

Academy of Breastfeeding Medicine
Annotated Bibliography:
Protocol on Analgesia and Anesthesia for the Breastfeeding Mother

Reference	Content	Level of Evidence*
Studies Looking at Breastfeeding Outcomes and Anesthesia/Analgesia		
Baumgarder DJ, Muehl P, Fischer M, Pribbenow B. Effect of Labor Epidural Anesthesia on Breast-feeding of Healthy Full-term Newborns Delivered Vaginally. JABFP (2003) 16:1, 7-13.	Record review of 115 consecutive healthy full-term breastfeeding newborns of mothers receiving epidural anesthesia and 116 newborns not exposed to epidurals. There is no comment about whether any of the mothers received IV narcotics. Two successful breastfeedings within 24 hours were achieved by 69.6% of mothers with epidurals and 81% without ($p=.04$). Infants exposed to epidurals were more likely to receive bottle supplements, especially if breastfeeding was not initiated within 1 hour. The authors note that there were more primiparas in the epidural group but do not control for parity in their analysis.	II-2
Crowell MK, Hill PD, Humenick SS. Relationship between obstetric analgesia and time of effective breastfeeding. Journal of Nurse-Midwifery (1994) 39:3, 150-156.	26 babies whose mothers received IV butorphanol or nalbuphine in labor were compared with 22 infants whose mothers received no labor analgesia. Infants whose mothers received analgesia within an hour of birth, or no analgesia, and who initiated breastfeeding early, established effective feeding significantly earlier than infants whose mothers had longer duration of analgesia and later initiation of breastfeeding.	II-2
Dewey KG, Nommsen-Rivers LA, Heinig J, Cohen RJ. Risk Factors for Suboptimal Infant Breastfeeding Behavior, Delayed Onset of Lactation, and Excess Neonatal Weight Loss.	Prospective study of 280 mothers highly motivated to breastfeed who had good lactation support. Breastfeeding behavior, infant weight, and onset of lactation (lactogenesis ii) were assessed days 0,3,5,7, and 4 postpartum. Suboptimal breastfeeding behavior (IBFAT <10) was significantly associated with primiparity, cesarean delivery, stage II labor >1 hour, etc. Excess weight loss in 12 of infants associated with primiparity, long duration of labor, use of labor medications in multiparas and infant status at birth. The risk of excess infant weight loss was 2.6 times greater if infant had SIBB on day 0 and 7.1 times greater if mother had delayed onset of lactation (>72 hours.) “Modifications of the labor and delivery experience that reduce the duration of labor and increase the likelihood of a spontaneous, unmedicated vaginal delivery should improve early lactation success.”	II-2

<p>Dewey KG, Nommsen-Rivers LA, Heinig MJ, Cohen RJ. Risk Factors for Suboptimal Infant Breastfeeding Behavior, Delayed Onset of Lactation, and Excess Neonatal Weight Loss. Pediatrics (2003) 112:3,607-618.</p>	<p>Prospective study of 280 mothers in Davis, California, to determine incidence of and risk factors for suboptimal infant breastfeeding behavior, delayed onset of lactation, and excess neonatal weight loss in a highly educated, highly motivated population. Regional labor anesthesia was associated with SIBB on day 0, delayed milk onset, and excess weight loss by day3 compared to no anesthesia. Combined analgesia with IV/IM narcotics and regional anesthesia led to the highest incidence of excess weight loss. These results were confounded by other variables such as length of labor. The subgroup of infants delivered vaginally with IV/IM narcotics had significantly higher risk of SIBB on day 3. The infants delivered vaginally with regional anesthesia had more risk of excess weight loss. The authors suggest that this may have been affected by IV fluids in labor. Longer labor and cesarean section were associated with higher risk for SIBB and excess weight loss.</p>	<p>II-2</p>
<p>Halpern SH, Levine T, Wilson DB, et al. Effect of Labor Analgesia on Breastfeeding Success. Birth (1999) 26:2, 83-88.</p>	<p>Telephone interview 6-8 weeks postpartum. Epidural analgesia did not affect breastfeeding outcomes at 6-8 weeks in a sample of 171 women who delivered in a hospital that strongly promotes breastfeeding.</p>	<p>III</p>
