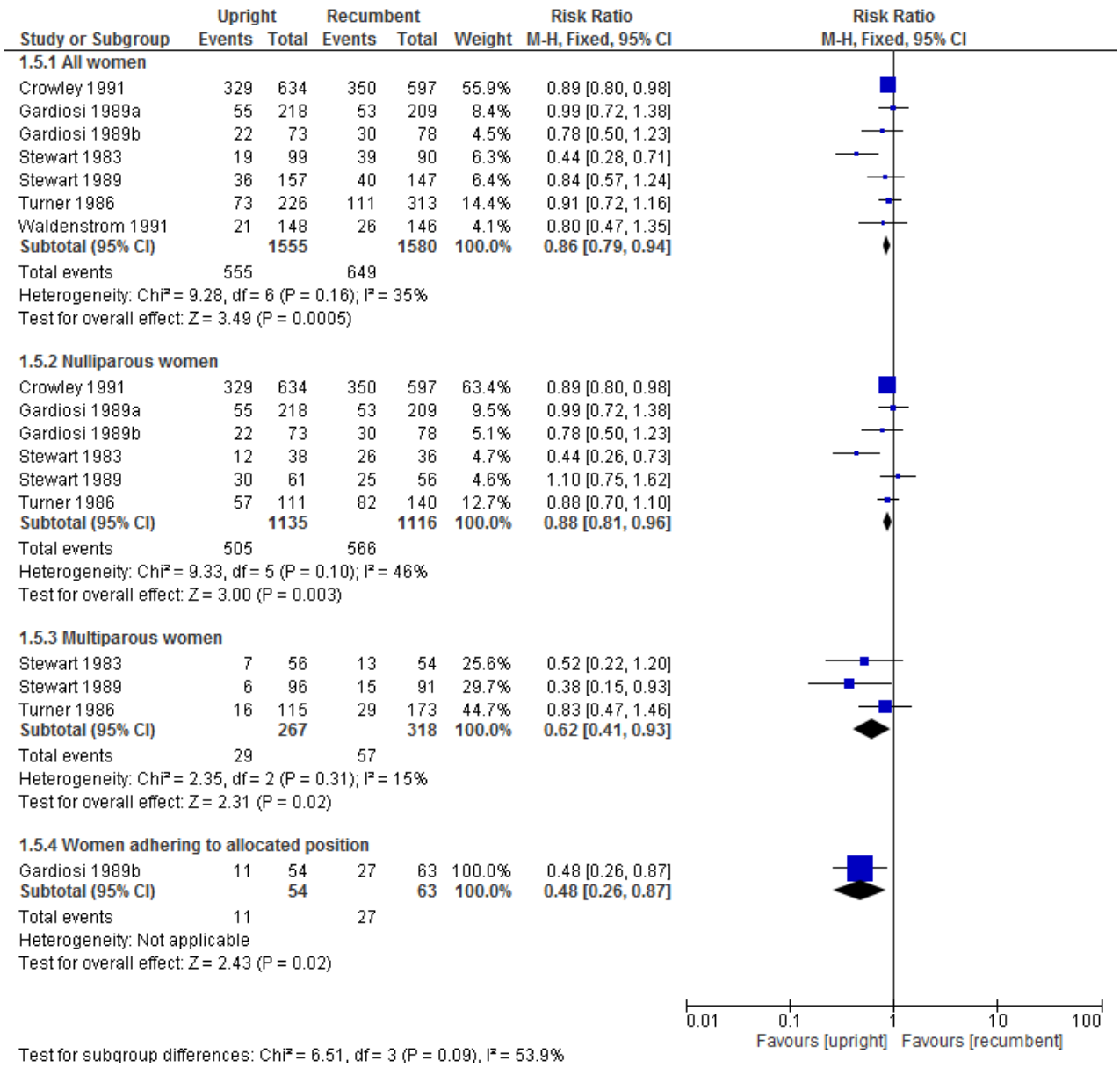


Figure 8: Genital tract trauma - perineal tear (grade 2 or higher)

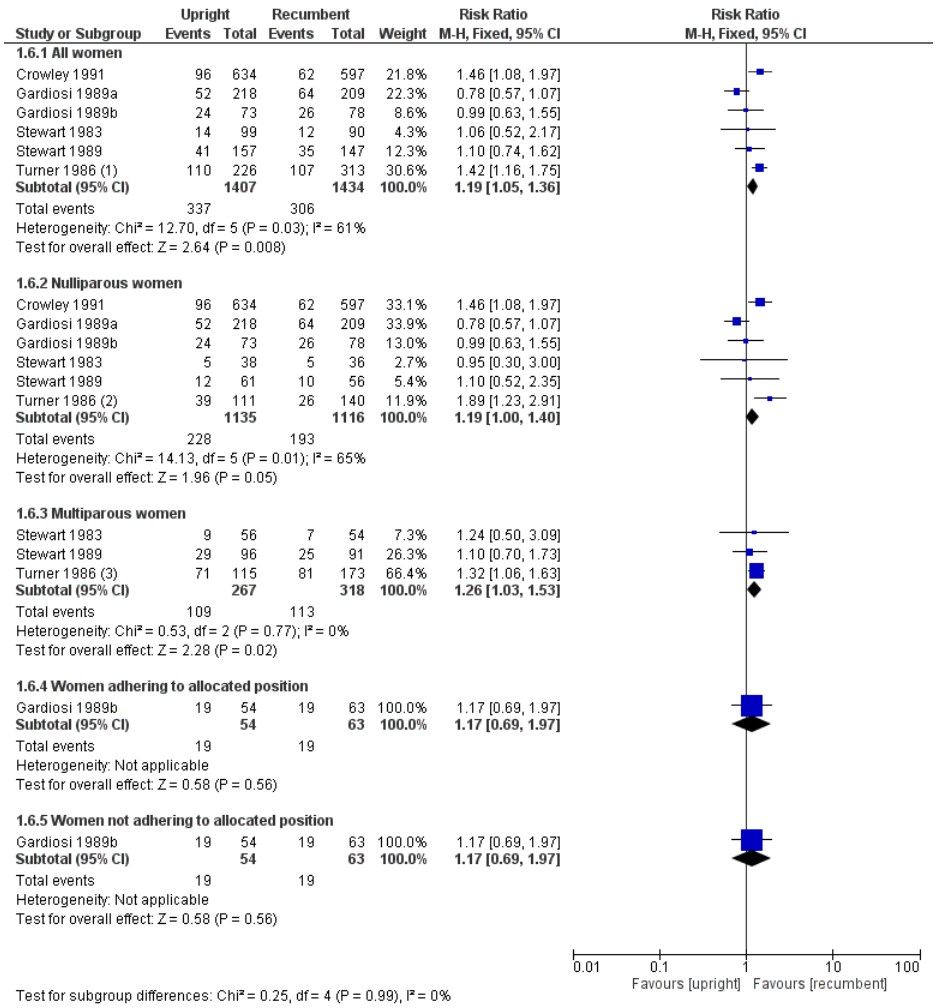
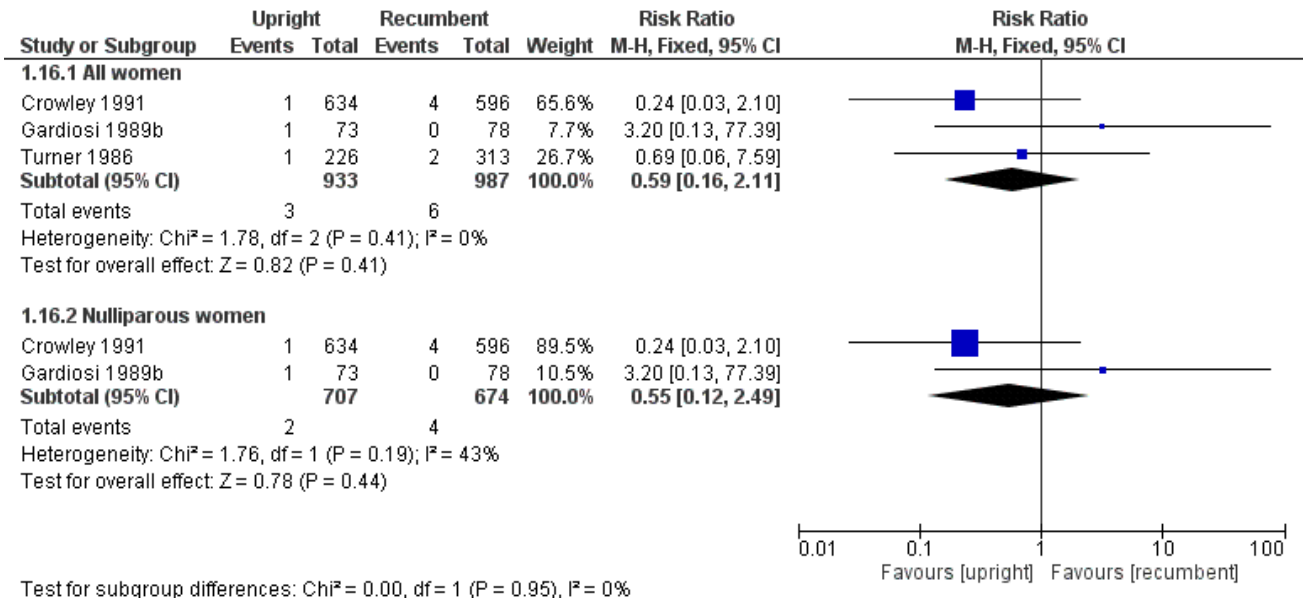


Figure 9: Apgar score < 7 at 5 minutes



Appendix F GRADE tables

GRADE tables for review: What is the most effective position for birth in women with an epidural in situ?

