British Columbia Perinatal Health Program
Optimizing Neonatal, Maternal and Fetal Health
- *British Columbia Reproductive Care Program (BCRCP)*
- *Provincial Specialized Perinatal Services (PSPS)*

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ALERT

ATTENTION: Perinatal Care Providers

October 2010

An error has been noted in Obstetric **Guideline 4**: Pain Management Options During Labour.

Page 22:7.3 ***Continuous Infusion Techniques and PCEA, A: General Information,***

Bullet 3 should read, "a dilute solution is recommended: bupivacaine 0.05 – **0.125%** or ropivacaine 0.8 – **0.125%**

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Obstetric Guideline 4

PAIN MANAGEMENT OPTIONS DURING LABOUR

ACKNOWLEDGEMENTS

The British Columbia Perinatal Health Program (formally BCRCP) gratefully acknowledges the following physicians and midwife for their expertise and contributions in the revision of this guideline:

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This guideline discusses the common types of pain management during labour and presents them from the perspective of non-interventionist to most interventionist.

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1. INTRODUCTION

The information in this guideline is intended as a clinical resource based on current literature and expert opinion.

Information about pain management options for labour and birth should be shared with every woman during her prenatal care. This information should include indications for, as well as risks and benefits of pain management options available in her community. Her preferences and concerns should be addressed. Prenatal referral to an anesthesiologist should be arranged when indicated.

The administration of analgesia during labour should not be undertaken without due consideration for the potential risks. Extra caution should be exercised for all types of pharmacological intrapartum analgesia in preterm labour as there are potential adverse effects on the preterm infant due to decreased capacity to metabolize medications. Facilities providing planned maternal-child care services should ensure that equipment for both adult and neonatal resuscitation is immediately available in the labour and birth area. Nursing, medical and midwifery personnel should be skilled in both adult and neonatal resuscitation.

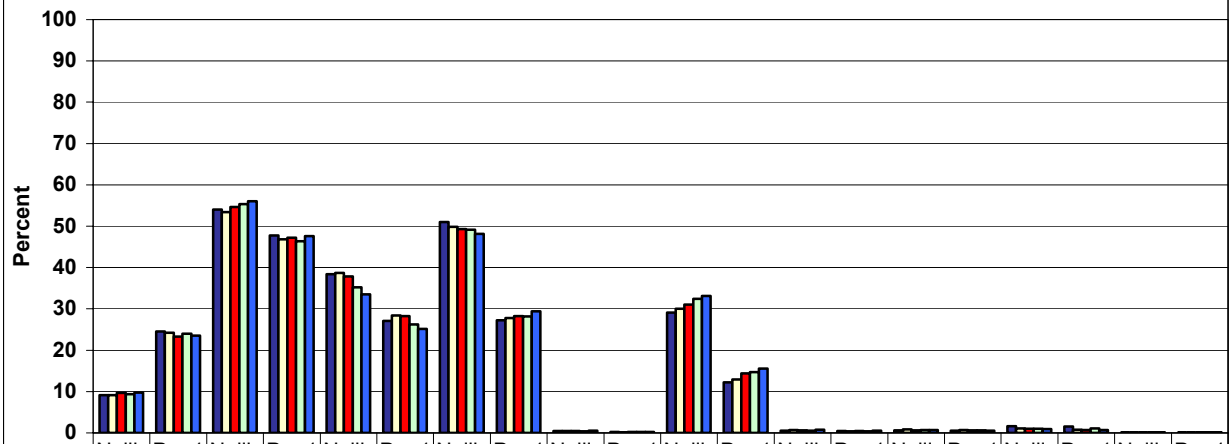
The following tables provide an overview of analgesia use during labour in BC from April 1, 2001 to March 31, 2006. They were compiled by the BC Perinatal Health Program Perinatal Database Registry.

Table 1 shows the total number of spontaneous vaginal deliveries in BC by parity for fiscal 2001/2002 to 2005/2006. **Table 2** shows the types of analgesia (by percentage) used in labour for nulliparous and multiparous women who had a spontaneous vaginal delivery. For nulliparous women, approximately 50% received entonox and/or narcotics at some point in labour and approximately 30% received an epidural. Use of all types of analgesia in labour is less for multiparous women.

Table 1: Total Spontaneous Vaginal Deliveries by Parity in BC

Fiscal Year	Parity		Total Spontaneous Vaginal Deliveries
	Nulliparous	Parity ≥ 1	
2001/2002	8,848	15,634	24,482
2002/2003	8,920	15,349	24,269
2003/2004	9,081	15,007	24,088
2004/2005	9,256	14,684	23,940
2005/2006	9,393	14,668	24,061

Table 2. Types of Analgesia/Anesthesia Administered (Not Mutually Exclusive)
Spontaneous Vaginal Deliveries by Parity
April 1, 2001 to March 31, 2006
Source: BC Perinatal Database Registry



	None		Entonox		Local		Narcotic (IV/IM)		Pudendal		Epidural		Spinal		General		Other		Unknown	
	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1
01/02	9.1	24.5	54.0	47.8	38.4	27.1	51.0	27.2	0.4	0.2	29.1	12.2	0.6	0.5	0.6	0.5	1.6	1.5	0.1	0.1
02/03	9.1	24.2	53.4	46.8	38.7	28.4	49.9	27.8	0.5	0.2	30.0	12.9	0.7	0.4	0.9	0.7	1.1	0.8	0.1	0.0
03/04	9.7	23.3	54.6	47.2	37.8	28.3	49.3	28.3	0.5	0.2	31.0	14.4	0.6	0.4	0.6	0.6	1.0	0.7	0.1	0.1
04/05	9.4	24.0	55.4	46.4	35.2	26.3	49.2	28.2	0.4	0.2	32.5	14.7	0.6	0.4	0.7	0.6	1.0	1.1	0.1	0.1
05/06	9.8	23.5	56.1	47.6	33.5	25.2	48.1	29.4	0.5	0.2	33.1	15.6	0.8	0.6	0.7	0.5	0.9	0.7	0.1	0.1

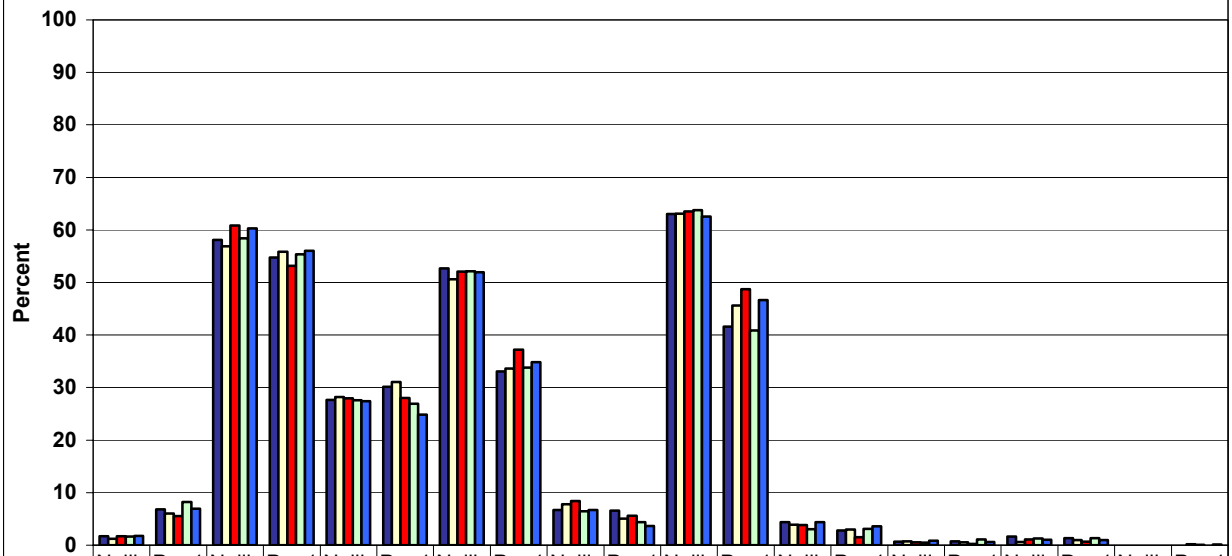
Note:
- Analgesia/Anesthesia given during first, second or third stage of labour (includes during manual removal of placenta or during repair of tear done during or shortly after third stage).
- Not Mutually Exclusive – please note that a mother may have been given more than one analgesia/anesthesia, so may appear in several analgesia/anesthesia groups.
- Fiscal Year: 01/02 is April 1, 2001 to March 31, 2002

Table 3 shows the total number of assisted vaginal deliveries in BC by parity for fiscal 2001/2002 to 2005/2006. **Table 4** shows analgesia/anesthesia administered (by percentage) during labour for women with assisted delivery. For both multiparous and primiparous women, the epidural use is higher in assisted vaginal delivery than for spontaneous delivery.

