WHO recommendations

non-clinical interventions to reduce unnecessary caesarean sections

Web annex 3:

GRADE evidence tables

World Health Organization

The guideline recommendations are available at
http://www.who.int/reproductivehealth

WHO/RHR/18.22

Suggested citation. WHO recommendations non-clinical interventions to reduce unnecessary caesarean sections. **Web annex 3:** GRADE evidence tables. Geneva: World Health Organization; 2018 (WHO/RHR/18.23). Licence: CC BY-NC-SA 3.0 IGO. Cataloguing-in-Publication (CIP) data. CIP data are available at http://apps.who.int/iris.

This publication forms part of the WHO recommendations non-clinical interventions to reduce unnecessary caesarean sections. It is being made publicly available as supplied by those responsible for its development for transparency purposes and information, as required by WHO (see the WHO handbook for guideline development, 2nd edition (2014).

TABLE 1. EFFECTS OF INTERVENTIONS TARGETED AT WOMEN

STUDY	QUALITY ASSESSMENT						OUTCOME	INTERVENTION	CONTROL	EFFECT (95% CI) OR P-VALUE	CERTAINTY (GRADE)*
	DESIGN	RISK OF BIAS	INCONSISTENCY	INDIRECTNESS	IMPRECISION	OTHER ASPECTS					
Masoumi et al (2016) Antenatal education programme on physiological childbirth (birth preparation training)	RCT	Not serious	Single study	Not serious	Serious[a]	None	CS	33/75 (44%)	32/75 (43.7%)	RR 1.03 (0.72 to 1.49)	⨁⨁⨁◯ MODERATE[a]
							Physiological birth	6/75 (8%)	0/75 (0%)	Not estimable	
							Normal vaginal birth	36/75 (48%)	43/75 (57%)	RR 0.84 (0.62 to 1.14)	
Feinberg et al (2015) Psychosocial couple-based prevention programme	RCT	Serious[b]	Single study	Not serious	Serious[a]	None	CS	21% (n = 76) (number of events unclear)	40% (n = 71) (number of events unclear)	OR 0.36 (0.15 to 0.86)	⨁⨁◯◯ LOW [a, b]
							Maternity length of stay (days) (mean, SD)	3.11 ± 2.09 (n = 76)	3.36 ± 2.50 (n = 71)	MD -0.25 (-1.00 to 0.50)	
							Newborn length of stay (days) (mean, SD)	2.67 ± 1.04 (n = 76)	2.89 ± 1.17 (n = 71)	MD -0.22 (-0.58 to 0.14)	

Fenwick et al (2015) Psycho-education by telephone	RCT	Serious[b]	Single study	Serious[c]	Serious[a]	None	Overall CS	31/91 (34.1%)	39/93 (41.9%)	RR 0.81 (0.56 to 1.18)	⨁◯◯◯ VERY LOW [a, b, c]
							Emergency CS	16/91 (17.6%)	23/91 (24.7%)	RR 0.70 (0.39 to 1.23)	
							SVD	44/91 (48.4%)	39/93 (41.9%)	RR 1.15 (0.84 to 1.59)	
							Forceps and vacuum delivery	16/91 (17.6%)	15/93 (16.1%)	RR 1.09 (0.57 to 2.07)	
							Nursery admission	16/91 (17.6%)	18/91 (19.4%)	RR 0.89 (0.48 to 1.63)	
							Maternal readmission	3/91 (3.3%)	5/91 (5.4%)	RR 0.60 (0.15 to 2.44)	
							Baby readmission	8/91 (8.8%)	6/91 (6.5%)	RR 1.33 (0.48 to 3.69)	
							Breastfeeding at six months	76/91 (83.5%)	73/91 (78.5%)	RR 1.04 (0.91 to 1.19)	
							Satisfaction with mode of birth	53/91 (58.2%)	61/91 (65.6%)	RR 0.87 (0.69 to 1.09)	
Wang, Li & Deng (2014) Pelvic floor muscle training exercises (PFMT) with telephone follow up	RCT	Serious[b]	Single study	Not serious	Serious[a]	None	Overall CS	16/35 (31.4%)	27/55 (49.1%)	RR 0.87 (0.37 to 2.04)	⨁⨁◯◯ LOW [a, b]
							Episiotomy	47.1% (number of events/ participants unclear)	47.3% (number of events/participants unclear)	*P*=0.35	
							Perineal laceration	7.8% (number of events/ participants unclear)	3.6% (number of events/ participants unclear)	*P*=0.98	