<p>Henderson J, Dickinson JE, Evans SF, et al. Impact of intrapartum epidural analgesia on breast-feeding duration. Aust NZ J Obst Gyn (2003) 43:372-377.</p>	<p>Randomized trial of nulliparous women assigned to continuous midwifery support vs. epidural analgesia for labor; breastfeeding outcomes assessed by data at initiation and by interview and 2 and 6 months. 95% of the mothers initiated breastfeeding. There was a large crossover in the RCT, so this data is considered observational. Intrapartum analgesia had significant univariate association with less breastfeeding at 2 and 6 months (78% vs. 68% at 2 months; 62% vs 60% at 6 months p=.003).</p>	<p>II-2</p>
<p>Nissen E, Lilja G, Matthiesen A-S, et al. Effects of maternal pethidine on infants' developing breast feeding behaviour. Acta Paediatr (1995) 84:140-5.</p>	<p>44 infants, 18 of whose mothers received pethidine, were observed skin-to-skin with their mothers for 2 hours immediately after birth. The observer was blind to analgesia status. Infants exposed to pethidine had delayed and depressed sucking and rooting behavior and fewer suckled spontaneously. The authors recommend that pethidine-exposed mother/infant couples stay together long enough after birth to enable the infant to make the choice to attach "without the forceful helping hand of the health staff."</p>	<p>III</p>
<p>Rajan L. The impact of obstetric procedures and analgesia/anesthesia during labour and delivery on breast feeding. Midwifery (1994)10, 87-103.</p>	<p>Re-analysis of data from a study of pain relief in labour done via phone survey 6 weeks post delivery. Better breastfeeding outcomes were found when a woman received "extra help" with breastfeeding if she received pethidine during the first stage and if she had adequate control of perineal pain postpartum.</p>	<p>III</p>

<p>Ransjo-Arvidson AB, Matthiesen, SA, Lilja G, et al. Maternal Analgesia During Labor Disturbs Newborn Behavior: Effects on Breastfeeding, Temperature, and Crying. Birth (2001) 28:1, 5-12.</p>	<p>Cohort analytical study examining infant behavior when skin-to-skin with their mothers immediately postpartum. Videotapes were analyzed blindly. Infants whose mothers had received analgesia were significantly less likely to show spontaneous early pre-breastfeeding behaviors and showed more crying.</p>	<p>II-2</p>
<p>Riordan J, Gross A, Angeron J, et al. The Effect of Labor Pain Relief Medication on Neonatal Suckling and Breastfeeding Duration. J Hum Lact (2000) 16:1, 7-12</p>	<p>Suckling (using IBFAT scores) and breastfeeding duration up to six weeks were measured in 129 mothers who delivered vaginally. Subgroups included mothers who received intravenous analgesia, epidural analgesia, both, or neither. IBFAT scores were lower for IV and epidural groups and lowest in the combined groups. Breastfeeding duration was not different overall but those with lower IBFAT scores weaned earlier.</p>	<p>II-2</p>
<p>Volmanen P, Valanne J, Alahuhta S. Breast-feeding problems after epidural analgesia for labour: a retrospective cohort study of pain, obstetrical procedures and breast-feeding practices. Int J Obstetric Anesthesia (2004) 13:1, 25-29.</p>	<p>Retrospective questionnaire study of 99 mothers, 64 of whom delivered vaginally. 67% of mothers who labored with epidural and 29% of those who did not have epidural analgesia reported less than full breastfeeding during the first 12 weeks. More mothers with epidurals reported “not enough milk”. Authors recommend prospective studies to establish whether a causal relationship exists between epidural analgesia and breastfeeding problems.</p>	<p>III</p>
<p>Wiener PC, Hogg MI, Rosen M. Neonatal respiration, feeding and neurobehavioural state: Effects of intrapartum bupivacaine, pethidine, and pethidine reversed by naloxone. Anaesthesia (1979) 34,996-1004.</p>	<p>Cohort study comparing babies of mothers who received epidural analgesia with bupivacaine only vs. neonates whose mothers had pethidine. There was no unmedicated control group but the pethidine plus naloxone group was considered “more like unmedicated babies” and used as a comparison group. The observer was blinded to the type of anesthetic though and most measurements were objective. Babies whose mothers had bupivacaine epidurals had less respiratory depression but more persistent neurobehavioral effects. The pethidine-naloxone group had better feeding behaviors than either of the other groups. None of the differences in the groups were felt to be clinically significant.</p>	<p>II-2</p>

Studies looking at postpartum analgesia and breastfeeding		
