

Intrapartum care for healthy women and babies

[G] Position for birth

NICE guideline number CG190 (update)

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

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1 **Position for birth**

2 **Review questions**

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

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

6 **Introduction**

7 Women can adopt a variety of positions during labour and for a spontaneous vaginal birth –
8 this can include remaining mobile and walking around, kneeling, squatting, sitting upright (for
9 example on a bed, beanbag or birthing chair), semi-reclined / semi-supine in a chair or bed
10 or fully recumbent positions such as lying supine on their back or on their side. Different
11 positions can have variable effects on the position of the pelvis which may result in birth
12 being easier in some positions compared to others. The assistance of gravity associated with
13 upright positions is also thought to lead to benefits during labour and birth.

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

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

19 **Summary of the protocol**

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

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

Population	<ul style="list-style-type: none"> • 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	<p>Maternal use of any upright position during the second stage of labour, including:</p> <ul style="list-style-type: none"> • kneeling • walking/ mobilisation • squatting • standing • sitting upright (throne position)
Comparison	<p>Maternal use of any recumbent position during the second stage of labour including:</p> <ul style="list-style-type: none"> • lying on back • lying on side, left or right lateral • semi-recumbent
Outcome	<p>Critical: For the woman:</p> <ul style="list-style-type: none"> • 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) <p>Important: For the woman:</p> <ul style="list-style-type: none"> • Women's experience of labour and birth • Long-term incontinence, including urinary and bowel (time-points as reported by authors) <p>For the baby:</p> <ul style="list-style-type: none"> • Apgar score below 7 at five minutes • Abnormal fetal heart rate needing intervention

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

Population	<ul style="list-style-type: none"> • 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	<p>Maternal use of any upright position during the second stage of labour, including:</p> <ul style="list-style-type: none"> • 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	<p>Maternal use of any recumbent position during the second stage of labour including:</p> <ul style="list-style-type: none"> • 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	<p>Critical: For the woman:</p> <ul style="list-style-type: none"> • 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) <p>Important: For the woman:</p> <ul style="list-style-type: none"> • Women’s experience of labour and birth • Long-term incontinence, including urinary and bowel (time-points as reported by authors) <p>For the baby:</p> <ul style="list-style-type: none"> • Apgar score below 7 at five minutes • Abnormal fetal heart rate needing intervention

3 For further details see the review protocols in appendix A.

4 **Methods and process**

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

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

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

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

15 Declarations of interest were recorded according to [NICE's conflicts of interest policy](#).

16 **Effectiveness evidence**

17 **Included studies**

18 **Women with an epidural in situ**

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

22 Both RCTs compared upright positions to recumbent positions in the second stage of labour
23 in women with a low dose infusion epidural bupivacaine and fentanyl mix. All RCTs included
24 only nulliparous women, who had a singleton pregnancy and were expecting an
25 uncomplicated spontaneous vaginal birth at term. In 1 RCT, women in the upright group were
26 encouraged to adopt any upright positions during the passive and active phases of the 2nd
27 stage of labour (BUMPES 2017); in the other RCT, women in the upright group were
28 encouraged to remain ambulatory during the passive 2nd stage of labour and all women
29 were then allowed to choose their preferred position for the active 2nd stage (Golará 2002).

30 The included studies are summarised in Table 3.

31 **Women without an epidural in situ**

32 Seven RCTs were included for the review on position for birth of women without an epidural
33 in situ (Crowley 1991; Gardosi 1989a; Gardosi 1989b; Stewart 1983; Stewart 1989; Turner
34 1986; Waldenstrom 1991). These RCTs were conducted in: Ireland (Crowley 1991); England
35 (Gardosi 1989a, Gardosi 1989b; Stewart 1989; Turner 1986); Scotland (Stewart 1983); and
36 Sweden (Waldenstrom 1991).

37 All RCTs compared upright positions to recumbent positions in the second stage of labour.
38 All RCTs included only women who had a singleton pregnancy and were expecting an
39 uncomplicated spontaneous vaginal birth (women had no obstetric risk factors and/or history
40 of caesarean birth). Four RCTs excluded the use of epidural and 3 RCTs were included in
41 which the proportion of women receiving epidural was less than a third (Stewart 1983; Turner
42 1986; Waldenstrom 1991). Three RCTs included only nulliparous women (Crowley 1991;
43 Gardosi 1989a; Gardosi 1989b) and 4 RCTs included women of any parity (Stewart 1983;
44 Stewart 1989; Turner 1986; Waldenstrom 1991). In terms of position for birth, in 2 RCTs,
45 women in the upright group were encouraged to adopt kneeling, squatting or sitting positions
46 (Gardosi 1989a; Gardosi 1989b); in 4 RCTs, women used a birthing chair to adopt a sitting
47 upright position (Crowley 1991; Stewart 1983; Stewart 1989; Turner 1986); and in 1 RCT,

1 women used a birthing stool (Waldenstom 1991). In all RCTs, women allocated to the upright
2 arm were encouraged to maintain the upright position for the duration of the second stage.

3 The included studies are summarised in Table 4.

4 **Unknown use of epidural**

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

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

10 This included study is summarised in Table 5.

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

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

15 **Summary of included studies**

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

18 **Table 3: Summary of included studies for position for birth in women with an epidural**
19 **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 2 nd 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 2 nd stage of labour until birth (left or right lateral) with 30 degree inclination of the bed	<ul style="list-style-type: none"> • 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 Parity: nulliparous	<u>Ambulatory position</u> Women encouraged to remain ambulatory (standing or walking) for as much of the passive 2 nd	<u>Recumbent position</u> Women asked to remain in bed or in a chair during for as much of the passive 2 nd stage as possible	<ul style="list-style-type: none"> • Mode of birth • Genital tract trauma (episiotomy and perineal tear) 	Women choose preferred position for birth for the active 2 nd stage Adherence: 88% in

Study	Population	Intervention	Comparison	Outcomes	Comments
	All women had a low-dose infusion epidural of bupivacaine and fentanyl	stage as possible			ambulatory group; 85% in recumbent group (including use of chair)

1 **Table 4: Summary of included studies for position for birth in women without an**
2 **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 2 nd and 3 rd 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 2 nd and 3 rd stages of labour	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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 2 nd stage Adherence: 82% in upright group; 89% in recumbent group
Gardosi 1989b Randomised controlled trial England	N=151 Gestational age: ≥37 weeks Parity: nulliparous	<u>Upright position</u> Women adopted squatting, kneeling (including hands and	<u>Recumbent position</u> Women adopted a conventional recumbent (back support at 30 degrees)	<ul style="list-style-type: none"> • Mode of birth • Duration of active 2nd stage • Genital tract trauma (episiotomy 	Women could be ambulatory during the 1st stage of labour and were free to change

Study	Population	Intervention	Comparison	Outcomes	Comments
		knees) and sitting positions	or lateral position	and perineal tear) <ul style="list-style-type: none"> Apgar score ≤ 7 at 5 minutes 	position in 2 nd 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	<u>Birth chair</u> Women used a 'Birth E-Z' chair (backrest inclination at 15 to 20 degrees from vertical) for 2nd stage	<u>Recumbent position</u> Use of a birthing bed (backrest inclination at maximum of 20 degrees from horizontal) for 2nd stage	<ul style="list-style-type: none"> 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	<u>Birthing chair</u> Women encouraged to use obstetric chair at 15-20 degree recline, with head-rest and side supports	<u>Supine position</u> Women adopted a supine position, described as a 'wedged' dorsal position	<ul style="list-style-type: none"> 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	<u>Birthing chair</u> Women used a 'Birth EZ' chair with adjustable height and angle of backrest for 2 nd stage	<u>Supine position</u> Women adopted a supine position in a bed	<ul style="list-style-type: none"> 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 Randomised controlled trial	N=294 Gestational age: not reported	<u>Birthing stool</u> Women were encouraged to sit on the birthing stool in a squatting	<u>Semi-recumbent position</u> Women were encouraged to adopt a semi-	<ul style="list-style-type: none"> Duration of active 2nd stage Genital tract trauma (episiotomy) 	6.9% of women in birth stool group and 3.5% women in semi-

Study	Population	Intervention	Comparison	Outcomes	Comments
Sweden	Parity: mixed parity	position during the 2nd stage	recumbent position during the 2nd stage	<ul style="list-style-type: none"> Women's experience of labour and birth 	<p>recumbent used epidural analgesia</p> <p>Adherence: 49% in the birthing stool group; 68% in the semi-recumbent group</p>

1 **Table 5: Summary of included studies for position for birth in women with unknown**
2 **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	<ul style="list-style-type: none"> Mode of birth Duration of active 2nd stage Women's experience of labour and birth Abnormal fetal heart rate needing intervention 	<p>All women were supine during the 1st stage</p> <p>All women delivered vaginally (unclear if women who had a caesarean birth were excluded)</p>

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

4 **Summary of the evidence**

5 **Women with an epidural in situ**

6 Overall, for nulliparous women with an epidural in situ, there was no evidence of an important
7 difference or no important difference in the outcomes between upright and recumbent
8 positions. The quality of the evidence for these outcomes ranged between very low to
9 moderate.

10 There was no evidence of an important difference, or no important difference between
11 upright and recumbent groups for the critical outcomes of mode of birth (spontaneous vaginal
12 birth, instrumental birth and caesarean birth) and episiotomy; and no important difference for
13 perineal tear (grade 2 or higher). In terms of important outcomes, overall, there was no
14 important difference between upright and recumbent groups for women's experience and
15 long-term incontinence (bowel and urinary).

16 No evidence was found for the remaining important outcomes: Apgar score <7 at 5 minutes
17 and abnormal fetal heart rate needing intervention. One study (BUMPES 2017) reported
18 median and inter quartile range (IQR) for the critical outcome, duration of active 2nd stage

1 (data were not normally distributed) and a relative or absolute effect estimate could not be
2 calculated based on the available data.

3 **Women without an epidural in situ**

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

17 For important outcomes, 3 studies reported on women's experience of labour and birth
18 (Crowley 1991; Stewart 1989; Waldenstrom 1991). From 1 study including only nulliparous
19 women (Crowley 1991), there were no important differences between groups for several
20 maternal-reported outcomes (women who agreed they "could move freely"; women who
21 agreed they "felt in control"; women who agreed labour was "unpleasant") and no evidence
22 of important difference for the maternal-reported outcome, women who reported "severe"
23 pain. In two smaller studies, important benefits were seen for women in the upright group,
24 with fewer women reporting that they were "uncomfortable" during 2nd stage (Stewart 1989)
25 and more women reporting their experience of birthing position as "excellent" (Waldenstrom
26 1991). In terms of Apgar score <7 at 5 minutes, there was no evidence of important
27 difference between groups for all women or nulliparous women. There were fewer
28 nulliparous women in the upright group with abnormal fetal heart rate needing intervention
29 compared to recumbent group, this was considered to be an important benefit.

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

32 **Unknown use of epidural**

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

39 In terms of women's experience of labour and birth, there were fewer women in the upright
40 group who reported "intolerable" pain compared to recumbent group, this was considered to
41 be an important benefit. There was no evidence of important difference between upright and
42 recumbent groups for women who agreed the experience was "unpleasant". There was no
43 important difference between upright and recumbent groups for women who wished to use
44 the half-sitting upright position for their next birth. There was no evidence of important
45 difference between groups in terms of abnormal fetal heart rate needing intervention.

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

1 See appendix F for full GRADE tables.

2 Economic evidence

3 Included studies

4 Women with an epidural in situ

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

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

8 Women without an epidural in situ

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

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

13 Excluded studies

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

16 Summary of included economic evidence

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

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

Study	Limitations	Applicability	Other comments	Incremental			Uncertainty
				Costs	Effect	Cost effectiveness	
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

20 SVB = spontaneous vaginal birth

21 ¹ The original analysis intended to use QALYs however this approach was abandoned due to difficulties in
22 obtaining HRQoL data at randomisation. Therefore, the authors decided to adopt a cost-consequence approach
23 as their primary analysis. A secondary CEA was conducted using spontaneous vaginal births as the measure of
24 effect.

25 ² Differences in spontaneous vaginal birth could be expected to lead to differences in QALYs and cost-
26 effectiveness threshold for NHS for an additional spontaneous vaginal birth is not known.
27

1 **Economic model**

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

5 **Evidence statements**

6 **Economic evidence statement**

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

11 **The committee's discussion and interpretation of the evidence**

12 **The outcomes that matter most**

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

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

33 **The quality of the evidence**

34 **Women with an epidural in situ**

35 The quality of the evidence ranged from moderate to very low, with most of the evidence
36 being of low quality. The main issues were around the indirectness of the evidence and risk
37 of bias. In one study (BUMPES 2017) >1/3 women who were induced before the onset of
38 active labour were included (39.5% in the upright group and 41.2% in the recumbent group;
39 not significantly different between groups). Outcomes which were not adjusted by the study
40 authors for induction were downgraded for indirectness. As participants and personnel could
41 not be blinded to intervention allocation, subjective outcomes were downgraded for risk of
42 bias.

43 **Women without an epidural in situ**

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

9 **Benefits and harms**

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

12 **Women with an epidural in situ**

13 The committee noted that the majority of the evidence for women with an epidural in situ was
14 from one large multicentre trial of nulliparous women (BUMPES 2017) comparing upright
15 positions to recumbent (left or right lateral) positions. The committee discussed that although
16 there were statistically significant differences in terms of spontaneous vaginal births and
17 births with forceps or ventouse in favour of recumbent positions, the effect estimates
18 provided no evidence of important difference with respect to the minimally important
19 differences. Overall, the committee agreed that there was no evidence of benefits or harms
20 associated with upright positions for any reported outcomes.