Valiani, Haghighatdana & Ehsanpour (2014) Childbirth training workshop	RCT	Serious[b]	Single study	Not serious	Serious[a]	None	Mothers alone vs control: CS	12/30 (40%)	22/30 (73.3%)	RR 0.55 (0.33 to 0.89)	⨁⨁◯◯ LOW [a, b]
							Couple vs control: CS	13/30 (43.3%)	22/30 (73.3%)	RR 0.59 (0.37 to 0.94)	
							Mothers alone vs control: vaginal delivery	18/30 (60%)	8/30 (26.7%)	RR 2.25 (1.16 to 4.36)	
							Couple vs control: vaginal delivery	17/30 (56.7%)	8/30 (26.7%)	RR 2.13 (1.09 to 4.16)	
Rouhe et al (2013) Psycho-education	RCT	Serious[b]	Single study	Not serious	Serious[a]	None	Overall CS	30/131 (22.9%)	78/240 (32.5%)	RR 0.70 (0.49 to 1.01)	⨁⨁◯◯ LOW [a, b]
							Elective CS	14/131 (10.1%)	31/240 (12.9%)	RR 0.83 (0.46 to 1.50)	
							Emergency CS	16/131 (12.2%)	47/240 (19.6%)	RR 0.62 (0.37 to 1.06)	
							SVD	83/131 (63.4%)	114/240 (47.5%)	RR 1.33 (1.11 to 1.61)	
							Positive delivery experience, >75th percentile of the DSS	30/77 (36.1%)	31/124 (22.8%)	RR 1.56 (1.03 to 2.36)	
Sharifirad et al (2013) Prenatal education for husbands	RCT	Serious[b]	Single study	Serious[c]	Serious[a]	None	CS	29.5% (n = 44) (number of events unclear)	50.0% (n = 44) (number of events unclear)	$P < 0.05$	⨁◯◯◯ VERY LOW [a, b, c]

Bergström, Kieler & Waldenström (2009) Antenatal education on natural childbirth preparation with training in breathing and relaxation techniques	RCT	Not serious	Single study	Not serious	Serious[d]	None	Elective CS	29/484 (6.0%)	31/493 (6.3%)	RR 0.95 (0.58 to 1.56)	⨁⨁⨁◯ MODERATE[d]
							Emergency CS	67/484 (13.8%)	75/493 (15.2%)	RR 0.91 (0.67 to 1.23)	
							SVD	321/484 (66.3%)	327/493 (66.3%)	RR 1.00 (0.91 to 1.09)	
							Instrumental delivery	67/484 (13.8%)	60/493 (12.2%)	RR 1.14 (0.82 to 1.57)	
							Experience of childbirth (W-DEQ B): mean (SD)	49.6 ± 26 (number of participants unclear)	50.1 ± 25 (number of participants unclear)	MD -0.5 (-3.2 to 4.1)	
Montgomery et al (2007) Computer decision aids vs usual care	RCT	Not serious	Single study	Not serious	Serious[d]	None	Information group vs usual care group: elective CS	117/240 (48.8%)	118/238 (49.6%)	RR 0.98 (0.82 to 1.18)	⨁⨁⨁◯ MODERATE[d]
							Decision analysis group vs usual care group: elective CS	97/235 (41.3%)	118/238 (49.6%)	RR 0.83 (0.68 to 1.02)	
							Information group vs usual care group: emergency CS	53/240 (22.1%)	48/238 (20.2%)	RR 1.09 (0.77 to 1.55)	
							Decision analysis group vs usual care group: emergency CS	50/235 (21.3%)	48/238 (20.2%)	RR 1.05 (0.74 to 1.50)	
							Decision analysis vs usual care group: vaginal birth	88/235 (37.5%)	72/238 (30.3%)	RR 1.24 (0.96 to 1.60)	
							Information group vs usual care group: vaginal birth	70/240 (29.2%)	72/238 (30.3%)	RR 0.96 (0.73 to 1.27)	