Table 3: Total Assisted Vaginal Deliveries by Parity in BC, Fiscal 2001/2002 to 2005/2006

Fiscal Year	Parity		Total Assisted Vaginal Deliveries
	Nulliparous	Parity ≥ 1	
2001/2002	3,439	1,257	4,696
2002/2003	3,427	1,146	4,573
2003/2004	3,331	1,159	4,490
2004/2005	3,235	1,070	4,305
2005/2006	3,229	1,007	4,236

Table 4. Types of Analgesia/Anesthesia Administered (Not Mutually Exclusive)
Assisted Vaginal Deliveries by Parity
April 1, 2001 to March 31, 2006
Source: BC Perinatal Database Registry



	None		Entonox		Local		Narcotic (IV/IM)		Pudendal		Epidural		Spinal		General		Other		Unknown	
	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1	Nullip	P>=1
01/02	1.7	6.8	58.1	54.7	27.7	30.2	52.7	33.1	6.7	6.6	63.0	41.6	4.4	2.8	0.7	0.7	1.7	1.4	0.0	0.0
02/03	1.2	6.0	56.9	55.9	28.2	31.1	50.6	33.6	7.8	5.1	63.1	45.6	3.9	3.0	0.8	0.5	0.6	1.0	0.0	0.2
03/04	1.7	5.5	60.8	53.2	28.0	28.0	52.1	37.2	8.4	5.6	63.5	48.8	3.8	1.6	0.6	0.3	1.1	0.7	0.0	0.1
04/05	1.7	8.2	58.4	55.3	27.6	26.9	52.2	33.8	6.5	4.4	63.7	40.8	3.0	3.1	0.5	1.1	1.3	1.3	0.0	0.0
05/06	1.8	7.0	60.3	56.0	27.4	24.8	51.9	34.9	6.7	3.7	62.6	46.7	4.4	3.6	0.9	0.6	1.1	1.0	0.0	0.1

Note:
- Analgesia/Anesthesia given during first, second or third stage of labour (includes during manual removal of placenta or during repair of tear done during or shortly after third stage).
- Not Mutually Exclusive – please note that a mother may have been given more than one analgesia/anesthesia, so may appear in several analgesia/anesthesia groups.
- Fiscal Year: 01/02 is April 1, 2001 to March 31, 2002

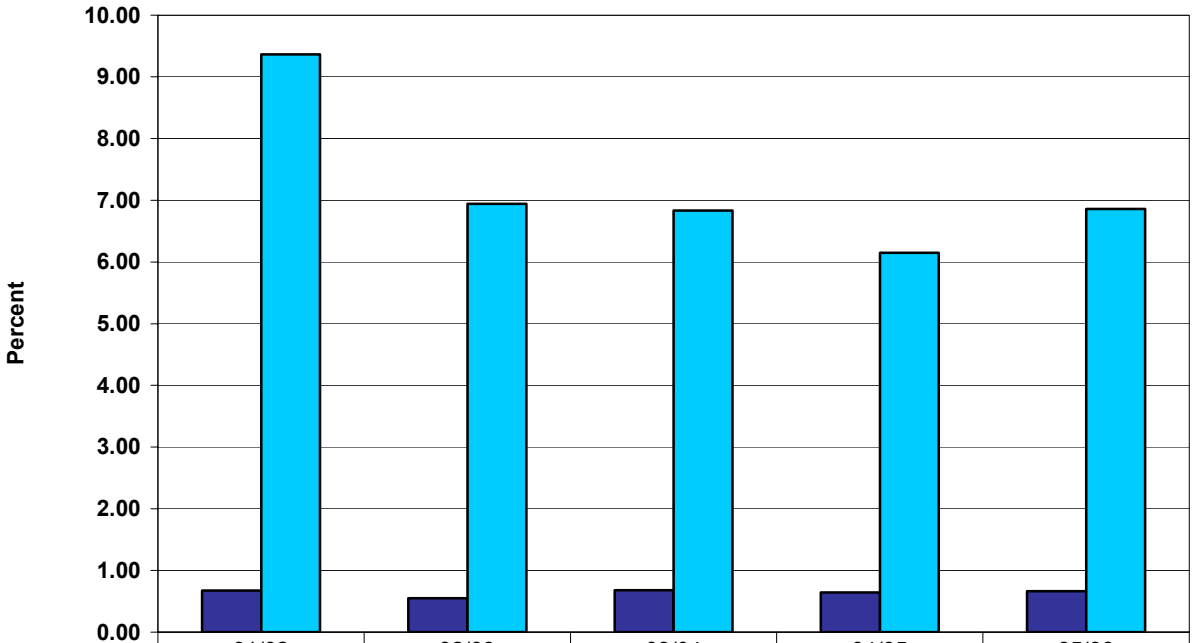
Table 5 shows the total number of women administered an epidural or narcotic in BC for fiscal 2001/2002 to 2005/2006 (excludes women administered a pudendal, spinal, general, and/or an epidural with narcotic).

Table 5: Women Administered an Epidural or Narcotic (excludes pudendal, spinal, general and epidural with narcotic)

Fiscal Year	Epidural	Narcotic	Total Deliveries
2001/2002	5,048	6,782	39,805
2002/2003	5,276	6,787	39,756
2003/2004	5,436	6,681	39,825
2004/2005	5,598	6,747	40,014
2005/2006	5,869	6,924	40,305

Table 6 indicates that a greater percentage of newborns received a drug for resuscitation, e.g. naloxone, adrenaline, sodium bicarbonate at birth if the mother received systemic narcotics vs. an epidural for labour analgesia.

Table 6. Mother Administered Epidural or Narcotic
(Excludes Pudendal, Spinal, General and Epidural with Narcotic)
Newborn Received Drug for Resuscitation
April 1, 2001 to March 31, 2006
Source: BC Perinatal Database Registry

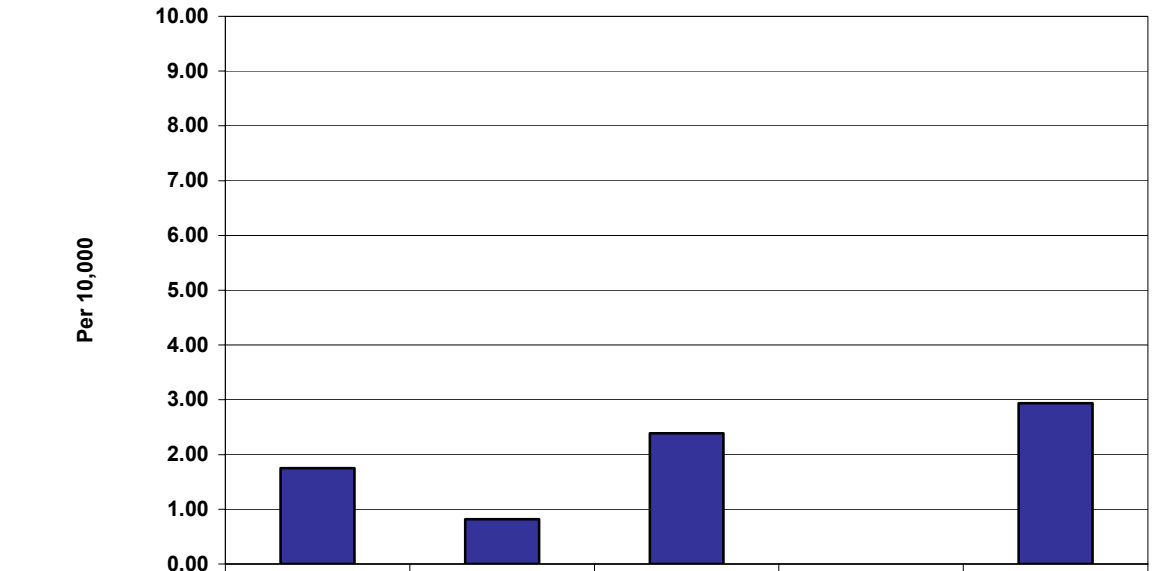


	01/02	02/03	03/04	04/05	05/06
Epidural	0.67	0.55	0.68	0.64	0.66
Narcotic	9.36	6.94	6.83	6.15	6.86

Note:
Narcotics – includes fentanyl (IV or injections), Demerol, Tylenol with codeine (Tylenol #1, 2, 3 or 4), Nubain, etc.