Table 9: Evidence profile for comparison 1: Upright positions versus recumbent positions in women with an epidural in situ

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright versus recumbent positions	Control	Relative (95% CI)	Absolute		
Mode of birth- spontaneous vaginal birth- Nulliparous women (Better indicated by higher values)												
1BUMPES 2017	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	serious[1]	none	548/1556 (35.2%)	632/1537 (41.1%)	RR 0.86 (0.79 to 0.94)[5]	58 fewer per 1000 (from 25 fewer to 86 fewer)	MODERATE	CRITICAL
Mode of birth: Spontaneous vaginal birth - Nulliparous women (Better indicated by higher values)												
1Golara 2002	randomised trials	no serious risk of bias	no serious inconsistency	serious[2]	serious[1]	none	16/25 (64%)	19/41 (46.3%)	RR 1.38 (0.89 to 2.15)	176 more per 1000 (from 51 fewer to 533 more)	LOW	CRITICAL
Mode of birth: instrumental birth - Nulliparous women (Better indicated by lower values)												
1 BUMPES 2017	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	no serious imprecision	none	849/1556 (54.6%)	778/1537 (50.6%)	RR 1.08 (0.99 to 1.18)[5]	40 more per 1000 (from 5 fewer to 91 more)	HIGH	CRITICAL
Mode of birth: instrumental birth - Nulliparous women (Better indicated by lower values)												
1 Golara 2002	randomised trials	no serious risk of bias	no serious inconsistency	serious[2]	very serious[3]	none	9/25 (36%)	21/41 (51.2%)	RR 0.7 (0.38 to 1.28)	154 fewer per 1000 (from 318 fewer to 143 more)	VERY LOW	CRITICAL
Mode of birth: caesarean birth - Nulliparous women (Better indicated by lower values)												
1 BUMPES 2017	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	serious[1]	none	158/1556 (10.2%)	127/1537 (8.3%)	RR 1.23 (0.92 to 1.64)[5]	19 more per 1000 (from 7 fewer to 53 more)	MODERATE	CRITICAL

Mode of birth: caesarean birth - Nulliparous women (Better indicated by lower values)												
1 Golara 2002	randomised trials	no serious risk of bias	no serious inconsistency	serious[2]	very serious[3]	none	0/25 (0%)	1/41 (2.4%)	pOR 0.2 (0 to 11.37)	19 fewer per 1000 (from 24 fewer to 197 more)	VERY LOW	CRITICAL
Duration of active 2nd stage (mins) -Nulliparous women (Better indicated by lower values)												
1 BUMPES 2017	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	no serious imprecision	none	Median IQR 94 (56-133)	Median IQR 88 (51-126)	Median Difference 6 (1 to 11)	Not estimable	HIGH	CRITICAL
Genital tract trauma: episiotomy - Nulliparous women (Better indicated by lower values)												
1 BUMPES 2017	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	no serious imprecision	none	914/1556 (58.7%)	838/1537 (54.5%)	RR 1.07 (0.99 to 1.15)[5]	38 more per 1000 (from 5 fewer to 82 more)	HIGH	CRITICAL
Genital tract trauma: episiotomy - Nulliparous women (Better indicated by lower values)												
1 Golara 2002	randomised trials	no serious risk of bias	no serious inconsistency	serious[2]	serious[1]	none	11/25 (44%)	28/41 (68.3%)	RR 0.64 (0.4 to 1.05)	246 fewer per 1000 (from 410 fewer to 34 more)	LOW	CRITICAL
Genital tract trauma: perineal tear (grade 2 or higher) - Nulliparous women (Better indicated by lower values)												
1 BUMPES 2017	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	no serious imprecision	none	667/1556 (42.9%)	689/1537 (44.8%)	RR 0.96 (0.88 to 1.04)	18 fewer per 1000 (from 54 fewer to 18 more)	HIGH	CRITICAL
Genital tract trauma: perineal tear (grade 2 or higher)- Nulliparous women (Better indicated by lower values)												
1 Golara 2002	randomised trials	no serious risk of bias	no serious inconsistency	serious[2]	very serious[3]	none	5/25 (20%)	6/41 (14.6%)	RR 1.37 (0.55 to 3.38)	54 more per 1000 (from 66 fewer to 348 more)	VERY LOW	CRITICAL
Long-term incontinence: bowel incontinence- no bowel control and/or soiling in the first 3 months - Nulliparous women (Better indicated by lower values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	serious[1]	none	101/950 (10.6%)	122/942 (13%)	RR 0.82 (0.64 to 1.05)	23 fewer per 1000 (from 47 fewer to 6 more)	LOW	IMPORTANT
Long-term incontinence: urinary incontinence- leakage in first 3 months - Nulliparous women (Better indicated by lower values)												

1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	432/950 (45.5%)	426/942 (45.2%)	RR 1.01 (0.91 to 1.11)	5 more per 1000 (from 41 fewer to 50 more)	MODERATE	IMPORTANT
Women's experience: satisfaction with overall experience - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	963/1208 (79.7%)	973/1165 (83.5%)	RR 0.95 (0.92 to 0.99)	42 fewer per 1000 (from 8 fewer to 67 fewer)	MODERATE	IMPORTANT
Women's experience: involved in making decisions - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	1102/1208 (91.2%)	1087/1165 (93.3%)	RR 0.98 (0.96 to 1)	19 fewer per 1000 (from 37 fewer to 0 more)	MODERATE	IMPORTANT
Women's experience: treated with respect by all staff - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	1146/1208 (94.9%)	1113/1165 (95.5%)	RR 0.99 (0.98 to 1.01)	10 fewer per 1000 (from 19 fewer to 10 more)	MODERATE	IMPORTANT
Women's experience: felt safe at all times - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	1105/1208 (91.5%)	1094/1165 (93.9%)	RR 0.97 (0.95 to 1)	28 fewer per 1000 (from 47 fewer to 0 more)	MODERATE	IMPORTANT
Women's experience: good communication from staff - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	1135/1208 (94%)	1094/1165 (93.9%)	RR 1 (0.98 to 1.02)	0 fewer per 1000 (from 19 fewer to 19 more)	MODERATE	IMPORTANT
Women's experience: felt in control - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	824/1208 (68.2%)	794/1165 (68.2%)	RR 1 (0.95 to 1.06)	0 fewer per 1000 (from 34 fewer to 41 more)	MODERATE	IMPORTANT
Women's experience: able to move as much as wanted - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	568/1208 (47%)	589/1165 (50.6%)	RR 0.93 (0.86 to 1.01)	35 fewer per 1000 (from 71 fewer to 5 more)	MODERATE	IMPORTANT

Women's experience: satisfied with position before pushing - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	1050/1208 (86.9%)	996/1165 (85.5%)	RR 1.02 (0.98 to 1.05)	17 more per 1000 (from 17 fewer to 43 more)	MODERATE	IMPORTANT
Women's experience: satisfied with position while pushing - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	1038/1208 (85.9%)	992/1165 (85.2%)	RR 1.01 (0.98 to 1.04)	9 more per 1000 (from 17 fewer to 34 more)	MODERATE	IMPORTANT
Women's experience: expectations for labour and birth were met - Nulliparous women (Better indicated by higher values)												
1 BUMPES 2017	randomised trials	serious[4]	no serious inconsistency	no serious indirectness	no serious imprecision	none	803/1208 (66.5%)	783/1165 (67.2%)	RR 0.99 (0.93 to 1.05)	7 fewer per 1000 (from 47 fewer to 34 more)	MODERATE	IMPORTANT

POR: peto odds ratio; MD: mean difference; RR: risk ratio; IQR: interquartile range

[1] 95% CI crossed one MID
[2] Golara 2002 used a low dose anaesthetic-opioid combined with either epidural or combined spinal-epidural
[3] 95% crosses 2 MIDs
[4] Serious risk of bias in the evidence contributing to the outcomes as per RoB 2

[5] adjusted risk ratio. BUMPES 2017 adjusted effect estimate for spontaneous vaginal birth from BUMPES 2017 has been used for meta-analysis (adjusted for age, ethnicity, diagnosis of delay, nature of the onset of labour)

GRADE tables for review: What is the most effective position for birth in women without an epidural in situ?

Table 10: Evidence profile for comparison 2: Upright versus recumbent positions in women without an epidural in situ

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright positions	Recumbent positions	Relative (95% CI)	Absolute		
Mode of birth: spontaneous vaginal birth - All women (Better indicated by higher values)												
6 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	1240/1407 (88.1%)	1232/1433 (86%)	RR 1.02 (1 to 1.05)	17 more per 1000 (from 0 more to 43 more)	MODERATE	CRITICAL
Mode of birth: spontaneous vaginal birth - Nulliparous women (Better indicated by higher values)												
6 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	982/1135 (86.5%)	924/1115 (82.9%)	RR 1.04 (1.01 to 1.08)	33 more per 1000 (from 8 more to 66 more)	MODERATE	CRITICAL
Mode of birth: spontaneous vaginal birth - Multiparous women (Better indicated by higher values)												
3 (Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	258/267 (96.6%)	308/318 (96.9%)	RR 0.99 (0.96 to 1.02)	10 fewer per 1000 (from 39 fewer to 19 more)	MODERATE	CRITICAL
Mode of birth: Instrumental birth - All women (Better indicated by lower values)												
6 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious	none	157/1346 (11.7%)	192/1377 (13.9%)	RR 0.83 (0.68 to 1.01)	24 fewer per 1000 (from 45 fewer to 1 more)	LOW	CRITICAL
Mode of birth: Instrumental birth - Nulliparous women (Better indicated by lower values)												
6 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	serious[3]	no serious indirectness	serious[2]	none	150/1135 (13.2%)	174/1115 (15.6%)	RR 0.86 (0.7 to 1.05)	22 fewer per 1000 (from 47 fewer to 8 more)	VERY LOW	CRITICAL

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright positions	Recumbent positions	Relative (95% CI)	Absolute		
Mode of birth: Instrumental birth - Multiparous women (Better indicated by lower values)												
3 (Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	serious[3]	no serious indirectness	serious[2]	none	27/270 (10%)	20/317 (6.3%)	RR 1.44 (0.82 to 2.51)	28 more per 1000 (from 11 fewer to 95 more)	VERY LOW	CRITICAL
Mode of birth: caesarean birth - All women (Better indicated by lower values)												
5 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	5/1250 (0.4%)	8/1286 (0.6%)	POR 0.74 (0.25 to 2.24)	2 fewer per 1000 (from 5 fewer to 8 more)	VERY LOW	CRITICAL
Mode of birth: caesarean birth - Nulliparous women (Better indicated by lower values)												
5 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	3/1074 (0.3%)	6/1059 (0.6%)	POR 0.55 (0.15 to 2.04)	3 fewer per 1000 (from 5 fewer to 6 more)	VERY LOW	CRITICAL
Mode of birth: caesarean birth - Multiparous women (Better indicated by lower values)												
2 (Stewart 1983; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	2/171 (1.2%)	2/227 (0.9%)	POR 1.53 (0.2 to 11.42)	5 more per 1000 (from 7 fewer to 83 more)	VERY LOW	CRITICAL
Duration of active 2nd stage - All women (Better indicated by lower values)												
4 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1989)	randomised trials	serious[1]	very serious[5]	no serious indirectness	none	none	1082	1030	-	MD 0.55 lower (2.37 lower to 1.28 higher)	VERY LOW	CRITICAL
Duration of active 2nd stage - Nulliparous women (Better indicated by lower values)												
5 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989)	randomised trials	serious[1]	serious[3]	no serious indirectness	none	none	1024	975	-	MD 1.03 lower (2.93 lower to 0.86 higher)	LOW	CRITICAL