21 The committee had some concerns with the BUMPES trial in terms of how the upright and
22 recumbent positions were defined, given the actual adopted positions for birth in the two
23 groups were not reported (BUMPES 2017). Specifically, the committee discussed the lack of
24 clarification around the classification of semi-recumbent positions within the study, given that
25 it is a commonly used position for birth and in their experience, the plane of the pelvis in this
26 position could be either more vertical or horizontal depending on both the inclination of the
27 headrest and how the woman was lying in the bed, but judgement of this was largely
28 subjective. The committee were concerned that semi-recumbent positions may have been
29 adopted in the recumbent group and this may have confounded the results as the pelvis
30 could be in either a vertical or horizontal plane.

31 The committee also discussed that the study by Golará 2002 terminated early due to
32 “movement of staff” and did not manage to recruit the estimated number of women needed to
33 detect differences between groups. Overall, the committee agreed that despite being
34 conducted in similar settings and including the women with similar characteristics, the
35 BUMPES study and Golará 2002 were very different in terms of sample size and the way
36 positions were categorised. This is reflected in the inconsistency reported in the meta-
37 analysis for spontaneous vaginal birth.

38 The committee agreed that, in their experience, upright positions and left or right lateral
39 recumbent positions were routinely used during the second stage of labour in women with
40 epidurals in situ and were safe for birth. This experience was confirmed by the evidence
41 which showed there was no difference in any outcomes between the 2 positions. The
42 committee therefore made a recommendation for women to adopt a position which was
43 comfortable for them during the second stage of labour. However, the committee were aware
44 that adopting a supine position during late pregnancy or labour can lead to supine
45 hypotensive syndrome or aortocaval compression, due to the pressure from the uterus
46 compressing the aorta and inferior vena cava. This leads to decreased blood pressure and
47 can limit blood flow to the placenta. The committee also highlighted that epidural analgesia
48 accentuates the effects of aortocaval compression and therefore supine positions should be
49 particularly avoided in women with epidurals. The committee noted that while supine
50 positions are rarely used in routine practice, their recommendations should include advice to
51 women that lying flat on their back may lead to these problems.

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

5 **Women without an epidural in situ**

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

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

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

37 As with the recommendations for women with an epidural in situ, the committee included
38 advice for women that lying flat on their back, may lead to aortocaval compression and
39 effects on blood pressure. The committee noted that the risks of lying flat without an epidural
40 are less than for women with an epidural in situ.

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

45 **Cost effectiveness and resource use**

46 A published UK study (Bick 2017), an economic evaluation, alongside the BUMPES study,
47 found no difference in intervention related maternal and infant costs at 12 months from
48 labour in nulliparous women with low-dose epidural in the 2nd stage of labour, giving birth in
49 an upright position, compared to women giving birth in a lying down position (difference -£42;
50 95% CI -£254 to £169). The study reported that an upright position resulted in a significantly

1 lower number of spontaneous vaginal births (difference -0.059; standard error 0.02). The
2 results showed that women in the lying down position incurred significantly less resources
3 during their original hospital stay due to the higher rate of spontaneous vaginal births, but
4 there was no significant difference in costs at 12-months follow-up as higher, albeit non-
5 significant, costs observed for babies in the lying down group during follow-up offset the
6 lower maternal costs from trial entry to hospital discharge.

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

17 **Recommendations supported by this evidence review**

18 This evidence review supports recommendations 1.6.30, 1.9.5 and 1.9.6.

19 **References – included studies**

20 **Effectiveness**

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

23 **BUMPES 2017**

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

27 **Golara 2002**

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

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

33 **Crowley 1991**

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

36 **Gardosi 1989a**

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

39 **Gardosi 1989b**

40 Gardosi, J.; Sylvester, S.; B-Lynch, C. (1989) Alternative positions in the second stage of
41 labour: a randomized controlled trial. *British journal of obstetrics and gynaecology* 96(11):
42 1290-6

1 **Marttila 1983**

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

4 **Stewart 1989**

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

7 **Turner 1986**

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

10 **Waldenstrom 1991**

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

13 **Economic**

14 **Bick 2017**

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

18

1 Appendices

2 Appendix A Review protocols

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

4 **Table 7: Review protocol**

5

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	<p>The following databases will be searched:</p> <ul style="list-style-type: none">• Cochrane Central Register of Controlled Trials (CENTRAL)• Cochrane Database of Systematic Reviews (CDSR)• Embase• MEDLINE & MEDLINE In-Process• International Health Technology Assessment (IHTA) database <p>Searches will be restricted by:</p> <ul style="list-style-type: none">• Date (1994-)• English language studies• Human studies

Field	Content
	<p>Other searches:</p> <ul style="list-style-type: none"> • Inclusion lists of systematic reviews <p>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.</p>
Condition or domain being studied	Labour and birth
Population	<ul style="list-style-type: none"> • 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	<p>Maternal use of any upright position during the second stage of labour including:</p> <ul style="list-style-type: none"> • kneeling • walking/ mobilisation • squatting • standing • sitting upright (throne position)
Comparator	<ul style="list-style-type: none"> • 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	<p>Include published full-text papers:</p> <ul style="list-style-type: none"> • Systematic reviews of RCTs

Field	Content
	<ul style="list-style-type: none"> • Parallel RCTs (individual, cluster) <p>Conference abstracts will not be included because these do not typically have sufficient information to allow full critical appraisal.</p>
Other exclusion criteria	<p>Population:</p> <ul style="list-style-type: none"> • 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 <p>Setting:</p> <ul style="list-style-type: none"> • Countries other than high income countries (as defined by the OECD) <p>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.</p>
Context	This guideline will partly update the following: Intrapartum care for healthy women and babies (CG190)
Primary outcomes (critical outcomes)	<p>For the woman:</p> <ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Women’s experience of labour and birth • Long-term incontinence, including urinary and bowel (time-points as reported by authors) <p>For the baby:</p> <ul style="list-style-type: none"> • Apgar score below 7 at five minutes • Abnormal fetal heart rate needing intervention <p>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</p>
Data extraction (selection and coding)	<p>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.</p> <p>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.</p> <p>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.</p>
Risk of bias (quality) assessment	<p>Quality assessment of individual studies will be performed using the following checklists:</p> <ul style="list-style-type: none"> • ROBIS tool for systematic reviews • Cochrane RoB tool v.2 for RCTs • Cochrane RoB tool v.2 for cluster randomised trials <p>The quality assessment will be performed by one reviewer and this will be quality assessed by a senior reviewer.</p>
Strategy for data synthesis	<p>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.</p>

Field	Content
	<p>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.</p> <p>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/</p> <p>Minimally important differences:</p> <ul style="list-style-type: none"> • Validated scales/continuous outcomes: published MID_s where available • All other outcomes & where published MID_s are not available: 0.8 and 1.25 for all relative dichotomous outcomes ; +/- 0.5x control group SD for continuous outcomes
Analysis of subgroups	<p>Evidence will be stratified by:</p> <ul style="list-style-type: none"> • Adherence to intervention <ul style="list-style-type: none"> ○ women who remain in the position allocated ○ women who change position • Parity <ul style="list-style-type: none"> ○ nulliparous ○ multiparous • Type of epidural <ul style="list-style-type: none"> ○ Low dose/ infusion epidural ○ Standard epidural • Drugs used for epidural analgesia <ul style="list-style-type: none"> ○ bupivacaine and fentanyl mix ○ other mixes

Field	Content
	<ul style="list-style-type: none"> • Fetal position <ul style="list-style-type: none"> ○ occiput anterior ○ right or left occiput anterior ○ right or left occiput transverse ○ occiput posterior ○ right or left occiput posterior • Woman's mobility <ul style="list-style-type: none"> ○ women with reduced mobility ○ women without reduced mobility • BMI thresholds on booking: <ul style="list-style-type: none"> ○ 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 <p>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).</p> <p>Evidence will be subgrouped by the following only in the event that there is significant heterogeneity in outcomes:</p> <ul style="list-style-type: none"> • Age of woman (<35 vs ≥ 35) • Ethnicity <ul style="list-style-type: none"> ○ 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	<input checked="" type="checkbox"/>	Intervention
	<input type="checkbox"/>	Diagnostic
	<input type="checkbox"/>	Prognostic
	<input type="checkbox"/>	Qualitative
	<input type="checkbox"/>	Epidemiologic
	<input type="checkbox"/>	Service Delivery
	<input type="checkbox"/>	Other (please specify)
Language	English	
Country	England	
Anticipated or actual start date	15/09/2021	
Anticipated completion date	22/09/2023	
Named contact	<p>5a. Named contact Guideline Development Team National Guideline Alliance (NGA)</p> <p>5b. Named contact e-mail IPCupdate@nice.org.uk</p> <p>5c. Organisational affiliation of the review Guideline Development Team NGA, Centre for Guidelines, National Institute for Health and Care Excellence (NICE)</p>	

Field	Content
Review team members	From the Guideline Development Team NGA: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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

1 CDSR: Cochrane Database of Systematic Reviews; CENTRAL: Cochrane Central Register of Controlled Trials; DARE: Database of Abstracts of Reviews of Effects; GRADE:
 2 Grading of Recommendations Assessment, Development and Evaluation; HTA: Health Technology Assessment; MID: minimally important difference; NGA: National Guideline
 3 Alliance; NHS: National health service; NICE: National Institute for Health and Care Excellence; OECD: Organisation for Economic Co-operation and Development; PRESS:
 4 peer review of electronic search strategies; RCT: randomised controlled trial; RoB(IS): risk of bias (in systematic reviews); SD: standard deviation
 5

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

7 **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	<p>The following databases will be searched:</p> <ul style="list-style-type: none"> • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Embase • MEDLINE & MEDLINE In-Process • International Health Technology Assessment (IHTA) database <p>Searches will be restricted by:</p> <ul style="list-style-type: none"> • 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	<p>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</p> <p>Women in labour whose baby has not been identified before labour to be at high risk of adverse outcome</p> <p>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)</p>
Intervention	<p>Maternal use of any upright position during the second stage of labour, including:</p> <ul style="list-style-type: none"> • 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	<p>Maternal use of any recumbent position during the second stage of labour including:</p> <ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Systematic reviews of RCTs • Parallel RCTs (individual, cluster) <p>Conference abstracts will not be included because these do not typically have sufficient information to allow full critical appraisal.</p>
Other exclusion criteria	<p>Population:</p> <ul style="list-style-type: none"> • 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 <p>Setting: Countries other than high income countries (as defined by the OECD)</p> <p>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.</p>
Context	This guideline will partly update the following: Intrapartum care for healthy women and babies (CG190)
Primary outcomes (critical outcomes)	<p>For the woman:</p> <ul style="list-style-type: none"> • 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)	<p>For the woman:</p> <ul style="list-style-type: none"> • Women’s experience of labour and birth • Long-term incontinence, including urinary and bowel (time-points as reported by authors) <p>For the baby:</p> <ul style="list-style-type: none"> • Apgar score below 7 at five minutes • Abnormal fetal heart rate needing intervention <p>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</p>
Data extraction (selection and coding)	<p>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.</p> <p>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.</p> <p>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.</p>
Risk of bias (quality) assessment	<p>Quality assessment of individual studies will be performed using the following checklists:</p> <ul style="list-style-type: none"> • ROBIS tool for systematic reviews • Cochrane RoB tool v.2 for RCTs • Cochrane RoB tool for cluster randomised trials <p>The quality assessment will be performed by one reviewer and this will be quality assessed by a senior reviewer.</p>
Strategy for data synthesis	<p>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.</p>

Field	Content
	<p>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.</p> <p>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/</p> <p>Minimally important differences:</p> <ul style="list-style-type: none"> • Validated scales/continuous outcomes: published MID_s where available • All other outcomes & where published MID_s are not available: 0.8 and 1.25 for all relative dichotomous outcomes ; +/- 0.5x control group SD for continuous outcomes
Analysis of subgroups	<p>Evidence will be stratified by:</p> <ul style="list-style-type: none"> • Adherence to intervention <ul style="list-style-type: none"> ○ women who remain in the position allocated ○ women who change position • Parity <ul style="list-style-type: none"> ○ nulliparous ○ multiparous • Fetal position <ul style="list-style-type: none"> ○ occiput anterior ○ right or left occiput anterior

Field	Content
	<ul style="list-style-type: none"> ○ right or left occiput transverse ○ occiput posterior ○ right or left occiput posterior <ul style="list-style-type: none"> ● Woman's mobility <ul style="list-style-type: none"> ○ women with reduced mobility ○ women without reduced mobility <ul style="list-style-type: none"> ● BMI thresholds on booking: <ul style="list-style-type: none"> ○ 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 <p>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).</p> <p>Evidence will be subgrouped by the following only in the event that there is significant heterogeneity in outcomes:</p> <ul style="list-style-type: none"> ● Age of woman (<35 vs ≥ 35) ● Ethnicity <ul style="list-style-type: none"> ○ 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	<input checked="" type="checkbox"/> Intervention <input type="checkbox"/> Diagnostic <input type="checkbox"/> Prognostic <input type="checkbox"/> Qualitative <input type="checkbox"/> Epidemiologic <input type="checkbox"/> Service Delivery <input type="checkbox"/> 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: <ul style="list-style-type: none"> • NGA Senior Systematic Reviewer

Field	Content
	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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
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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

1

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"/

#	Searches
46	exp ECONOMICS, HOSPITAL/
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

#	Searches
39	ANIMAL/ not HUMAN/
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

#	Searches
#29	MeSH descriptor: [Resource Allocation] explode all trees
#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.

