Labour Analgesia
Guidelines for Obstetrical Practice
Reproductive Care Program of Nova Scotia

This document is intended as a resource to guide practice in the labour and delivery setting only. The information contained herein is not intended for other areas of medical/nursing practice.

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-PREFACE-

Labour Analgesia

Introduction

Pain is a subjective and varied phenomenon. In the first stage of labour, pain arises primarily from nociceptors in uterine and perineal structures. Nerve fibers transmitting pain sensation during the first stage of labour travel with sympathetic fibers and enter at the T10-L1 spinal segments. In the second stage, fetal descent with subsequent distention of the pelvic floor results in somatic pain impulses primarily through the pudendal nerve (ACOG, 1996). Other factors such as patient ability and choice to receive pharmacological pain management, labour support, risk level of clinical situation and provider influence can impact a woman's pain experience.

There are typically three pharmacological choices for labour analgesia in Nova Scotia hospitals offering obstetrical services. These include: epidural, intravenous or intramuscular opioids and inhaled nitrous oxide. The availability of all three options is dependent on site-specific resources. The latter two are often more readily available at all centers. In Nova Scotia, the trend is a higher rate of epidural use in tertiary level facilities, most likely due to availability, increased patient acuity, and patient and caregiver preference. (The rate of use of each specific type of analgesia/anesthesia in Nova Scotia and by facility-type (community, regional or tertiary) is provided graphically throughout the document).

According to the Nova Scotia Atlee Perinatal Database the rate of epidural for vaginal births in Nova Scotia for 2001-2002 is approximately 45% for all vaginal deliveries. In 2001–2002, epidural analgesia was used in almost half (45.4%) of all vaginal births in Canada (CIHI, 2003). The range of its use varies across the country with a low of 4% in the Northwest Territories to a high of over 60% in Quebec (CIHI, 2003). In the United States approximately 60% of women (2.4 million each year) choose epidural or combined epidural-spinal analgesia for pain relief during labour (Eltzschig, Lieberman & Carnann, 2003).

There is ongoing debate regarding epidural effects on labour progression, use of oxytocin augmentation, operative deliveries and breastfeeding rates (Ramin et. Al, 1995; Leighton & Halpern, 2002; Eltzschig et al., 2003). Comparative studies between opioids and epidural demonstrate an increase in maternal satisfaction with epidural for pain relief, as well as fewer reported maternal and neonatal side effects. The use of parenteral opioids varies from institution to institution, with variations in type of narcotic used and dosage. Although use of specific narcotics (namely meperidine) in other areas of medicine has decreased due to cited side effects, meperidine remains a mainstay in obstetrics in a number of facilities throughout the province. Nitrous oxide has been used for centuries for labour analgesia. Although its efficacy varies, it is recommended as a

pharmacological pain management option, when used with proper waste anesthetic gas scavenging.

Physiologic Considerations

There are a number of physiologic changes that occur during pregnancy and labour that can contribute to the efficacy, metabolism and safety of pharmacological pain management for labouring women. Delayed or decreased absorption of orally administered drugs occur due to slowed gastrointestinal motility and increased emesis and reflux. An increased sensitivity to inhaled agents is noted during pregnancy as a result of decreased MAC (minimum alveolar concentration). MAC is defined as the alveolar concentration of anesthetic at which 50% of the patients are unresponsive to a standard surgical stimulus (Wenker, 1999). As well, cutaneous blood flow is also enhanced, increasing the absorption of transdermal medications. Drug distribution is altered as the total plasma volume (due to an increase in total body water by 8 litres) is increased by more than 50% and fat stores by 25%. Lipo-soluble drugs are stored more in fat tissues resulting in less free drug in plasma (Loebstein, Lalkin, & Koren, 1997). A decrease in plasma volume leads to decreased bound drug and more unbound drug to act at receptor sites or cross the placenta and cause fetal effects. While we know that renal function is increased, leading to enhanced elimination of water-soluble drugs, further research about maternal hepatic function is necessary to estimate hepatic metabolism. (Loebstein, Lalkin, & Koren, 1997). These physiologic changes make it difficult to determine the detailed pharmacokinetic properties of some drugs for the labouring patient. In addition to maternal factors, there are a number of placental and fetal factors that can contribute to drug metabolism. Highly lipo-soluble or smaller molecular weight substances readily cross the placenta. However, the placenta may act as a filter by metabolizing drugs to either an active or an inactive form before being transferred to the fetus. There are a number of developmental fetal characteristics that may impinge or enhance drug metabolism. The fetal liver does not reach adult enzymatic function until 11-18 weeks gestation. Even at this time, the fetus is still unable to metabolize a number of lipophilic drugs (Munsch et. al., 2003). A notable fetal change is increased fetal albumin levels as development ensues, leading to less free drug available for metabolism. It is apparent that the complex inter-related maternal-placental-fetal triad could markedly influence drug safety, efficacy and dosing in labour.

