

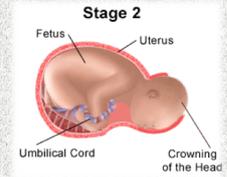
II stage of labor and duration of active pushing -affection on neonatal outcomes?



Branka M. Yli
Oslo Universitetsykehus

Second stage:

from maximum dilatation of the uterus to labor



Passive phase:

- Contractions

Active phase

- Contractions + mothers pushing



Trang fødselskanal

International guidelines about ii stage/pushing time

American College Ob/Gyn:

only address the length of the whole 2nd stage :
P0 2-3 hours, P≥1 1-2 hours

French guidelines:

consider an assisted delivery when pushing exceeds a 30 min length

United Kingdom's guidelines NICE:

delay in the active 2nd stage when it has lasted 2 hours if P0 and 1 hour if P≥1. An operative vaginal birth is suggested if birth is not imminent.

- ACOG Practice Bulletin Number 49, December 2003: Dystocia and augmentation of labor. Obstet Gynecol 2003 Dec;102(6):1445-54.
- Recommandations pour la pratique clinique: modalités de surveillance fœtale pendant le travail. In: 31e journées nationales du Collège national des gynécologues obstétriciens français. Paris; 2007
- <http://www.nice.org.uk/guidance/CG55/NICEGuidance/doc>

Prolonged second stage of labor is associated with low Apgar score

Maria Altman¹ · Anna Sandström^{1,2} · Gunnar Petersson¹ · Thomas Frisell¹ · Sven Cnattingius¹ · Olof Stephansson^{1,2}

All nulliparous women (n= 32 796) delivering a live born singleton infant in cephalic presentation at ≥37 completed weeks after spontaneous onset of labor between 2008 and 2012 in the counties of Stockholm and Gotland were included.

Primary outcome measure was 5 min Apgar score <7 and <4

OBSTETRIC EPIDEMIOLOGY, European Journal of Epidemiology, May 2015

Total population

Overall rates:

- 5 min Apgar score <7 was 0,7%,
- 5 min Apgar score <4 was 0,13%

How many PO had II stage <1 hour?

From 32 796 P0women with spontaneous onset of labor the duration of second stage of labor was

- <1 hour 32.7% of all deliveries
- 1- 2 hours 28.9%,
- 2 - 3 hours 17.9%,
- 3 - 4 hours 11.9%,
- 4 or more 8.6%.

Table 2. Time from retracted cervix to birth and risk of Apgar score < 7 at 5 minutes. Nulliparous women with term and post term singleton live births.

Time from retracted cervix to birth (hours)	Total 32 796	n	rate/1000	Crude	Apgar 5 min < 7 Odds ratio (95% CI)		
					Adjusted ^a	Adjusted ^b	Reference
<1	10731	44	4.1	1.00	Reference	1.00	Reference
1 to <2	9491	66	7.0	1.70	1.16-2.49	1.78	1.19-2.66 1.71 1.14-2.56
2 to <3	5856	43	7.3	1.80	1.17-2.74	1.66	1.05-2.62 1.55 0.98-2.46
3 to <4	3898	35	9.0	2.20	1.41-3.44	2.08	1.29-3.35 1.91 1.18-3.09
≥4	2820	39	13.8	3.41	2.21-5.25	2.71	1.67-4.40 2.45 1.49-4.02

^aAdjusted for maternal age, height, BMI, smoking, sex, gestational age, sex-specific birth weight for gestational age and head circumference.

^bAdjusted for maternal age, height, BMI, smoking, sex, gestational age, sex-specific birth weight for gestational age, head circumference and epidural analgesia.

Table 4. Time from retracted cervix to birth and risk of Apgar score < 4 at 5 minutes stratified by mode of delivery (n=32 021). Nulliparous women with term and postterm singleton live births.