#	Searches
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	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/

#	Searches
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	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

#	Searches
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/

#	Searches
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* 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/

#	Searches
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.
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 mobiliz* 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

#	Searches
#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

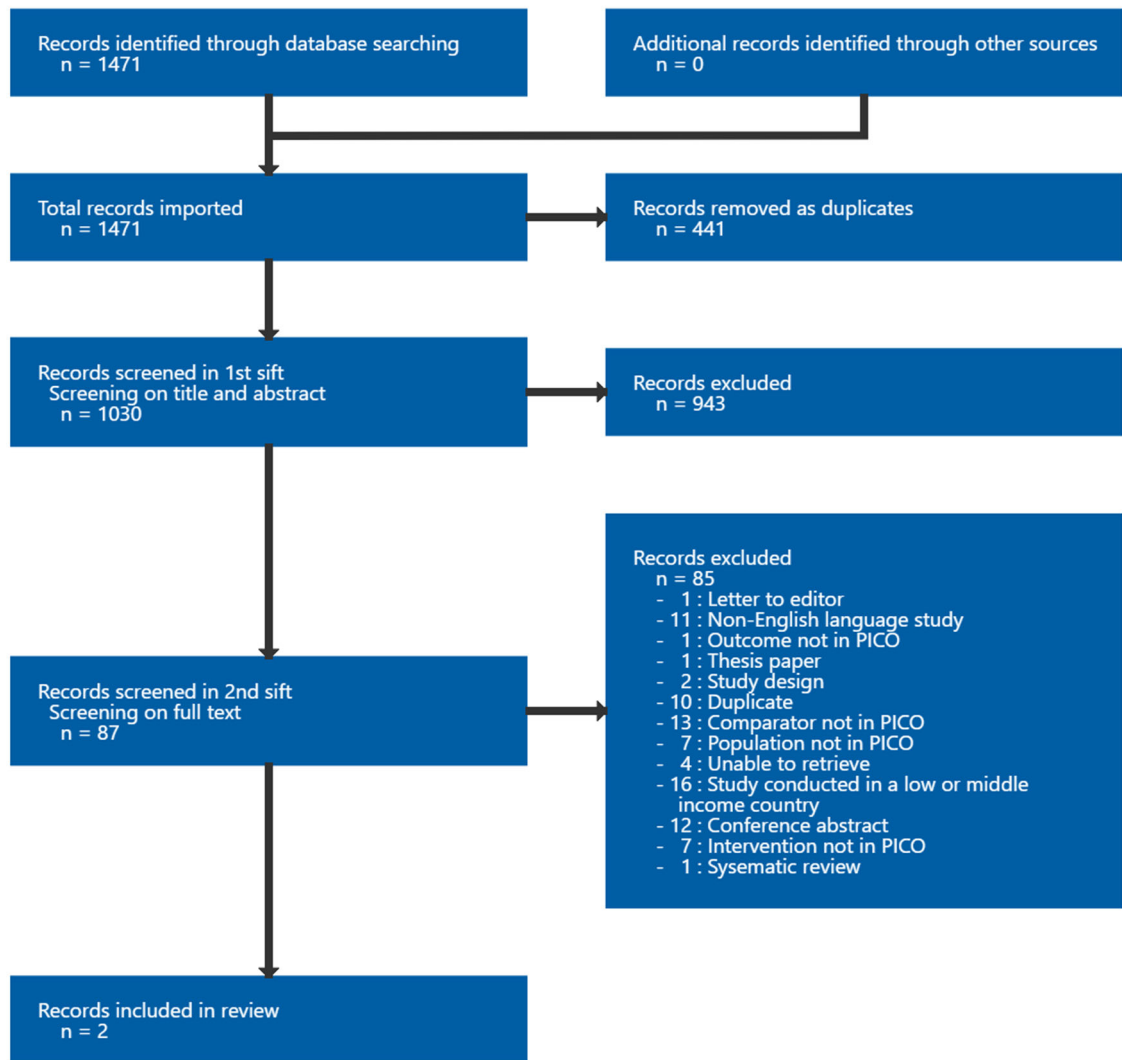
Date of last search: 07/12/2022

#	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

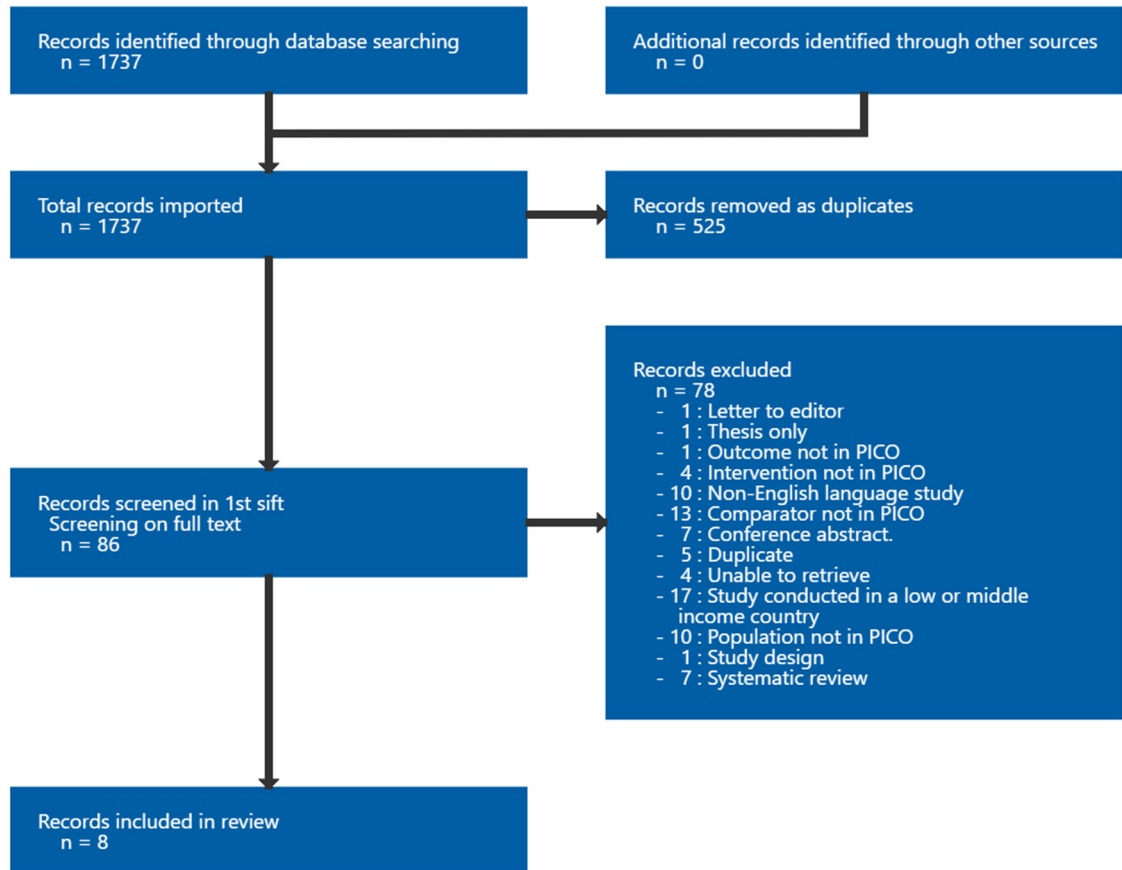
Study selection for: What is the most effective position for birth in women with an epidural in situ?

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	<ul style="list-style-type: none"> • 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	<p><u>Maternal age in years, mean (SD)</u></p> <ul style="list-style-type: none"> • Upright positions: 28.4 (5.7) • Lying down: 28.4 (5.6) <p><u>Gestational age, mean (SD)</u></p> <ul style="list-style-type: none"> • Upright positions: 40.4 (1.2)

	<ul style="list-style-type: none"> Lying down: 40.4 (1.2) <p><u>BMI, mean (SD)</u></p> <ul style="list-style-type: none"> Upright positions: 25.5 (5.4) Lying down: 25.2 (5.3) <p><u>Parity</u></p> <ul style="list-style-type: none"> All nulliparous <p><u>Induction of labour, n (%)</u></p> <ul style="list-style-type: none"> Upright positions: 613 (39.5) Lying down: 632 (41.2) <p><u>Cervical dilatation</u></p> <ul style="list-style-type: none"> Not reported (women randomised when 2nd stage of labour was confirmed, upon full cervical dilation of when presenting part visible) <p><u>Type of epidural (epidural maintained with PCEA/ infusion), n (%)</u></p> <ul style="list-style-type: none"> Upright positions: 1224 (80.6) Lying down: 1196 (79.9) <p><u>Drugs used for epidural analgesia, n</u></p> <ul style="list-style-type: none"> Upright positions: Bupivacaine, 814; Lidocaine, 6; Ropivacaine, 2; Fentanyl, 809; Diamorphine, 4 Lying down: Bupivacaine, 849; Lidocaine, 8; Ropivacaine, 1; Fentanyl, 840; Diamorphine, 1
Intervention(s)/control	Upright position

	<ul style="list-style-type: none"> 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) <p>Lying down position</p> <ul style="list-style-type: none"> 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 <p>Women were free to change position at any stage</p>
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 active 2nd 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	n = 548	n = 632
No of events		
Adjusted* effect measure, RR (95% CI)	0.86 (0.79 to 0.94)	
Instrumental birth	n = 849	n = 778
No of events		
Caesarean birth	n = 158	n = 127
No of events		

* 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)

Genital tract trauma

Outcome	Upright position, , N = 1556	Lying down position, , N = 1537
Episiotomy	n = 914	n = 838
No of events		
Perineal tear Grade 2 tear	n = 563	n = 608
No of events		
Perineal tear Grade 3-4 tears	n = 104	n = 81

Outcome	Upright position, , N = 1556	Lying down position, , N = 1537
No of events		

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)	n = 963	n = 973
No of events		
Involved in making decisions (strongly agree & agree)	n = 1102	n = 1087
No of events		
Treated with respect by all staff (strongly agree & agree)	n = 1146	n = 1113
No of events		
Expectations for labour & birth were met (strongly agree & agree)	n = 803	n = 783
No of events		
Felt safe at all times (strongly agree & agree)	n = 1105	n = 1072
No of events		
Good communication from staff (strongly agree & agree)	n = 1135	n = 1094
No of events		
Felt in control (strongly agree & agree)	n = 824	n = 794
No of events		
Able to move as much as wanted (strongly agree & agree)	n = 568	n = 589
No of events		

Outcome	Upright position, , N = 1208	Lying down position, , N = 1165
Satisfied with position before pushing (strongly agree & agree)	n = 1050	n = 996
No of events		
Satisfied with position while pushing (strongly agree & agree)	n = 1038	n = 992
No of events		

Long-term incontinence

Outcome	Upright position, , N = 950	Lying down position, , N = 942
Urinary incontinence Leakage in first 3 months	n = 432	n = 426
No of events		
Bowel incontinence No bowel control and/or soiling in first 3 months	n = 101	n = 122
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 <i>(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)).</i>
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 <i>(Adherence was similar in both groups (~ 70%); no analysis was performed to examine the effect of adhering to the intervention.)</i>

Section	Question	Answer
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low <i>(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)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns <i>(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)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(All outcomes reported as prespecified in the protocol)</i>
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Directly applicable <i>(Proportion of women who had their labour induced >1/3 in both groups (study included due to large sample size))</i>
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	<ul style="list-style-type: none"> • Singleton pregnancy • GA \geq 37 weeks • Epidural combined-spinal epidural in situ • Full dilatation • Adequate motor function • Vertex presentation • Nulliparous women
Exclusion criteria	<ul style="list-style-type: none"> • Inadequate motor function • Received pethidine within 4 hours of full dilatation
Patient characteristics	<p><u>Maternal age in years, mean (SD)</u></p> <ul style="list-style-type: none"> • Ambulatory: 30 (5) • Recumbent: 30 (6) <p><u>Gestational age, mean (SD)</u></p> <ul style="list-style-type: none"> • Not reported <p><u>BMI, mean (SD)</u></p> <ul style="list-style-type: none"> • Ambulatory: 27 (4) • Recumbent: 28 (3) <p><u>Parity</u></p> <ul style="list-style-type: none"> • All women were nulliparous <p><u>Induction of labour, n (%)</u></p> <ul style="list-style-type: none"> • Ambulatory: 7 (17)

	<ul style="list-style-type: none"> • Recumbent: 6 (24) <p><u>Cervical dilatation at insertion of epidural catheter</u></p> <ul style="list-style-type: none"> • Ambulatory: 4 cm • Recumbent: 4 cm <p><u>Type of epidural</u></p> <ul style="list-style-type: none"> • Low-dose infusion epidural <p><u>Drugs used for epidural analgesia, n</u></p> <ul style="list-style-type: none"> • 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	<p><u>Ambulatory</u></p> <ul style="list-style-type: none"> • Women encouraged to remain ambulatory (standing or walking) for as much of the passive 2nd stage as possible <p><u>Recumbent</u></p> <ul style="list-style-type: none"> • Women asked to remain in bed or in a chair during for as much of the passive 2nd stage as possible <p>All women were allowed to choose their preferred position for birth for the active 2nd stage</p>
Duration of follow-up	Duration of labour
Sources of funding	Not reported
Sample size	<p>N= 66</p> <p>Ambulatory n= 25</p> <p>Recumbent n= 41</p>