-CHAPTER ONE-
INHALED NITROUS OXIDE USE IN LABOUR

Inhaled Nitrous Oxide use in Labour

Overview

One of the long-standing choices for pharmacological pain management for laboring women is inhaled nitrous oxide (N_20). Usually supplied in tanks or a direct wall installed system, N_20 is inhaled by laboring women via facemask or mouthpiece. However, face mask is recommended to decrease blown-off waste anesthetic gases. Although it is not associated with complete pain control, it is a viable, inexpensive, easily administered analgesic with varying patient reports of efficacy. As well, it is non-odourous, has limited flammability and minimal toxicity (Rosen, 2002). Nitrous oxide is an analgesic option for laboring women in laboring environments where epidural anesthesia is not readily available, when the patient does not prefer an epidural or narcotic analgesia or when the labor or the delivery is precipitous. A number of studies have explored the possible environmental/workplace hazards of waste anesthetic gases (WAGs) from inhaled N_20. Much of the research has been conducted in the operating room or dental care environment. Before the advent of closed, vented scavenging systems, a number of adverse environmental effects for care providers were reported. However, with the implementation of proper venting systems, well-ventilated practice environments and ongoing air quality monitoring, the level of WAGs detected were more in keeping with national and international threshold values. The recommendation from Health Canada and NIOSH is to minimize the risk of exposure to WAGs to the greatest extent possible. Implementing the aforementioned suggested safety strategies will ensure risk is minimized and nitrous oxide can continue to be used as a safe, inexpensive pain management option for laboring women (Wiesner et al., 2000).

Recommendation:

1. **Provide nitrous oxide inhalation as a pain relief option for women in labour.**

Mechanism of Action

Although its mechanism of action is not completely clear, nitrous oxide is a central nervous system depressant hypothesized to alter pain stimuli through descending spinal cord nerve pathways (Rosen, 2002).

Labour Analgesia Efficacy

Due to the subjective and varied nature of pain experienced by laboring women (Lowe, 2002), it is difficult to assess the effectiveness of inhaled N_20 as a labor pain analgesic. Approximately 70% of women stated good pain relief in first and second stages of labour with nitrous oxide use. Some women may find it effective during specific stages of labor while others receive very little analgesic effect. It is important to perform individual assessment of each woman's pain experience through different labor stages and provide safe pain management options to women so they may make informed choices. This enhances patient satisfaction during labor by providing them increased opportunity for control over intrapartum decision making (Marmour & Krol, 2002). There is no quantitative evidence that demonstrates the analgesic efficacy of nitrous oxide however qualitative evidence from parturient women identifies nitrous oxide as a viable pain management option.

Administration and Safety Issues

Nitrous oxide is self-administered with supervision via facemask connected to a breathing circuit with a demand valve. The demand valve opens and administers nitrous oxide only when the patient's inspiration creates negative pressure. This prevents flow of N_20 into the environment and facilitates scavenging of exhaled gas. The time from inhalation to peak analgesic effect is approximately 50 seconds therefore careful instruction about its use in relation to contraction pattern is important to ensure maximal efficacy. There is ongoing debate over the risks and benefits associated with intermittent versus continuous administration of nitrous oxide during labor. The primary concern with continuous administration is the risk of increased sedation and loss of consciousness for the woman, possibly leading to airway compromise. The incidence of this however, is low, approximately 0.4% with 50% $N_2O/O2$ and 3% with 70% $N_20/O2$ (Shukla, 2004 personal communication). Conversely the risk with intermittent administration is primarily due to the exposure of care providers to exhaled WAGs not vented by the scavenging system (Cope et. al., 2002; Krenzischek et al., 2002). However, properly ventilated practice environments, regularly scheduled air quality testing and regular maintenance and inspection of equipment, should keep exposure within threshold values. (Please see Appendix A for intermittent administration instructions).

Recommendation:

2. **Provide intermittent inhaled nitrous oxide via facemask with a demand valve attached to a properly scavenged breathing circuit.**

Benefits

There are a number of benefits for N_20 use including: it is relatively inexpensive compared to epidural analgesia, lacks flammability, is not malodorous, has minimal toxicity, is easy to administer, causes minimal cardiac depression, is relatively benign, has rapid onset and termination, has no effect on uterine contractility, it does not trigger malignant hyperthermia and it has little to no neonatal effects (Rosen, 2002).