Table 7 shows the major central nervous system complications associated with epidural or spinal analgesia/anesthesia per 10,000 women, e.g. obstetrical maternal palsy and other nerve injuries secondary to epidural or spinal. (Note that for 2004/2005 no CNS complications were recorded).

Table 7: Mother Administered Epidural or Spinal
(Excludes Narcotics Only, Pudendal or General)
Mother's Central Nervous System Complications of Analgesia/Anesthesia
April 1, 2001 to March 31, 2006
Source: BC Perinatal Database Registry



	2001/2002 (n=11,405)	2002/2003 (n=12,218)	2003/2004 (n=12,555)	2004/2005 (n=13,030)	2005/2006 (n=13,590)
CNS Complications	1.75	0.82	2.39	0.00	2.94

Note:

- Central Nervous System complications may include nerve injury (cord or peripheral), cerebral anoxia, etc. These have been identified by the use of International Classification of Diseases (ICD) diagnostic codes at the mother's delivery episode of care as follows:
  ICD-9 (9th edition) (April 1, 2001 to March 31, 2004) 668.2 – CNS Complications of anesthesia
  ICD-10 (10th edition) (April 1, 2004 to March 31, 2006) O74.3 – CNS complications of anesthesia during labour and delivery. O89.2 – Central nervous system complications of anesthesia during the puerperium.

2.0 COMFORT MEASURES AND RELAXATION TECHNIQUES

A wide range of non-pharmacological comfort measures and relaxation techniques should be available and routinely offered to all women during labour.[1] The effectiveness of each comfort measure and relaxation technique will vary among women, between births, and over the phase and stage of any labour. Women should be informed of options available to them and their choice should be supported where it is safe and reasonable to do so. Every effort should be made to ensure that continuous support is provided to women in active labour. Each woman's

preferences and choices for her labour should be respected.

2.1 LABOUR SUPPORT

Labour support is the close, continuous presence of a person trained in providing emotional and physical support and encouragement throughout labour and birth. A recent randomized study from Vancouver compared early labour support at home to telephone triage and found that support at home reduced visits to hospital for labour assessment and fewer women were admitted to hospital with a cervical dilation of less than 3 cm.[2] Labour support was evaluated in a study of more than 6,900 women from US and Canadian hospitals randomized to receive usual care versus continuous support from a specially trained nurse.[3] The authors found no difference in birth outcome or analgesic use between the two groups. Although a Cochrane systematic review analyzing 15 trials involving 12,791 women reported that continuous labour support reduced intrapartum analgesia, operative birth, and increased women's satisfaction with their birth experience, the benefit of labour support was restricted to Latin American and Southern US hospitals where women did not have access to nursing support in labour.[4] The Society of Obstetricians and Gynecologists of Canada recommends continuous close support from an appropriately trained professional and a one-to-one nurse-patient ratio in active labour.[5,6]

2.2 POSITIONING[5]

Women should be encouraged to adopt positions and activities that increase their comfort. If electronic fetal monitoring is indicated then telemetry should be used where available. Labour pain may be ameliorated by the following position options:

- walking
- standing
- squatting or supported squat
- sitting
- hands and knees
- semi-reclining or side-lying
- pelvic rocking

Additional inexpensive supportive devices should be available for use including:

- birthing ball
- birthing stool / toilet
- birthing rope

2.3 MASSAGE

Touch can provide significant comfort. Examples include:

- firm sacral pressure
- effleurage
- shoulder, back, foot massage

2.4 HYDROTHERAPY & THERMAL THERAPY

Deep water immersion during the first stage of labour is associated with a significant reduction

in both pain scores and regional analgesia without affecting operative birth rates or neonatal outcomes including Apgar scores, NICU admissions, and infection.[7]

Women can spend long periods of time in the tub. Hyperthermia is possible after prolonged immersion in warm water, but the risk may be reduced by ensuring adequate oral intake, maintaining water temperature around 37.0 C and assessing maternal temperature every hour. If the women's temperature does exceed 37.5 C, reduce the temperature of the water or have her leave the tub for a period of time and re-evaluate. There are no known contraindications to using the tub in the presence of ruptured membranes.[8] Fetal status can be assessed without difficulty while a woman labours in water. Waterproof Dopplers for intermittent auscultation and ultrasound transducers for electronic fetal monitoring, when indicated, are available.

Showers, and warm or cold packs to the lower back or abdomen can also provide relief.

2.5 PSYCHOPROPHYLAXIS & COMPLEMENTARY THERAPIES

Acupuncture and hypnosis may help relieve labour pain.[9] More research is needed to evaluate the effectiveness of commonly used alternative therapies such as:

- acupressure[10]
- visualization
- biofeedback
- music
- patterned breathing
- chant, song or prayer
- aromatherapy
- homeopathy
- herbs

2.6 ENVIRONMENTAL

The labour and birthing space should offer a comfortably furnished room with attention to lighting, noise level, and privacy.

3.0 TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS)

TENS is a non-invasive therapy provided by a battery-powered unit which sends electrical impulses through electrodes placed on the body. The electrical current causes a tingling sensation thought to stimulate the body's production of endorphins and block pain messages at the spinal cord.

Evidence for pain relief with TENS during labour was evaluated in a systematic review of 8 randomized trials involving 712 women.[11] Only one of the trials introduced blinding. There was no difference in pain scores between groups, however, there was a slight reduction in use of analgesia within the TENS group. The number needed to treat to see this reduction was 14. The authors suggest that failure to blind could have introduced this effect.

Familiarization with TENS prior to the onset of labour is advantageous. Women or coaches may adjust the intensity of the signal, as required. Record modes used, duration of treatment and

patient's assessment of pain relief. Use of TENS with EFM may cause interference resulting in artifact on the tracing.

Cardiac pacemaker is a contraindication to using TENS.

4.0 SUBCUTANEOUS STERILE WATER PAPULES[12-14]

This safe and simple technique is easy to learn and appears effective for relieving back pain in first stage labour.[12-14] Subcutaneous injection has been found to be less painful than intracutaenous/intradermal injection, yet equally efficacious at relieving the back pain.[14] The subcutaneous injection (with a 30g needle) of a small volume (0.1ml) of sterile water into four sites over the sacrum is thought to act in the same manner as TENS. The optimal injection sites are over each posterior superior iliac spine and two others placed 2-3 cm below and 1-2 cm medial to the posterior superior iliac spine (see following 3 diagrams). Women report intense stinging and pain for 30 seconds immediately following each injection, so providers must deliver each subcutaneous dose rapidly. Back pain is frequently relieved within 2 minutes and the effect can last 45 minutes to 2 hours. This technique can be repeated after an hour for further relief. A physician, midwife or nurse may administer sterile water injections.

Figure 1. Identify Landmarks by Palpation

The posterior superior iliac spines are palpated by feeling the bony prominences just lateral to the sacrum and below the iliac crest. These can be marked with pen or a fingernail indentation.