Hirose M, Hara Y, Hosokawa T, Tanaka Y. The Effect of Postoperative Analgesia with Continuous Epidural Bupivacaine after Cesarean Section on the Amount of Breast Feeding and Infant Weight Gain. Anesth Analg (1996) 82:1166-9.	Randomized trial of post-cesarean analgesia in women who had spinal anesthesia for surgery with or without epidural bupivacaine for 3 days postpartum. All mothers had diclofenac on demand. Pain score and both weight of milk fed by breast and infant weight (measured for 11 days) were significantly better in patients who received epidural bupivacaine postoperatively.	I
Wittels F, Glosten G, Faure E, et al. Postcesarean Analgesia with Both Epidural Morphine and Intravenous Patient-Controlled Analgesia: Neurobehavioral Outcomes Among Nursing Neonates. Anesth Analg (1997) 85(3):600-606.	RCT of intravenous PCA with morphine vs. meperidine after cesarean delivery. All patients received a single dose of epidural morphine 4 mg initially. Intravenous PCA with meperidine was associated with more neonatal neurobehavioral depression and less alertness and orientation to human cues than IV PCA with morphine.	I
Studies looking at breastfeeding outcomes related to infant behavior		
Mizuno K, Fujimaki K, Sawada M. Sucking Behavior at breast during the early newborn period affects later breast-feeding rate and duration of breast-feeding. Pediatrics International (2004) 46: 15-20.	Retrospective survey of 1582 mothers of infants aged 6-12 months. Mothers were asked to characterize their babies' feeding behavior in the newborn period, with four categories: "barracuda", "excited ineffectives", "procrastinators", and "gourmets/mothers". They were asked about full and partial breastfeeding and also asked when and why they discontinued breastfeeding. Babies whose mothers described as "barracudas" had the highest rates of continued breastfeeding at 3 and 6 months and the most babies fully breastfeeding. Babies whose mothers described as "procrastinators" were most likely to wean early. Perceived shortage of milk was the most common reason for weaning.	III
Studies looking at other forms of pharmacologic anesthesia/analgesia		
Merkow AJ, McGuinness GA, Erenberg A, Kenney RL. The Neonatal Neurobehavioral effects of bupivacaine, mepivacaine, and 2-Chloroprocaine used for pudendal block. Anesthesiology (1980) 52:309-312.	54 infants were studied 4 and 24 hours after delivery. There was no significant effect of any agent on infant neurobehavior. Mepivacaine and bupivacaine levels were detectable in neonatal capillary blood at very low levels.	II-2

<p>Stefani SJ, Hughes SC, Shnider SM, et.al. Neonatal neurobehavioral effects of inhalation analgesia for vaginal delivery. Anesthesiology (1982) 56:351-355.</p>	<p>61 women were randomly assigned to no analgesia, enflurane, or nitrous oxide during the second stage of labor. Examiners blinded to the analgesia/anesthesia evaluated the neurobehavioral status of the infants at 15 minutes and at 2 and 24 hours. 30-50% of the patients received small doses of meperidine or alphaprodine in labor. There was no significant difference in neurobehavioral score among infants in any of the groups, with or without narcotic analgesia. (The authors caution that their results should not be interpreted as suggesting that narcotics would have no effect on infant status.)</p>	<p>I</p>
<p>Studies looking at labor related to anesthesia/analgesia that may have secondary effects on breastfeeding</p>		
<p>Howell CJ, Kidd C, Roberts W, et.al. A randomized controlled trial of epidural compared with non-epidural analgesia in labour. Br J Ob Gyn (2001) 108:27-33.</p>	<p>Primiparous women in spontaneous labor were randomized to epidural vs. non-epidural analgesia for labor. In the non-epidural group, women could request analgesia with pethidine. There was some crossover. Length of second stage and rates of instrumented delivery were significantly higher in the epidural group. There were no differences in apgar scores, meconium, or NICU admission.</p>	<p>I</p>