Reported Short-Term Side Effects

Possible short-term central nervous system and psychomotor patient effects reported include: short term relaxation, reduced fear/anxiety, mild parethesias (peripheral numbing and tingling), tinnitus, feelings of heaviness or lightness, flushing, laughter, dissociation, and variations in body temperature (Misiraca, 2003). The most common physiological side effects include nausea, vomiting and light-headedness. Studies in practice environments without proper scavenging have included these possible environmental/workplace side effects for care providers as well. Nurses, dentists, dental assistants and anesthesiologists were most often cited as those with higher exposure to WAGs. These studies were retrospective, lacked quantitative information and were inconclusive.

Reported Long-Term Side Effects without Scavenging

The American Conference of Governmental Industrial Hygienists has designated nitrous oxide 'A4' or not classifiable as a human carcinogen. International bodies have not reviewed nitrous oxide specifically for carcinogenicity and have concluded that evidence for carcinogenicity of other volatile anesthetics is inadeqate (International Agency for Research on Cancer, 1987). Possible long-term side effects without proper scavenging systems for waste anaesthetic gases have been reported in older, retrospective studies lacking scientific rigor. The side effects noted in a number of the studies varied in incidence and frequency. As well, there were a number of notable methodological issues

such as small sample size, few prospective studies and lack of comparable or generalizable results. There is no causal evidence between WAG exposure from nitrous oxide use and possible effects. It is clear, however, that further, prospective, objective investigation is necessary. The reported adverse effects include: reproductive toxicity, spontaneous abortion, liver and kidney disease, inhibition of vitamin B12, varying degrees of hypoxia and carcinogenic effects (Boivin, 1997; Rowland, 1995; Axelesson et al., 1996; Sessler & Badgwell, 1998; Misiraca, 2003). Studies did show (via dosimetry, air quality testing and breath analysis), higher than recommended levels of WAGs especially in practice environments lacking proper ventilation and/or lacking WAGs scavenging (Mills et al., 1996; Newton et al., 1999). There remain incidents of WAGs beyond recommended threshold values even with scavenging systems (Donaldson, & Meechan, 1995; Hoerauf, Koller, Taeger & Hobbhahn, 1997; Wiesner et al., 2001). Therefore, regular air quality monitoring, proper practice environment ventilation and regular equipment inspection and maintenance are also necessary to limit WAG exposure.

Threshold Values

The recommended threshold values for WAGs exposure varies internationally, with a range from 25-100 parts per million (ppm). According to the Canadian Centre for Occupational Health and Safety (2004), the **current national threshold values for ambient WAGs is 50 ppm.** The American recommendation for maximal exposure of N_20 to limit possible environmental health risks is 25 parts per million (ppm) (NIOSH, 1994) over a time-dependent period. In regards to room ventilation and air quality, it is recommended by the Canadian Family-Centred Maternity and Newborn Care: National Guidelines (Health Canada, 2000) that labour rooms have the same air change cycles as operating suites (ie: 16 to 20 cycles per hour).

Recommendations:

3. **Have a well-designed WAGs scavenging system to collect and dispose of waste gases with regular maintenance of breathing circuit equipment and external out take valves placed well beyond institutional fresh air intake valves.**

4. **Have properly designed heating-ventilation systems to contribute to the removal of WAGs not collected by the scavenging system (e.g.: leaks in equipment or resulting from exhaled gases in the practice environment).**

5. **Engage in regularly scheduled or continuous air quality testing.**

6. **Engage in regular preventative maintenance of inhaled anesthetic gas and scavenging equipment.**

7. **Provide regular education of care providers who are exposed to WAGs.**

8. **Have material safety data sheets available for staff with ongoing education and certification of MSDS information in the practice area.**

9. **Encourage proper work practices in keeping with the policies outlined by NIOSH and the Canadian Centre for Occupational Health and Safety (Appendix B). These include: regular monitoring and testing of all N_2O equipment, monitoring of room air, control of WAGs with a well-designed scavenging system and staff education that describes N20 hazards and defines prevention measures.**