Other information	Positions were only maintained for the passive phase of the 2nd stage
	Adherence, % in position
	<ul style="list-style-type: none"> 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	n = 16	n = 19
No of events		
Instrumental birth	n = 9	n = 21
No of events		
Caesarean birth	n = 0	n = 1
No of events		

Genital tract trauma

Outcome	Ambulatory, , N = 25	Recumbent, , N = 41
Episiotomy	n = 11	n = 28
No of events		
Perineal tear Grade 2	n = 5	n = 5
No of events		
Perineal tear Grade 3	n = 0	n = 1
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 <i>(Randomisation was via computer generated random numbers and sealed brown envelopes. Baseline characteristics were balanced despite recumbent n= 41 and upright n= 25).</i>
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 <i>(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.)</i>
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low <i>(Data available for all participants (mode of birth). Data available for most participants (genital tract trauma)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns <i>(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received.)</i>

Section	Question	Answer
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	<p><u>Maternal age in years, mean (SD)</u></p> <p>Birthing chair group: 24.1 (4.1)</p> <p>Recumbent positions group: 24.3 (4.5)</p> <p><u>Gestational age in weeks, mean (SD)</u></p> <p>Upright group: 39.7 (1.3); 2.3% < 37 weeks</p> <p>Recumbent group: 39.7 (1.3); 2.2% < 37 weeks</p> <p><u>BMI</u></p> <p>Not reported</p> <p><u>Parity</u></p> <p>Only nulliparous women included</p> <p><u>Induction of labour, n (%)</u></p> <p>Upright group: 109 (17.2%)</p> <p>Recumbent group: 101 (16.9%)</p>
Intervention(s)/control	<p>Birthing chair</p> <p>use of a birthing chair (height and angle of the chair were adjusted according to the preference of the midwife and the woman)</p> <p>Recumbent positions</p> <p>use of a birthing bed, adopting any of the following positions: recumbent, semi-recumbent, dorsal, or left lateral</p>
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	n = 554	n = 506
No of events		

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

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)
Mean (SD)		

Genital tract trauma

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

Women's experience of labour and birth

Outcome	Birthing chair, , N = 263	Recumbent positions, , N = 289
Women who agreed they "could move freely"	n = 175	n = 195

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

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	n = 1	n = 4
No of events		

Abnormal fetal heart rate needing intervention

Outcome	Birthing chair, , N = 634	Recumbent positions, , N = 596
Instrumental births due to fetal heart rate abnormalities	n = 19	n = 36
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 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 <i>(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.)</i>
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Some concerns <i>(Women were excluded from analysis post-randomisation (7 from birthing chair group and 13 from bed group) and reasons not provided.)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low <i>(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(Study states that there is a protocol but doesn't not provide a way of accessing it)</i>
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	<p>Singleton pregnancies</p> <p>Nulliparous</p> <p>GA: 37 weeks completed</p> <p>Expecting vaginal birth</p> <p>Vertex presentation</p> <p>No relevant risk factors</p> <p>Induced and spontaneous labours included</p>
Exclusion criteria	Epidural anaesthesia
Patient characteristics	<p><u>Maternal age in years, median (range)</u></p> <p>Upright group: 24.1 (4.3)</p> <p>Recumbent group: 24.4 (4.5)</p> <p><u>Gestational age in weeks, median (range)</u></p> <p>Upright group: 40.1 (1.3)</p> <p>Recumbent group: 39.8 (1.3)</p> <p><u>BMI, mean (SD)</u></p> <p>Not reported (height was similar between groups)</p> <p><u>Parity</u></p> <p>Only nulliparous women included</p>

	<p><u>Induction of labour , n (%)</u></p> <p>Upright group: 35 (16%)</p> <p>Recumbent group: 30 (14%)</p>
Intervention(s)/control	<p>Upright positions group:</p> <p>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)</p> <p>Recumbent positions group:</p> <p>Women adopted a conventional recumbent (back support at 30 degrees) or lateral position</p> <p>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)</p>
Duration of follow-up	Duration of labour
Sources of funding	Oxford Regional Health Authority
Sample size	<p>N= 427</p> <p>Upright positions n= 218</p> <p>Recumbent positions n= 209</p>
Other information	<p>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</p> <p>Adherence</p>

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	n = 199	n = 173
No of events		
Instrumental birth	n = 19	n = 34
Forceps and Ventouse		
No of events		
Caesarean birth	n = 0	n = 2
No of events		

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 <i>(Randomisation method was quasi-random. Baseline characteristics of interest reported and do not indicate problem with randomisation.)</i>
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 <i>(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)</i>
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low <i>(Data available for all participants)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low <i>(Outcome assessors were not blinded to the intervention,</i>

Section	Question	Answer
		<i>but unlikely that assessment was influenced by knowledge of intervention received)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(Protocol unavailable, no evidence of selective reporting)</i>
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

	<p>Expecting a vaginal birth</p> <p>Vertex presentation</p> <p>No relevant risk factors</p> <p>Induced and spontaneous labours included</p>
Exclusion criteria	Epidural anaesthesia
Patient characteristics	<p><u>Maternal age in years, mean (SD)</u></p> <p>Upright group: 24.5 (4.4)</p> <p>Recumbent group: 24.6 (4.3)</p> <p><u>Gestational age in weeks, median (range)</u></p> <p>Upright group: 40.1 (1.3)</p> <p>Recumbent group: 39.8 (1.3)</p> <p><u>BMI, mean (SD)</u></p> <p>Not reported (height was similar between groups)</p> <p><u>Parity</u></p> <p>Only nulliparous women included</p> <p><u>Induction of labour , n</u></p> <p>Upright group: 10</p> <p>Recumbent group: 12</p>
Intervention(s)/control	<p>Upright positions group:</p> <p>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)</p>

	<p>Recumbent positions group:</p> <p>Women adopted a conventional recumbent (back support at 30 degrees) or lateral position</p> <p>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)</p>
Duration of follow-up	Duration of labour
Sources of funding	Oxford Regional Health Authority
Sample size	<p>N= 151</p> <p>Upright group n= 73</p> <p>Recumbent group n= 78</p>
Other information	<p>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.</p> <p>Adherence to intended position, n (%)</p> <p>Upright positions group: 54 (74)</p> <p>Recumbent positions group: 63 (81)</p>

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	n = 66	n = 66
No of events		
Instrumental birth	n = 7	n = 12
Forceps or Ventouse		
No of events		
Caesarean birth	n = 0	n = 0
No of events		

Duration of active second stage

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

Genital tract trauma

Outcome	Upright positions, , N = 73	Recumbent positions, , N = 78
Episiotomy	n = 22	n = 30
No of events		

Outcome	Upright positions, , N = 73	Recumbent positions, , N = 78
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)

Section	Question	Answer
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low <i>(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(Study mentions the protocol but it is unavailable)</i>
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	<ul style="list-style-type: none"> • Singleton • Mixed parity • GA: 37 to 42 weeks • Expecting vaginal birth <p>Cephalic presentation</p>

Exclusion criteria	None reported
Patient characteristics	<p><u>Maternal age in years</u></p> <ul style="list-style-type: none"> • Not reported <p><u>Gestational age</u></p> <ul style="list-style-type: none"> • Not reported <p><u>BMI</u></p> <ul style="list-style-type: none"> • Not reported <p><u>Parity, n</u></p> <ul style="list-style-type: none"> • Birth chair group: nulliparous, 40; multiparous 59 • Recumbent group: nulliparous 36; multiparous 54 <p><u>Induction of labour, n (%)</u></p> <ul style="list-style-type: none"> • Birth chair group: nulliparous 17 (42); multiparous 28 (47) • Recumbent group: nulliparous 10 (27); multiparous 33 (61) <p><u>Use of epidural analgesia, n</u></p> <ul style="list-style-type: none"> • Birth chair group: nulliparous 23; multiparous 6 • Recumbent group: nulliparous 18; multiparous 7 <p>Author reported no differences between groups in age, height, weight, parity, gestational age and social class</p>
Intervention(s)/control	<p><u>Birth chair group</u></p> <p>Use of a birthing chair 'Birth E-Z' chair (backrest inclination at 15 to 20 degrees from vertical) for 2nd stage</p>

	<u>Recumbent group</u>
	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	n = 83	n = 77
No of events		
Nulliparous women	n = 28	n = 24
Chair n=38; recumbent n=36		
No of events		

Outcome	Birthing chair, , N = 99	Recumbent position, , N = 90
Multiparous women Chair n=56; recumbent n=54	n = 55	n = 53
No of events		
Instrumental birth	n = 10	n = 12
No of events		
Nulliparous women Chair n=38; recumbent n=36	n = 9	n = 1
No of events		
Multiparous women Chair n=56; recumbent n=54	n = 11	n = 1
No of events		
Caesarean birth	n = 1	n = 1
No of events		
Nulliparous women Chair n=38; recumbent n=36	n = 1	n = 1
No of events		
Multiparous women Chair n=56; recumbent n=54	n = 0	n = 0
No of events		

Duration of active 2nd stage

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

Genital tract trauma

Outcome	Birthing chair, , N = 99	Recumbent position, , N = 90
Episiotomy	n = 19	n = 39
No of events		
Nulliparous women Chair n=38; recumbent n=36	n = 12	n = 26
No of events		
Multiparous women Chair n=56; recumbent n=54	n = 7	n = 13
No of events		
Perineal tear Grade 2 or higher	n = 14	n = 12
No of events		
Nulliparous women Chair n=38; recumbent n=36	n = 5	n = 5
No of events		

Outcome	Birthing chair, , N = 99	Recumbent position, , N = 90
Multiparous women Chair n=56; recumbent n=54	n = 9	n = 7
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 <i>(Randomisation was done by drawing a sealed envelope)</i>
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 <i>(Women were aware of their assigned intervention; adherence was not reported)</i>
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low <i>(Outcome data available for all participants for mode of birth. Data available for most participants for genital tract trauma)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Some concerns <i>(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(Protocol unavailable, no evidence of selective reporting)</i>
Overall bias and Directness	Risk of bias judgement	Some concerns
Overall bias and Directness	Overall Directness	Indirectly applicable <i>(Women who received epidural and who were induced were included, but < 1/3)</i>
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 \geq 37 weeks completed Singleton pregnancies Expecting uncomplicated vaginal birth. Cephalic presentation
Exclusion criteria	Augmentation Use of epidural analgesia
Patient characteristics	<u>Maternal age in years, mean (SD)</u> Birthing chair: multiparous 27.8 (4.0); nulliparous 24.5 (4.0) Supine: multiparous 27.3 (4.4); nulliparous 24.8 (4.3) <u>Gestational age</u> Birthing chair: multiparous 39.7 (1.3); nulliparous 39.8 (0.9) Supine: multiparous 39.5 (1.1); nulliparous 39.8 (1.1)

	<p><u>BMI, mean (SD)</u></p> <p>Not reported, height and weight similar between groups</p> <p><u>Parity, n</u></p> <p>Birth stool group: multiparous 96; nulliparous 61</p> <p>Semi-recumbent group: multiparous 91; nulliparous 56</p> <p><u>Induction of labour, n (%) *</u></p> <p>Not reported</p> <p>* author reported groups were 'similar' in all measured baseline characteristics</p>
Intervention(s)/control	<p>Birthing chair group</p> <p>Women encouraged to use obstetric chair at 15-20 degree recline, with head-rest and side supports</p> <p>Supine/ dorsal group</p> <p>Supine position, described as a 'wedged' dorsal position</p> <p>All women were allowed to be ambulant during the first stage of labour and were randomised in late first stage</p>
Duration of follow-up	Duration of labour
Sources of funding	Rocket Instruments of London
Sample size	<p>N= 304</p> <p>Birthing stool group n= 157</p>

	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

Outcome	Birthing chair, , N = 157	Supine , , N = 147
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 No of events	n = 41	n = 35
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 <i>(Randomisation was done via sealed opaque envelopes)</i>
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 <i>(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.)</i>
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low <i>(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)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low <i>(Outcome assessors were not blinded to the intervention, but unlikely that assessment was influenced by knowledge of intervention received)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(Protocol unavailable, no evidence of selective reporting)</i>
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	<ul style="list-style-type: none"> • Singleton pregnancies • GA > 36 weeks • Cephalic presentation
Exclusion criteria	None reported
Patient characteristics	<p><u>Maternal age in years, mean (SD)</u> Authors reported no differences</p> <p><u>Gestational age in weeks, median (range)</u> Authors reported no differences</p> <p><u>BMI, mean (SD)</u> Not reported</p>

	<p><u>Parity, n</u></p> <p>Birthing chair group: nulliparous, 111; multiparous, 115</p> <p>Supine group: nulliparous, 140; multiparous, 173</p> <p><u>Induction of labour</u></p> <p>33.8% (author reported similar between groups)</p> <p><u>Use of epidural analgesia</u></p> <p>26.4% (author reported similar between groups)</p>
Intervention(s)/control	<p>Birthing chair</p> <p>Women used the Birth EZ chair with adjustable height and angle of backrest (set at 40 degrees, with leg supports and foot-rests)</p> <p>Women were transferred to the birthing chair upon full cervical dilatation or if vertex was visible</p> <p>Supine position</p> <p>Women adopted a supine position in a bed</p>
Duration of follow-up	Duration of labour
Sources of funding	Not reported
Sample size	<p>N= 318</p> <p>Birthing chair group n= 226 (nulliparous n=111; multiparous n=140)</p> <p>Supine position group n= 313 (nulliparous n=115; multiparous n=173)</p>