Bastani et al (2006) Nurse-led applied relaxation training programme	RCT	Serious[b]	Single study	Not serious	Serious[a]	None	CS	8/52 (15.4%)	21/52 (40.4%)	RR 0.22 (0.11 to 0.43)	⊕⊕⊖⊖ LOW [a, b]
							Instrumental delivery (forceps and vacuum extraction)	11/52 (21.2%)	25/52 (48.1%)	RR 0.44 (0.24 to 0.80)	
Shorten et al (2005) Decision-aid booklet	RCT	Not serious	Single study	Not serious	Serious[a]	None	Elective repeat CS	Baseline: 29.6% Follow-up: 52.2% (n = 115)	Baseline: 23.2% Follow-up: 49.4% (n = 112)	Absolute change from baseline: 26.2% vs 22.6% Difference in absolute change from baseline: -3.6% (NS)	⊕⊕⊕⊖ MODERATE[a]
							Decisional conflict scores	Baseline: 2.34 Follow-up: 1.94 Change in score: -0.40 (-0.51 to -0.29); n = 99	Baseline: 2.26 Follow-up: 2.18 Change in score: -0.08 (-0.22 to 0.06); n = 88	$P < 0.05$	
							Satisfaction with birth experience (scale: 1 to 10)	Mean satisfaction rating: 7.70	Mean satisfaction rating: 7.90	NS	
Saisto et al (2001) Intensive group therapy (cognitive behavioural therapy and childbirth psychotherapy)	RCT	Serious[b]	Single study	Not serious	Serious[a]	None	CS	37/85 (43.5%)	44/91 (48.4%)	RR 0.90 (0.65 to 1.24)	⊕⊕⊖⊖ LOW [a, b]
							CS for psychosocial reasons	20/85 (23.5%)	26/91 (28.6%)	RR 0.82 (0.50 to 1.36)	
							Satisfaction with childbirth (scale: from 1 to 5)	Mean score, SD: 3.7 ± 1.4	Mean score, SD: 4.0 ± 1.3	NS	

Fraser et al (1997) Individualized prenatal education and support programme vs written information in pamphlet	RCT	Not serious	Single study	Not serious	Serious[a]	None	Overall CS	302/641 (47.1%)	324/634 (51.1%)	RR 0.92 (0.82 to 1.03)	⨁⨁⨁◯ MODERATE[a]
							Scheduled CS	137/641 (21.4%)	150/634 (23.7%)	RR 0.90 (0.74 to 1.11)	
							Urgent CS	39/641 (6.1%)	44/634 (6.9%)	RR 0.88 (0.58 to 1.33)	
							VBAC	339/641 (53%)	310/634 (49%)	RR 1.08 (0.97 to 1.21)	
							Birth experience	Mean score, SD: 75.2 ± 20.7	Mean score, SD: 74.2 ± 21.8	*P* = 0.59	
							Maternal morbidity and neonatal outcomes	Rates of maternal morbidity and neonatal outcomes were similar in the study groups (maternal–uterine rupture or dehiscence, hysterectomy, blood transfusion; neonatal–perinatal deaths, Apgar score less than 7 at 5 minutes, admission to NICU)			
Navaee & Abedian (2015) Role play education vs standard education using lectures	RCT	Serious[b]	Single study	Not serious	Serious[a]	None	CS	13/35 (37.1%)	18/32 (56.2%)	RR 0.66 (0.39 to 1.12)	⨁⨁◯◯ LOW [a, b]
Eden et al (2014) Computerized decision aid vs educational brochures	RCT	Serious[b]	Single study	Not serious	Serious[a]	None	Decisional conflict (overall, women in third trimester)	Mean score: Baseline: 19.4 (12.7 to 26.1) Follow-up: 10.7 (5.6 to 15.9) n = 35	Mean score: Baseline: 16.5 (9.5 to 23.5) Follow-up: 14.1 (8.7 to 19.4) n = 32	MD: -0.32, *P* = 0.003	⨁⨁◯◯ LOW [a, b]
							VBAC	41% (number of events/participants unclear)	37% (number of events/participants unclear)	*P* = 0.72	

CS – caesarean section; **DSS –** delivery satisfaction scale; **MD –** mean difference; **NICU –** neonatal intensive care unit; **NS –** not significant; OR – odds ratio; **RCT –** randomized controlled trial; **RR –** risk ratio; **SVD –** spontaneous vaginal delivery; **VBAC –** vaginal birth after cesarean; **W-DEQ B –** Wijma Delivery Expectancy/Experience Questionnaire–Version B.