Prevalence of Use

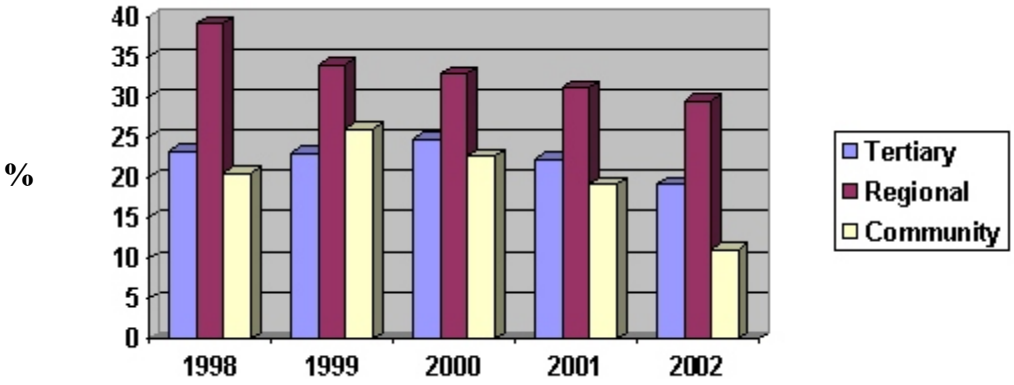
There are global variations in nitrous oxide use for laboring women. A 1993 survey from 68% of Canadian hospitals found that 37% of Canadian women used nitrous oxide inhalation for labor pain management (Levitt et al., 1995). An informal email inquiry amongst facilities offering obstetrical services in Nova Scotia showed varying use of nitrous oxide. The graph below indicates nitrous oxide use in Nova Scotia by facility type from 1998-2002. The variation in use may be due to the availability of epidural analgesia, the preference and/or expectations of laboring women, the availability of labor support; the availability of recommended equipment (i.e.: scavenging system and good ventilation system) and the duration of labor.

Recommendation:

10. **Endeavour to document detailed efficacy of the drug by doing a prospective study using data from all centers using nitrous oxide for labour analgesia.**

Graph 1

Nitrous Oxide Use without Epidural in Nova Scotia by Facility Type 1998-2002



Neonatal Outcomes

There have been no reported harmful effects on the neonate identified with the use of nitrous oxide for intrapartum pain management nor have there been any studies to indicate an effect on breastfeeding.

Summary of Recommendations for Inhaled Nitrous Oxide use in Labour

It is recommended that Labour and Delivery Units throughout Nova Scotia:

1. **Provide nitrous oxide inhalation as a pain relief option for women in labour.**

2. **Provide intermittent inhaled nitrous oxide via facemask with a demand valve attached to a properly scavenged breathing circuit.**

3. **Have a well-designed WAGs scavenging system to collect and dispose of waste gases with regular maintenance of breathing circuit equipment and external out take valves placed well beyond institutional fresh air intake valves.**

4. **Have properly designed heating-ventilation systems to contribute to the removal of WAGs not collected by the scavenging system (eg:leaks in equipment or resulting from exhaled gases in the practice environment).**

5. **Engage in regularly scheduled or continuous air quality testing.**

6. **Engage in regular preventative maintenance of inhaled anesthetic gas and scavenging equipment.**

7. **Provide regular education of care providers who are exposed to WAGs.**

8. **Have material safety data sheets available for staff with ongoing education and certification of MSDS information in the practice area.**

9. **Encourage proper work practices in keeping with the policies outlined by NIOSH and the Canadian Centre for Occupational Health and Safety (Appendix B). These include: regular monitoring and testing of all N_2O equipment, monitoring of room air, control of WAGs with a well-designed scavenging system and staff education that describes N20 hazards and defines prevention measures.**

10. **Endeavour to document detailed efficacy of the drug by doing a prospective study using data from all centers using nitrous oxide for labour analgesia.**

Appendix A

Instructions for Intermittent Nitrous Oxide (Nitronox) Inhalation

Instruct patient in the technique (slow, deep breaths with constant verbal contact with care provider); provide reasonable expectations for pain relief and possible side effects such as dizziness or nausea.

IV access & pulse oximetry may be necessary if increased maternal sedation occurs.

Adequate scavenging of WAGs is recommended (so threshold values of waste anesthetic gases do not exceed 50 ppm).

Caution is recommended in administering nitrous oxide after previous administration of opioids as it can cause additional sedation, possible unconsciousness and airway compromise.

Inhalation should start 50 seconds before the peak of the contraction or the moment the contraction is felt. Inhalation should cease once the contraction has receded.

Encourage the woman to remove the mask between contractions and breathe room air normally. **The drug is self-administered therefore only the woman should hold the mask in place.**

During second stage 2-3 deep inhalations of nitrous oxide can be taken before each push.

Additional analgesia during second stage such as pudendal block or infiltration of local anesthetic into the perineum may be considered.

Adapted from Rosen, 2002.