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright positions	Recumbent positions	Relative (95% CI)	Absolute		
Duration of active 2nd stage - Multiparous women (Better indicated by lower values)												
2 (Stewart 1983; Stewart 1989)	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	none	none	152	145	-	MD 0.18 lower (3.26 lower to 2.89 higher)	HIGH	CRITICAL
Genital tract trauma: episiotomy - All women (Better indicated by lower values)												
7 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986; Waldenstrom 1991)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	555/1555 (35.7%)	649/1580 (41.1%)	RR 0.86 (0.79 to 0.94)	58 fewer per 1000 (from 25 fewer to 86 fewer)	LOW	CRITICAL
Genital tract trauma: episiotomy - Nulliparous women (Better indicated by lower values)												
6 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	505/1231 (41%)	566/1207 (46.9%)	RR 0.88 (0.81 to 0.96)	56 fewer per 1000 (from 19 fewer to 89 fewer)	MODERATE	CRITICAL
Genital tract trauma: episiotomy - Multiparous women (Better indicated by lower values)												
3 (Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	29/267 (10.9%)	57/318 (17.9%)	RR 0.62 (0.41 to 0.93)	68 fewer per 1000 (from 13 fewer to 106 fewer)	LOW	CRITICAL
Genital tract trauma: episiotomy - Women adhering to allocated position, Nulliparous (Better indicated by lower values)												
1 (Gardosi 1989b)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	11/54 (20.4%)	27/63 (42.9%)	RR 0.48 (0.26 to 0.87)	223 fewer per 1000 (from 56 fewer to 317 fewer)	LOW	CRITICAL
Genital tract trauma: perineal tear (grade 2 and higher) - All women (Better indicated by lower values)												

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright positions	Recumbent positions	Relative (95% CI)	Absolute		
6 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	serious[3]	no serious indirectness	serious[2]	none	337/1407 (24%)	306/1434 (21.3%)	RR 1.19 (1.05 to 1.36)	41 more per 1000 (from 11 more to 77 more)	VERY LOW	CRITICAL
Genital tract trauma: perineal tear (grade 2 and higher) - Nulliparous women (Better indicated by lower values)												
6 (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	serious[3]	no serious indirectness	serious[2]	none	228/1135 (20.1%)	193/1116 (17.3%)	RR 1.19 (1 to 1.4)	33 more per 1000 (from 0 more to 69 more)	VERY LOW	CRITICAL
Genital tract trauma: perineal tear (grade 2 and higher) - Multiparous women (Better indicated by lower values)												
3 (Stewart 1983; Stewart 1989; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	109/267 (40.8%)	113/318 (35.5%)	RR 1.26 (1.03 to 1.53)	92 more per 1000 (from 11 more to 188 more)	LOW	CRITICAL
Genital tract trauma: perineal tear (grade 2 and higher) - Women adhering to allocated position (Better indicated by lower values)												
1 (Gardosi 1989b)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	19/54 (35.2%)	19/63 (30.2%)	RR 1.17 (0.69 to 1.97)	51 more per 1000 (from 93 fewer to 293 more)	VERY LOW	CRITICAL
Women's experience: Women who agreed they "could move freely" - Nulliparous women (Better indicated by higher values)												
1 (Crowley 1991)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	175/263 (66.5%)	195/289 (67.5%)	RR 0.99 (0.88 to 1.11)	7 fewer per 1000 (from 81 fewer to 74 more)	MODERATE	IMPORTANT
Women's experience: Women who agreed they "felt in control" - Nulliparous women (Better indicated by higher values)												
1 (Crowley 1991)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	190/263 (72.2%)	209/289 (72.3%)	RR 1 (0.9 to 1.11)	0 fewer per 1000 (from 72 fewer to 80 more)	MODERATE	IMPORTANT

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright positions	Recumbent positions	Relative (95% CI)	Absolute		
Women's experience: Women who agreed labour was "unpleasant" - Nulliparous women (Better indicated by lower values)												
1 (Crowley 1991)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	111/263 (42.2%)	127/289 (43.9%)	RR 0.96 (0.79 to 1.16)	18 fewer per 1000 (from 92 fewer to 70 more)	MODERATE	IMPORTANT
Women's experience: Women who reported "severe" pain - Nulliparous women (Better indicated by lower values)												
1 (Crowley 1991)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	16/263 (6.1%)	14/289 (4.8%)	RR 1.26 (0.63 to 2.52)	13 more per 1000 (from 18 fewer to 74 more)	VERY LOW	IMPORTANT
Women's experience: women who reported being "uncomfortable" during 2nd stage - All women (Better indicated by lower values)												
1 (Stewart 1989)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	no serious imprecision	none	0/52 (0%)	10/40 (25%)	RR 0.04 (0 to 0.61)	240 fewer per 1000 (from 97 fewer to 250 fewer)	MODERATE	IMPORTANT
Women's experience: Women's experience of birthing position was "excellent" - All women (Better indicated by higher values)												
1 (Waldenstrom 1991)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	serious[2]	none	94/147 (63.9%)	65/140 (46.4%)	RR 1.38 (1.11 to 1.71)	464 fewer per 1000 (from 464 fewer to 464 fewer)	LOW	IMPORTANT
Apgar score < 7 at 5 minutes - All women (Better indicated by lower values)												
3 (Crowley 1991; Gardosi 1989b; Turner 1986)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	3/933 (0.3%)	6/987 (0.6%)	RR 0.59 (0.16 to 2.11)	2 fewer per 1000 (from 5 fewer to 7 more)	VERY LOW	IMPORTANT
Apgar score < 7 at 5 minutes - Nulliparous women (Better indicated by lower values)												

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright positions	Recumbent positions	Relative (95% CI)	Absolute		
2 (Crowley 1991; Gardosi 1989b)	randomised trials	serious[1]	no serious inconsistency	no serious indirectness	very serious[4]	none	2/707 (0.3%)	4/674 (0.6%)	RR 0.55 (0.12 to 2.49)	3 fewer per 1000 (from 5 fewer to 9 more)	VERY LOW	IMPORTANT
Abnormal fetal heart rate needing intervention - Nulliparous women (Better indicated by lower values)												
1 (Crowley 1991)	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	serious[2]	none	19/634 (3%)	36/596 (6%)	RR 0.5 (0.29 to 0.86)	30 fewer per 1000 (from 8 fewer to 43 fewer)	MODERATE	IMPORTANT

MD: mean difference; POR: peto odds ratio; RR: risk ratio
1 Serious risk of bias in the evidence contributing to the outcomes as per RoB 2
2 95% CI crosses 1 MID
3 Serious heterogeneity
4 95% CI crosses 2 MIDs
5 Very serious heterogeneity

Table 11: Upright positions versus recumbent positions in women with unknown use of epidural

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright positions	Recumbent positions	Relative (95% CI)	Absolute		
Mode of birth: spontaneous birth - All women (Better indicated by higher values)												
1 (Marttila 1983)	randomised trials	no serious risk of bias	no serious inconsistency	serious[1]	no serious imprecision	none	48/50 (96%)	44/50 (88%)	RR 1.09 (0.97 to 1.23)	79 more per 1000 (from 26 fewer to 202 more)	MODERATE	CRITICAL
Mode of birth: instrumental birth - All women (Better indicated by lower values)												

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Upright positions	Recumbent positions	Relative (95% CI)	Absolute		
1 (Marttila 1983)	randomised trials	no serious risk of bias	no serious inconsistency	serious[1]	very serious[2]	none	2/50 (4%)	6/50 (12%)	RR 0.33 (0.07 to 1.57)	80 fewer per 1000 (from 112 fewer to 68 more)	LOW	CRITICAL
Duration of active 2nd stage - Nulliparous women (Better indicated by lower values)												
1 (Marttila 1983)	randomised trials	no serious risk of bias	no serious inconsistency	serious[1]	serious[3]	none	50	50	-	MD 3.2 lower (9.02 lower to 2.62 higher)	LOW	CRITICAL
Duration of active 2nd stage - Multiparous women (Better indicated by lower values)												
1 (Marttila 1983)	randomised trials	no serious risk of bias	no serious inconsistency	serious[1]	serious[3]	none	50	50	-	MD 6.6 higher (1 lower to 14.2 higher)	LOW	CRITICAL
Women's experience: women who reported "intolerable" pain (Better indicated by lower values)												
1 (Marttila 1983)	randomised trials	serious[4]	no serious inconsistency	serious[1]	serious[5]	none	0/50 (0%)	4/50 (8%)	POR 0.13 (0.02 to 0.93)	70 fewer per 1000 (from 6 fewer to 78 fewer)	VERY LOW	IMPORTANT
Women's experience: women who agreed the experience was "unpleasant" (Better indicated by lower values)												
1 (Marttila 1983)	randomised trials	serious[4]	no serious inconsistency	serious[1]	very serious[2]	none	5/50 (10%)	9/50 (18%)	POR 0.56 (0.20 to 1.54)	79 fewer per 1000 (from 144 fewer to 97 more)	LOW	IMPORTANT
Women's experience: women who wished to use the half-sitting position for next birth (Better indicated by higher values)												
1 (Marttila 1983)	randomised trials	serious[4]	no serious inconsistency	serious[1]	serious[5]	none	48/50 (96%)	43/50 (86%)	POR 1.12 (0.98 to 1.27)	103 more per 1000 (from 17 fewer to 232 more)	LOW	IMPORTANT
Abnormal fetal heart rate needing intervention- All women (Better indicated by lower values)												
1 (Marttila 1983)	randomised trials	no serious risk of bias	no serious inconsistency	serious[1]	very serious[2]	none	7/50 (14%)	11/50 (22%)	RR 0.64 (0.27 to 1.51)	79 fewer per 1000 (from 161 fewer to 112 more)	LOW	CRITICAL

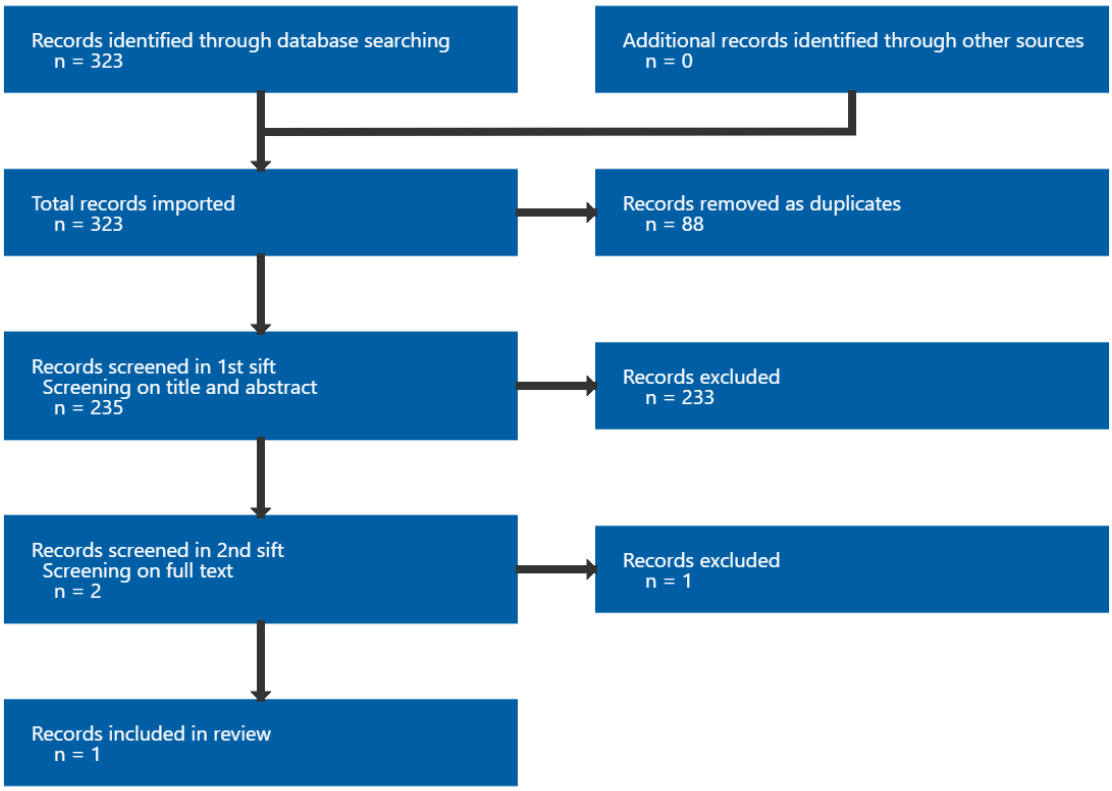
MD: mean difference; POR: peto odds ratio; RR: risk ratio