About the certainty of the evidence (Grading of Recommendations Assessment, Development and Evaluation; GRADE)*

High: This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different † is low.
Moderate: This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different † is moderate.
Low: This research provides some indication of the likely effect. However, the likelihood that it will be substantially different † is high.
Very low: This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different † is very high.

* This is sometimes referred to as "quality of evidence" or "confidence in the estimate"
† Substantially different = a large enough difference that it might affect a decision

[a] Downgraded one level for serious imprecision (due to small sample size and few events).

[b] Downgraded one level for serious risk of bias (due to flaws in randomization procedures).

[c] Downgraded one level for serious indirectness (follow-up analyses, not described in the trial report, indicated that the impact on caesarean sections was due to reduced birth complications arising from fetal position (e.g. breech birth) and labour progression).

[d] Downgraded one level due to serious imprecision (95% CI includes appreciable benefit and harm).

References

Bastani F, Hidarnia A, Montgomery KS, Aguilar-Vafaei ME, Kazemnejad A (2006). Does relaxation education in anxious primigravid Iranian women influence adverse pregnancy outcomes? A randomised controlled trial. J Perinat Neonatal Nurs. 20(2):138–46.

Bergström M, Kieler H, Waldenström U (2009). Effects of natural childbirth preparation versus standard antenatal education on epidural rates, experience of childbirth and parental stress in mothers and fathers: a randomised controlled multicentre trial. BJOG. 116(9):1167–76. doi: 10.1111/j.1471-0528.2009.02144.x.

Eden KB, Perrin NA, Vesco KK, Guise JM (2014). A randomized comparative trial of two decision tools for pregnant women with prior cesareans. J Obstet Gynecol Neonatal Nurs. 43(5):568–79. doi: 10.1111/1552-6909.12485.

Feinberg ME, Roettger ME, Jones DE, Paul IM, Kan ML (2015). Effects of a psychosocial couple-based prevention program on adverse birth outcomes. Matern Child Health J. 19(1):102–11. doi: 10.1007/s10995-014-1500-5.

Fenwick J, Toohill J, Gamble J, Creedy DK, Buist A, Turkstra E et al (2015). Effects of a midwife psycho-education intervention to reduce childbirth fear on women's birth outcomes and postpartum psychological wellbeing. BMC Pregnancy Childbirth. 15:284. doi: 10.1186/s12884-015-0721-y.

Fraser W, Maunsell E, Hodnett E, Moutquin J-M (1997). Randomized controlled trial of a prenatal vaginal birth after cesarean section education and support program. Am J Obstet Gynecol. 176(2):419–25.

Masoumi SZ, Kazemi F, Oshvandi K, Jalali M, Esmaeili-Vardanjani A, Rafiei H (2016). Effect of training preparation for childbirth on fear of normal vaginal delivery and choosing the type of delivery among pregnant women in Hamadan, Iran: a randomized controlled trial. J Family Reprod Health. 10(3):115–21.

Montgomery AA, Emmett CL, Fahey T, Jones C, Ricketts I, Patel RR (2007). Two decision aids for mode of delivery among women with previous caesarean section: randomised controlled trial. BMJ. 334(7607):1305. doi: 10.1136/bmj.39217.67101955.

Navaee M, Abedian Z (2015). Effect of role play education on primiparous women's fear of natural delivery and their decision on the mode of delivery. Iran J Nurs Midwifery Res. 20(1):40–6.

Rouhe H, Salmela-Aro K, Toivanen R, Tokola M, Halmesmäki E, Saisto T (2013). Obstetric outcome after intervention for severe fear of childbirth in nulliparous women – randomised trial. BJOG. 120(1):75–84. doi: 10.1111/1471-0528.12011.

Saisto T, Salmela-Aro K, Nurmi JE, Könönen T, Halmesmäki E (2001). A randomized controlled trial of intervention in fear of childbirth. Obstet Gynecol. 98(5 Pt 1):820–6.