Appendix B

STEPS FOR MAINTAINING WORKPLACE SAFETY

Workers and employers should take the following steps to reduce N_2O exposure in the workplace:

Monitor anesthetic equipment when installed and every 3 months thereafter:

- Leak test equipment
- Monitor air in the worker's personal breathing zone
- Monitor the environment (room air)
- Prevent leakage from the anesthetic delivery system through proper maintenance and inspection of equipment. Eliminate or replace the following:
- Loose-fitting connections
- Loosely assembled or deformed slip joints and threaded connections
- Defective or worn seals, gaskets, breathing bags, and hoses

Control waste N_2O with a well-designed scavenging system that includes the following:

- Securely fitting masks
- Sufficient flow rates (i.e., 45 liters per minute) for the exhaust system
- Properly vented vacuum pumps

Make sure that the room ventilation effectively removes waste N_2O. If concentrations of N_2O are above 50 ppm (Canadian standard) take the following steps:

- Increase the airflow into the room
- Use supplemental local ventilation to capture N_2O at the source

Institute an education program that describes N_2O hazards and defines prevention measures.

Adapted from National Institute of Occupational Safety and Health, 1994

-CHAPTER TWO-
OPIOID USE IN LABOUR

Opioid use in Labour

History

Opioids were first noted for use in labour in China where naturally occurring opium was given to relieve labour pain. With the isolation of morphine from opium in the 1800's and the subsequent invention of the hypodermic needle, it was used for labour pain. However, neonatal side effects diminished its use. Later a combination of morphine and scopolamine created a "twilight sleep" in which women endured little analgesic effect amidst an amnesic stupor during labour. Although neonatal respiratory depression remained a concern, this regimen was popular for many years (Bricker & Lavender, 2002). There are a number of choices for opioid analgesia in labour. The following will highlight the most common opioids currently in use for labour analgesia in Nova Scotia.

Recommendation:

1. **There are a number of viable opioid choices for labour analgesia. It is imperative that health care providers provide complete information regarding potential maternal and neonatal side effects to patients so they can make informed decisions about pain management in labour.**

Meperidine

The most common opioid used for labour pain is meperidine (Demerol™). It was isolated in 1939 and first used in labour in the 1940's (Latta et al., 2002; Bricker & Lavender, 2002). Although the hope was that it would not have the side effects associated with its predecessor, morphine, it too was associated with adverse maternal and neonatal effects such as respiratory depression, constipation, urinary retention and the potential for chemical dependency (Latta et. al., 2002). However, due to its ease of administration and cost-effectiveness, it continues to be used for labour analgesia. Further research comparing meperidine with other opioid analgesics is required to support a change in current practice.

Pharmacokinetics of Meperidine

Unlike other opioids available for parenteral use, such as morphine and hydromorphone, meperidine forms an active metabolite, normeperidine, which can cause increasing central nervous system (CNS) toxicity as it accumulates. The active metabolite

is thought to cause serotonin reuptake blockade resulting in CNS excitation. The excitatory effects of meperidine-induced CNS toxicity include tremor, twitching, myoclonus, and finally, grand mal seizures (Latta et al., 2002;)

Side Effects

Meperidine's lack of analgesic effect (especially in the second stage), maternal sedation, vomiting and nausea, constipation and neonatal birth depression has resulted in recent re-evaluation of its use for labour analgesia (Matheson & Nylander, 1999).

A large meta-analysis of all relevant randomized control trials (RCTs) of parenteral opioid use for labour analgesia by Lavender & Bricker (2002), discusses the safety and efficacy of opioid use as the primary outcomes. The secondary measures in the analysis included maternal, fetal and neonatal outcomes. Although meperidine is known to have a number of potential maternal, fetal and neonatal side effects, they concluded that there is no convincing data to indicate a better opioid alternative. In another meta-analysis exploring meperidine use post-operatively, Latta et al., (2002) conclude that the historical status of meperidine as the analgesic drug of choice, is fraught with misrepresentation and lack of scientific data. Its' numerous and potentially dangerous side effects together with its' poor analgesic efficacy has resulted in its' loss of clinical utility in many settings therefore making it antiquated. Alternatives such as morphine, hydromorphone, levorphanol, fentanyl and butorphanol may provide better analgesia with fewer side effects. In a study by Soontrapa et. al., (2002), it was found that although meperidine has analgesic effect compared to control groups without pharmacologic management, its efficacy varies and there are a number of reported side effects. These side effects may include: maternal nausea, vomiting, pruritus, decreased gastrointestinal motility, hypotension and obtunded airway reflexes. As well as the potential for a decrease in fetal heart rate variability, impaired early breastfeeding and possible respiratory depression at birth and/or altered early neonatal neurobehaviour has also been noted (ACOG, 1996). In comparisons between patient controlled analgesia (PCA) morphine and meperidine for post-operative pain, it was found that at rest both drugs were comparable for pain relief. However, with movement, morphine offered better pain control (Latta et. al., 2002).