<p>Dickinson JE, Paech MJ, McDonald SJ, Evans SF. The impact of intrapartum analgesia on labour and delivery outcomes in nulliparous women. Aust N Z J Obstet Gynaecol (2002) 42:1, 59-66.</p>	<p>Randomized control trial of 992 women to continuous midwifery support or epidural analgesia. Second stage labor was longer in the epidural group. 28% of those randomized to epidural did not have epidurals; 61% of women randomized to CMS had epidurals. Results are reported by initial groups, with no comment on those who actually had epidurals vs. those who did not. The use of narcotic or inhalational analgesia was not controlled in either group, and non-pharmacologic methods were also used. There were more operative deliveries in the epidural group but no difference in the cesarean section rate. There was a nonsignificant trend toward more oxytocin use in the epidural group.</p>	<p>I</p>
<p>Patel RR, Liegling RE, Murphy DJ. Effect of Operative Delivery in the Second Stage of Labor on Breastfeeding Success. Birth (2003) 30:4,255-260.</p>	<p>Prospective cohort study of 393 women. All women had instrumented vaginal delivery or cesarean section after full cervical dilatation. There were no significant differences in breastfeeding rates at discharge and 6 weeks postpartum. Women who had cesarean sections with a longer postpartum stay were more likely to be exclusively breastfeeding at discharge. This study did not compare outcomes with mothers who did not have operative delivery.</p>	<p>II-2</p>

Tamminen T, Verronen P, Saarikoski S, et.al. The influence of perinatal factors on breast feeding. Acta Paediatr Scand (1983) 72:9-12.	1701 mothers studied by questionnaire 6-8 months after delivery. Infants born by cesarean section or assisted delivery, those of low birth weight or asphyxiated at birth were less likely to breastfeed. Among those who initiated breastfeeding, breastfeeding duration was not affected by any of these factors.	III
Ferber SG, Ganot M, Zimmer EZ. Catastrophizing labor pain compromised later maternity adjustments. Am J Obstet Gyn 2005 192:826-31.	Pain intensity and catastrophizing were assessed in 89 women in active labor before analgesia and again 2 days after delivery. The women also completed the Edinburgh Postpartum Depression Scale and a social functioning form. Labor pain catastrophizing rather than intensity predicted difficult postpartum maternal adjustments.	III
Studies looking at infant outcomes of anesthesia for cesarean section		
Krishnan L, Gunaskearan N, Bhaskaranan N. Anesthesia for cesarean section and immediate neonatal outcome. Indian J Pediatr (1995) 62:219-223.	Low-risk mothers with term singleton infants were studied for effects of general vs. spinal anesthesia. Babies whose mothers had general anesthesia were relatively depressed. There was no significant difference in Apgar scores.	III
Kangas-Saarel T., Kovivist M, Jouppila R, et. al. Comparison of the effects of general and epidural anaesthesia for cesarean section on the neurobehavioural responses of newborn infants. Acta Anaesthesiol Scand (1989) 33:313-319.	Thirty one infants delivered by elective cesarean section without labor were evaluated at 3 hours, 1 day, 2 days, and 4-5 days of age. Infants whose mothers had epidural anesthesia had lower rooting scores at 3 h but higher scores in other areas indicating more general depression in the babies exposed to general anesthesia. There were no differences after 24 hours.	III
Kolatat T, Lertakyamanee J, Tritkrakarn T, et. al. Effects of general and regional anesthesia on the neonate (a prospective, randomized trial). J Med Assoc Thai (1999) 82:1, 40-45.	341 women with elective cesarean section at term were randomized to general, epidural or spinal anesthesia. Apgar scores were lower in the mothers who received general anesthesia. There were no significant differences in Neurologic and Adaptive Capacity scores within 4 hours of birth.	I
Reviews of alternative methods of pain management in labor		
Simkin PP, O'Hara MA. Nonpharmacologic relief of pain during labor: Systematic reviews of five methods. Am J Obstet Gynecol (2002) 186:S131-59.	Continuous labor support, baths, touch and massage, maternal movement and positioning, and intradermal water blocks for back pain relief may all be effective in reducing labor pain and improving other obstetric outcomes, and are safe when used appropriately.	III: Review
Smith CA, Collins CT, Cyna AM, Crowther CA. Complementary and alternative therapies for pain management in labour. The Cochrane Database of Systematic Reviews 2003, Issue 2.	Acupuncture and hypnosis may help relieve pain during labor but more research is needed on these and other complementary therapies.	I: Metaanalysis of RCTs.