Other information	<p>Active management was used for nulliparous women</p> <p>Vaginal assessment was carried out every 2 hours (nulliparous women) or 4 hours (multiparous women)</p> <p>Oxytocin for augmentation used only in nulliparous women</p> <p>Adherence</p> <p>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)</p> <p>Per-protocol followed (authors report that mode of birth, duration of active second stage and perineal tears did not differ between ITT and PP)</p>
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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	n = 194	n = 271
No of events		
Nulliparous	n = 87	n = 107

Outcome	Birthing chair, , N = 226	Supine position, , N = 313
No of events		
Multiparous	n = 107	n = 164
No of events		
Instrumental birth	n = 28	n = 38
No of events		
Nulliparous	n = 22	n = 31
No of events		
Multiparous	n = 6	n = 7
No of events		
Caesarean birth	n = 4	n = 4
No of events		
Nulliparous	n = 2	n = 2
No of events		
Multiparous	n = 2	n = 2
No of events		

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 No of events	n = 71	n = 81

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 <i>(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)</i>
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 <i>(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)</i>
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low <i>(Data available for all participants across all outcomes)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low <i>(Not clear if outcome assessors were aware of the allocation, but unlikely that assessment was influenced by knowledge of intervention received)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(Protocol unavailable, no evidence of selective reporting)</i>
Overall bias and Directness	Risk of bias judgement	High
Overall bias and Directness	Overall Directness	Indirectly applicable <i>(Use of epidural included; use of induction before the onset of active labour included)</i>
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	<p>Singleton and twin pregnancies</p> <p>Mixed parity</p> <p>GA: not reported</p> <p>Expecting vaginal birth</p> <p>Vertex and breech presentations included</p>
Exclusion criteria	Fetal distress
Patient characteristics	<p><u>Maternal age in years, mean</u></p> <p>Birth stool group: 28.4</p> <p>Semi-recumbent group: 28.3</p> <p><u>Gestational age</u></p> <p>Not reported</p>

	<p><u>BMI, mean (SD)</u></p> <p>Not reported</p> <p><u>Parity, primigravidas (%)</u></p> <p>Birth stool group: 52.1</p> <p>Semi-recumbent group: 51.1</p> <p><u>Induction of labour, n (%) *</u></p> <p>Not reported</p> <p>* author reported no significant difference in baseline characteristics</p>
Intervention(s)/control	<p>Birth stool group</p> <p>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</p> <p>Semi-recumbent group</p> <p>Women were encouraged to adopt a semi-recumbent position during the second stage of labour</p>
Duration of follow-up	Two hours after birth
Sources of funding	Swedish Ministry of Health and Social Affairs, Commission for Social Research
Sample size	<p>N= 294</p> <p>Birth stool group n= 148</p> <p>Semi-recumbent group n= 146</p>
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	% = 14	% = 18
No of events		

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'	n = 94	n = 65

Outcome	Birthing stool, , N = 147	Semi-recumbent, , N = 140
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 <i>(Randomisation via sealed opaque envelopes at end of first stage)</i>
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 <i>(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).)</i>
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low <i>(Data available for all participants (episiotomy). Data available for most participants (women's experience of labour and birth)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low <i>(Not clear if outcome assessors were aware of the allocation, but unlikely that assessment was influenced by knowledge of intervention received)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(Protocol unavailable, no evidence of selective reporting)</i>
Overall bias and Directness	Risk of bias judgement	High <i>(Non-adherence was high and unbalanced between groups and not sufficiently examined)</i>
Overall bias and Directness	Overall Directness	Directly applicable
Overall bias and Directness	Risk of bias variation across outcomes	Use of epidural included Use 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	<p>Singleton pregnancies</p> <p>GA: 38 to 42 weeks</p> <p>Nulliparous and multiparous</p> <p>Induced and augmented labours included</p>
Exclusion criteria	Use of any analgesia
Patient characteristics	<p><u>Maternal age in years, mean (SD)</u></p> <p>Half-sitting birthing chair group: 27.3 (4.2)</p> <p>Supine group: 28.8 (4.1)</p> <p><u>Gestational age in weeks, mean (SD)</u></p> <p>Half-sitting birthing chair group: 40.3 (1.0)</p> <p>Supine group: 40.4 (0.9)</p> <p><u>BMI</u></p>

	<p>Not reported</p> <p><u>Parity, n</u></p> <p>Half-sitting birthing chair group: nulliparous 30; multiparous 20</p> <p>Supine group: nulliparous 30; multiparous 20</p> <p><u>Induction of labour, n (%)</u></p> <p>97/100 women had spontaneous onset of labour</p>
Intervention(s)/control	<p>Women remained in the supine position during the first stage of labour (except for 8 women who were ambulatory for a 'brief period')</p> <p>Randomisation occurred when the cervix was dilated 4-6 cm</p> <p>Half-sitting birthing chair group</p> <p>Women used a birthing chair constructed from birthing beds to adopt a 'half-sitting' position at 50 degrees</p> <p>Supine position group</p> <p>Women adopted a supine position on a birthing bed</p>
Duration of follow-up	Duration of labour
Sources of funding	Not reported
Sample size	<p>N=100 women</p> <p>Intervention n= 50</p>

	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
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)

Outcome	Half-sitting, , N = 50	Supine, , N = 50
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 <i>(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.)</i>
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 <i>(Women were aware of their assigned intervention. Adherence was not reported.)</i>
Domain 3. Bias due to missing outcome data	Risk-of-bias judgement for missing outcome data	Low <i>(Data available for all participants)</i>
Domain 4. Bias in measurement of the outcome	Risk-of-bias judgement for measurement of the outcome	Low <i>(Not clear if outcome assessors were aware of the allocation, but unlikely that assessment was influenced by knowledge of intervention received.)</i>
Domain 5. Bias in selection of the reported result	Risk-of-bias judgement for selection of the reported result	Low <i>(Protocol unavailable, no evidence of selective reporting)</i>
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

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

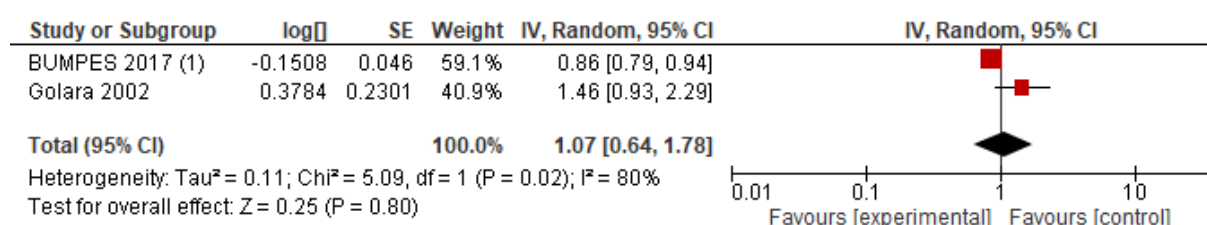
Appendix E Forest plots

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?

Comparison 1. Upright positions versus recumbent positions in women with an epidural in situ

Figure 3: Spontaneous vaginal birth



Footnotes

(1) Adjusted for age, ethnicity, diagnosis of delay, nature of the onset of labour

Figure 4: Instrumental birth

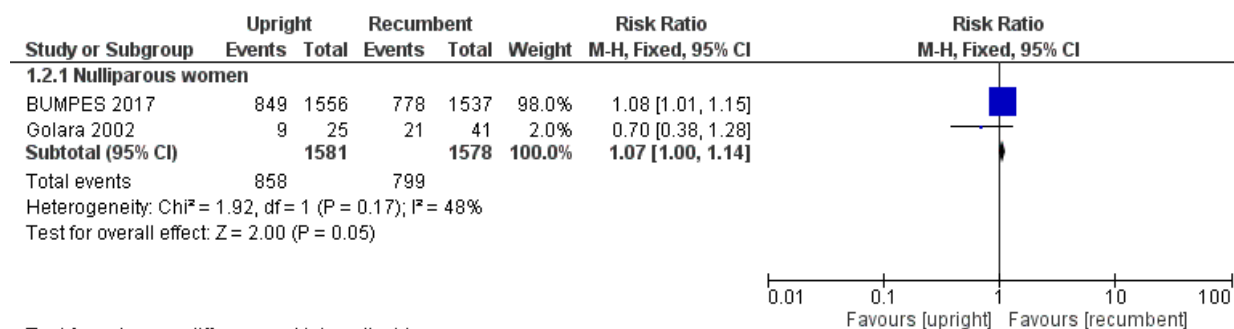


Figure 5: Caesarean birth

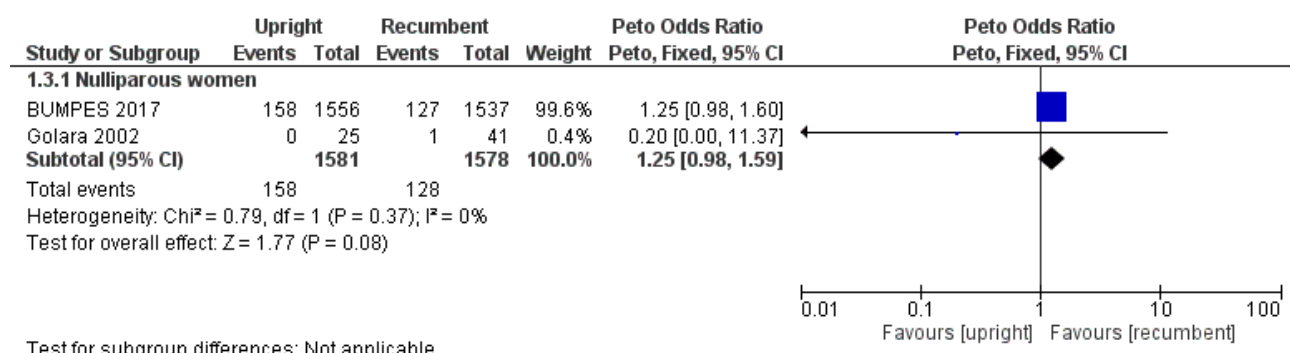


Figure 6: Genital tract trauma- episiotomy

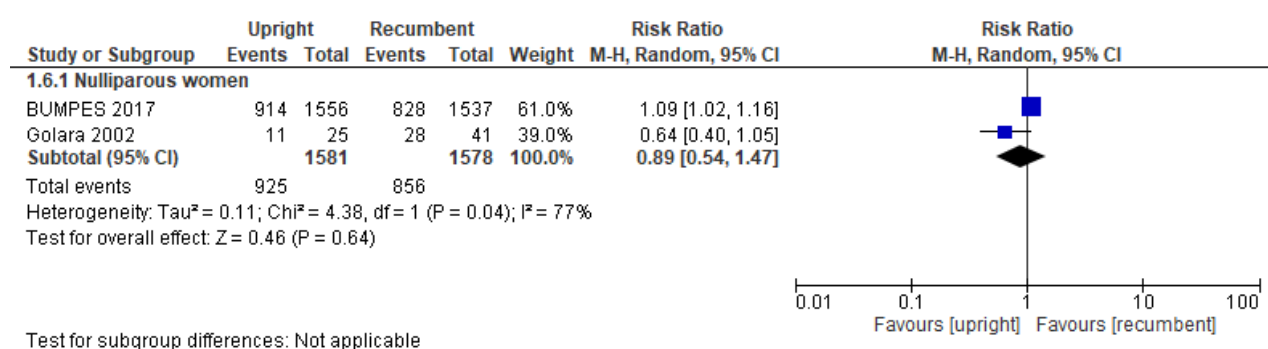
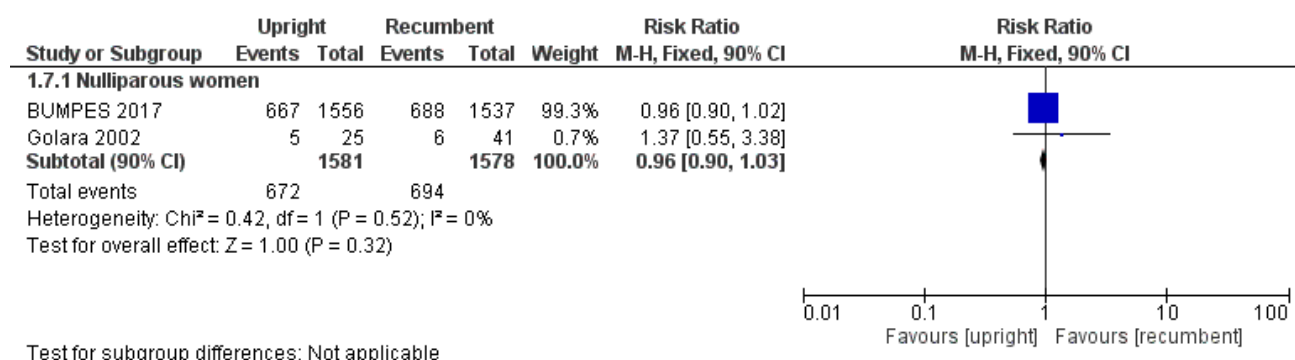


Figure 7: Genital tract trauma- perineal tear (grade 2 or higher)



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 8: Spontaneous vaginal birth