Efficacy

Meperidine has a short duration of action (2-4hrs), which although a possible disadvantage in other medical-surgical settings, is an advantage for women in labour, as it may be excreted from the maternal system before delivery, resulting in decreased chance of neonatal birth depression. It is also familiar; well –studied and cost effective (Lavender & Bricker, 2002).

Administration/Dosing

If access is available, IV administration is preferred due to its lack of local site irritability, decreased chance of nurse needle stick injury and enhanced analgesic effect. Although the use of continuous intravenous meperidine infusion is not common practice for labour analgesia, a study by Isenor & Penny-MacGillivray (1993) compared the use of intermittent intramuscular (IM) and continuous intravenous (IV) infusion of meperidine and concluded that the IV infusion was superior for pain relief in labour. The American Pain Society states that meperidine use should be limited to 600mg in a 24-hour period, and the drug shouldn't be administered for longer than 48 hours. Traditionally, meperidine has been prescribed in subtherapeutic doses, such as 50 to 75mg IM every three to four hours in adults with moderate to severe pain. For this reason, many physicians and nurses haven't observed signs of CNS toxicity. Yet administering doses lower than recommended usually results in the inadequate treatment of pain. Please see Table 1 for suggested dosages. **For optimal pain relief with meperidine, an intravenous dose of 25mg together with an intramuscular dose of 1-1.5mg/kg has been used with effect.** Multiple IM injections may contribute to fibrosis, painful administration and erratic, less predictable and incomplete absorption. Therefore, the subcutaneous route is preferred, especially when multiple doses may be given (Kettleman, 2000; Austin, 1980). **Recommended dosages for a variety of opioids are outlined in Table 1**

Recommendations:

2. **Health care providers should consider a subcutaneous route of administration for opioids (where multiple doses will be provided) to minimize tissue trauma, discomfort for the patient and enhance absorb ability.**

Contraindications

Meperidine active metabolite, normeperidine is excreted from the kidneys. Therefore, meperidine is contraindicated in patients with renal dysfunction; however it's been established that patients with normal renal function are also at risk. Meperidine shouldn't be used to treat pain in patients who have sickle cell disease, a history of seizures, or chronic pain. All of the risk factors for meperidine induced CNS toxicity have not been identified, and its rate of incidence is not yet known. Therefore, the Agency for Healthcare Research and Quality guidelines for acute pain management related to trauma, medical procedures or operative procedures, recommend that meperidine be used only in

patients who are either allergic to or intolerant of all other opioids.

Meperidine should not be administered to patients:**

> **Taking MAOIs (monoamine oxidase inhibitors) (or have taken MAOIs in the past 14 days)**
> **With known hypersensitivity or allergy.**
> **With renal insufficiency (creatinine clearance less than 50 ml/min)**
> **With untreated hypothyroidism, Addison's disease, or urethral stricture.**
> **In patients with Sickle Cell Disease.**
>
> Modified from CPS, 2002

**** Use with caution in patients with known seizure disorders**.

Conclusions

There is conflicting evidence between the studies specific to meperidine use in labour and those involving meperidine use on a broader scale, such as post-operatively. The results of the review of labour analgesia by Lavender & Bricker (2002) suggest **there is no strong preference for any opioid or any specific mode of administration.** A Cochrane Review by Elborne & Wiseman (1999), also concluded that **there is not enough evidence to comparatively evaluate the safety and efficacy of opioids for labour analgesia** and although they could not recommend an optimal opioid for labour analgesia, they too, recognize the familiarity and low cost of meperidine (Watts, 2004). Recommendations made by the American Pain Society and the Agency for Health Care Policy and Research (AHCPR), have prompted many U.S. hospitals who offer maternal/child care to remove meperidine from first-line use and use fentanyl or hydromorphone. However, as no conclusive evidence is available to change current practice, and meperidine is familiar and cost-effective, RCP continues to support the use of meperidine as a choice for labour analgesia. We do, however recognize the need for further research in this area. **Regardless of the analgesic choices currently available, it is imperative that patients be made aware of the potential side effects of any opioids and make informed choices for pain management in labour.**

Recommendations:

3. **If meperidine is chosen as a labour analgesic, health care providers should provide an optimal dose for pain management (typically 100-150mg for labouring women , dependent on maternal weight). For optimal pain relief with meperidine, an intravenous dose of 25mg together with an intramuscular dose of 1-1.5mg/kg has been used with good effect.**