1 Population is indirect as use of epidural is not reported
2 95% CI crosses 2 MIDs
3 95% CI crosses 1 MID (0.5x control group SD, for 'Duration of active 2nd stage- Nulliparous women' = 7.4; for 'Duration of active 2nd stage- Nulliparous women' = 8.1)
4 Serious risk of bias in the evidence contributing to the outcomes as per RoB 2
5 95% CI crosses 1 MID

Appendix G Economic evidence study selection

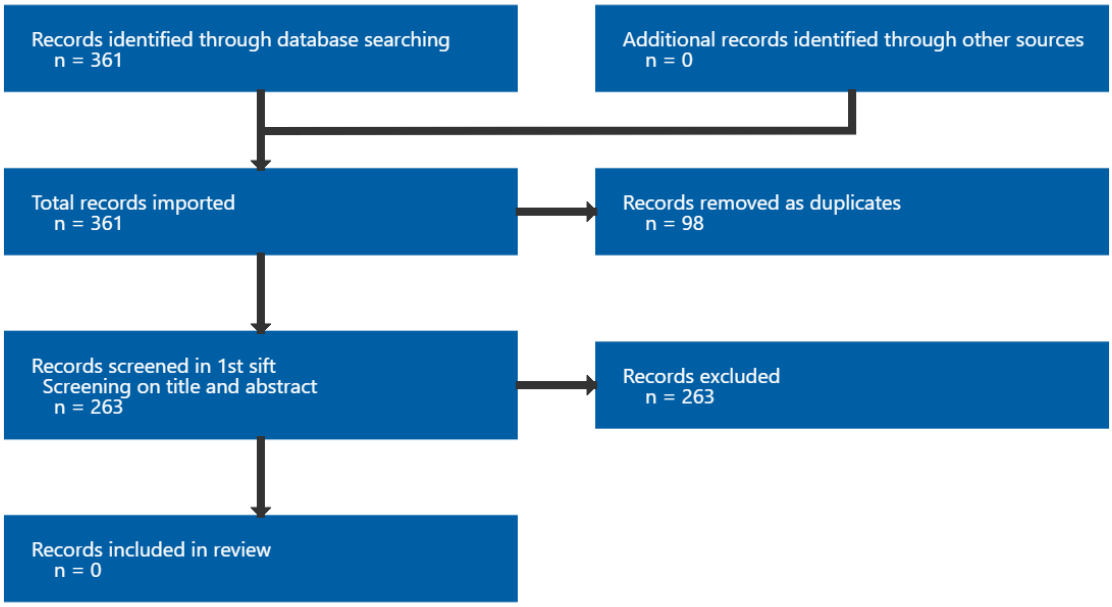
Study selection for: What is the most effective position for birth in women with an epidural in situ?

Figure 10: Study selection flow chart



Study selection for: What is the most effective position for birth in women without an epidural in situ?

Figure 11: Study selection flow chart



Appendix H Economic evidence tables

Economic evidence tables for review question: What is the most effective position for birth in women with an epidural in situ?

Table 12: Economic evidence tables for position for birth in women with an epidural in situ

Study country and type	Intervention and comparator	Study population, design and data sources	Costs and outcomes (descriptions and values)	Results	Comments
Author and year: Bick 2017 **Country:** UK **Type of economic analysis**: Cost analysis **Source of funding:** Health Technology Assessment programme of the National Institute for Health Research	**Intervention:** An upright birth position **Comparator:** A lying-down birth position	**Population characteristics:** nulliparous women with low-dose epidural in the second stage of labour **Modelling approach/alongside an RCT:** Economic data alongside an RCT **Source of baseline data:** Trial control (lying down birth position) **Source of effectiveness data:**	**Mean cost per participant:** Upright: £3,207 (SE: £73) Lying down: £3,252 (SE £82) Difference: -£42 (95% CI: -£254 to £169) **Mean outcome per participant:** Upright: 0.352 SVB (SE: 0.012) Lying-down: 0.411 (SE: 0.012) Difference: -0.059 SVB (SE: 0.02)	**ICERs:** £722 per additional SVB (95% CI: -£2,986 to £6,358)	**Perspective:** NHS **Currency:** GBP **Cost year:** 2013-14 **Time horizon:** 1-year **Discounting**: N/A **Applicability:** Directly applicable **Limitations:** Minor limitations **Other comments:**

Study country and type	Intervention and comparator	Study population, design and data sources	Costs and outcomes (descriptions and values)	Results	Comments
		Comparison of intervention and controls in RCT **Source of cost data:** Information was collected on the use of secondary care from the late stages of labour to hospital discharge and for the first 12 months after birth. **Source of unit cost data:** Personal Social Services Research Unit and NHS Reference Costs 2013-14			Uncertainty was quantified by providing a 95% CI around the ICER and the parameters needed to do this were obtained from multiple imputation analysis. Analysis departed from plan in that QALYs were not estimated. Differences in mode of birth could be expected to lead to a differences between the different birth positions

CI: confidence interval; GBP: Great British Pounds; ICER: Incremental cost-effectiveness ratio; NHS: National Health Service; QALYs: Quality Adjusted Life Years; RCT: randomised controlled trial; SE: standard error; SVB: spontaneous vaginal birth; UK: United Kingdom;

Economic evidence tables for review question: What is the most effective position for birth in women without an epidural in situ?

No evidence was identified which was applicable to this review question.

Appendix I Economic model

Economic model for review question: What is the most effective position for birth in women with an epidural in situ?

No economic analysis was conducted for this review question.

Economic model for review question: What is the most effective position for birth in women without an epidural in situ?

No economic analysis was conducted for this review question.

Appendix J Excluded studies

Excluded studies for review question: What is the most effective position for birth in women with an epidural in situ?

Excluded effectiveness studies

Table 13: Excluded studies and reasons for their exclusion

Study	Reason
(2018) Upright Versus Lying Down Position in Second Stage of Labour in Nulliparous Women with Low Dose Epidural: BUMPES Randomised Controlled Trial. Obstetrical & gynecological survey 73(3): 133-134	- Duplicate
(2018) Upright Versus Lying Down Position in Second Stage of Labour in Nulliparous Women with Low Dose Epidural: BUMPES Randomised Controlled Trial. Obstetrical and Gynecological Survey 73(3): 133-134	- Duplicate
(2018) Upright versus lying down position in second stage of labour in nulliparous women with low dose epidural: BUMPES randomised controlled trial. MIDIRS midwifery digest 28(1): 68-68	- Duplicate
Aguilar, Omar Calvo; Romero, Ana Luisa Flores; Garcia, Victor Edilberto Morales (2013) Comparison of obstetric and perinatal outcomes in childbirth upright posture vs. supine. Ginecologia y Obstetricia de Mexico 81(1): 1-10	- Non-English language study
Amini, L., Jamshidi, R., Kashanian, M. et al. (2011) The effect of sitting position during labour on 3rd stage duration and postpartum haemorrhage. Journal of Obstetrics and Gynaecology 31(suppl1): 33-34	- Conference abstract
Amiri Farahani, L.; Shirazi, V.; Rajabalipoor, F. (2012) The effects of different positioning on the duration of the second stage of labor in primiparous women. Journal of zanjan university of medical sciences and health services 20(80): 11	- Non-English language study
Anonymous (1999) Hands/knees posture in late pregnancy or labour for malposition (lateral or posterior) of the presenting part. The practising midwife 2(4): 10-1	- Outcome not in PICO Systematic review reporting the outcome of fetal position from one trial comparing hands and knees position to sitting
Bahmaei, K., Iravani, M., Moosavi, P. et al. (2018) Effect of maternal positioning with occipito-posterior fetal position during labor on pain intensity and satisfaction of mothers. Iranian journal of obstetrics, gynecology and infertility 21(5): 66-73	- Non-English language study
Berta, Marta, Lindgren, Helena, Christensson, Kyllike et al. (2019) Effect of maternal birth positions on duration of second stage of labor:	- Population not in PICO Systematic review does not exclude studies in which women did not receive epidural and does

Study	Reason
Systematic review and meta-analysis. BMC Pregnancy and Childbirth 19(1): 466	not perform subgroup analysis; induction of labour not reported; individual studies checked for eligibility
Bhardwaj, N. (1994) Randomised controlled trial on modified squatting position of birthing. International journal of gynaecology and obstetrics 46: 118	- Unable to retrieve
Bhardwaj, N., Kukade, J. A., Patil, S. et al. (1995) Randomised controlled trial on modified squatting position of delivery. Indian journal of maternal and child health 6(2): 33-39	- Unable to retrieve
Bick, D., Briley, A., Brocklehurst, P. et al. (2016) A multicentre, randomised controlled trial of position during the late stages of labour in women with an epidural-(BUMPES). BJOG 123: 61	- Conference abstract
Bick, D., Briley, A., Brocklehurst, P. et al. (2017) A multicentre, randomised controlled trial of position during the late stages of labour in nulliparous women with an epidural: clinical effectiveness and an economic evaluation (BUMPES). Health technology assessment (Winchester, England) 21(65): 1-176	- Duplicate
Bick, D., Shennan, A., Briley, A. et al. (2016) A multicentre, randomised controlled trial of position during the late stages of labour in women with an epidural-(BUMPES). BJOG: An International Journal of Obstetrics and Gynaecology 123(supplement2): 61	- Duplicate
Bomfim-Hyppolito, S. (1998) Influence of the position of the mother at delivery over some maternal and neonatal outcomes. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics 63suppl1: S67-73	- Study conducted in a low or middle income country Study conducted in Brazil
Bonoan, M. J.; Otayza, M. L.; Garcia, G. (1997) Acceptability of an indiginous birthing position using a filipino-improvised birthing chair - a third world tertiary care center prospective trial. Acta obstetricia ET gynecologica scandinavica 76(167): 45	- Study conducted in a low or middle income country Study conducted in the Philippines
Brocklehurst, P., Rivero-Arias, O., Eddama, O. et al. (2016) A multicentre, randomised controlled trial of position during the late stages of labour in women with an epidural-(BUMPES). BJOG: An International Journal of Obstetrics and Gynaecology 123(suppl1): 11	- Conference abstract
Brément, S., Mossan, S., Belery, A. et al. (2007) Delivery in lateral position. Randomized clinical trial comparing the maternal positions in lateral position and dorsal position for the second stage of labour. Gynecologie, obstetrique & fertilite 35(78): 637-644	- Non-English language study
Bueno-Lopez, Vanessa, Falgueras-Serrano, Ana Maria, Crespo-Berros, Silvia et al. (2018)	- Comparator not in PICO