Hodnett ED, Gates S, Hofmeyr G J, Sakala C. Continuous support for women during childbirth.	Women who received continuous support during labor and birth were less likely to have intrapartum analgesia or operative delivery. They reported more	I: Metaanalysis

The Cochrane Database of Systematic Reviews 2003, Issue 3.	satisfaction with birth and were more likely to be breastfeeding at 1-2 months postpartum.	is of RCTs
Studies looking at choice of drug for analgesia in labor		
Evron S, Glezerman M, Sadan O, Boaz M, Ezri T. Remifentanil: a novel systemic analgesic for labor pain. Anesth. Anal. 2005,100(1):233-8	Study of PCIA (patient controlled IV anesthesia) compared the use of IV remifentanil and meperidine in 88 women during labor and delivery. Remifentanil was more reliable, effective, and produced less sedation in parturients than meperidine. Remifentanil is an ultra short-acting opioid that is rapidly metabolized by all tissue esterases and has a brief half life (10-20 minutes).	I
Ericksson SL, Gentile C, Olofsson CH. PCEA compared to continuous epidural infusion in an ultra-low-dose regimen for labor pain relief: a randomized study.	Study comparing patient controlled epidural anesthesia with standard continuous epidural anesthesia. Eighty parturients were randomized to have either continuous epidural infusion with ropivacaine 1 mg ml ⁻¹ and sufentanil 0.5 micro g ml ⁻¹ , 6 ml h ⁻¹ , or patient-controlled epidural analgesia (PCEA) with 4 ml demand doses with 20 min' lockout. The PCEA group consumed 33% less analgesics than the continuous epidural group. There were no significant differences between the two groups in pain relief, epidural efficacy, side-effects or obstetric outcome.	I
Capogna G, Camorca M. Epidural analgesia for childbirth. Effects of newer techniques on neonatal outcome. Pediatr Drugs 2004, 6(6): 375-386	Excellent review of the various epidural and CSE techniques used in childbirth. Includes a table of meta analyses of neonatal outcomes following epidural analgesia.	III:Review
Poole JH. Analgesia and anesthesia during labor and birth: Implications for mother and fetus. JOGNN 32(6): 780-793	Excellent review of analgesia and anesthesia during labor and delivery. Has numerous tables on the implications of the various drugs on maternal and neonatal outcome.	III: Review
Studies looking at anesthesia in breastfeeding women (not peripartum)		
Bond GM, Holloway AM. Anaesthesia and Breast-feeding—the Effect on Mother and Infant	Review of perioperative management of breastfeeding women including fluid balance, premedication, general anesthesia and routine postoperative analgesics.	III
Guilian M, Grossi GB, Piler M, et. al. Could Local Anesthesia While Breast-Feeding be Harmful to Infants? JPGN 2001 32:142-244.	Blood and milk concentrations of lidocaine and its metabolite were measured after local anesthesia for dental procedures. Infant doses were minimal, and the study concluded that lidocaine local anesthesia for dental procedures is safe in breastfeeding mothers.	III