4. **If meperidine is chosen as a labour analgesic, health care providers should consider the effects of its active metabolite, normeperidine, in an effort to anticipate possible neonatal respiratory depressive effects beyond the half-life of the original drug. It may be necessary to administer several doses of naloxone.**

Alternate Opioids in Labour

Alternate opioid choices used throughout Nova Scotia include: morphine, hydromorphone and fentanyl. Combinations of antiemetics, sedatives or opioid antagonists with opioids have been studied in hopes of reducing opioid dose and subsequent side effects. Manipulation of dosage and route of administration have also been conducted to enhance analgesic effect and limit side effects. Although most of the opioid research has involved meperidine, further research comparing meperidine with other opioid choices and synergistic effects with other substances is recommended. (Lavender & Bricker, 2002). Further research comparing parenteral opioids in general, with other pharmacological and non-pharmacological pain management options is suggested as well (Leeman et. al., 2003). However, some acute care facilities in Canada and the United States have removed meperidine as the first line choice opioid for all clinical settings due to preliminary research which indicates the need for a practice change to an opioid without an active metabolite, with fewer side effects and equivalent or enhanced analgesic efficacy (such as fentanyl).

Morphine

This naturally occurring substance was first isolated in the 1800's from opium and with the invention of the hypodermic needle subsequently used for labour pain. It however, has notable neonatal respiratory depressive effects, similar to other opioids such as meperidine.

Fentanyl

Intravenous infusion or intravenous patient controlled analgesia (PCA) with fentanyl is an option in some facilities throughout Nova Scotia. Fentanyl is a highly lipid-soluble synthetic opioid 100 times more potent than morphine and 800 times more potent than meperidine. It has a short duration of action and rapid onset. Maternal side effects may include: sedation, nausea, vomiting, decreased gastrointestinal motility and decreased respiration (Morley-Forester & Weberpals, 1997). However, compared to meperidine, it has no active metabolite and therefore produces less of these maternal effects. Fetal effects may include decreased fetal heart rate variability (ACOG, 1996) and due to its potent nature, it can depress newborn respiration (Morley-Forester & Weberpals, 1997). Please see Table 1 for recommended doses and routes of administration. Fentanyl has relatively low placental transfer; low fetal plasma levels and lacks meperidine's active metabolite. The MEAPOL ("Multicentre Trail on the Effects of Analgesia on the Progress of Labor") study in the early 1990's led to two established uses for fentanyl in labour. First via intravenous route to provide analgesia until the anesthesiologist is available to provide an epidural. Secondly, as a PCA (patient controlled analgesia) option for patients when an epidural is not preferred or is contraindicated (Campbell, 2003).

Hydromorphone

Hydromorphone is used in some maternal/child settings for labour and post-operative pain relief. In the United States and in some hospitals in Canada, it is one of the opioids replacing meperidine as first line choice. In a study by Chan et. al, (1999), hydromorphone administered subcutaneously for post-operative pain was found to be as effective an analgesic as meperidine given intramuscularly with fewer side effects. A small meta-analysis by Quigley (2003), reviewed hydromorphone efficacy for acute and chronic pain. The majority of the studies demonstrated that hydromorphone is a potent analgesic, its clinical effects seem to be dose-related, and its side effects are similar to other opioids. A review article by Pasero (2001) reiterated these findings. There have been a few studies comparing hydromorphone for use intrathecally for epidural or spinal analgesia. However, there has been little research undertaken comparing hydromorphone intramuscularly or subcutaneously with other opioids or exploring its efficacy and side effects for labour analgesia. Although hydromorphone is currently used clinically for labour analgesia, further research is necessary to support its routine use. Please see Table 1 for recommended doses and routes of administration.

Other Opioids

Studies with pregnant women recovering from narcotic addiction have shown positive outcomes with the use of methadone, buprenorphine and slow-release morphine for withdrawal treatment. Neonatal outcomes in regards to birth weight, length, head circumference, gestational age and Apgar scores were normal with neonatal abstinence scale scores ranging from absent to moderate in severity (Fischer et al., 1999).

Dosing and Administration

There are a variety of dosages that have been used depending on type of narcotic, level of pain, route of administration, provider preference and knowledge, addition of other pharmacological substances and patient weight. The primary objective is to provide adequate pain management with the lowest possible dose in order to minimize maternal and fetal side effects. See table below for common dosages for morphine, fentanyl and meperidine.