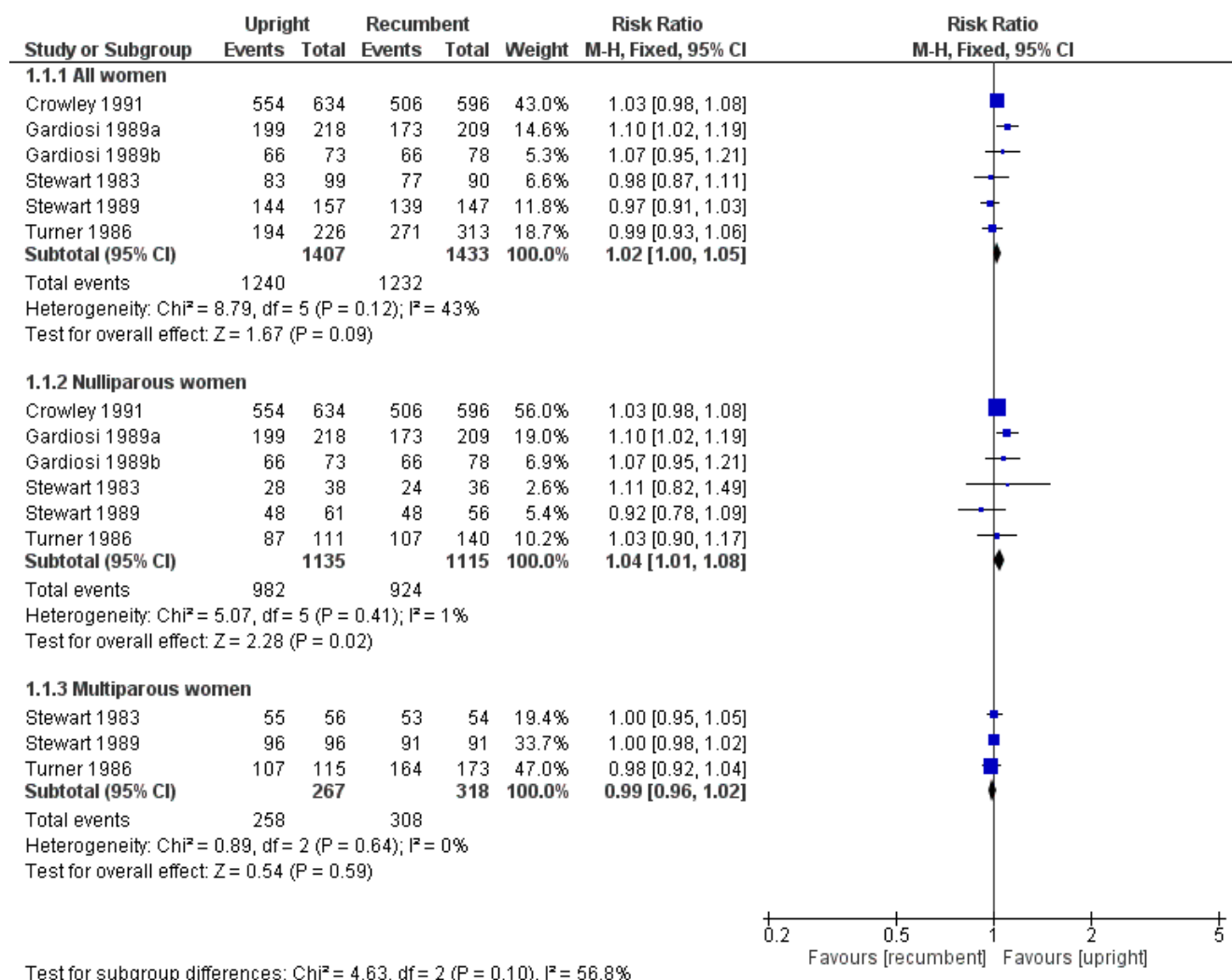


Figure 9: Instrumental birth

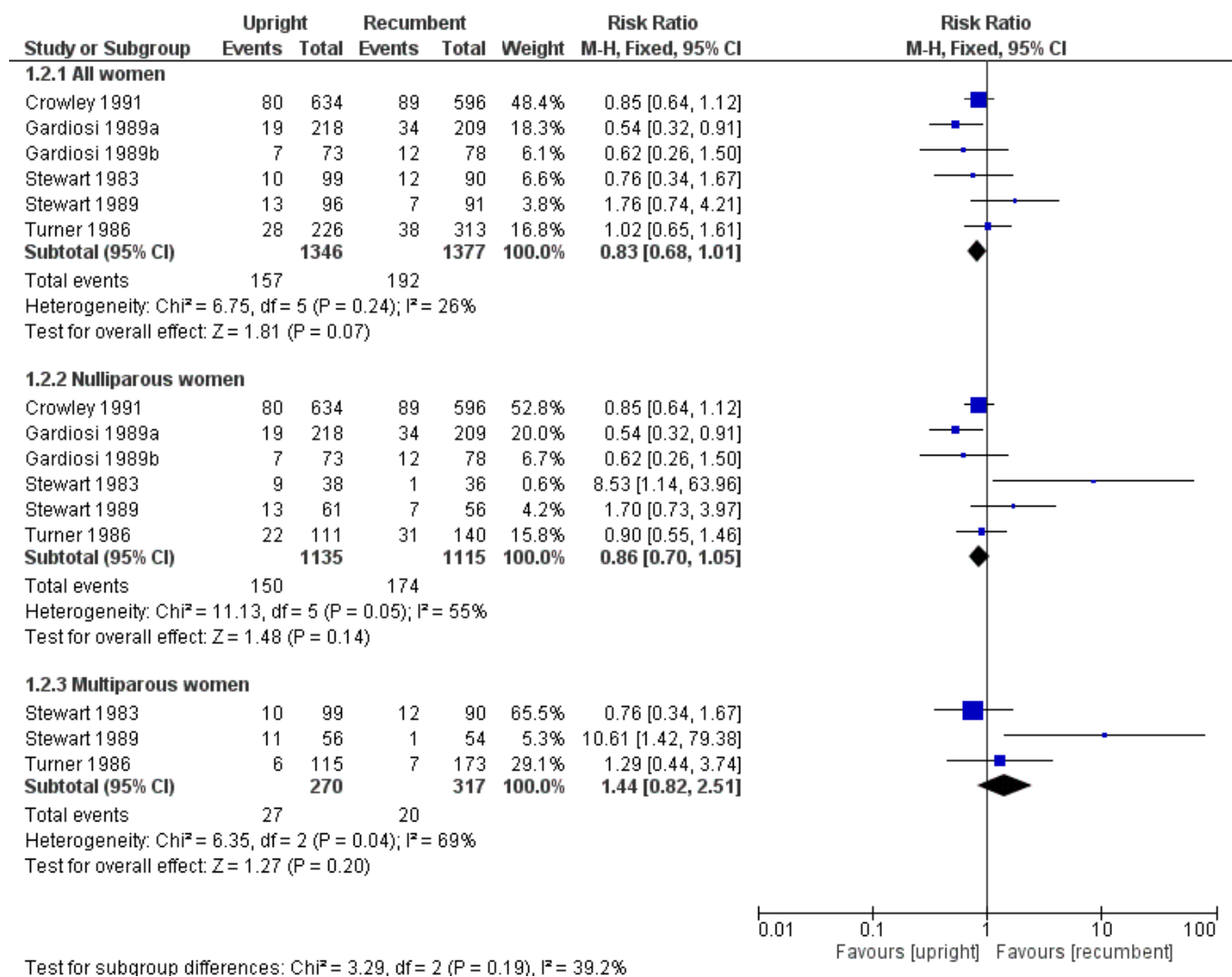


Figure 10: Caesarean birth

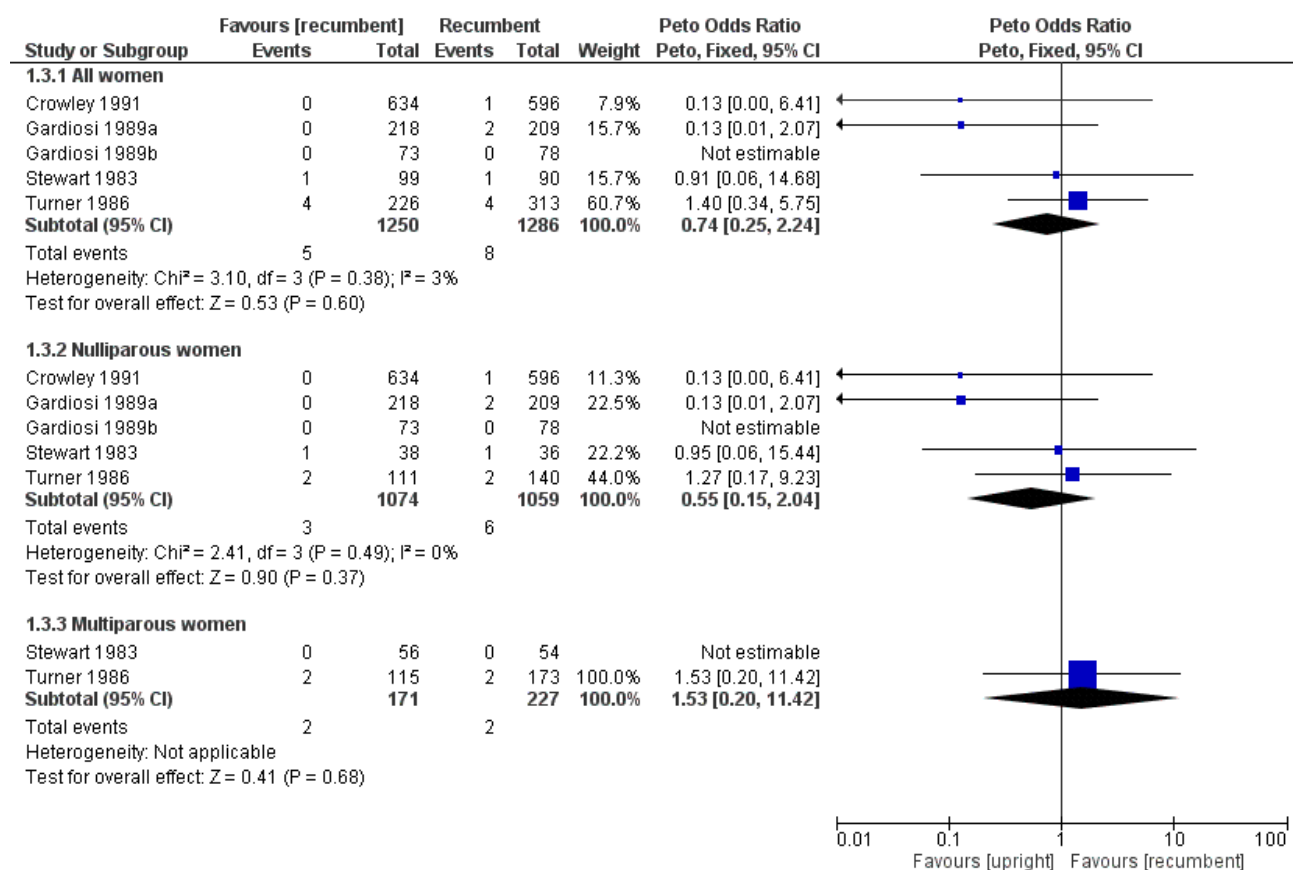


Figure 11: Duration of active 2nd stage

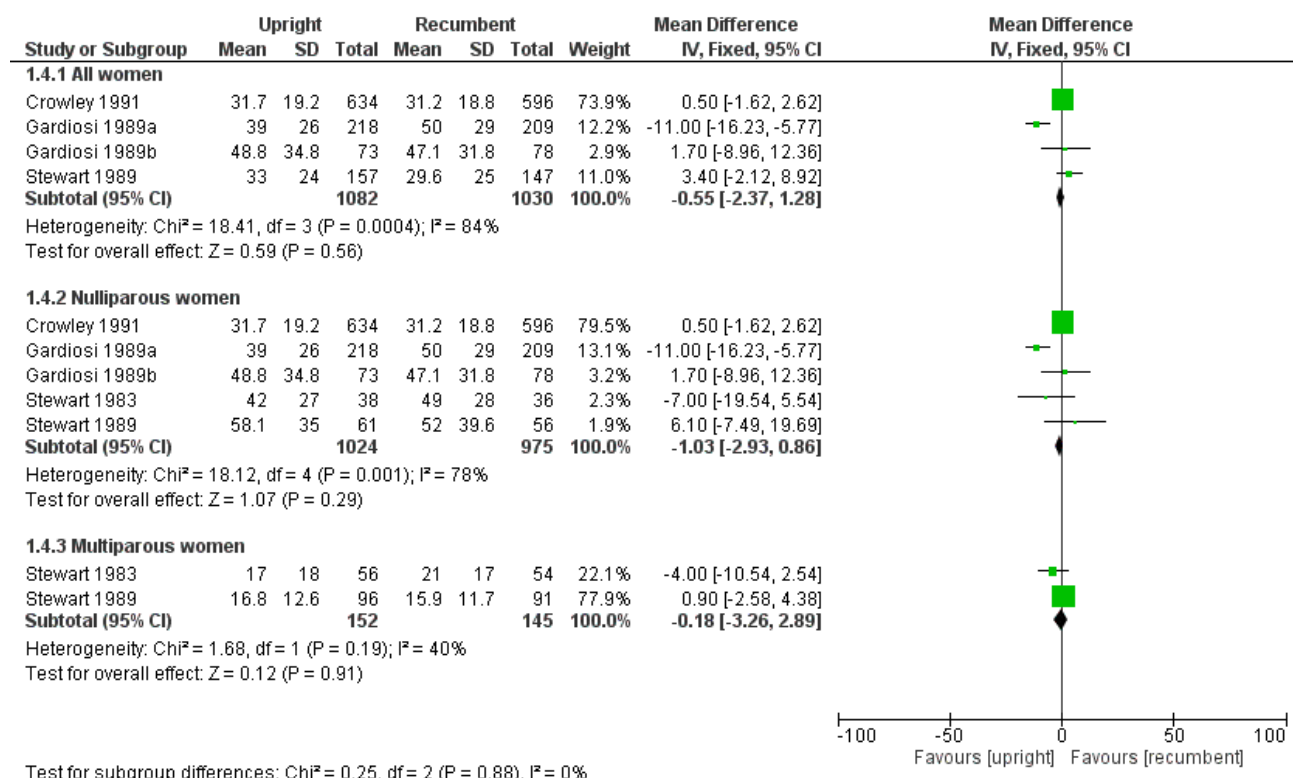


Figure 12: Genital tract trauma – episiotomy

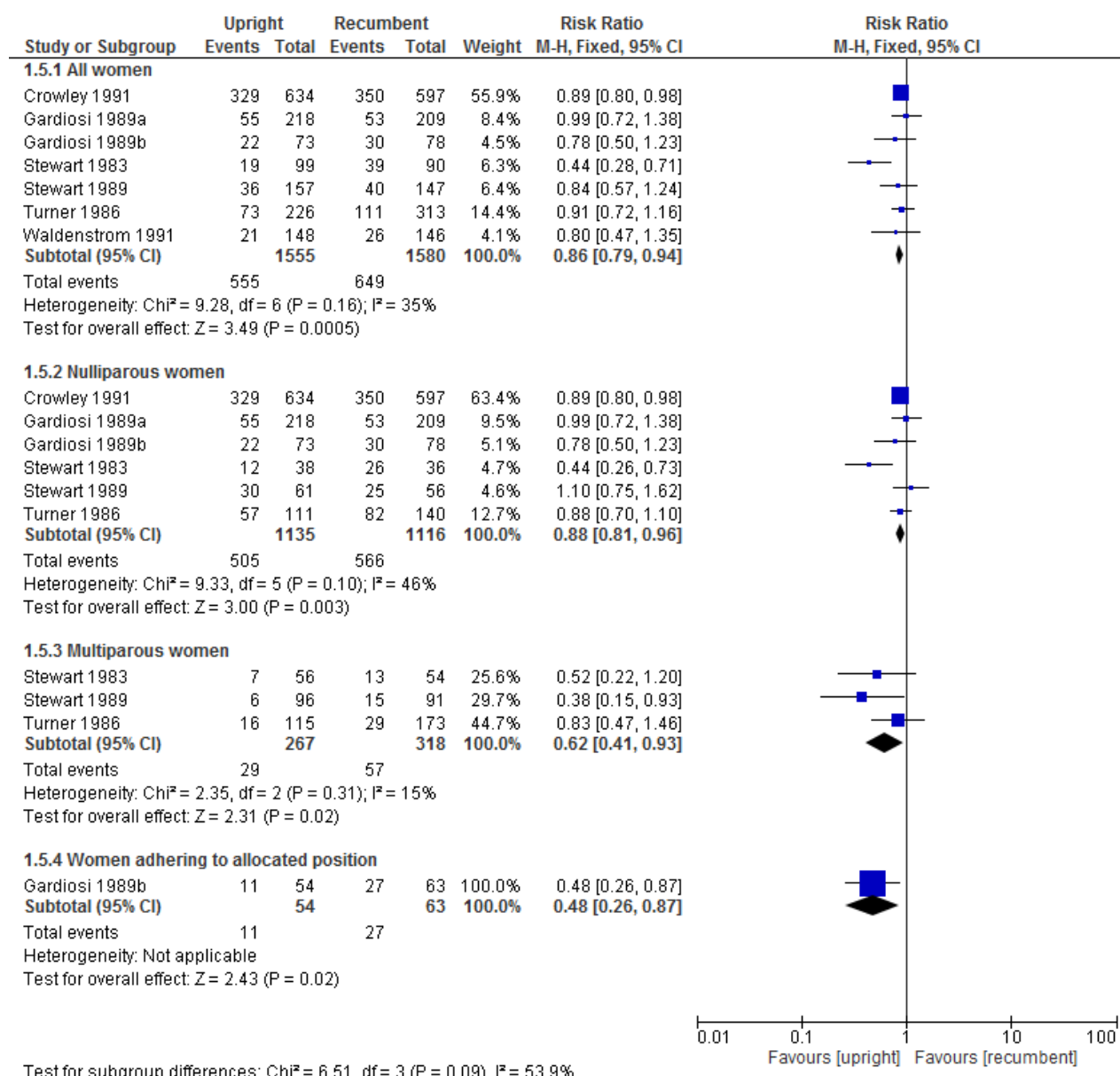
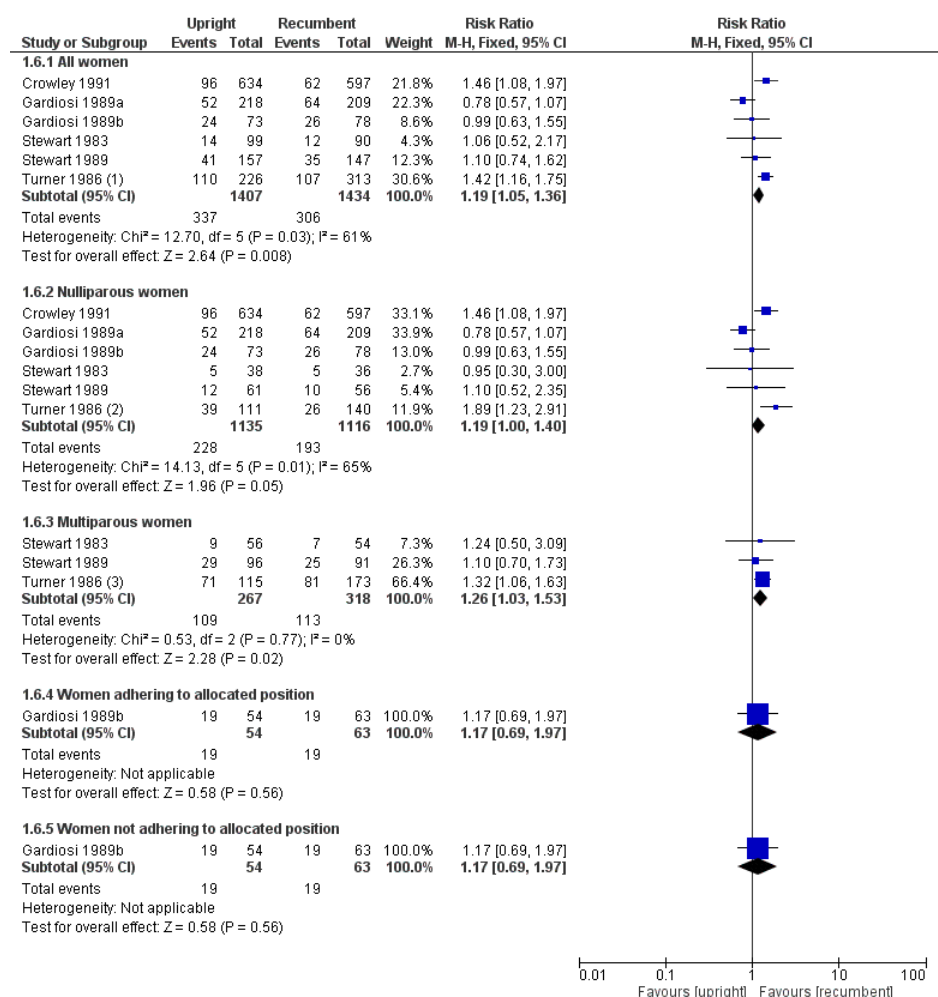
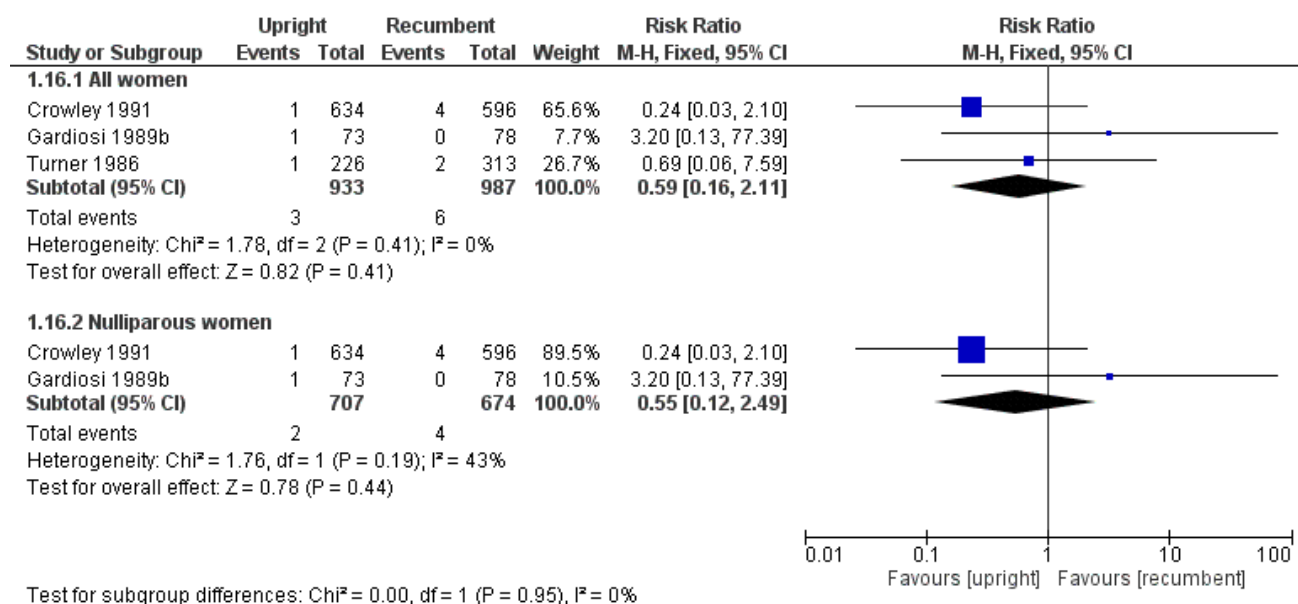


Figure 13: Genital tract trauma - perineal tear (grade 2 or higher)



Footnotes

- (1) Grades not specified
- (2) Grades not specified
- (3) Grades not specified

Figure 14: 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 positions	Recumbent positions	Relative (95% CI)	Absolute		
Mode of birth: spontaneous vaginal birth - Nulliparous women (Better indicated by higher values)												
2 (BUMPES 2017; Golará 2002)	randomised trials	no serious risk of bias	very serious ¹	no serious indirectness	very serious imprecision ²	none	564/1581 (35.7%)	650/1578 (41.2%)	RR 1.07 (0.64 to 1.78)	49 fewer per 1000 (from 16 fewer to 82 fewer)	VERY LOW	CRITICAL
Mode of birth: instrumental birth - Nulliparous women (Better indicated by lower values)												
2 (BUMPES 2017; Golará 2002)	randomised trials	no serious risk of bias	no serious inconsistency	serious ³	no serious imprecision	none	858/1581 (54.3%)	799/1578 (50.6%)	RR 1.07 (1 to 1.14)	35 more per 1000 (from 0 more to 71 more)	MODERATE	CRITICAL
Mode of birth: caesarean birth - Nulliparous women (Better indicated by lower values)												
2 (BUMPES 2017; Golará 2002)	randomised trials	no serious risk of bias	no serious inconsistency	serious ³	serious ⁴	none	158/1581 (10%)	128/1578 (8.1%)	POR 1.25 (0.98 to 1.59)	20 more per 1000 (from 2 fewer to 48 more)	LOW	CRITICAL
Duration of active 2nd stage – Nulliparous women (Better indicated by lower values)												
1 (BUMPES 2017)	randomised trials	no serious risk of bias	no serious inconsistency	serious ³	very serious ⁶	none	Median (IQR) 94 (56 to 133)	Median (IQR) 88 (51 to 126)	Not estimable	Not estimable	VERY LOW	CRITICAL
Genital tract trauma: episiotomy - 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 (BUMPES 2017; Golar 2002)	randomised trials	no serious risk of bias	serious ⁵	serious ³	very serious imprecision ²	none	925/1581 (58.5%)	856/1578 (54.2%)	RR 0.89 (0.54 to 1.47)	43 more per 1000 (from 5 more to 81 more)	VERY LOW	CRITICAL
Genital tract trauma: perineal tear (grade 2 or higher) - Nulliparous women (Better indicated by lower values)												