Time from retracted cervix to birth (hours)	Apgar 5 min < 7							
	n	Rate/1000	aOR ^a	95% CI	n	Rate/1000	aOR ^a	95% CI
<1	20	2.0	1.00	Reference	22	24.1	1.00	Reference
1 to <2	39	4.8	2.66	1.49-4.75	24	19.4	0.89	0.48-1.65
2 to <3	25	5.6	2.65	1.37-5.11	18	14.4	0.60	0.31-1.17
3 to <4	10	4.1	2.41	1.09-5.33	20	15.1	0.61	0.32-1.18
≥4	10	8.3	3.77	1.60-8.88	24	19.4	0.70	0.37-1.36

aOR^a adjusted for maternal age, height, BMI, smoking, sex, gestational age, sex-specific birth weight for gestational age and head circumference.

Conclusion

A second stage of labor of three hours or more is associated with low 5-min Apgar scores in non-instrumental deliveries of first-born infants also after taking maternal and foetal characteristics into account.

In clinical decisions, it is important to consider time from retracted cervix to delivery in relation to risks of adverse neonatal outcomes.

Risk factors for intrapartum acidemia - a cohort study.

Wretling S¹, Nordström L¹, Graner S², Holzmann M¹.

Author information

Abstract

PL In a multivariate logistic regression analysis, minor language barriers (OR 2.21; 95% CI 1.05-4.67) **int** active pushing (OR 2.68; 95% CI 1.20-6.00) remained **op** significant **M**

between February 2009 and February 2011. The study population included 10/10 women in labor where fetal scalp blood sampling (f-SB) was performed.

RESULTS: In a univariate logistic regression analysis for lactate > 4.8 mmol/L at FBS, minor language barriers (OR 2.54; 95% CI 1.26-5.11), active bearing down (OR 2.46; 95% CI 1.12-5.39) and maternal height < 155 cm (OR 2.15; 95% CI 1.08-4.26) were found as risk factors. In a multivariate logistic regression analysis, minor language barriers (OR 2.21; 95% CI 1.05-4.67) and active pushing (OR 2.68; 95% CI 1.20-6.00) remained significant.

CONCLUSIONS: Language barriers, active pushing and short stature were found to be significant risk factors for intrapartum lactacidemia. In the group with minor language problems better use of interpreters might be beneficial.

RESEARCH ARTICLE

Open Access

Intrapartum factors associated with neonatal hypoxic ischemic encephalopathy: a case-controlled study

Vanessa E. Torbenson¹, Mary Catherine Tolcher¹, Kate M. Nesbitt¹, Christopher E. Colby², Sherif A. EL-Nashar³, Bobbie S. Gostout¹, Amy L. Weaver⁴, Michaela E. Mc Gree⁵ and Abimbola O. Farnuyide^{1*}

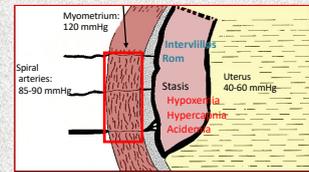
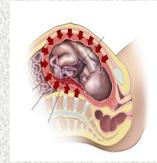
Table 2 Clinical and labor characteristics evaluated as risk factors for hypoxic ischemic encephalopathy