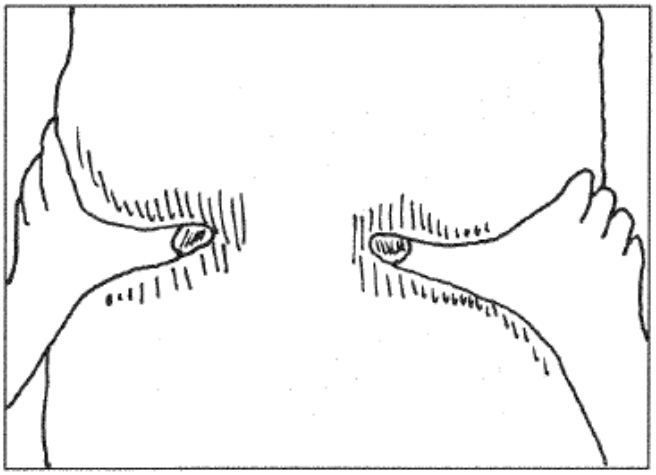


Figure 2. Mark Optimal Injection Sites

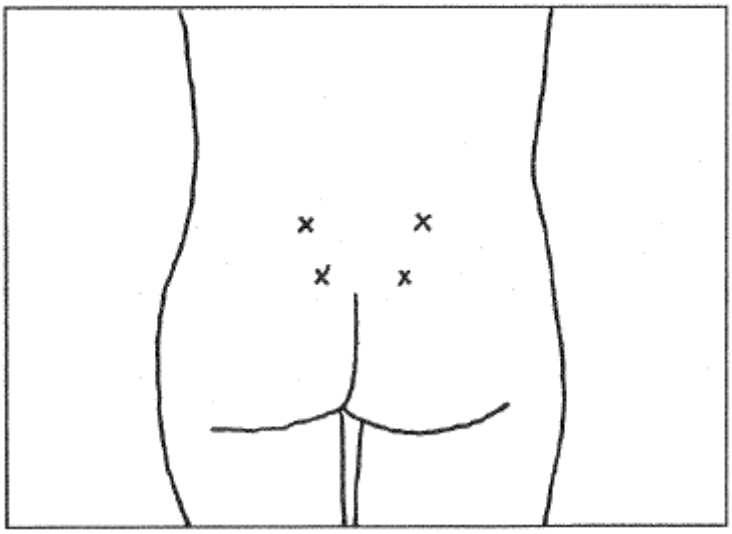
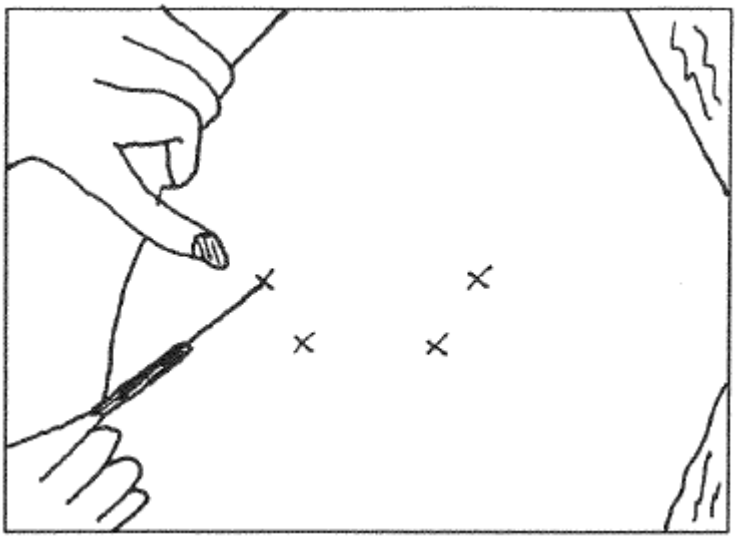


Figure 3. Inject Points with 0.1 ml of Subcutaneous Sterile Water



5.0 NITRONOX OR ENTONOX

This 50/50 mix of oxygen and nitrous oxide is inexpensive, easy to deliver and can be used at any time in both term and preterm labour. Women self administer with a mask or mouthpiece; the mouthpiece may be preferred by women as nothing covers the face. Maximum therapeutic effect takes up to 50 seconds after continuous inhalation is commenced. Compared to placebo and other inhaled agents, Entonox provided consistent, moderate analgesic effect and 50% of

study participants reported significant pain relief.[15] Nitrous oxide can cause nausea, vomiting, dizziness and poor recall of labor. Loss of consciousness can result from prolonged inhalation when someone other than the mother holds the mask.

Considerations:

- the room should be well ventilated (scavenging is recommended)
- useful during rapid labour, transition, or suturing the perineum
- effects are non-cumulative
- inhalation of Entonox should commence as soon as the contraction starts and stop when the contraction has neared completion
- self-administration is essential

6.0 NARCOTICS (OPIOIDS)

Although opioids have been used in obstetrics for over 100 years, sufficient evidence for their efficacy and safety is lacking.[16,17] A modest level of intrapartum pain relief has been reported with the use of narcotic analgesia[18] although others have found no effect.[19] However, even with modest to no pain relief, sedation caused by narcotics may offer "therapeutic rest" for women who experience prodromal labour or irregular uterine contraction patterns of early labour that lead to exhaustion. Narcotics administered during active labour **will never completely remove pain**, but may help some women cope with anxiety or labour pain. There is no evidence to clearly support the use of one opioid over another in terms of analgesic effect or side-effect profile other than the association of increased nausea/vomiting with meperidine.[17] There is limited information about the effect of individual opioids on breastfeeding and mother-infant bonding.[17]

Women should be advised of the impact narcotics administered during labour can have on neonatal respirations and behavior; including breastfeeding (all opioids in sufficient doses may impair early breast feeding). Women might experience dysphoria, sedation, nausea and vomiting, pruritus, amnesia and in high doses, respiratory depression. It is therefore important that when intravenous opioids are administered there should be 1:1 nursing care for 30 minutes following the last dose of intravenous opioid. Additionally, opioids commonly reduce fetal heart rate variability for a period of 30-60 minutes; and can also cause a decrease in the baseline fetal heart rate by 10-15 bpm.

Depending on the timing of birth and the mode of administration of the narcotic, newborn respiratory depression and sedation can occur, e.g. birth within 4 hours of IM administration of morphine or within 1 hour of IV administration of fentanyl.

Women should be advised that narcotics will not remove the experience of pain but may enable some women's ability to manage labour more comfortably.

Use with caution in preterm labour as the preterm newborn is more sensitive to the depressant effects of narcotics and may develop respiratory depression.

All parenteral opioids administered during labour cause further delay in gastric emptying and may increase gastric acid secretion, therefore increasing the risk of maternal

regurgitation and aspiration.[20] Caution should therefore be used when administering parenteral opioids to women at high risk for emergency cesarean delivery.

Naloxone Hydrochloride (Narcan®) should be readily available for administration to the neonate – 0.1 mg/kg IV, IM, SC, or IT. **Note**: Naloxone does not counteract the action of normeperidine. Caution should be exercised to prevent administration of naloxone to the infant of a drug addicted mother. Administration of Naloxone Hydrochloride to the mother to prevent neonatal depression is **not** recommended.

The following table provides a guide for recommended choice of opioid use in labour.

Table 8: Choice of Opioid in Labour

Stage of Labour	Nulliparous	Multiparous
Latent Stage	IM Morphine	IM Morphine
Early Active Stage	IM or IV Morphine	IV Fentanyl
Late Active Stage	IV Fentanyl	IV Fentanyl
Second Stage	* IV Fentanyl	Rarely needed

* If Fentanyl is administered in second stage there may be neonatal depression, depending on when delivery occurs relative to the last does given.

Meperidine is not recommended for obstetrical analgesia and should only be used in the case of true morphine allergy.

6.1 MORPHINE

A. Introduction

Morphine is a derivative of the opium poppy and was first introduced in obstetrics in the early 20th century. Its duration of effect is 3-4 hours, with a maternal T ½ life of 1 hour and a neonatal T ½ life of 6 hours. It has no active metabolites. Most infants delivered 3 hours after a dose will have no detectable cord levels. When compared to meperidine it has similar or increased modest analgesic action, less nausea, and fewer significant side effects for the neonate.[18] As morphine is more sedating and has a longer half life than fentanyl, it should probably be reserved for early labour analgesia where intramuscular administration will provide longer relief, or for women who do not want IV access in labour.

B. Procedure

1) Morphine should be administered IM. IV administration may be used for nulliparous women in the early active first stage of labour.
2) IM injections act in 15-20 minutes, peak effect is in 40-50 minutes, and effect duration is 3-4 hours.