Sharifirad G, Rezaeian M, Soltani R, Javaheri S, Mazaheri MA (2013). A survey on the effects of husbands' education of pregnant women on knowledge, attitude, and reducing elective cesarean section. J Educ Health Promot. 2:50. doi: 10.4103/2277-9531.119036.

Shorten A, Shorten B, Keogh J, West S, Morris J (2005). Making choices for childbirth: a randomised controlled trial of a decision-aid for informed birth after cesarean. Birth. 32(4):252–61. doi: 10.1111/j.0730-7659.2005.00383.x.

Valiani M, Haghighatdana Z, Ehsanpour S (2014). Comparison of childbirth training workshop effects on knowledge, attitude, and delivery method between mothers and couples groups referring to Isfahan health centers in Iran. Iran J Nurs Midwifery Res. 19(6):653–8.

Wang X, Li GY, Deng, ML (2014). Pelvic floor muscle training as a persistent nursing intervention: Effect on delivery outcome and pelvic floor myodynamia. Int J Nurs Sci. 1(1):48–52. doi: 10.1016/j.ijnss.2014.02.017.

TABLE 2. EFFECTS OF INTERVENTIONS TARGETED AT HEALTH-CARE PROFESSIONALS

STUDY	QUALITY ASSESSMENT						OUTCOME	INTERVENTION	CONTROL	EFFECT (95% CI[a]) OR P-VALUE	CERTAINTY (GRADE)
	DESIGN	RISK OF BIAS	INCONSISTENCY	INDIRECTNESS	IMPRECISION	OTHER ASPECTS					
Hemminki et al (2008) Education of public health nurses on childbirth classes	CRT	Serious[b]	Single study	Not serious	Not serious	None	CS	166/845 (19%)	116/723 (16%)	OR 1.29 (0.99 to 1.67)	⨁⨁⨁◯ MODERATE[b]
Althabe et al (2004) Evidence-based clinical practice guidelines plus mandatory second opinion	RCT	Not serious	Single study	Not serious	Not serious	None	All CS	Mean baseline rate (34 735 women): 26.3 Mean follow-up rate (35 675): 24.7 Mean rate change: -1.6	Mean baseline rate (39 175 women): 24.6 Mean follow-up rate (39 638): 24.9 Mean rate change: 0.3	Mean difference in rate change: -1.9 (-3.8 to -0.1)	⨁⨁⨁⨁ HIGH
							Elective CS	Mean baseline rate (34 735 women): 8.9 Mean follow-up rate (35 675): 9.1 Mean rate change: 0.1	Mean baseline rate (39 175 women): 9.1 Mean follow-up rate (39 638): 9.0 Mean rate change: -0.1	Mean difference in rate change: 0.2 (-1.4 to 1.8)	

							Intrapartum CS	Mean baseline rate (34 735 women): 17.4 Mean follow-up rate (35 675): 15.6 Mean rate change: -1.8	Mean baseline rate (39,175 women): 15.4 Mean follow-up rate (39 638): 15.9 Mean rate change: 0.4	Mean difference in rate change: -2.2 (-4.3 to -0.1)	
Liang et al (2004) Peer review plus mandatory second opinion	ITS	Serious[c]	Single study	Not serious	Not serious	None	CS	Change in level of total caesarean deliveries at 12 months:[d] -2.4% (-11.4% to 6.7%); Change in slope:d 1.34% (-2.5% to 5.2%)			⨁◯◯◯ VERY LOW [c]
Scarella et al (2011) Audit and feedback using the Robson classification	ITS	Serious[c]	Single study	Not serious	Not serious	None	CS	Change in level of caesarean deliveries during intervention: -11% (-23.2 to 1.2%), NS Change in slope: -1.1% (-6.4 to 4.2%), NS Change in level of caesarean deliveries in the immediate post-intervention period compared with the intervention period: 8.6% (2.1 to 15.2%), *P* = 0.022 Change in slope: -0.3% (-1.6 to 0.9%), NS			⨁◯◯◯ VERY LOW [c]
Mohammadi, Källestål & Essén (2012) Audit and feedback plus financial incentive	CBA (reanalysed as ITS)	Serious[c]	Single study	Not serious	Not serious	None	CS	Change in level of caesarean deliveries during the intervention: -14.6% (-24.4% to -4.8%), P = 0.02; Change in slope -0.07% (-1.5% to 1.3%), NS			⨁◯◯◯ VERY LOW [c]