Characteristic	Cases (N = 26)	Controls (N = 104)	Univariate analysis		Multivariable analysis ^a	
			Unadjusted OR (95% CI)	P	Adjusted OR (95% CI)	P
Prior cesarean delivery	6 (23.1%)	11 (10.6%)	2.53 (0.83, 7.75)	0.10		
Chronic hypertension	2 (7.7%)	1 (1.0%)	8.00 (0.72, 88.23)	0.09		
Gestational diabetes	1 (3.8%)	4 (3.8%)	1.00 (0.02, 10.11)	1.00		
Fetal growth restriction	0 (0%)	2 (1.9%)	1.66 (0, 13.89)	1.00		
Oligohydramnios	1 (3.8%)	2 (1.9%)	2.00 (0.18, 22.06)	0.57		
Prolonged labor	2 (7.7%)	4 (3.8%)	2.67 (0.33, 21.56)	0.36		
Meconium-stained amniotic fluid ^b	11 (42.3%)	16 (15.4%)	4.62 (1.63, 13.06)	0.004	12.41 (2.10, 144.83)	0.002
Chorioamnionitis	2 (7.7%)	3 (2.9%)	3.46 (0.43, 27.86)	0.26		
Oxytocin use	14 (53.8%)	50 (48.1%)	1.26 (0.53, 3.00)	0.60		
Abnormal first stage of labor ^c	12/17 (70.6%)	48/94 (51.1%)	2.19 (0.71, 6.76)	0.17		
Prolonged second stage of labor ^d	5/17 (29.4%)	4/9 (44%)	1.24 (1.92, 65.58)	0.007	9.49 (1.06, 135.30)	0.042
Any sentinel or acute event ^e	6 (23.1%)	0 (0%)	32.66 (6.18, infinity)	< 0.001	74.86 (11.86, infinity)	< 0.001
Any 'category 3' segment in the last hour of labor ^f	7/25 (28.0%)	4/101 (4.0%)	7.30 (2.11, 25.30)	0.002		

What about active pushing the last part of II stage?



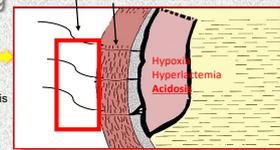
Contractions



+ active pushing



Circulation to spiral arteries is reduced!



Posserio J et al. Pan American WHO, 1969
Bassell GM et al. Obstet Gynecol 1980

pH during pushing time

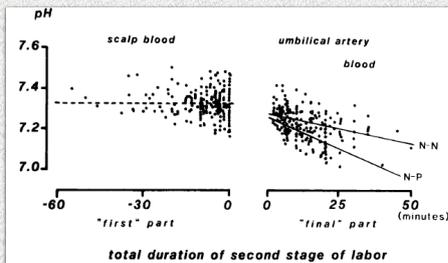


Fig. 2. Relationships between pH values and duration of 'first' and 'final' parts of second stage of labor. The reference point (0) is the time at which mothers began voluntary bearing down efforts. In the 'final' part, dotted line indicates the mean value of all scalp blood data (7.33 SD 0.06). In the 'final' part, regression lines were calculated from umbilical artery blood for fetuses of group N-N (●), $y = 7.281 - 0.009x$ and for fetuses of group N-P (◐), $y = 7.262 - 0.007x$.

Piquard F, et al. Are there two biological parts in the second stage of labor?
Acta Obstet Gynecol Scand 1989;68(8):713-8.

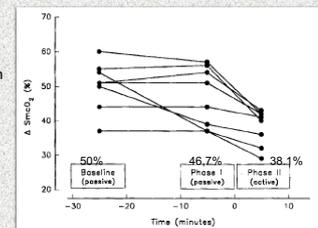
Fetal cerebral oxygenation

Near infrared spectroscopy: light-based way of measuring oxygen flows through the brain

Mean O2 saturation

Phase I 46.7% (SD 8) Phase II 38.1% (SD 5.2)

$p < 0.01$



Mean O2 saturation during second stage

Aldrich CJ et al. The effect of maternal pushing on fetal oxygenation and blood volume during second stage of labour. Br J Obstet Gynaecol. Jun;102(6):448-53 1995;102:448-453

Laktat 4-10 cm 66 kasus

- ◆ The mean lactate 1.7 +/- 0.8 mmol/.
- ◆ The mean pH 7.36 +/- 0.04
- ◆ Base Deficit 2.1 (+/- 1.9)
- ◆ No difference was seen in lactate concentrations or pH values in early compared to late first stage of labor
- ◆ The mean lactate umbilical artery immediately after delivery 3.7 mmol/l +/- 1.2 .

Nordström L et al. Acta Obstet Gynecol Scand. 1994 Mar;73(3):250-4.