3) Usual initial dose is 10-15 mg IM. IM morphine may be more effective in early labour for duration of action.
   or
   3-5 mg IV bolus, repeated at 10 min. intervals prn. will give 1-2 hours of relief.
4) Dimenhydrinate (Gravol®) 25 mg IV or 25-50 mg IM is often given with morphine to counteract the side effects of nausea and vomiting. Dimenhydrinate appears to be safe, but will produce some sedation. There is minimal information available regarding which antiemetic is most efficacious when given prophylactically with a narcotic for non-operative pain; dimenhydrinate is probably as effective as others.
5) Naloxone should be readily available for administration to the mother or neonate.

6.2 FENTANYL

A. Introduction

This potent, short-acting opioid is administered intravenously (onset 3-5 minutes, peak effect 5-15 minutes) with a duration of effect of $\leq$ 1 hour, a maternal T ½ (half life) of less than 1 hour and a neonatal T ½ of 1 – 6 hours. It has no active metabolites and produces less maternal sedation, nausea, and vomiting than morphine. It is particularly useful in: early active labour, in women who have a contraindication to epidural analgesia, in multiparous women with rapid intense labours, or for women where regional analgesia is not available. As with morphine, it can depress maternal and newborn respiration[24] and in almost every study there is an increased use of naloxone when maternal IV fentanyl is used.[25] Fentanyl has been used in IV PCA format until delivery is imminent; naloxone is required in approximately 20% of the neonates.[26] Intravenous fentanyl can cause hypotension and bradycardia in hypovolemic individuals. It is a very potent respiratory depressant. **Naloxone should be readily available for administration to the mother or neonate.**

B. Contraindications

- allergy to fentanyl
- obesity (pre-pregnancy BMI >35: e.g. 185 lbs and 5'1 or 85 kg and 155 cm tall)
- uncorrected hypotension or hypovolemia
- liver disease
- respiratory compromise (e.g. severe asthma, cystic fibrosis)

C. Use with Caution

- women at high risk for emergency cesarean delivery (evidence of fetal compromise, twins)
- preterm labour (increased risk of respiratory depression in the neonate)
- women with a history of difficult intubation
- women with hypertensive diseases of pregnancy (increased sensitivity to hemodynamic effects of fentanyl)
- women who have received more than one dose of a longer acting narcotic (e.g. morphine)

D. Procedure

1) Give IV (by the nurse, midwife or physician) during the contraction. Occasionally it is given via IV patient controlled (IV-PCA) device.[27]

2) Dilute 100 micrograms (2 ml) into 8 ml normal saline to obtain 10 ml of solution (concentration of 10 micrograms/ml).
3) Provide 1:1 nursing care.
4) Monitor respirations and sedation scores for 30 minutes after IV fentanyl administration at the same frequency as other maternal vital signs are monitored.
5) Monitor maternal oxygen saturation for a 5 minute period with each set of maternal vitals if total doses greater than 200 micrograms/hr are used, *or* if morphine or meperidine has been administered IM in the 3 hours preceding IV fentanyl administration. The oxygen saturation monitoring should continue for 30 minutes after the last dose of fentanyl was administered.
6) If oxygen saturations fall below 92%, supplemental oxygen should be provided until the saturations remain above 92% on room air.

E. Weight - Based Dosage (See Table 9: Fentanyl weight-based dosing guidelines, p. 15)

1) Recommended initial dose is 0.5-1.0 micrograms/kg (maximum 100 micrograms) over 30 seconds, waiting for 10 minutes for effect. Repeat every 10 minutes until satisfactory pain relief or a total dose of 2.0 micrograms/kg/hr (200 micrograms/hr, or 2-4 doses in one hour) has been given.
2) Alternatively, with continuous maternal oxygen saturation monitoring doses up to 2.0 microgram/kg (maximum 200 micrograms) can be given initially, with one repeat dose after a minimum of 45 minutes has elapsed. Oxygen saturation monitoring should continue for 30 minutes post-dose.
3) Once a total dose of 4.0 micrograms/kg (8 doses of 0.5 micrograms/kg, 4 doses of 1 microgram/kg or 2 doses of 2 micrograms/kg in total) to a maximum of 400 micrograms has been administered, consideration should be given to an alternate technique (epidural or, if not available/contraindicated, IV PCA fentanyl).
4) Caution should be observed if fentanyl use continues for more than 5 hours or a total dose of 400 micrograms has been administered. Evidence in a small study found that there were more episodes of desaturation in newborns whose mothers had received fentanyl.[28] Generally, the larger the dose of maternal fentanyl, the more likely that the neonate will be depressed. Therefore, oxygen saturation monitoring should be considered for at least 2 hours (longer if there is an episode of desaturation) after birth in newborns whose mothers have received >250 micrograms.
5) When administered via IV-PCA the woman should have continuous oxygen saturation monitoring, 1:1 nursing care, and the newborn should be monitored as indicated above.
6) Fentanyl 100 micrograms IV is equivalent to 10 mg morphine *or* 75 mg meperidine.

Table 9: Fentanyl Weight-based Dosing Guidelines

Initial Dose (over 30 seconds)	**Dosing interval**	**Maximum doses per hour**	**Maximum total dose mcg/kg and absolute maximum dose mcg**	**Monitoring requirements**
0.5 mcg/kg	10 minutes	4	4 mcg/kg 400 mcg	Usual maternal and fetal
1 mcg/kg max up to 100 mcg	10 minutes	2	4 mcg/kg 400 mcg	Usual maternal and fetal
2 mcg/kg up to 200 mcg	45 minutes	n/a (note dosing interval)	2 doses = 4 mcg/kg 400 mcg	Continuous maternal oxygen saturation monitoring for 30 minutes post-dose

6.3 MEPERIDINE (DEMEROL ®)

Meperidine is not recommended for obstetrical analgesia and should only be used in the case of true morphine allergy.

A. Introduction

Meperidine is a synthetic opioid first synthesized in 1939. It quickly replaced morphine in labour after early false reports associated meperidine with a decrease in neonatal respiratory depression compared to morphine. Meperidine's short duration of effect is between 2-3 hours. However, it has a relatively long maternal T ½ life of 8 hours and a neonatal T ½ life of 22 hours. Normeperidine is its active metabolite – a neurotoxin with CNS excitatory effects that can be exacerbated by naloxone (Narcan®). The T ½ life of normeperidine is 22 hours in the woman. However, in the newborn it is 62 hours. Normeperidine can decrease the neonate's seizure threshold and contributes to disturbed sleep-wakefulness. When compared to morphine and fentanyl, meperidine is associated with increased maternal nausea,[16] higher pain scores,[21] and in the neonate; more depressed Apgar scores, impaired Brazelton Neonatal Behavioral Assessment Scores, and impaired initiation of breastfeeding for up to 5 days.[21,22] Initial claims of meperidine's superiority over morphine have not been substantiated and the impact of normeperidine is now better understood. With better options readily available, meperidine can no longer be recommended as the narcotic of choice for early labour analgesia.

B. Procedure

1) **Meperidine should be administered IM for early labour analgesia only in those women with a true morphine allergy.**
2) Timing of administration is important due to placental transfer and risk of neonatal respiratory depression. Meperidine should not be given within 4 hours of delivery.
3) IM injections act in 10-15 minutes, with a peak effect in 40-50 minutes. Duration of clinical effect is 2-3 hours.
4) The usual initial dose is meperidine 75-150 mg IM (maximum 2 milligrams/kg).

5) Dimenhydrinate (Gravol) 25 mg IV or 25-50 mg IM is often given with meperidine to counteract the side effects of nausea and vomiting. Dimenhydrinate appears to be safe, but will produce some sedation. There is minimal information available regarding which antiemetic is most efficacious when given prophylactically with a narcotic for non-operative pain; dimenhydrinate is probably as effective as others.

6.4 NALBUPHINE[23]

A. Introduction

Nalbuphine hydrochloride (Nubain) is a synthetic opioid agonist-antagonist analgesic that is considered to be equipotent to morphine on a milligram basis. The onset of action is within 2-3 minutes after intravenous administration, and in less than 15 minutes following subcutaneous or intramuscular injection. Clinical duration is 3-4 hours and the elimination half-life is 5 hours. The antagonist activity is about one-fourth as potent as nalorphine. Placental transfer is high. Fetal and neonatal adverse effects have been reported following administration for labour analgesia, including fetal bradycardia, respiratory depression at birth, apnea, cyanosis and hypotonia. A sinusoidal fetal heart pattern following administration of maternal administration has also been reported.