Chaillet et al (2015) Evidence-based clinical practice guidelines plus audit and feedback	Cluster-RCT	Not serious	Single study	Not serious	Not serious	None	Overall CS	Baseline: 5484/24 388 (22.5%) Post-intervention: 5128/23 484 (21.8%)	Baseline: 6671/28 698 (23.2%) Post-intervention: 6767/28 781 (23.5%)	OR 0.90 (0.80 to 0.99)[e] RD -1.8% (-3.8 to -0.2)[e]	⊕⊕⊕⊕ HIGH
							Elective repeat caesarean section	Baseline: 1995/24 388 (8.2%) Post-intervention: 1931/23 484 (8.2%)	Baseline: 2404/28 698 (8.4%) Post-intervention: 2598/28 781 (9.0%)	RD 0.6 % (-0.07 to 1.28)	
							Low-risk group: CS	Baseline: 971/11 478 (8.5%) Post-intervention: 763/10 067 (7.6%)	Baseline: 1256/14 717 (8.5%) Post-intervention: 1172/13 019 (9.0%)	RD -1.7% (-3.0 to -0.3)	
							Assisted vaginal delivery[f]	Baseline: 2535/21 449 (11.8%) Post-intervention: 2223/20 612 (10.8%)	Baseline: 2574/24 997 (10.3%) Post-intervention: 2605/24 874 (10.5%)	RD -1.1 (-2.2 to -0.1)	
							Episiotomy[f]	Baseline: 3762/21 449 (17.5%) Post-intervention: 2953/20 612 (14.3%)	Baseline: 4777/24 997 (19.1%) Post-intervention: 3871/24 874 (15.6%)	RD 0.1% (-2.0 to 2.7)	
							Major maternal morbidity	Baseline: 161/24 388 (0.66%) Post-intervention: 167/23 484 (0.71%)	Baseline: 138/28 698 (0.48%) Post-intervention: 141/28 781 (0.49%)	RD 0.03% (-0.11 to 0.23)	
							Minor maternal morbidity	Baseline: 3293/24 388 (13.5%) Post-intervention: 3576/23 484 (15.2%)	Baseline: 3869/28 698 (13.5%) Post-intervention: 4244/28 781 (14.7%)	RD 0.3% (-1.2 to 1.8)	

							Major neonatal morbidity	Baseline: 1172/24 823 (4.7%) Post-intervention: 1070/23 902 (4.5%)	Baseline: 1018/29 107 (3.5%) Post-intervention: 1156/29 211 (4.0%)	RD -0.7% (-1.3 to -0.1)	
							Minor neonatal morbidity	Baseline: 3936/25 823 (15.9%) Post-intervention: 4261/23 902 (17.8%)	Baseline: 3947/29 107 (13.6%) Post-intervention: 5002/29 211 (17.1%)	RD -1.7% (-2.6 to -0.9)	
							Intrapartum and neonatal deaths	Baseline: 35/24 823 (0.1%) Post-intervention: 20/23 902 (0.1%)	Baseline: 14/29 107 (0.0%) Post-intervention: 28/29 211 (0.0%)	RD -0.06% (-0.08 to -0.03%)	
							Major trauma	Baseline: 258/24 823 (1.0%) Post-intervention: 213/23 902 (0.9%)	Baseline: 237/29 107 (0.8%) Post-intervention: 269/29 211 (0.9%)	RD -0.23% (-0.40 to -0.01)	
							Use of invasive mechanical ventilation	Baseline: 439/24 823 (1.8%) Post-intervention: 335/23 902 (1.4%)	Baseline: 289/29 107 (1.0%) Post-intervention: 333/29 211 (1.1%)	RD -0.38% (-0.60 to -0.09)	
Poma (1998) Audit and feedback plus 24-hour in-house coverage by dedicated physician	ITS	Serious[c]	Single study	Not serious	Not serious	None	CS	Change in level of total caesarean deliveries (primary and repeat caesarean sections) at 24 months: -6.6% (-10.1 to -3.2); change in slope: -0.11% (-0.25 to 0.02) (data reanalysed).			⨁◯◯◯ VERY LOW [c]