British Journal of Obstetrics and Gynaecology
March 2001, Vol. 108, pp. 263-268

Fetal and maternal lactate increase during active second stage of labour

Lennart Nordström^{a,*}, Siva Achanna^b, Keiichi Naka^c, Sabaratnam Arulkumaran^d

Fetal lactate increases 1mmol/30 min pushing

	No. of women	Fetal scalp blood lactate	Maternal venous lactate
Cervix fully dilated	69	2.4 (1.1)	2.6 (1.0)
15 min	53	3.1 (1.6)	3.6 (1.4)
30 min	33	3.2 (1.8)	4.2 (1.7)
45 min	21	4.2 (2.4)	4.8 (1.6)
60 min	14	4.9 (2.8)	5.4 (2.1)
75 min	7	5.8 (1.9)	4.3 (0.9)

BD increases during pushing time!

Table 3 Mean values (95% CI) of pH, pCO₂, and BDecf relative to TAP.

TAP* (min)	Mean pH (95% CI)	Mean pCO ₂ (95% CI)	Mean BDecf (95% CI)
<15	7.25 (7.24–7.26)	7.3 (7.2–7.4)	2.5 (1.8–3.2)
15–29	7.23 (7.23–7.23)	7.4 (7.4–7.5)	3.6 (3.6–3.7)
30–59	7.21 (7.21–7.22)	7.4 (7.4–7.5)	4.6 (4.5–4.7)
60–89	7.21 (7.20–7.21)	7.4 (7.4–7.5)	5.1 (4.9–5.2)
90–119	7.21 (7.20–7.21)	7.5 (7.4–7.6)	5.1 (4.8–5.3)
>120	7.20 (7.19–7.21)	7.5 (7.3–7.6)	5.4 (5.1–5.7)

*For pH, pCO₂, and BDecf between groups, P<0.0001. Multilevel analysis of variance.
pCO₂=partial pressure of carbon dioxide, BDecf=base deficit in the extracellular fluid, TAP=time of active pushing.

Yli B.M. et al J.Perinat Med. 2011 Nov 19;40(2):171-8.



How does the duration of active pushing in labor affect neonatal outcomes?

Yli B.M., Kro G, Rasmussen S, Khoury J, Norén H, Amer-Wählin I, Saugstad O.D. Stray-Pedersen B.

J.Perinat Med. 2011 Nov 19;40(2):171-8.



Aim

To determine how increased pushing time can affect neonatal outcome

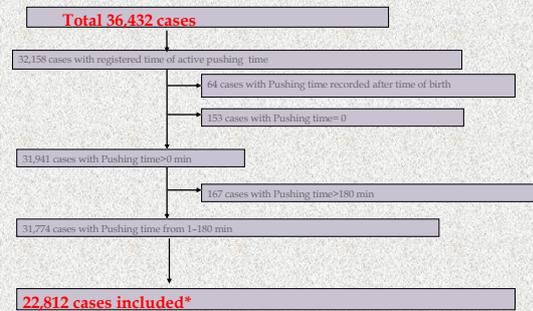


Population (≥36 GW)

Trial		n (%)
SRCT	University Hospital Lund, Sweden	1,463 (4.0)
	University Hospital Malmö, Sweden	1,513 (4.2)
	Sahlgrenska University Hospital, Gothenburg, Sweden	1,986 (5.5)
Total SRCT		4,964 (13.6)
EU-STAN trial	Virchow Klinikum, Charité, Berlin, Germany	298 (0.8)
	Derby City General Hospital, University of Nottingham, UK	383 (1.1)
	Gentofte Hospital, Copenhagen, Denmark	511 (1.4)
	Hopital Edouard Herrat, University of Lyon, France	717 (2.0)
	Sahlgrenska University Hospital, delivery wards Ostra and Mölndal, Gothenburg, Sweden	3,971 (10.9)
	Rikshospitalet, University of Oslo, Norway	478 (1.3)
	University of Perugia, Italy	107 (0.3)
	Derriford Hospital, University of Plymouth, UK	138 (0.4)
	Wilhelmina Children's Hospital, University of Utrecht, the Netherlands	506 (1.4)
	Åbo Hospital, University of Turku, Finland	714 (2.0)
Total EU-STAN trial		7,823 (21.5)
Mölnadal data	Mölnadal Hospital, Sahlgrenska University Hospital, University of Gothenburg, Sweden	23,645 (64.9)
Total deliveries		36,432