2 (BUMPES 2017; Golar 2002)	randomised trials	no serious risk of bias	no serious inconsistency	serious ³	no serious imprecision	none	672/1581 (42.5%)	694/1578 (44%)	RR 0.96 (0.90 to 1.03)	18 fewer per 1000 (from 48 fewer to 18 more)	MODERATE	CRITICAL
Women's experience: satisfaction with overall experience - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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)	LOW	IMPORTANT
Women's experience: involved in making decisions - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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)	LOW	IMPORTANT
Women's experience: treated with respect by all staff - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁶	no serious inconsistency	serious ²	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)	LOW	IMPORTANT
Women's experience: expectations for labour and birth were met - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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)	LOW	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: felt safe at all times - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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)	LOW	IMPORTANT
Women's experience: good communication from staff - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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)	LOW	IMPORTANT
Women's experience: felt in control - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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)	LOW	IMPORTANT
Women's experience: able to move as much as wanted - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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)	LOW	IMPORTANT
Women's experience: satisfied with position before pushing - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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)	LOW	IMPORTANT
Women's experience: satisfied with position while pushing - Nulliparous women (Better indicated by higher values)												
1 (BUMPES 2017)	randomised trials	serious ⁷	no serious inconsistency	serious ³	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 17 more)	LOW	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		
										fewer to 34 more)		
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 ⁷	no serious inconsistency	serious ³	serious ⁴	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)	VERY 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 ⁷	no serious inconsistency	serious ³	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)	LOW	IMPORTANT