Lomas et al (1991) Audit and feedback plus local opinion leader education	Cluster-RCT	Not serious	Single study	Not serious	Not serious	None		Audit and feedback (n=524 deliveries)	Opinion leader education (n=739 deliveries)	Control (n=1233 deliveries)	⊕⊕⊕⊕ HIGH
							Elective CS	69.7% (62.4 to 77.0%)	53.7% (46.5 to 61.0%)	66.8% (61.7 to 72.0%)	
							Unscheduled CS	18.6% (13.9 to 23.2%)	21.4% (16.8 to 26.1%)	18.7% (15.4 to 22.1%)	
							Trial of labour rates (%)	21.4% (13.9 to 29.0%)	38.2% (30.6 to 45.7%)	28.3% (23.0 to 33.7%)	
							Vaginal births (%)	11.8% (5.8 to 17.7%)	25.3% (19.3 to 31.2%)	14.5% (10.3 to 18.7%)	
							Low Apgar score < 7 at 5 minutes (%)	5.9 (4.2 to 7.6)	0.9 (0.0 to 2.6)	1.2 (0.0 to 2.4)	
							Duration of hospital stay (%)	< 6 days: 27.9 6 days: 29.9 > 6 days: 42.2	< 6 days: 46.6 6 days: 31.4 > 6 days: 22.0	< 6 days: 32.2 6 days: 31.1 > 6 days: 36.7	

[a] Numbers in parentheses are 95% confidence limits; **CBA** – controlled before-and-after study; **CRT** – cluster-randomized trial; **CS** – caesarean section; **ITS** – interrupted time-series; **NS** – not significant; **OR** – odds ratio; **RD** – risk difference; **RR** – risk ratio.

[b] Downgraded one level for serious risk of bias (pilot study with no sample size calculation; unit of analysis error).

[c] Downgraded one level for possible confounding (unclear whether the intervention occurred independently of other changes over time).

[d] Two standardized effect sizes are obtained from ITS analysis: *change in level* (also called 'step change') and *change in trend* (also called 'change in slope') before and after the intervention. **Change in level** = difference between the observed level at the first intervention time point and that predicted by the pre-intervention time trend; **Change in trend** = difference between post- and pre-intervention slopes. A negative change in level and slope indicates a reduction in caesarean section rate.

[e] Adjusted in between-group comparison of the change from the pre-intervention period to the post-intervention period (adjusted for hospital and patient characteristics).

[f] In women who attempted labour.

References

Althabe F, Belizán JM, Villar J, Alexander S, Bergel E, Ramos S et al (2004). Mandatory second opinion to reduce rates of unnecessary caesarean sections in Latin America: a cluster randomised controlled trial. Lancet. 363(9425):1934-40. Lancet. 2004 Jun 12;363(9425):1934–40. doi: 10.1016/S0140-6736(04)16406-4.

Chaillet N, Dumont A, Abrahamowicz M, Pasquier JC, Audibert F, Monnier P et al (2015). A cluster-randomized trial to reduce cesarean delivery rates in Quebec. N Engl J Med. 372(18):1710–21. doi: 10.1056/NEJMoa1407120.

Hemminki E, Heikkilä K, Sevón T, Koponen P (2008). Special features of health services and register based trials – experiences from a randomized trial of childbirth classes. BMC Health Serv Res. 8:126. doi: 10.1186/1472-6963-8-126.

Liang WH, Yuan CC, Hung JH, Yang ML, Yang MJ, Chen YJ et al (2004). Effect of peer review and trial of labor on lowering cesarean section rates. J Chin Med Assoc. 67(6):281–6.

Lomas J, Enkin M, Anderson GM, Hannah WJ, Vayda E, Singer J (1991). Opinion leaders vs adult and feedback to implement practice guidelines. Delivery after previous cesarean section. JAMA. 265(17):2202–7.

Mohammadi S, Källestål C, Essén B (2012). Clinical audits: a practical strategy for reducing cesarean section rates in a general hospital in Tehran, Iran. J Reprod Med. 57(1–2):43–8.