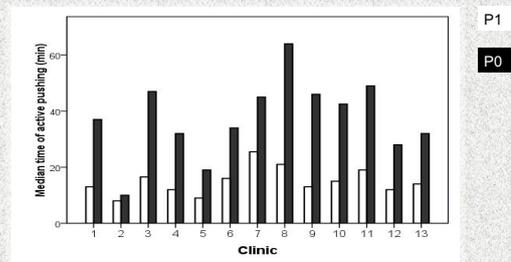
pH<7: 0.5%; MA : 0.19%

13 European clinics

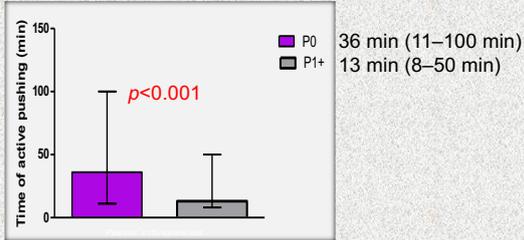


* Kro G.B, Yli B.M. et al. BJOG 2010

Pushing time at the different clinics



Median pushing time n=22812



For analyses, the time of active pushing was divided into 6 groups:

<15 min (n=7863), 15-29 (n=6378), 30-59 (n=5662), 60-89 (n=1889), 90-119 (697) ≥120 (n=323)

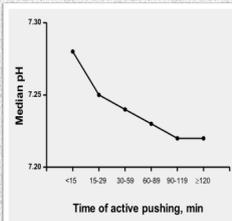
BD increase during pushing time!

TAP* (min)	Mean pH (95% CI)	Mean pCO ₂ (95% CI)	Mean BDecf (95% CI)
<15	7.25 (7.24-7.26)	7.3 (7.2-7.4)	2.5 (1.8-3.2)
15-29	7.23 (7.23-7.23)	7.4 (7.4-7.5)	3.6 (3.6-3.7)
30-59	7.21 (7.21-7.22)	7.4 (7.4-7.5)	4.6 (4.5-4.7)
60-89	7.21 (7.20-7.21)	7.4 (7.4-7.5)	5.1 (4.9-5.2)
90-119	7.21 (7.20-7.21)	7.5 (7.4-7.6)	5.1 (4.8-5.3)
>120	7.20 (7.19-7.21)	7.5 (7.3-7.6)	5.4 (5.1-5.7)

*For pH, pCO₂, and BDecf between groups, P<0.0001. Multilevel analysis of variance.

pCO₂=partial pressure of carbon dioxide, BDecf=base deficit in the extracellular fluid, TAP=time of active pushing.

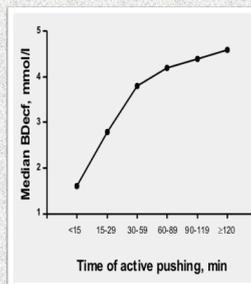
Neonatal outcome in relation to pushing time



Pushing time (min)	n(%)	pH <7 OR (95% CI)	n(%)	pH <7 or BDecf >12 or 5' Apgar <7 OR (95% CI)
<15	12(0.2)	1	41(0.6)	1
15-29	34(0.5)	3.2 (1.7-6)	73(1.1)	1.8 (1.2-2.7)
30-59	45(0.8)	4.7 (2.5-9)	94(1.6)	2.4 (1.6-3.6)
60-89	13(0.6)	3.8 (1.7-8.4)	38(1.9)	2.7 (1.7-4.3)
90-119	9(1.3)	7.3 (3.1-17.5)	18(2.5)	3.5 (1.6-7.7)
≥120	3(0.9)	5.1 (1.5-17.9)	41(2.3)	3.3 (2.3-4.9)

Multilevel regression analyses after adjustment for parity, induction of labor, epidural use, birth weight and gender