IQR: interquartile range; POR: peto odds ratio; RR: risk ratio

1. Very serious heterogeneity

2. 95% CI crosses 2 MIDs

3. Population is indirect as > 1/3 women received epidural analgesia in BUMPES 2017. The 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) and this outcome has not been downgraded for indirectness

4. 95% CI crosses 1 MID

5. Serious heterogeneity

6. Sample size < 200

7. Serious risk of bias in the evidence contributing to the outcomes as per RoB 2

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)

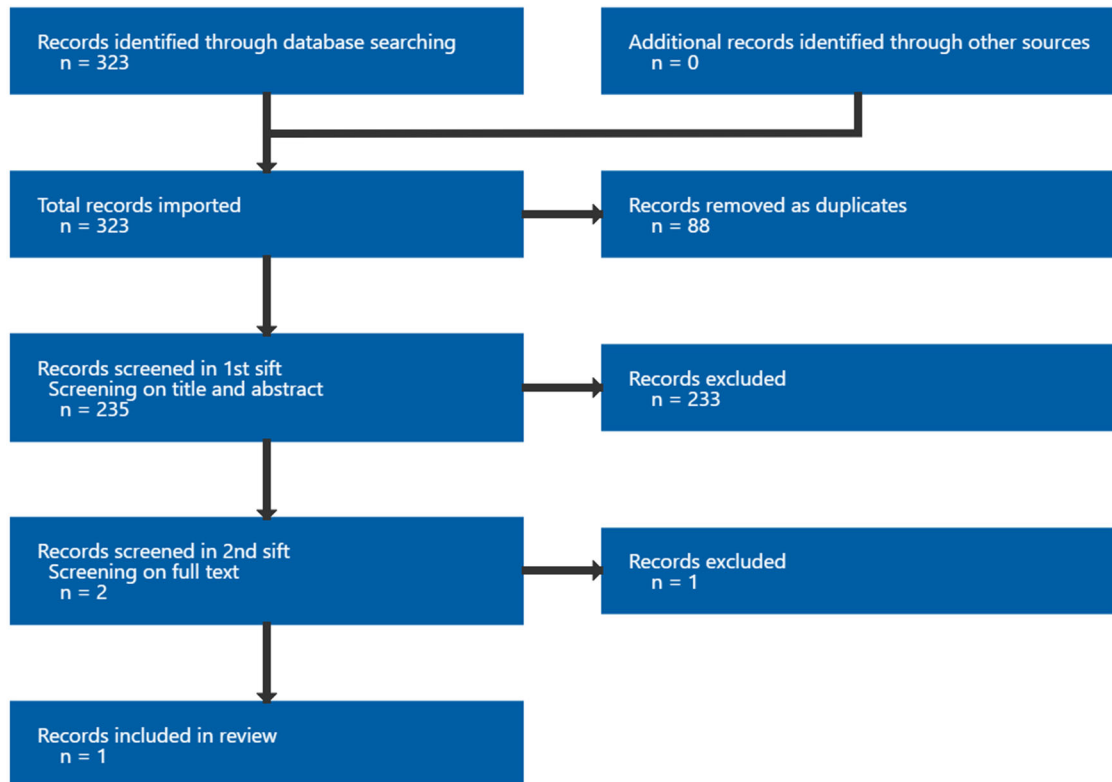
4 Serious risk of bias in the evidence contributing to the outcomes as per RoB 2

5 95% CI crosses 1 MID

Appendix G Economic evidence study selection

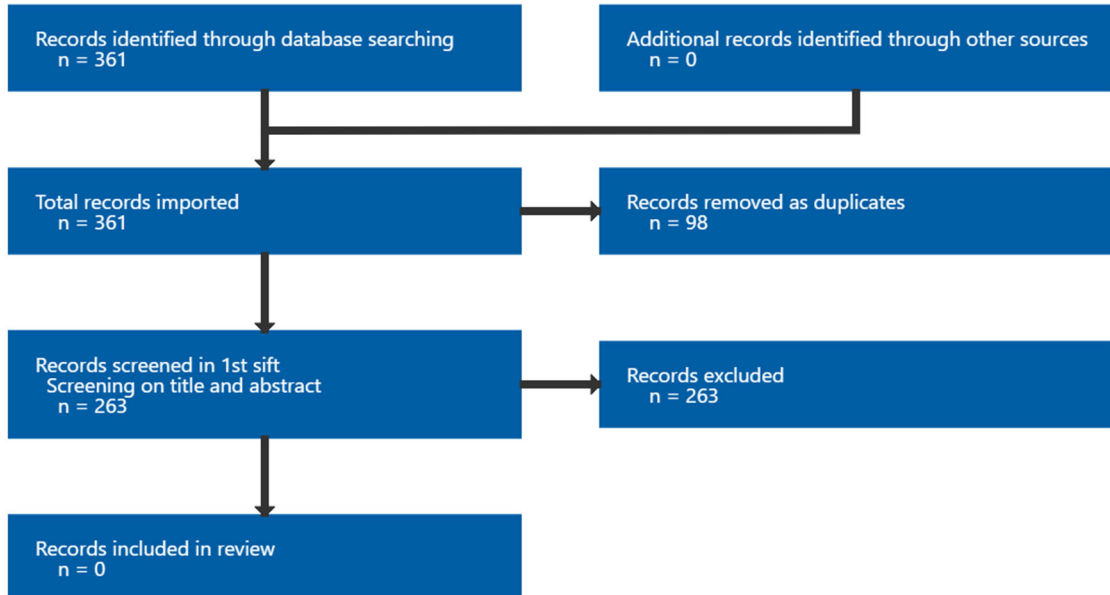
Study selection for: What is the most effective position for birth in women with an epidural in situ?

Figure 15: Study selection flow chart



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

Figure 16: 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
<p>Author and year: Bick 2017</p> <p>Country: UK</p> <p>Type of economic analysis: Cost analysis</p> <p>Source of funding: Health Technology Assessment programme of the National Institute for Health Research</p>	<p>Intervention: An upright birth position</p> <p>Comparator: A lying-down birth position</p>	<p>Population characteristics: nulliparous women with low-dose epidural in the second stage of labour</p> <p>Modelling approach/alongside an RCT: Economic data alongside an RCT</p> <p>Source of baseline data: Trial control (lying down birth position)</p> <p>Source of effectiveness data:</p>	<p>Mean cost per participant: Upright: £3,207 (SE: £73) Lying down: £3,252 (SE: £82)</p> <p>Difference: -£42 (95% CI: -£254 to £169)</p> <p>Mean outcome per participant: Upright: 0.352 SVB (SE: 0.012) Lying-down: 0.411 (SE: 0.012)</p> <p>Difference: -0.059 SVB (SE: 0.02)</p>	<p>ICERs: £722 per additional SVB (95% CI: -£2,986 to £6,358)</p>	<p>Perspective: NHS</p> <p>Currency: GBP</p> <p>Cost year: 2013-14</p> <p>Time horizon: 1-year</p> <p>Discounting: N/A</p> <p>Applicability: Directly applicable</p> <p>Limitations: Minor limitations</p> <p>Other comments:</p>

Study country and type	Intervention and comparator	Study population, design and data sources	Costs and outcomes (descriptions and values)	Results	Comments
		<p>Comparison of intervention and controls in RCT</p> <p>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.</p> <p>Source of unit cost data: Personal Social Services Research Unit and NHS Reference Costs 2013-14</p>			<p>Uncertainty was quantified by providing a 95% CI around the ICER and the parameters needed to do this were obtained from multiple imputation analysis.</p> <p>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</p>

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. <i>Obstetrical & gynecological survey</i> 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. <i>Obstetrical and Gynecological Survey</i> 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. <i>MIDIRS midwifery digest</i> 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. <i>Ginecologia y Obstetricia de Mexico</i> 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. <i>Journal of Obstetrics and Gynaecology</i> 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. <i>Journal of zanzan university of medical sciences and health services</i> 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. <i>The practising midwife</i> 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. <i>Iranian journal of obstetrics, gynecology and infertility</i> 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 indigenous birthing position using a filipino-improvised birthing chair - a third world tertiary care center prospective trial. Acta obstetrica 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 & fertilité 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. <i>Birth</i> (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. <i>Ginecología y obstetricia de Mexico</i> 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. <i>Acta Obstetrica et Gynecologica Scandinavica</i> 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. <i>Obstetrics and gynecology</i> 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. <i>Midwifery</i> 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. <i>BMC Pregnancy and Childbirth</i> 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. <i>BMC Pregnancy and Childbirth</i> 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. <i>American journal of obstetrics and gynecology</i> 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. <i>British Journal of Obstetrics and Gynaecology</i> 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 Fertilité et Senologie 48(12): 931-943	- Non-English language study
Plaat, F.; Golar, 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.; Golar, 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 phase. Journal de gynécologie, obstétrique 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 gynécologie, obstétrique 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. <i>Midwifery</i> 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. <i>International Journal of Nursing Sciences</i> 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. <i>Obstetrics and Gynecology</i> 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. <i>Obstetrical & gynecological survey</i> 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. <i>Obstetrical and Gynecological Survey</i> 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. <i>MIDIRS midwifery digest</i> 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. <i>Ginecologia y Obstetricia de Mexico</i> 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. <i>Journal of Obstetrics and Gynaecology</i> 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. <i>Journal of zanjan university of medical sciences and health services</i> 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. <i>The practising midwife</i> 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. <i>Iranian journal of obstetrics, gynecology and infertility</i> 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. <i>BMC Pregnancy and Childbirth</i> 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. <i>International journal of gynaecology and obstetrics</i> 46: 118	- Unable to retrieve
Bhardwaj, N., Kukade, J. A., Patil, S. et al. (1995) Randomised controlled trial on modified squatting position of delivery. <i>Indian journal of maternal and child health</i> 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). <i>BJOG</i> 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). <i>Health technology assessment (Winchester, England)</i> 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). <i>BJOG: An International Journal of Obstetrics and Gynaecology</i> 123(supplement2): 61	- Duplicate
Bomfim-Hyppolito, S. (1998) Influence of the position of the mother at delivery over some maternal and neonatal outcomes. <i>International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics</i> 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 indigenous birthing position using a filipino-improvised birthing chair - a third world tertiary care center prospective trial. <i>Acta obstetrica ET gynecologica scandinavica</i> 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). <i>BJOG: An International Journal of Obstetrics and Gynaecology</i> 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. <i>Gynecologie, obstetrique & fertilité</i> 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. <i>Birth (Berkeley, Calif.)</i> 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. <i>Ginecología y obstetricia de Mexico</i> 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. <i>Acta Obstetrica et Gynecologica Scandinavica</i> 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. <i>Obstetrics and gynecology</i> 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. <i>Midwifery</i> 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. <i>BMC Pregnancy and Childbirth</i> 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. <i>BMC Pregnancy and Childbirth</i> 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://trialssearch.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://trialssearch.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, Igbo 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 Fertilité et Senologie 48(12): 931-943	- Non-English language study
Plaat, F.; Golar, 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.; Golar, 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. <i>Women and birth : journal of the Australian College of Midwives</i> 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 phase. <i>Journal de gynecologie, obstetrique ET biologie de la reproduction</i> 28(3): 263-270	- Non-English language study
Racinet, C., Eymery, P., Philibert, L. et al. (1999) [Labor in the squatting position. <i>Journal de gynecologie, obstetrique et biologie de la reproduction</i> 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. <i>BJOG : an international journal of obstetrics and gynaecology</i> 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. <i>Posicoes verticalizadas no parto e a prevencao de laceracoes perineais: revisao sistematica e metanalise.</i> 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. <i>MCN. The American journal of maternal child nursing</i> 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. <i>Acta paulista de enfermagem</i> 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. <i>Journal of obstetrics and gynaecology of India</i> 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. <i>International Urogynecology Journal and Pelvic Floor Dysfunction</i> 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. <i>Dissertation/ thesis</i> : 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. <i>International Journal of Obstetric Anesthesia</i> 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. <i>Journal of Paediatrics and Child Health</i> 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. <i>Journal of Paediatrics and Child Health</i> 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. <i>Midwifery</i> 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. <i>Iranian journal of nursing and midwifery research</i> 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. <i>Iranian Red Crescent Medical Journal</i> 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. <i>Jordemodern</i> 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. <i>International Urogynecology Journal and Pelvic Floor Dysfunction</i> 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. <i>Cochrane Database of Systematic Reviews</i> 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. <i>International journal of nursing studies</i> 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. <i>Journal of clinical nursing</i> 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.