The purported benefit to nalbuphine over opioids that have only agonist function at the opioid receptors, is the ceiling effect it has on respiratory depression once a dose of 30 milligrams is exceeded. In other words, compared to morphine, which will continue to depress respiratory function in a dose-dependent fashion, maximal respiratory depression is seen once a dose of 30 milligrams of nalbuphine has been administered. In reality, the dose of nalbuphine typically used for early labour analgesia is 15 to 20 milligrams, so the benefit of reduced risk of respiratory depression does not exist. Nalbuphine does not appear to offer any benefit over other opioids for labour analgesia.

B. Contraindications

- Allergy to nalbuphine hydrochloride.

C. Procedure

1) Nalbuphine should be administered IM for early labour analgesia.
2) IM injections act in 15 minutes, peak effect is in 30 minutes, and effect duration is 3-4 hours.
3) Usual initial dose is 15-20 mg IM.
4) Nausea may be less with nalbuphine than morphine or meperidine because of antagonist activity at the delta receptor. Therefore, it is not necessary to automatically administer a dose of dimenhydrinate at the time of nalbuphine administration.
5) Naloxone should be readily available for administration to the mother or neonate.

6.5 REMIFENTANIL[26, 29-31]

This relatively new opioid is ultra-short acting due to its rapid metabolism by nonspecific esterases in the blood and other tissues. It is occasionally used for labor analgesia as its short half life (3 minutes) has advantages for the mother and fetus. Remifentanil has a rapid onset (peak effect 60-90 seconds) and rapidly crosses the placenta to the fetus where it is rapidly

metabolized and redistributed. Because of its rapid metabolism and individual variability, the ideal way to administer this drug is not yet known. Some centres administer it as IV-PCA only, while others use a background infusion with IV-PCA. It mainly is being used when an epidural is contraindicated.

Remifentanil is a very potent opioid and women can rapidly develop respiratory depression with oxygen desaturation and sedation. It is essential therefore, that women have 1:1 nursing care and pulse oximetry monitoring. Oxygen must be readily available and most women will require supplemental oxygen. It is important to remember that respiratory rate must also be monitored as provision of supplemental oxygen may maintain maternal oxygenation but respiration may be depressed with resultant accumulation of carbon dioxide.

The major advantage of remifentanil is for the newborn. Because of its short half life the mother can continue to use remifentanil until delivery and even if the newborn is depressed at birth it will rapidly recover with minimal resuscitation. Naloxone is unlikely to be necessary. At present time there is not enough information available to make recommendations as to optimal dosing for remifentanil. It should only be ordered by an anesthesiologist, who must be immediately available to deal with maternal side-effects.

7.0 LABOUR EPIDURAL ANALGESIA

7.1 OVERVIEW

A. Introduction

Epidural analgesia (EA) is considered the gold standard for effective pain relief in labour. A meta-analysis of 21 trials including 6,664 women found EA to be an effective form of pain relief associated with an increase in assisted vaginal birth. There was no significant difference in cesarean births, maternal satisfaction with pain relief, long-term back-ache or Apgar scores between those who had epidurals versus those who did not.[32] A critique of this meta-analysis indicated that the trials that showed no difference in cesarean delivery used active management of labour with high dose oxytocin, which is not typical of Canadian labour management practice.[33] However, a recent Canadian multi-centred trial comparing low-dose epidural analgesia (used with a patient-controlled technique) versus IV PCA fentanyl demonstrated no difference in cesarean delivery, with a similar proportion of women requiring oxytocin labour augmentation.[25] Epidurals are associated with an increased duration of first and second stage labour by 40-60 minutes and 14-23 minutes respectively.[25,32] The question of whether an "early" labour epidural has more impact on labour progress than a "late" epidural is unclear, because of varying definitions of "early" versus "late" with respect to cervical dilation, and how labour was managed post-epidural insertion. However, a recent study using contemporary low-dose epidural technique did not show that an early epidural (median 2.4 cm cervical dilation versus 4.6 cm at time of insertion) resulted in increased duration of labour nor an increased need for cesarean delivery. There was no difference in oxytocin use between the early and late groups.[34] And finally, stopping an epidural for second stage to enhance expulsive efforts has not been shown in a Cochrane systematic review to make a difference in need for assisted delivery, but is associated with increased pain and decreased maternal satisfaction.[35]

Regional analgesia should be initiated and maintained only in locations where appropriate resuscitation equipment and drugs are immediately available to manage potential problems related to the procedure. Each facility should develop specific policies and procedures. Staff should be trained to recognize problems in order to rapidly institute corrective measures. Regional analgesia should not be administered until:

- a qualified practitioner has examined the patient.
- a registered nurse has communicated the maternal and fetal status and progress of labour with the primary care provider.
- a baseline fetal heart assessment has been obtained. From the epidural point of view, continuous fetal monitoring is **not** necessary and the decision to use it should be based on obstetric considerations.

B. Common Indications

- woman's choice for pain relief with informed consent
- analgesia for long labours; the distressed, fatigued women; back-labours associated with OP position
- twins, planned vaginal breech delivery, prematurity
- slow progress, oxytocin augmentation/induction
- pregnancy induced hypertension
- high risk for cesarean birth
- other medical conditions as warranted

Epidurals are not contraindicated for VBAC.[36,37]

C. Contraindications

Absolute contraindications:

- non consent
- frank coagulopathy – abnormal PTT, PT, low platelets (<80,000), current heparin use
- systemic sepsis untreated with antibiotics or localized sepsis at epidural site
- uncorrected maternal hypovolemia
- history of allergy to the local anesthetic typically used in epidural analgesia
- increased intracranial pressure
- lack of resuscitation equipment

Relative contraindications:

- history of active neurological disease
- minor coagulation abnormalities (i.e. INR$\geq$ 1.2-1.3)
- ongoing significant hemorrhage
- fixed cardiac output (i.e. aortic stenosis)

There may be circumstances when regional anesthesia may be appropriate in women whose platelet count is 50,000-80,000, e.g. ITP where platelet count may be 60,000 but platelets are functional and patient is not at risk of bleeding. For a platelet count from 50,000-80,000 the risk benefit ratio of regional anesthesia has to be considered on an individual basis.[38]

D. Risks / Side Effects

- hypotension (less common now when low dose solutions are used)
- dural puncture and spinal headache
- failed block, unilateral or patchy block (10-15%) } most common
- pruritis
- maternal fever
- higher likelihood of requiring an assisted vaginal delivery in nulliparous women
- catheter migration either subarachnoid or intravascular (resulting in decreasing BP)
- drug effects – toxicity
- urinary retention } less common
- infection or hematoma (rare)
- nerve injury – rare 1:25,000

There is contradictory information in the literature regarding the effect of labour epidural analgesia on breastfeeding success. The confounding factors of labour duration, mode of delivery, and variations in epidural management, including total dose of epidural opioid, make it impossible to make a definitive conclusion; however, the availability of breastfeeding expertise to assist new mothers is an important factor in breastfeeding success, regardless of the use of labour analgesia.[39-42]

E. Considerations

- an intravenous preload of R/L or N/S is no longer considered necessary unless the woman is dehydrated, hypovolemic, or has evidence of fetal compromise. It is essential that a functional IV be established prior to administering a neuraxial block.
- prevent aorto-caval compression:
  - **never** position supine
  - position on side or use wedge (30 – 45° tilt) under right hip for left uterine displacement.

F. Preparation of the Woman

- rule out contraindications
- educate the woman and support person and obtain informed consent
- obtain platelet count if abnormality suspected, e.g. hypertension in pregnancy
- empty bladder
- check maternal vital signs
- initiate IV
- administer fluid bolus 250 ml – 500 ml R/L or N/S pre-epidural **only if indicated**
- assess fetal status and uterine activity. The fetal heart rate should be assessed by intermittent auscultation in the case of a healthy woman with no risks for adverse perinatal outcome. In the presence of obstetrical indications, use electronic fetal monitoring.

G. Procedure

- the needle is inserted at L_{2-3} or L_{3-4} level and the catheter is threaded through to the epidural space.

- continuous epidural may be administered (preferably) by continuous infusion technique, or by patient-controlled epidural analgesia (PCEA).
- walking epidural – medication is adjusted to allow for ambulation. Use a low-dose technique so there is no motor block or risk of postural hypotension. The woman should meet the criteria for walking epidurals (see section 7.6, page 25).