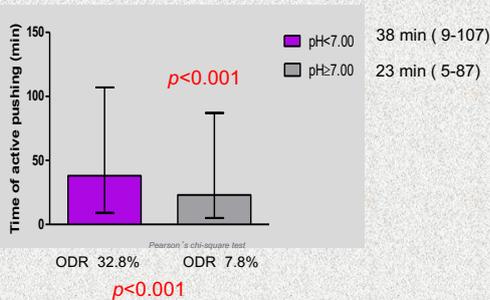
Neonatal outcome in relation to pushing time



Pushing time (min)	n	pH<7 and BDecf>10 OR (95% CI)
<15	4	1
15-29	23	6.0(2.4-15.3)
30-59	31	8.6(3.4-22.0)
60-89	11	8.3(2.9-23.5)
90-119	7	14.0(3.0-65.3)
>120	2	8.6(3.3-22.2)

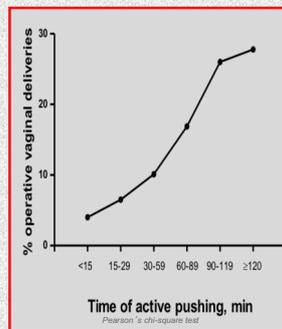
Multilevel regression analyses after adjustment for parity, induction of labor, epidural use, birth weight and gender

Relation between pushing time and cord artery pH<7.00



p < 0.001

Operative vaginal delivery and pushing time



Time of pushing (min)	OR	95% CI
<15	1	
15-29.9	1.5	1.3-1.6
30-59.9	2.2	2.0-2.5
60-89.9	3.8	3.4-4.3
90-119.9	6.0	5.0-7.0
120+	6.1	4.9-7.7
missing	1.7	1.5-1.9

Probability of spontaneous vaginal delivery decreased for every 30 min increase in pushing time (p < 0.05)

J Matern Fetal Neonatal Med. 2015 Dec 2:1-6. [Epub ahead of print]

Effect of oxytocin during labor on neonatal acidemia.

Mussi S¹, Inceri M¹, Plevani C¹, Ghidini A², Pozzullo Jc³, Locatelli A¹.

Author information

¹ Department of Obstetrics and Gynecology, San Gerardo Hospital-FMBGM, University of Milano-Bicocca, Monza, Italy.
² Perinatal Diagnostic Center, Inova Alexandria Hospital, Alexandria, VA, USA, and.
³ Georgetown University Medical Center, Washington, DC, USA.

Abstract

OB The duration of active phase of the second stage of labour was independently predictive of neonatal acidemia (p < 0.009) while abnormal FHR tracing approached significance (p < 0.088)

ME In women receiving oxytocin during labour, the duration of active phase of the second stage of labour correlates with neonatal acidemia, whereas maximum dose of oxytocin, duration of oxytocin administration and occurrence of tachysystole during labour do not.

RE the duration of active phase of the second stage of labour correlates with neonatal acidemia, whereas maximum dose of oxytocin, duration of oxytocin administration and occurrence of tachysystole during labour do not.

CONCLUSIONS: In women receiving oxytocin during labour, the duration of active phase of the second stage of labour correlates with neonatal acidemia, whereas maximum dose of oxytocin, duration of oxytocin administration and occurrence of tachysystole during labour do not.



1. Individualization of the active pushing time, irrespective of guideline threshold
Timing of the beginning of active pushing
Active evaluation of the progress (after 30 to 45) fetal monitoring
 --> to avoid operative delivery and risk for adverse neonatal outcome
2. Another pushing technique?

Active versus spontaneous pushing

- Norway usually **active pushing: Valsalva maneuver**
 "Take a deep breath and hold while the provider counts to 10"



What about spontaneous pushing (open glottis)?

"respiratory efforts typically involve breathing with an open glottis, rather than a closed glottis, such as the case during a VM
 When women push spontaneously, they begin to push from their resting respiratory volume, and they push multiple times per contraction (3-5) for 3 to 5 seconds per effort, followed by about 2 seconds of breaths and the release of air."
 Vocalization requires that the glottis is open.