Study	Reason
Efficiency of the modified Sims maternal position in the rotation of persistent occiput posterior position during labor: A randomized clinical trial. Birth (Berkeley, Calif.) 45(4): 385-392	Study compares a modified lateral position with any other position (control group not clearly defined)
Calvo Aguilar, O.; Flores Romero, A. L.; Morales García, V. E. (2013) Comparison of obstetric and perinatal results of childbirth vertical position vs. childbirth supine position. Ginecologia y obstetricia de Mexico 81(1): 1-10	- Non-English language study
Cameron, Carolyn A., Torvaldsen, Siranda, Algert, Charles S. et al. (2005) A meta-analysis of upright positions in the second stage to reduce instrumental deliveries in women with epidural analgesia. Acta Obstetricia et Gynecologica Scandinavica 84(8): 794-798	- Intervention not in PICO Systematic review includes studies in which position was only maintained in the 1st stage of labour
Carbonne, B., Benachi, A., Leveque, M. L. et al. (1996) Maternal position during labor: effects on fetal oxygen saturation measured by pulse oximetry. Obstetrics and gynecology 88(5): 797-800	- Comparator not in PICO Study compares different recumbent positions
Chang, Su-Chuan, Lin, Lie-Chu, Chou, Min-Min et al. (2011) Effects of a pushing intervention on pain, fatigue and birthing experiences among Taiwanese women during the second stage of labour. Midwifery 27(6): 825-831	- Study design Study is not a parallel RCT (data for experimental and control groups collected at different times)
Christensson, Kyllike, Thies-Lagergren, Li, Kvist, Linda J. et al. (2011) No reduction in instrumental vaginal births and no increased risk for adverse perineal outcome in nulliparous women giving birth on a birth seat: Results of a Swedish randomized controlled trial. BMC Pregnancy and Childbirth 11: 22	- Comparator not in PICO Comparator not in PICO as women who gave birth in sitting position compared to women who gave birth in 'any other position' (control group not clearly defined).
Christensson, Kyllike, Thies-Lagergren, Li, Kvist, Linda J. et al. (2012) Striving for scientific stringency: A re-analysis of a randomised controlled trial considering first-time mothers' obstetric outcomes in relation to birth position. BMC Pregnancy and Childbirth 12: 135	- Comparator not in PICO Comparator not in PICO as women who gave birth in sitting position compared to women who gave birth in 'any other position' (control group not clearly defined)
Cuerva Carvajal, A. and Marquez Calderon, S. (2006) [Expulsion stage of delivery: comparison of upright versus lying down positions for childbirth, through maternal and foetal outcomes].	- Non-English language study
Danilenko-Dixon, D. R., Tefft, L., Cohen, R. A. et al. (1996) Positional effects on maternal cardiac output during labor with epidural analgesia. American journal of obstetrics and gynecology 175(4pt1): 867-72	- Comparator not in PICO Study compares two recumbent positions
De Jong, P. R., Johanson, R. B., Baxen, P. et al. (1997) Randomised trial comparing the upright and supine positions for the second stage of labour. British Journal of Obstetrics and Gynaecology 104(5): 567-571	- Duplicate
de Jong, P. R., Johanson, R. B., Baxen, P. et al. (1997) Randomised trial comparing the upright	- Study conducted in a low or middle income country

Study	Reason
and supine positions for the second stage of labour. British journal of obstetrics and gynaecology 104(5): 567-71	Study conducted in South Africa
de Jong, P. R., Johanson, R., Baxen, P. et al. (1995) St Monica's randomized controlled trial of upright vs dorsal position for the second stage of labour. 27th british congress of obstetrics and gynaecology;1995 july 4-7; dublin, ireland: abstractno493	- Conference abstract
De Jonge, A.; Teunissen, T. A. M.; Lagro-Janssen, A. L. M. (2004) Supine position compared to other positions during the second stage of labor: a meta-analytic review. Journal of psychosomatic obstetrics and gynaecology 25(1): 35-45	- Comparator not in PICO Position in control group not defined. Study compares supine position to 'any other position'
Dokmak, Fatima, Michalek, Irmina Maria, Boulvain, Michel et al. (2020) Squatting position in the second stage of labor: A systematic review and meta-analysis. European journal of obstetrics, gynecology, and reproductive biology 254: 147-152	- Population not in PICO Systematic review does not exclude studies in which women did not receive epidural and does not perform subgroup analysis; individual studies checked for eligibility
Downe, Soo; Gerrett, David; Renfrew, Mary J. (2004) A prospective randomised trial on the effect of position in the passive second stage of labour on birth outcome in nulliparous women using epidural analgesia. Midwifery 20(2): 157-68	Intervention is not applicable to the review question. Women received bolus doses of epidural (not low dose infusion epidurals which are the current standard of care).
Eason, E. (1999) Randomised trial comparing the upright and supine positions for the second stage of labour. British journal of obstetrics and gynaecology 106(3): 291-2	- Letter to editor
Ekstrom, Asa, Olsson, Sven-Eric, Ragnar, Inga et al. (2007) Anal sphincter lacerations and upright delivery postures - A risk analysis from a randomized controlled trial. International Urogynecology Journal 18(2): 141-146	- Comparator not in PICO Study compares two upright positions
Farahani, L. A.; Ali Pour, F. R.; Shirazi, V. (2012) Effect of different birthing positions during the second stage of labor on mother's experiences regarding birth, pain, anxiety and fatigue. Journal of mazandaran university of medical sciences 22(95): 75-83	- Non-English language study
Frenea, Stephane, Chirossel, Christine, Rodriguez, Raphael et al. (2004) The effects of prolonged ambulation on labor with epidural analgesia. Anesthesia and analgesia 98(1): 224-229	- Intervention not in PICO Intervention compares ambulation and recumbent position during the first stage of labour
Gupta, J. K. and Hofmeyr, G. J. (2004) Position for women during second stage of labour. Cochrane database of systematic reviews (Online): cd002006	- Duplicate
Gupta, J. K. and Nikodem, V. C. (2000) Woman's position during second stage of labour. Cochrane database of systematic reviews (Online): cd002006	- Duplicate

Study	Reason
Gupta, Janesh K., Sood, Akanksha, Hofmeyr, G. Justus et al. (2017) Position in the second stage of labour for women without epidural anaesthesia. Cochrane Database of Systematic Reviews 2017(5): cd002006	- Population not in PICO Systematic review includes studies conducted in low or middle income countries
Hodnett, Ellen D., Weston, Julie, Stremler, Robyn et al. (2013) Repeated hands-and-knees positioning during labour: A randomized pilot study. PeerJ 2013(1): e25	- Comparator not in PICO Position in control group was woman's choice
Hofmeyr, G. Justus, Vogel, Joshua P., Singata, Mandisa et al. (2018) Does gentle assisted pushing or giving birth in the upright position reduce the duration of the second stage of labour? A three-arm, open-label, randomised controlled trial in South Africa. BMJ global health 3(3): e000906	- Study conducted in a low or middle income country Study conducted in South Africa
Jahdi, Freshteh, Shahnazari, Maryam, Kashanian, Maryam et al. (2011) A randomized controlled trial comparing the physiological and directed pushing on the duration of the second stage of labor, the mode of delivery and apgar score. International Journal of Collaborative Research on Internal Medicine and Public Health 3(2): 159-165	- Study conducted in a low or middle income country Study conducted in Iran
Kafka, M., Riss, P., von Trotsenburg, M. et al. (1994) The birthing stool--an obstetrical risk?. Geburtshilfe und Frauenheilkunde 54(9): 529-531	- Non-English language study
Karraz MA (2003) Ambulatory epidural anesthesia and the duration of labor. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics 80(2): 117-122	- Intervention not in PICO Intervention is during 1st stage of labour only
Kemp, Emily, Kingswood, Claire J., Kibuka, Marion et al. (2013) Position in the second stage of labour for women with epidural anaesthesia. Cochrane Database of Systematic Reviews 2013(1): cd008070	- Duplicate Earlier version of Cochrane review
Kibuka, Marion and Thornton, Jim G. (2017) Position in the second stage of labour for women with epidural anaesthesia. The Cochrane database of systematic reviews 2: cd008070	- Duplicate Earlier version of Walker 2018
Leila, Amini, Shayesteh, Jahanfar, Maryam, Kashanian et al. (2010) Sitting position: A right way to reduce labour pain with shortening duration of labor. Journal of Psychosomatic Obstetrics and Gynecology 31(suppl1): 104	- Conference abstract
Levy, Ariel T., Weingarten, Sarah, Ali, Ayesha et al. (2021) Hands-and-knees posturing and fetal occiput anterior position: a systematic review and meta-analysis. American Journal of Obstetrics and Gynecology MFM 3(4): 100346	- Population not in PICO Systematic review does not exclude studies in which women did not receive epidural and does not perform subgroup analysis; individual studies checked for eligibility