Poma PA (1998). Effect of departmental policies on cesarean delivery rates: a community hospital experience. Obstet Gynecol. 91(6):1013–8.

Scarella A, Chamy V, Sepúlveda M, Belizán JM (2011). Medical audit using the Ten Group Classification System and its impact on the cesarean section rate. Eur J Obstet Gynecol Reprod Biol. 154(2):136–40. doi: 10.1016/j.ejogrb.2010.09.005.

TABLE 3. EFFECTS OF DIFFERENT STAFFING MODELS OF CARE

STUDY	QUALITY ASSESSMENT						OUTCOME	INTERVENTION	CONTROL	RELATIVE EFFECT (95% CI)	CERTAINTY (GRADE)
	DESIGN	RISK OF BIAS	INCONSISTENCY	INDIRECTNESS	IMPRECISION	OTHER ASPECTS					
Rosenstein et al (2015) Expanded access to collaborative 24-hour midwifery-labourist care model	Cohort (with ITS analysis)	Not serious	Single study	Not serious	Not serious	None	Primary CS	Before expansion: 381/1201 (31.7%)	After expansion: 130/521 (25.0%)	OR 0.56 (0.39 to 0.81)	⨁⨁⨁◯ LOW
							VBAC	Before expansion: 60/452 (13.3%)	After expansion: 52/232 (22.4%)	OR 2.03 (1.08 to 3.80)	

CI – confidence interval; **CS** – caesarean section; **ITS** – interrupted time-series; **OR** – odds ratio; **VBAC** – vaginal birth after caesarean section.

Reference

Rosenstein MG, Nijagal M, Nakagawa S, Gregorich SE, Kuppermann M (2015). The association of expanded access to a collaborative midwifery and laborist model with cesarean delivery rates. Obstet Gynecol. 126(4):716–23. doi: 10.1097/AOG.0000000000001032.

TABLE 4. EFFECTS OF FINANCIAL STRATEGIES TARGETED AT HEALTH-CARE PROFESSIONALS

STUDY	QUALITY ASSESSMENT						OUTCOME	EFFECT	CERTAINTY (GRADE)
	DESIGN	RISK OF BIAS	INCONSISTENCY	INDIRECTNESS	IMPRECISION	OTHER ASPECTS			
Keeler & Fok (1996) Equalizing physician fees for vaginal and caesarean section delivery	ITS	Serious[a]	Single study	Not serious	Not serious	None	CS	CS rates for non-breech deliveries decreased by 1.2 percentage points (22.5% before reform vs 21.3% after reform)	⨁◯◯◯ VERY LOW [a]
Lo (2008) Increase physician fees for vaginal birth after caesarean to the same level as for caesarean section; Increase in vaginal birth physician fees to that of caesarean section	ITS	Serious[a]	Single study	Not serious	Not serious	None	CS	The change in the level of total CS rates following the rise in VBAC fees was -1.68 (95% CI -2.3 to -1.07); the change in slope was -0.004 (95% CI -0.05 to 0.04)[b] The change in the level of total CS rates (for all indications and order of birth) following the rise in vaginal birth fees was 1.19 (95% CI -0.01 to 2.40) and the change in slope was -0.43 (95% CI -0.78 to -0.09)[b]	⨁◯◯◯ VERY LOW [a]

CI – confidence interval; **CS** – caesarean section; **ITS** – interrupted time series; **VBAC** – vaginal birth after caesarean.

[a] Downgraded one level for serious risk of bias (due to possible confounding of outcome; it was unclear whether the intervention occurred independently of other changes over time).

[b] Two standardized effect sizes are obtained from ITS analysis: a change in level (also called "step change") and a change in trend (also called "change in slope") before and after the intervention. Change in level = difference between the observed level at the first intervention time point and that predicted by the pre-intervention time trend; Change in trend = difference between post- and pre-intervention slopes. A negative change in level and slope indicates a reduction in CS rate.

References

Keeler EB, Fok T (1996). Equalizing physician fees had little effect on cesarean rates. Med Care Res Rev. 53(4):465–71

Lo JC (2008). Financial incentives do not always work – an example of cesarean sections in Taiwan. Health Policy. 88(1):121–9. doi: 10.1016/j.healthpol.2008.02.013.