The Valsalva maneuver duration during labor expulsive stage: repercussions on the maternal and neonatal birth condition

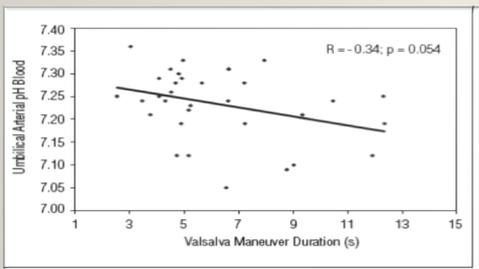


Figure 3. Relationship between the duration of the Valsalva maneuver during the expulsive stage of labor and umbilical arterial pH.

Andrea Lemos, Elizabeth Dean, Armèle Dornelas de Andrade, *Rev Bras Fisioter.* 2011;15(1):66-72.

Effect of spontaneous pushing versus Valsalva pushing in the second stage of labour on mother and fetus: a systematic review of randomised trials

Table 2. Summary of the meta-analysis of maternal and fetal outcomes

Outcome or subgroup	Studies	Participants	Statistical method*	Effect estimate	P value	Heterogeneity I ² (%)
Operative or instrumental delivery	3	425	Risk Ratio (M-H, Fixed, 95% CI)	0.70 (0.34-1.43)	0.33	27
Duration of second stage (defined from full dilatation) (minutes)	3	425	Mean difference (IV, Random, 95% CI)	18.59 (0.46-36.73)	0.04	78
Episiotomy	4	320	Risk ratio (M-H, Fixed, 95% CI)	0.70 (0.43-1.13)	0.26	
pH arterial <7.20 mmol/l	1	320	Risk ratio (M-H, Fixed, 95% CI)	0.65 (0.22-1.94)	0.44	
Mean venous pH	1	32	Mean difference (IV, Fixed, 95% CI)	-0.05 (-0.12 to 0.02)	Not applicable	
Mean arterial pH	1	320	Mean difference (IV, Fixed, 95% CI)	0.00 (-0.22 to 0.22)	1.00	
Mean Apgar score after 5 minutes	1	73	Mean difference (IV, Fixed, 95% CI)	0.00 (-0.23 to 0.23)	1.00	
Apgar score <7 after 5 minutes	2	393	Risk ratio (M-H, Fixed, 95% CI)	0.35 (0.01-8.43)	0.51	Not applicable
Any perineal repair	2	352	Risk ratio (M-H, Random, 95% CI)	0.95 (0.64-1.40)	0.79	57
Third- or fourth-degree tear	1	320	Risk ratio (M-H, Fixed, 95% CI)	0.87 (0.45-1.66)	0.66	
Need for resuscitation	2	352	Risk ratio (M-H, Fixed, 95% CI)	0.83 (0.40-1.75)	0.63	0
Admission to neonatal intensive care unit	2	393	Risk ratio (M-H, Fixed, 95% CI)	1.08 (0.30-3.79)	0.91	0
Mean estimated blood loss	2	105	Mean difference (IV, Fixed, 95% CI)	9.22 (-17.85 to 37.41)	0.69	0
First urge to void	1	128	Mean difference (IV, Fixed, 95% CI)	41.50 (8.40-74.60)	0.01	
Bladder capacity	1	128	Mean difference (IV, Fixed, 95% CI)	54.60 (13.31-95.89)	0.010	

*IV, Inverse variance; M-H, Mantel-Haenszel.

Prins M, Boxem J, Lucas C, Hutton EC. *BJOG* 2011;118:662-670.

Konklusjon

- ▣ Det støttes ikke rutinemessig bruk av Valsalva i den II stadiet av fødselen.
- ▣ Valsalvas metoden har en negativ effekt på urodynamiske faktorer
- ▣ Varigheten av II stadiet av fødsel er kortere med Valsalva men den kliniske betydningen av dette funnet er usiker!