Study	Reason
Levy, Ariel, Ali, Ayesha, Quist-Nelson, Johanna et al. (2021) 512 Hands-and-knees position and incidence of occiput anterior position at birth: a systematic review and meta-analysis. American Journal of Obstetrics and Gynecology 224(2supplement): 323	- Conference abstract
Moraloglu, Ozlem, Kansu-Celik, Hatice, Tasci, Yasemin et al. (2017) The influence of different maternal pushing positions on birth outcomes at the second stage of labor in nulliparous women. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians 30(2): 245-249	- Study conducted in a low or middle income country Study conducted in Turkey
Nasir, Ayesha; Korejo, Razia; Noorani, K. J. (2007) Child birth in squatting position. JPMA. The Journal of the Pakistan Medical Association 57(1): 19-22	- Study conducted in a low or middle income country Study conducted in Pakistan
Pizzagalli, F. (2020) Normal childbirth: physiologic labor support and medical procedures. Guidelines of the French National Authority for Health (HAS) with the collaboration of the French College of Gynaecologists and Obstetricians (CNGOF) and the French College of Midwives (CNSF) - Maternal postures during the second stage of labour, delivery techniques and perineal protection. Gynecologie Obstetrique Fertilite et Senologie 48(12): 931-943	- Non-English language study
Plaat, F.; Golara, M.; Shennan, A. (1996) Upright vs recumbent position with mobile extradurals in the early second stage of labour. British journal of anaesthesia 76: 102	- Conference abstract
Plaat, F.; Golara, M.; Shennan, A. (1996) Upright versus recumbent position with mobile extradurals in the early second stage of labour. Br-j-anaesth 76suppl2: 102	- Conference abstract
Priddis, Holly; Dahlen, Hannah; Schmied, Virginia (2012) What are the facilitators, inhibitors, and implications of birth positioning? A review of the literature. Women and birth : journal of the Australian College of Midwives 25(3): 100-6	- Population not in PICO Systematic review does not exclude studies in which women did not receive epidural and does not perform subgroup analysis; individual studies checked for eligibility
Racinet, C., Eymery, P., Philibert, L. et al. (1999) Delivery in the squatting position. A randomized trial comparing the squatting position and the lithotomy position for the expulsion phrase. Journal de gynecologie, obstetrique ET biologie de la reproduction 28(3): 263-270	- Non-English language study
Racinet, C., Eymery, P., Philibert, L. et al. (1999) [Labor in the squatting position. Journal de gynecologie, obstetrique et biologie de la reproduction 28(3): 263-270	- Non-English language study

Study	Reason
Ragnar, I., Altman, D., Tyden, T. et al. (2006) Comparison of the maternal experience and duration of labour in two upright delivery positions--a randomised controlled trial. BJOG : an international journal of obstetrics and gynaecology 113(2): 165-70	- Comparator not in PICO Study compares two upright positions
Raulli, A. (2001) The use of birth stools during second stage labour and the risk of perineal trauma.	- Conference abstract
Rocha, Bruna Dedavid da, Zamberlan, Claudia, Pivetta, Hedioneia Maria Foletto et al. (2020) Upright positions in childbirth and the prevention of perineal lacerations: a systematic review and meta-analysis. Posicoes verticalizadas no parto e a prevencao de laceracoes perineais: revisao sistematica e metanalise. 54: e03610	- Comparator not in PICO Systematic review of studies comparing upright positions
Roth, Cheryl, Dent, Sarah A., Parfitt, Sheryl E. et al. (2016) Randomized Controlled Trial of Use of the Peanut Ball During Labor. MCN. The American journal of maternal child nursing 41(3): 140-6	- Intervention not in PICO Study does not compare upright to recumbent positions
Schirmer, J.; Fustinoni, S. M.; Basile, Aldo (2011) Perineal outcomes on the left lateral versus vertical semi-sitting birth positions: a randomized study. Acta paulista de enfermagem 24(6): 745-750	- Study conducted in a low or middle income country Study conducted in Brazil
Shedmake, Priyanka Vijay and Wakode, S. R. (2021) A Hospital-Based Randomized Controlled Trial-Comparing the Outcome of Normal Delivery Between Squatting and Lying Down Positions During Labour. Journal of obstetrics and gynaecology of India 71(4): 393-398	- Study conducted in a low or middle income country Study conducted in India
Simarro, M., Salinas, C., Martinez, A. et al. (2011) Effects of postural changes during the second stage of labor among women with epidural analgesia. International Urogynecology Journal and Pelvic Floor Dysfunction 22(suppl1): S13-S14	- Intervention not in PICO Study compares different postural changes (both upright and recumbent positions) to recumbent position
Stremler, R. L. (2003) The labour position trial: a randomized, controlled trial of hands and knees positioning for women labouring with a fetus in occipitoposterior position. Dissertation/ thesis: 163p	- Thesis paper
Theron, A., Baraz, R., Thorp-Jones, D. et al. (2011) Does position in the passive second stage of labour affect birth outcome in nulliparous women using epidural analgesia. International Journal of Obstetric Anesthesia 20(suppl1): 12	- Conference abstract
Thies-Lagergren, L., Christensson, K., Kvist, L. J. et al. (2011) Maternal outcomes in nulliparous women who gave vaginal birth on a birth seat or in any other position: Results of a randomised	- Conference abstract

Study	Reason
controlled trial in Sweden. Journal of Paediatrics and Child Health 47(suppl1): 36-37	
Thies-Lagergren, L., Kvist, L. J., Sandin-Bojo, A. K. et al. (2012) Augmentation of labour and fetal outcomes in relation to birth positions: A secondary analysis of an RCT evaluating birth seat births. Journal of Paediatrics and Child Health 48(suppl1): 101-102	- Conference abstract
Thies-Lagergren, L., Kvist, Linda J., Sandin-Bojo, Ann-Kristin et al. (2013) Labour augmentation and fetal outcomes in relation to birth positions: a secondary analysis of an RCT evaluating birth seat births. Midwifery 29(4): 344-350	- Comparator not in PICO Position for birth in control group not sufficiently defined
Valiani, Mahboubeh; Rezaie, Mehri; Shahshahan, Zahra (2016) Comparative study on the influence of three delivery positions on pain intensity during the second stage of labor. Iranian journal of nursing and midwifery research 21(4): 372-8	- Study conducted in a low or middle income country Study conducted in Iran
Vaziri, Farideh, Moshfeghy, Zeinab, Arzhe, Amene et al. (2016) Spontaneous pushing in lateral position versus Valsalva maneuver during second stage of labor on maternal and fetal outcomes: A randomized clinical trial. Iranian Red Crescent Medical Journal 18(10): e29279	- Comparator not in PICO Study compares different pushing techniques in two recumbent positions (lateral and supine)
Waldenström, U. and Gottval, K. (1994) Randomized trial of birthing stool or conventional semi-recumbent position for second-stage labor. Jordemodern 107(78): 261-265	- Population not in PICO Included in review for position of birth in women without epidural analgesia
Walker, C., Rodriguez, T., Herranz, A. et al. (2011) Second stage of labor with postural change and lateral position in women with epidural analgesia: A randomized controlled trial. International Urogynecology Journal and Pelvic Floor Dysfunction 22(suppl1): S11-S12	- Comparator not in PICO Study compares two recumbent positions (lateral vs lithotomy position)
Walker, Kate F., Thornton, Jim G., Jones, Nia W. et al. (2018) Maternal position in the second stage of labour for women with epidural anaesthesia. Cochrane Database of Systematic Reviews 2018(11): cd008070	- Intervention not in PICO Review does not exclude studies in which the position was not maintained into second stage or studies which compare a postural changes intervention; individual studies checked for eligibility
Zang, Yu, Lu, Hong, Zhang, Huixin et al. (2021) Benefits and risks of upright positions during the second stage of labour: An overview of systematic reviews. International journal of nursing studies 114: 103812	- Study design Overview of systematic reviews; included systematic reviews checked for eligibility
Zang, Yu, Lu, Hong, Zhao, Yang et al. (2020) Effects of flexible sacrum positions during the second stage of labour on maternal and neonatal outcomes: A systematic review and meta-analysis. Journal of clinical nursing 29(1718): 3154-3169	- Intervention not in PICO Intervention is flexible sacrum positions which include both upright positions and lateral positions compared to recumbent positions

Study	Reason
Zhang, H., Huang, S., Guo, X. et al. (2017) A randomised controlled trial in comparing maternal and neonatal outcomes between hands-and-knees delivery position and supine position in China. Midwifery 50: 117-124	- Study conducted in a low or middle income country Study conducted in China
Zhang, Hong-Yu, Shu, Rong, Cai, Wen-Zhi et al. (2016) Comparing maternal and neonatal outcomes between hands-and-knees delivery position and supine position. International Journal of Nursing Sciences 3(2): 178-184	- Study conducted in a low or middle income country Study conducted in China

Excluded economic studies

Table 14: Excluded studies and reasons for exclusion

Study	Code [Reason]
Packer, Claire, Hersh, Alyssa R., Greiner, Karen S. et al. (2019) Recumbent Versus Upright Positioning during Labor with an Epidural: A Cost-Effectiveness Analysis. Obstetrics and Gynecology 133(suppl1)	- Conference abstract

Excluded studies for review question: What is the most effective position for birth in women without an epidural in situ?

Excluded effectiveness studies

Table 15: Excluded studies and reasons for their exclusion

Study	Reason
(2018) Upright Versus Lying Down Position in Second Stage of Labour in Nulliparous Women with Low Dose Epidural: BUMPES Randomised Controlled Trial. Obstetrical & gynecological survey 73(3): 133-134	- Duplicate
(2018) Upright Versus Lying Down Position in Second Stage of Labour in Nulliparous Women with Low Dose Epidural: BUMPES Randomised Controlled Trial. Obstetrical and Gynecological Survey 73(3): 133-134	- Duplicate
(2018) Upright versus lying down position in second stage of labour in nulliparous women with low dose epidural: BUMPES randomised controlled trial. MIDIRS midwifery digest 28(1): 68-68	- Duplicate
Aguilar, Omar Calvo; Romero, Ana Luisa Flores; Garcia, Victor Edilberto Morales (2013) Comparison of obstetric and perinatal outcomes in childbirth upright posture vs. supine. Ginecologia y Obstetricia de Mexico 81(1): 1-10	- Non-English language study
Amini, L., Jamshidi, R., Kashanian, M. et al. (2011) The effect of sitting position during labour on 3rd stage duration and postpartum haemorrhage. Journal of Obstetrics and Gynaecology 31(suppl1): 33-34	- Conference abstract
Amiri Farahani, L.; Shirazi, V.; Rajabalipoor, F. (2012) The effects of different positioning on the duration of the second stage of labor in primiparous women. Journal of zanjan university of medical sciences and health services 20(80): 11	- Non-English language study