H. Local Anesthetic Agents

The drug concentration and volume of local anesthetics, opioids, and epinephrine used to initiate epidural analgesia will depend on the stage of labour and the woman's preference/need for analgesia. For example, in early labour 12 - 14 ml of 0.1% bupivacaine with 2 micrograms/ml fentanyl or 12-20 ml of 0.08% bupivacaine with 2 micrograms/ml fentanyl may be appropriate, whereas at 8 cm dilation a stronger concentration may be appropriate. Generally speaking, all medications administered into the epidural space should be given incrementally to avoid complications related to inadvertent intravenous or intrathecal administration.

1) Local anesthetic agents commonly used:
   - lidocaine (Xylocaine ®)
   - bupivacaine (Marcaine ®)
     a) onset approximately 10 – 20 minutes
     b) duration approximately 2 hours
   - ropivacaine (Naropin ®) similar to bupivacaine
2) Other agents commonly added:
   - epinephrine
     a) prolongs and enhances block, but also increases the incidence of motor block
     b) may be used for test dose
   - fentanyl
     a) narcotic
     b) is synergistic with bupivacaine, allowing a significant reduction in the concentration of local anesthetic required for good analgesia, and reduces the incidence of motor block. It is effective in all epidurals, and may help OP, backpain, or rectal pressure; however, it does not correct a poor epidural. Total dose of fentanyl given via the epidural over the course of an average labour epidural of 6-8 hours should not exceed 200 micrograms.[43] Therefore, boluses of fentanyl should be limited to 50 micrograms. Systemic absorption of fentanyl from the epidural space does occur, and the fetus does therefore receive fentanyl from the maternal blood stream.[44,45]

I. Complications May Include

1) Subarachnoid injection "spinal" – onset within minutes
   - hypotension
   - high sensory level
   - profound motor weakness, symmetric block
   - respiratory distress, SOB
   - intubation/ventilation may be necessary
2) Subdural injection
   - signs similar to subarachnoid injection except:
     - typically slower onset occurring over 15-30 minutes

- high sensory level with hypotension, but absent motor block

3) Intravascular injection
   - metallic taste and ringing in the ears the earliest signs
   - mild dizziness, confusion, agitation, jitteriness
   - hypotension
   - unconsciousness
   - severe cardio-respiratory collapse
   - systemic toxicity – depends on dose and rapidity of injection
   - generalized tonic-clonic seizure (seizures occur before cardiac collapse with lidocaine)

Management for Seizure
- supportive, if seizure of short duration
- 0_2, airway, ventilation
- midazolam or diazepam (Valium®)
- protect patient from injury

Emergency Equipment
- IV fluids – crystalloids
- 0_2
- airway, intubation equipment, ambubag
- suction
- monitors – auto BP, oximeter, ECG
- drugs – atropine, epinephrine, ephedrine, phenylephrine, diazepam or midazolam, thiopental, succinylcholine, nitroglycerin (IV or spray), magnesium sulphate

7.2 INTERMITTENT BOLUS TECHNIQUE

This technique is used less frequently as it is less effective and requires more anesthesiologist intervention than techniques such as PCEA. It requires higher concentrations of local anesthetic, therefore is associated with more motor block and hypotension. Use of intermittent bolus technique also requires the in-house presence of an anesthesiologist (as per CAS Regional Anesthesia in Labour guidelines).

A. Initial Dose/Bolus Dose

1) A portion of the initial dose and each subsequent bolus dose is referred to as a "test-dose" to detect proper catheter placement (rule out spinal or intravascular position). Note that bupivacaine and ropivacaine have been found to be very poor predictors of a spinal catheter due to the slow onset of motor block (5-7 minutes).
2) Response to test dose:
   - epidural → no immediate effect
   - spinal → rapid onset of block, hypotension
   - intravascular → dizziness; ringing in ears; tingling/numb lips and tongue (if sufficient dose given, need 100 mg of lidocaine for these symptoms to appear); transient tachycardia if epinephrine used
3) Remainder of initial/bolus dose is administered after approximately 3 – 5 minutes

4) Effective pain relief is evident within 10 – 20 minutes if catheter is correctly positioned

B. Care and Monitoring: Intermittent bolus technique

1) Close monitoring of both fetal and maternal well-being is mandatory, especially during initiation and top-up boluses
2) Monitor BP and fetal heart q 5 minutes for 30 minutes (due to anesthetic effects) after the initial bolus and after any top-up bolus
3) Observe for "expected" physiological effects
4) Assess for motor block, i.e. ability to lift legs
5) Observe for "exaggerated" effects such as hypotension (decreased BP > 20%) or unexplained high block
6) Notify the anesthesiologist if the sensory block to ice is above T6

Management for High Block

- place in left lateral/sit up
- 0_2 at 8 L per mask
- IV fluid bolus of R/L or N/S
- use vasopressor if hypotensive, e.g. ephedrine 10 mg
- Continue monitoring fetal heart

C. Bolus "Top-Ups"

1) Approximately q1 – 2 hrs, as the block begins to wear off, a "top-up" of the anesthetic may be required
2) The procedure for administration and care is the same as that described above

7.3 CONTINUOUS INFUSION TECHNIQUE AND PCEA (Initiated and rate ordered by an Anesthesiologist)

A. General Information

- administration is consistent at a slow rate
- analgesia is continuous – there are no hills or valleys
- a dilute solution is recommended: bupivacaine 0.05-0.125% or ropivacaine 0.8-0.125%, with the addition of a lipid-soluble opioid such as fentanyl (1.5-2 micrograms/mL) or sufentanil (0.2-0.35 micrograms/mL) with or without epinephrine
- the incidence and magnitude of adverse effects and complications is lower because a lower dose is administered over time and the cumulative dose is less
- mixtures of dilute local anesthetic and opioid are associated with less pelvic motor effects resulting in better maternal expulsive efforts and less need for assisted vaginal delivery
- complications have slow onset, and may occur at any time
- it is easy to regulate an increase or decrease in infusion rate
- normal infusion will provide good segmental analgesia at $T_{10} – L_1$, stable BP, minimal paresthesia, minimal or no motor weakness
- there is potential for patient controlled epidural analgesia (PCEA)

B. Complications

Symptoms are the same as those mentioned in Section 7.1-I with the following differences:

- subarachnoid infusion has a slow onset over 20 minutes – 2 hours.
- intravascular infusion may present as loss of effective analgesia; minimal or no systemic symptoms due to the low dose infusion rate.
- if the epidural is no longer effective, the catheter may have migrated into a blood vessel or more likely become displaced out of the epidural space. The possibility of intravenous migration requires extra vigilence in monitoring but is a very rare event.
- notify anesthesiologist if there is increasing level of block or instability of maternal cardiovascular status. If there is a drop in fetal heart rate, notify the obstetric care provider first, and then the anesthesiologist.

C. Care and Monitoring

In addition to the monitoring and care outlined for intermittent bolus technique, close monitoring should include the following:

- BP/HR q 15-60 minutes, depending upon sensory/motor levels and labour progress
- sensory level $T_{8\text{-}10}$ – assess q 30-60 min, costal margin to umbilicus
- motor function - assess q30-60 min, should be normal
- position change q 30-60 minutes
- bladder attention and care

7.4 PATIENT CONTROLLED EPIDURAL ANALGESIA (PCEA)

This technique is being used more frequently as it allows the woman a degree of control over the amount of analgesia that is administered. This technique may consist of a background infusion supplemented by patient administered boluses of local anesthetic as required to maintain analgesia or patient administered boluses alone. Recent evidence supports use of a low background infusion.[46,47] It usually is associated with high patient satisfaction and decreased need for additional top-ups by the anesthesiologist, nurse, or midwife. When dilute local anesthetic solutions are used (e.g. 0.08% bupivacaine + fentanyl 2 μg/ml) there is minimal to no motor block and the woman may ambulate providing checks are done as listed below under "Mobile Labour Epidural Analgesia". Background infusions of 5-8 ml/hr and PCEA bolus doses of 5-8 ml with a lockout of 5-8 minutes works very effectively. Women should be encouraged to use the PCEA bolus dose when the pain stimulus intensifies, or sensory levels are below T8.