Study	Reason
Anonymous (1999) Hands/knees posture in late pregnancy or labour for malposition (lateral or posterior) of the presenting part. The practising midwife 2(4): 10-1	- Outcome not in PICO Systematic review reporting the outcome of fetal position from one trial comparing hands and knees position to sitting
Bahmaei, K., Iravani, M., Moosavi, P. et al. (2018) Effect of maternal positioning with occipito-posterior fetal position during labor on pain intensity and satisfaction of mothers. Iranian journal of obstetrics, gynecology and infertility 21(5): 66-73	- Non-English language study
Berta, Marta, Lindgren, Helena, Christensson, Kyllike et al. (2019) Effect of maternal birth positions on duration of second stage of labor: Systematic review and meta-analysis. BMC Pregnancy and Childbirth 19(1): 466	- Population not in PICO Systematic review does not exclude studies in which women did not receive epidural and does not perform subgroup analysis; induction of labour not reported; individual studies checked for eligibility
Bhardwaj, N. (1994) Randomised controlled trial on modified squatting position of birthing. International journal of gynaecology and obstetrics 46: 118	- Unable to retrieve
Bhardwaj, N., Kukade, J. A., Patil, S. et al. (1995) Randomised controlled trial on modified squatting position of delivery. Indian journal of maternal and child health 6(2): 33-39	- Unable to retrieve
Bick, D., Briley, A., Brocklehurst, P. et al. (2016) A multicentre, randomised controlled trial of position during the late stages of labour in women with an epidural-(BUMPES). BJOG 123: 61	- Conference abstract
Bick, D., Briley, A., Brocklehurst, P. et al. (2017) A multicentre, randomised controlled trial of position during the late stages of labour in nulliparous women with an epidural: clinical effectiveness and an economic evaluation (BUMPES). Health technology assessment (Winchester, England) 21(65): 1-176	- Duplicate
Bick, D., Shennan, A., Briley, A. et al. (2016) A multicentre, randomised controlled trial of position during the late stages of labour in women with an epidural-(BUMPES). BJOG: An International Journal of Obstetrics and Gynaecology 123(supplement2): 61	- Duplicate
Bomfim-Hyppolito, S. (1998) Influence of the position of the mother at delivery over some maternal and neonatal outcomes. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics 63suppl1: S67-73	- Study conducted in a low or middle income country Study conducted in Brazil
Bonoan, M. J.; Otayza, M. L.; Garcia, G. (1997) Acceptability of an indiginous birthing position using a filipino-improvised birthing chair - a third world tertiary care center prospective trial. Acta obstetricia ET gynecologica scandinavica 76(167): 45	- Study conducted in a low or middle income country Study conducted in the Philippines
Brocklehurst, P., Rivero-Arias, O., Eddama, O. et al. (2016) A multicentre, randomised controlled trial of position during the late stages of labour in women with an epidural-(BUMPES). BJOG: An International Journal of Obstetrics and Gynaecology 123(suppl1): 11	- Conference abstract

Study	Reason
Brément, S., Mossan, S., Belery, A. et al. (2007) Delivery in lateral position. Randomized clinical trial comparing the maternal positions in lateral position and dorsal position for the second stage of labour. Gynecologie, obstetrique & fertilite 35(78): 637-644	- Non-English language study
Bueno-Lopez, Vanessa, Falgueras-Serrano, Ana Maria, Crespo-Berros, Silvia et al. (2018) Efficiency of the modified Sims maternal position in the rotation of persistent occiput posterior position during labor: A randomized clinical trial. Birth (Berkeley, Calif.) 45(4): 385-392	- Comparator not in PICO Study compares a modified lateral position with any other position (control group not clearly defined)
Calvo Aguilar, O.; Flores Romero, A. L.; Morales García, V. E. (2013) Comparison of obstetric and perinatal results of childbirth vertical position vs. childbirth supine position. Ginecologia y obstetricia de Mexico 81(1): 1-10	- Non-English language study
Cameron, Carolyn A., Torvaldsen, Siranda, Algert, Charles S. et al. (2005) A meta-analysis of upright positions in the second stage to reduce instrumental deliveries in women with epidural analgesia. Acta Obstetricia et Gynecologica Scandinavica 84(8): 794-798	- Intervention not in PICO Systematic review includes studies in which position was only maintained in the 1st stage of labour
Carbonne, B., Benachi, A., Leveque, M. L. et al. (1996) Maternal position during labor: effects on fetal oxygen saturation measured by pulse oximetry. Obstetrics and gynecology 88(5): 797-800	- Comparator not in PICO Study compares different recumbent positions
Chang, Su-Chuan, Lin, Lie-Chu, Chou, Min-Min et al. (2011) Effects of a pushing intervention on pain, fatigue and birthing experiences among Taiwanese women during the second stage of labour. Midwifery 27(6): 825-831	- Study design Study is not a parallel RCT (data for experimental and control groups collected at different times)
Christensson, Kyllike, Thies-Lagergren, Li, Kvist, Linda J. et al. (2011) No reduction in instrumental vaginal births and no increased risk for adverse perineal outcome in nulliparous women giving birth on a birth seat: Results of a Swedish randomized controlled trial. BMC Pregnancy and Childbirth 11: 22	- Comparator not in PICO Comparator not in PICO as women who gave birth in sitting position compared to women who gave birth in 'any other position' (control group not clearly defined).
Christensson, Kyllike, Thies-Lagergren, Li, Kvist, Linda J. et al. (2012) Striving for scientific stringency: A re-analysis of a randomised controlled trial considering first-time mothers' obstetric outcomes in relation to birth position. BMC Pregnancy and Childbirth 12: 135	- Comparator not in PICO Comparator not in PICO as women who gave birth in sitting position compared to women who gave birth in 'any other position' (control group not clearly defined).
CTRI/2022/04/041740 (2022) A Clinical Trial to Determine the Effects of Upright Position on Labour Outcomes. https://trialsearch.who.int/Trial2.aspx?TrialID=CTRI/2022/04/041740	- Study conducted in a low or middle income country Conducted in India
CTRI/2022/05/042671 (2022) impact of mothers birthing position on mother and child outcome. https://trialsearch.who.int/Trial2.aspx?TrialID=CTRI/2022/05/042671	- Study conducted in a low or middle income country Conducted in India

Study	Reason
Cuerva Carvajal, A. and Marquez Calderon, S. (2006) [Expulsion stage of delivery: comparison of upright versus lying down positions for childbirth, through maternal and foetal outcomes].	- Non-English language study
Danilenko-Dixon, D. R., Tefft, L., Cohen, R. A. et al. (1996) Positional effects on maternal cardiac output during labor with epidural analgesia. American journal of obstetrics and gynecology 175(4pt1): 867-72	- Comparator not in PICO Study compares two recumbent positions
De Jong, P. R., Johanson, R. B., Baxen, P. et al. (1997) Randomised trial comparing the upright and supine positions for the second stage of labour. British Journal of Obstetrics and Gynaecology 104(5): 567-571	- Duplicate
de Jong, P. R., Johanson, R. B., Baxen, P. et al. (1997) Randomised trial comparing the upright and supine positions for the second stage of labour. British journal of obstetrics and gynaecology 104(5): 567-71	- Study conducted in a low or middle income country Study conducted in South Africa
de Jong, P. R., Johanson, R., Baxen, P. et al. (1995) St Monica's randomized controlled trial of upright vs dorsal position for the second stage of labour. 27th british congress of obstetrics and gynaecology;1995 july 4-7; dublin, ireland: abstractno493	- Conference abstract
De Jonge, A.; Teunissen, T. A. M.; Lagro-Janssen, A. L. M. (2004) Supine position compared to other positions during the second stage of labor: a meta-analytic review. Journal of psychosomatic obstetrics and gynaecology 25(1): 35-45	- Comparator not in PICO Position in control group not defined. Study compares supine position to 'any other position'
Dokmak, Fatima, Michalek, Irmina Maria, Boulvain, Michel et al. (2020) Squatting position in the second stage of labor: A systematic review and meta-analysis. European journal of obstetrics, gynecology, and reproductive biology 254: 147-152	- Population not in PICO Systematic review does not exclude studies in which women did not receive epidural and does not perform subgroup analysis; individual studies checked for eligibility
Downe, Soo; Gerrett, David; Renfrew, Mary J. (2004) A prospective randomised trial on the effect of position in the passive second stage of labour on birth outcome in nulliparous women using epidural analgesia. Midwifery 20(2): 157-68	- Population not in PICO Study conducted pre-date cut-off (1993) and women received bolus doses of epidural (not low dose infusion epidurals which are the current standard of care)
Eason, E. (1999) Randomised trial comparing the upright and supine positions for the second stage of labour. British journal of obstetrics and gynaecology 106(3): 291-2	- Letter to editor
Ekstrom, Asa, Olsson, Sven-Eric, Ragnar, Inga et al. (2007) Anal sphincter lacerations and upright delivery postures - A risk analysis from a randomized controlled trial. International Urogynecology Journal 18(2): 141-146	- Comparator not in PICO Study compares two upright positions
Farahani, L. A.; Ali Pour, F. R.; Shirazi, V. (2012) Effect of different birthing positions during the second stage of labor on mother's experiences regarding birth, pain, anxiety and fatigue. Journal of mazandaran university of medical sciences 22(95): 75-83	- Non-English language study
Frenea, Stephane, Chirossel, Christine, Rodriguez, Raphael et al. (2004) The effects of prolonged ambulation on labor with epidural analgesia. Anesthesia and analgesia 98(1): 224-229	- Intervention not in PICO Intervention compares ambulation and

Study	Reason
	recumbent position during the first stage of labour
Gupta, J. K. and Hofmeyr, G. J. (2004) Position for women during second stage of labour. Cochrane database of systematic reviews (Online): cd002006	- Duplicate
Gupta, J. K. and Nikodem, V. C. (2000) Woman's position during second stage of labour. Cochrane database of systematic reviews (Online): cd002006	- Duplicate
Hodnett, Ellen D., Weston, Julie, Stremler, Robyn et al. (2013) Repeated hands-and-knees positioning during labour: A randomized pilot study. PeerJ 2013(1): e25	- Comparator not in PICO Position in control group was woman's choice
Hofmeyr, G. Justus, Vogel, Joshua P., Singata, Mandisa et al. (2018) Does gentle assisted pushing or giving birth in the upright position reduce the duration of the second stage of labour? A three-arm, open-label, randomised controlled trial in South Africa. BMJ global health 3(3): e000906	- Study conducted in a low or middle income country Study conducted in South Africa
IRCT20091001002531N5 (2021) Comparison of maternal and neonatal outcomes between two delivery positions. https://trialsearch.who.int/Trial2.aspx?TrialID=IRCT20091001002531N5	- Study conducted in a low or middle income country Conducted in Iran
IRCT20220306054201N1 (2022) effectiveness of maternal lunge position on rotation of posterior fetal occipital position and delivery outcome. https://trialsearch.who.int/Trial2.aspx?TrialID=IRCT20220306054201N1	- Study conducted in a low or middle income country Conducted in Iran
Jahdi, Freshteh, Shahnazari, Maryam, Kashanian, Maryam et al. (2011) A randomized controlled trial comparing the physiological and directed pushing on the duration of the second stage of labor, the mode of delivery and apgar score. International Journal of Collaborative Research on Internal Medicine and Public Health 3(2): 159-165	- Study conducted in a low or middle income country Study conducted in Iran
Kafka, M., Riss, P., von Trotsenburg, M. et al. (1994) The birthing stool--an obstetrical risk?. Geburtshilfe und Frauenheilkunde 54(9): 529-531	- Non-English language study
Karraz MA (2003) Ambulatory epidural anesthesia and the duration of labor. International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics 80(2): 117-122	- Intervention not in PICO Intervention is during 1st stage of labour only
Kemp, Emily, Kingswood, Claire J., Kibuka, Marion et al. (2013) Position in the second stage of labour for women with epidural anaesthesia. Cochrane Database of Systematic Reviews 2013(1): cd008070	- Duplicate Earlier version of Cochrane review
Kibuka, Marion, Price, Amy, Onakpoya, Igho et al. (2021) Evaluating the effects of maternal positions in childbirth: An overview of Cochrane Systematic Reviews. European journal of midwifery 5: 57	- Systematic review Studies do not meet inclusion: Does not exclude studies in which the position was not maintained into second stage or studies which compare a postural changes intervention. Intervention during first stage of labour. Women did not have epidural analgesia. Reference list

Study	Reason
	checked for eligible studies
Kibuka, Marion and Thornton, Jim G. (2017) Position in the second stage of labour for women with epidural anaesthesia. The Cochrane database of systematic reviews 2: cd008070	- Duplicate Earlier version of Walker 2018
Leila, Amini, Shayesteh, Jahanfar, Maryam, Kashanian et al. (2010) Sitting position: A right way to reduce labour pain with shortening duration of labor. Journal of Psychosomatic Obstetrics and Gynecology 31(suppl1): 104	- Conference abstract
Levy, Ariel T., Weingarten, Sarah, Ali, Ayesha et al. (2021) Hands-and-knees posturing and fetal occiput anterior position: a systematic review and meta-analysis. American Journal of Obstetrics and Gynecology MFM 3(4): 100346	- Population not in PICO Systematic review does not exclude studies in which women did not receive epidural and does not perform subgroup analysis; individual studies checked for eligibility
Levy, Ariel, Ali, Ayesha, Quist-Nelson, Johanna et al. (2021) 512 Hands-and-knees position and incidence of occiput anterior position at birth: a systematic review and meta-analysis. American Journal of Obstetrics and Gynecology 224(2supplement): 323	- Conference abstract
Moraloglu, Ozlem, Kansu-Celik, Hatice, Tasci, Yasemin et al. (2017) The influence of different maternal pushing positions on birth outcomes at the second stage of labor in nulliparous women. The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians 30(2): 245-249	- Study conducted in a low or middle income country Study conducted in Turkey
Nasir, Ayesha; Korejo, Razia; Noorani, K. J. (2007) Child birth in squatting position. JPMA. The Journal of the Pakistan Medical Association 57(1): 19-22	- Study conducted in a low or middle income country Study conducted in Pakistan
NCT05307393 (2022) Maternal Positioning to Correct Fetal Occiput Posterior. https://clinicaltrials.gov/show/NCT05307393	- Unable to retrieve Clinical trial - study start date January 2023
NCT05360823 (2022) The Effect of Using a Birth Ball and Squatting Position During Labor. https://clinicaltrials.gov/show/NCT05360823	- Unable to retrieve Clinical trial - no results posted or publication link
Pizzagalli, F. (2020) Normal childbirth: physiologic labor support and medical procedures. Guidelines of the French National Authority for Health (HAS) with the collaboration of the French College of Gynaecologists and Obstetricians (CNGOF) and the French College of Midwives (CNSF) - Maternal postures during the second stage of labour, delivery techniques and perineal protection. Gynecologie Obstetrique Fertilite et Senologie 48(12): 931-943	- Non-English language study
Plaat, F.; Golara, M.; Shennan, A. (1996) Upright vs recumbent position with mobile extradurals in the early second stage of labour. British journal of anaesthesia 76: 102	- Conference abstract
Plaat, F.; Golara, M.; Shennan, A. (1996) Upright versus recumbent position with mobile extradurals in the early second stage of labour. Br-j-anaesth 76suppl2: 102	- Conference abstract

Study	Reason
Priddis, Holly; Dahlen, Hannah; Schmied, Virginia (2012) What are the facilitators, inhibitors, and implications of birth positioning? A review of the literature. Women and birth : journal of the Australian College of Midwives 25(3): 100-6	- Population not in PICO Systematic review does not exclude studies in which women did not receive epidural and does not perform subgroup analysis; individual studies checked for eligibility
Racinet, C., Eymery, P., Philibert, L. et al. (1999) Delivery in the squatting position. A randomized trial comparing the squatting position and the lithotomy position for the expulsion phrase. Journal de gynecologie, obstetrique ET biologie de la reproduction 28(3): 263-270	- Non-English language study
Racinet, C., Eymery, P., Philibert, L. et al. (1999) [Labor in the squatting position. Journal de gynecologie, obstetrique et biologie de la reproduction 28(3): 263-270	- Non-English language study
Ragnar, I., Altman, D., Tyden, T. et al. (2006) Comparison of the maternal experience and duration of labour in two upright delivery positions--a randomised controlled trial. BJOG : an international journal of obstetrics and gynaecology 113(2): 165-70	- Comparator not in PICO Study compares two upright positions
Raulli, A. (2001) The use of birth stools during second stage labour and the risk of perineal trauma.	- Conference abstract
Rocha, Bruna Dedavid da, Zamberlan, Claudia, Pivetta, Hedioneia Maria Foletto et al. (2020) Upright positions in childbirth and the prevention of perineal lacerations: a systematic review and meta-analysis. Posicoes verticalizadas no parto e a prevencao de laceracoes perineais: revisao sistematica e metanalise. 54: e03610	- Comparator not in PICO Systematic review of studies comparing upright positions
Roth, Cheryl, Dent, Sarah A., Parfitt, Sheryl E. et al. (2016) Randomized Controlled Trial of Use of the Peanut Ball During Labor. MCN. The American journal of maternal child nursing 41(3): 140-6	- Intervention not in PICO Study does not compare upright to recumbent positions
Schirmer, J.; Fustinoni, S. M.; Basile, Aldo (2011) Perineal outcomes on the left lateral versus vertical semi-sitting birth positions: a randomized study. Acta paulista de enfermagem 24(6): 745-750	- Study conducted in a low or middle income country Study conducted in Brazil
Shedmake, Priyanka Vijay and Wakode, S. R. (2021) A Hospital-Based Randomized Controlled Trial-Comparing the Outcome of Normal Delivery Between Squatting and Lying Down Positions During Labour. Journal of obstetrics and gynaecology of India 71(4): 393-398	- Study conducted in a low or middle income country Study conducted in India
Simarro, M., Salinas, C., Martinez, A. et al. (2011) Effects of postural changes during the second stage of labor among women with epidural analgesia. International Urogynecology Journal and Pelvic Floor Dysfunction 22(suppl1): S13-S14	- Intervention not in PICO Study compares different postural changes (both upright and recumbent positions) to recumbent position
Stremler, R. L. (2003) The labour position trial: a randomized, controlled trial of hands and knees positioning for women labouring with a fetus in occipitoposterior position. Dissertation/ thesis: 163p	- Thesis paper
Theron, A., Baraz, R., Thorp-Jones, D. et al. (2011) Does position in the passive second stage of labour affect birth outcome in nulliparous women using epidural analgesia. International Journal of Obstetric Anesthesia 20(suppl1): 12	- Conference abstract
Thies-Lagergren, L., Christensson, K., Kvist, L. J. et al. (2011) Maternal outcomes in nulliparous women who gave vaginal birth on a birth seat	- Conference abstract

Study	Reason
or in any other position: Results of a randomised controlled trial in Sweden. Journal of Paediatrics and Child Health 47(suppl1): 36-37	
Thies-Lagergren, L., Kvist, L. J., Sandin-Bojo, A. K. et al. (2012) Augmentation of labour and fetal outcomes in relation to birth positions: A secondary analysis of an RCT evaluating birth seat births. Journal of Paediatrics and Child Health 48(suppl1): 101-102	- Conference abstract
Thies-Lagergren, L., Kvist, Linda J., Sandin-Bojo, Ann-Kristin et al. (2013) Labour augmentation and fetal outcomes in relation to birth positions: a secondary analysis of an RCT evaluating birth seat births. Midwifery 29(4): 344-350	- Comparator not in PICO Position for birth in control group not sufficiently defined
Valiani, Mahboubeh; Rezaie, Mehri; Shahshahan, Zahra (2016) Comparative study on the influence of three delivery positions on pain intensity during the second stage of labor. Iranian journal of nursing and midwifery research 21(4): 372-8	- Study conducted in a low or middle income country Study conducted in Iran
Vaziri, Farideh, Moshfeghy, Zeinab, Arzhe, Amene et al. (2016) Spontaneous pushing in lateral position versus Valsalva maneuver during second stage of labor on maternal and fetal outcomes: A randomized clinical trial. Iranian Red Crescent Medical Journal 18(10): e29279	- Comparator not in PICO Study compares different pushing techniques in two recumbent positions (lateral and supine)
Waldenström, U. and Gottval, K. (1994) Randomized trial of birthing stool or conventional semi-recumbent position for second-stage labor. Jordemodern 107(78): 261-265	- Population not in PICO Included in review for position of birth in women without epidural analgesia
Walker, C., Rodriguez, T., Herranz, A. et al. (2011) Second stage of labor with postural change and lateral position in women with epidural analgesia: A randomized controlled trial. International Urogynecology Journal and Pelvic Floor Dysfunction 22(suppl1): S11-S12	- Comparator not in PICO Study compares two recumbent positions (lateral vs lithotomy position)
Walker, Kate F., Thornton, Jim G., Jones, Nia W. et al. (2018) Maternal position in the second stage of labour for women with epidural anaesthesia. Cochrane Database of Systematic Reviews 2018(11): cd008070	- Intervention not in PICO Review does not exclude studies in which the position was not maintained into second stage or studies which compare a postural changes intervention; individual studies checked for eligibility
Zang, Yu, Lu, Hong, Zhang, Huixin et al. (2021) Benefits and risks of upright positions during the second stage of labour: An overview of systematic reviews. International journal of nursing studies 114: 103812	- Study design Overview of systematic reviews; included systematic reviews checked for eligibility
Zang, Yu, Lu, Hong, Zhao, Yang et al. (2020) Effects of flexible sacrum positions during the second stage of labour on maternal and neonatal outcomes: A systematic review and meta-analysis. Journal of clinical nursing 29(1718): 3154-3169	- Intervention not in PICO Intervention is flexible sacrum positions which include both upright positions and lateral positions compared to recumbent positions
Zhang, H., Huang, S., Guo, X. et al. (2017) A randomised controlled trial in comparing maternal and neonatal outcomes between hands-	- Study conducted in a low or middle income country

Study	Reason
and-knees delivery position and supine position in China. Midwifery 50: 117-124	Study conducted in China
Zhang, Hong-Yu, Shu, Rong, Cai, Wen-Zhi et al. (2016) Comparing maternal and neonatal outcomes between hands-and-knees delivery position and supine position. International Journal of Nursing Sciences 3(2): 178-184	- Study conducted in a low or middle income country Study conducted in China

Excluded economic studies

No economic evidence was identified for this review.

Appendix K Research recommendations – full details

Research recommendations for review question: What is the most effective position for birth in women with an epidural in situ?

No research recommendations were made for this review question.

Research recommendations for review question: What is the most effective position for birth in women without an epidural in situ?

No research recommendations were made for this review question.