7.5 COMBINED SPINAL EPIDURAL TECHNIQUE (CSE)

- Combined Spinal Epidural Technique is similar to lumbar epidural analgesia except that some medications (short-acting opioids +/- local anesthetic) are first given into the subarachnoid (spinal / intrathecal) space.
- The advantages of CSE are:
  - Rapid onset of analgesia
  - Minimal motor block with excellent "pushing power" if administered in late first stage
  - Maternal satisfaction
  - Possibly better subsequent epidural catheter function
- The epidural space is identified with the epidural needle then a longer spinal

needle is inserted through that epidural needle into the spinal space. The medication (e.g. bupivacaine 1.25-2.5 mg plus fentanyl 15-20 micrograms or sufentanil 1.5-3 micrograms) is given through the spinal needle. The spinal needle is then withdrawn and the epidural catheter inserted.

- The epidural component, either continuous infusion or PCEA, may be initiated immediately. Some practitioners wait 30 minutes to initiate the infusion, others start the infusion at a lower rate i.e. 5 mL/hr. PCEA is a very effective technique following CSE, preventing any "gaps" in analgesia.[46]
- Many use the term "walking epidural" synonymously with the CSE but walking epidural can also be done using an epidural only technique.
- Side effects occur within the first 30 minutes of the spinal injection. The side effects and complications are similar to that for a standard epidural **except:**
  - Fetal bradycardia is more common[48] – may be related to a hypertonic uterine contraction. The relative risk of fetal bradycardia within the first 60 minutes after a CSE is twice as high compared to a standard epidural. The actual incidence of fetal bradycardia has been reported anywhere from 3.9 to 33%.[49] The bradycardia usually responds to measures such as fluid bolus, lateral position, and maternal oxygenation. If uterine hypertonus is present, a tocolytic such as nitroglycerin may be used either intravenously 100 micrograms or spray 400 micrograms.
  - Maternal dysphagia (difficulty swallowing) has occasionally been reported.
  - Maternal respiratory depression rarely occurs.
- **Single-shot spinal analgesia for labour** is used in some hospitals where epidural analgesia is not available. It is a time-limited technique that offers none of the advantages of an epidural with respect to ability to provide rapid anesthesia for intervention, however provides superior analgesia than parenteral narcotics.[50,51] It is important that resuscitative equipment is available as for epidural analgesia and that strict aseptic technique is used. The analgesia is provided with a combination of short acting opioid (fentanyl or sufentanil), small amount of local anesthetic, and long-acting opioid (preservative free morphine). The initial analgesia is exactly as that provided in a CSE, providing rapid onset and analgesia that on its own may last from 45 minutes to 2 hours. The long-acting morphine onset time is approximately one hour, and will provide 4-6 hours of analgesia. The analgesia provided by the morphine is not as intense as that provided either by the initial short-acting opioid/local anesthetic combination or by an epidural. The analgesia provided by morphine is usually not adequate for 2nd stage perineal stretching. The risk of fetal bradycardia is the same as described in the CSE technique; appropriate protocols to manage this complication should be in place.
  - Dosing: *the amount of short-acting opioid/local anesthetic for initial analgesia should be the same as for CSE technique*
    - Fentanyl 15-20 micrograms OR
    - Sufentanil 1.5-3 micrograms (take note of the newly recommended low dose of sufentanil[52] AND
    - Bupivacaine 1.25-2.5 milligrams (0.25% plain bupivacaine solution) AND
    - Morphine, preservative-free (1mg/mL or 0.5 mg/mL) 0.2-0.3 milligrams
  - Note that the side-effects of the long-acting morphine are considerable (this dose is 2 to 3 times higher than that used for post-cesarean analgesia) and include:
  - Nausea/vomiting in 20-50%

- Pruritus in 80%
- Sedation
- Increased risk of respiratory depression (from interaction with the short-acting opioid or from parenteral opioid administered in the previous 2-3 hours)
- The use of narcotic antagonists (naloxone) or agonist-antagonists (nalbuphine) to treat the intrathecal opioid side-effects DO cause a decrease in analgesic effect

7.6 MOBILE LABOUR EPIDURAL ANALGESIA, aka: WALKING EPIDURAL

- Any epidural has the potential to allow the parturient to be "mobile". As motor block will impede the woman's ability to be mobile (including ambulation), more dilute solutions of local anesthetic are used and combined with an opioid such as fentanyl. Most women can ambulate successfully even with 0.08% bupivacaine with fentanyl 2.0 micrograms/ml. Note that in early labour, the use of an epidural "test dose" containing epinephrine may produce motor block sufficient to prohibit ambulation.
- Motor block is minimized and sensory block is sufficient to provide adequate pain relief.
- Minimal motor block may allow the woman to sit in the chair, use the bathroom or ambulate, as well as use different labour positions.
- Women should ambulate with an assistant in constant attendance.
- If a woman requires additional medication to achieve desired pain relief this may prevent ability to ambulate.
- The woman's satisfaction may be enhanced as her legs will be less heavy, she will have more choice for position, and urinary catheterization may be decreased.
- There may be specific obstetric contraindications to ambulation such as vaginal bleeding, unengaged head, non-reassuring fetal heart pattern, or oxytocin stimulation without telemetry.
- Specific safety checks are done to ensure that it is safe for the patient to stand and walk.

A. Care and Monitoring

- Same as for regular epidural.
- After initial epidural dose and with any additional top-ups, the woman must remain in bed for 30 minutes while regular "top-up" checks of BP and FHR are performed.
- In addition, the following safety checks must be done **BEFORE ambulation**:
  - Sitting and supine blood pressures within 10% (no postural hypotension)
  - Motor function:
    a) Full strength straight leg raising bilaterally.
    b) Stand at bedside with two assistants without dizziness or weakness.
    c) Partial deep knee bends X3 with two assistants (good quadriceps strength).
    d) Normal or near normal sensation in the feet.
- Safety checks must be repeated when a woman returns to bed or is sitting in a chair for >60 minutes.
- There is no need to monitor maternal vital signs after each PCEA dose, even if the woman is mobile.

8.0 PERIPHERAL NERVE BLOCKS IN SECOND STAGE

The maximum doses of local anesthetic that should be administered from all sources within a 1.5-2 hour period are:

1) Lidocaine:
   - 5 milligrams/kilogram without epinephrine
   - 7 milligrams/kilogram with epinephrine
2) Bupivacaine:
   - 2.5 milligrams/kilogram with or without epinephrine

8.1 PUDENDAL NERVE BLOCK

A. Introduction

A pudendal nerve block provides excellent vaginal anaesthesia for an operative vaginal delivery if there is insufficient time to arrange a regional block (epidural and/or spinal). However, it must be remembered that the pudendal nerves do not innervate the perineum (ilioinguinal, genitofemoral, and perineal branch of posterior cutaneous nerve of the thigh), so a pudendal nerve block should be supplemented with perineal infiltration.

B. Technique

1) Prepare a 20 ml syringe with 20 ml 1% plain lidocaine.
2) Use a 23g pudendal needle. With guard advanced in front of the needle tip, advance the round head of the guard to lie on the left sacro-spinous ligament just medial to the ischial spine.
3) Advance the needle tip into the ligament and aspirate (no blood should be obtained). Inject 5 ml of 1% lidocaine.
4) Advance the tip a short distance, aspirate, and inject a further 5 ml of 1% lidocaine.
5) Repeat the procedure on the right side.
6) Infiltrate the perineum using 10 ml of 1% lidocaine, at the practitioner's usual site of episiotomy (mediolateral or midline; see below).
7) The block will take 5-10 min to be fully effective.

8.2 PERINEAL BLOCK

A. Introduction

A perineal block should be used prior to any operative vaginal delivery where an episiotomy may be required to minimize vaginal and perineal trauma (and fourth stage, prior to repair of any trauma requiring suturing). The distension of the perineum during crowning of the head does not desensitize the perineum to the pain of episiotomy.

B. Technique

1) Prepare a 10 ml syringe with 10 ml 1% lidocaine.
2) Use a 26g needle to inject an initial bolus of lidocaine at the posterior fourchette.
3) Use a 22g needle to infiltrate along the line of the intended episiotomy (mediolateral or midline); aspirate and then inject 10 ml of 1% lidocaine.

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