Treating Opioid-Induced Respiratory or Neurobehavioural Depression (This applies to all opioids used for labour analgesia)

The narcotic antagonist, naloxone hydrochloride, is a specific antidote against respiratory or neurobehavioural depression, which may result from overdosage or unusual sensitivity to narcotics, including meperidine. Therefore, an appropriate dose of this antagonist should be administered simultaneously with efforts at respiratory resuscitation, if clinical signs indicate neonatal respiratory depression at birth. The neonatal dose is 0.1 mg/kg. Although IV administration is recommended when possible, IM administration to the neonate in the delivery room is the usual route of adminstration. As the duration of action of naloxone is shorter (20-60 minutes) than most opioids, it may need to be repeated in 3-5 minutes depending on patient response. Neonates require observation to make sure the dose is enough. Neonates who have received naloxone MUST be closely observed for **at least 2 hours** post-administration for signs of respiratory depression. Neonates who have not received naloxone at birth but whose mothers have received opioid analgesia within four hours prior to delivery, require observation for signs of respiratory depression for at least 2 hours post –delivery (American Academy of Pediatrics, 2004; Buck, 2002). It is important to remember that neonates who are not adequately warmed may not show the signs of respiratory depression as readily.

Infants of mothers receiving long-term narcotics, methadone or who are suspected of narcotic abuse should not receive nalaxone but should instead have appropriate respiratory support and monitoring. Naloxone in this setting causes acute withdrawal and many lead to neonatal seizures.

Recommendation:

5. **Health care facilities throughout Nova Scotia must have the opioid antagonist, naloxone readily available for administration if neonatal respiratory depression occurs due to maternal opioid administration for labour analgesia.**

6. **As the duration of action of naloxone is shorter than most opioids, neonates who have received naloxone MUST be closely observed for at least 2 hours post-administration for signs of respiratory depression.**

7. **Neonates who have not received naloxone at birth but whose mothers received opioid analgesia within four hours of delivery, MUST be observed for at least 2 hours post-delivery.**

8. **It is important to remember that neonates who are not adequately warmed may not show the signs of respiratory depression as readily.**

9. **Infants of mothers receiving long-term narcotics, methadone or who are suspected of narcotic abuse should not receive nalaxone but should instead have appropriate respiratory support and monitoring.**

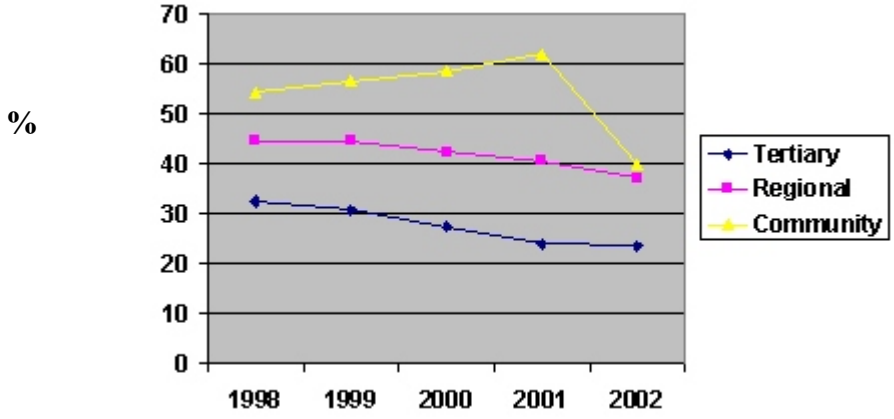
Table 1 RECOMMENDED DOSAGES FOR OPIOIDS (in Labour) AND NALOXONE

	Route of Administration	Dosage	Onset of Action (minutes)	Duration of Action (hours)
Morphine	IM/SC	5 to 20 mg q 4hrs	30-60	4-5
	IV	2.5 to 10 mg q 4hrs injected over 4-5 mins	20	4-5
Fentanyl	IM/SC	0.05-0.10 mg q 1-2 hours prn	7-15	1-2
	IV	.025-.05 mg prn may be given hourly	3-5	30-60 minutes
	PCA	.01-0.025 mg q 5 minutes after initial IV loading dose		
Meperidine	IM/SC	Usually 100-150 mg q 3-4 hrs prn	10-15	2-4
	IV	Slow IV push 25 mg with subsequent dose of 25mg q 2-3 hrs prn to a maximum dose of 100mg	1 minute	2-4
	IV & IM simultaneously	25mg IV with 1.0-1.5 mg/kg IM at the same time	IV action within 1 minute/ IM action 10-15 minutes	2-4
Hydromorphone	IM/SC	0.5- 2.0 mg	15 minutes	4-5
	IV PCA	0.1-0.2 mg bolus with lockout of 6 minutes and continuous infusion of 0.1-0.2 mg/hr	No information available	No information available
Naloxone	IM/IV	0.1mg/kg	~2minutes	20-60 minutes

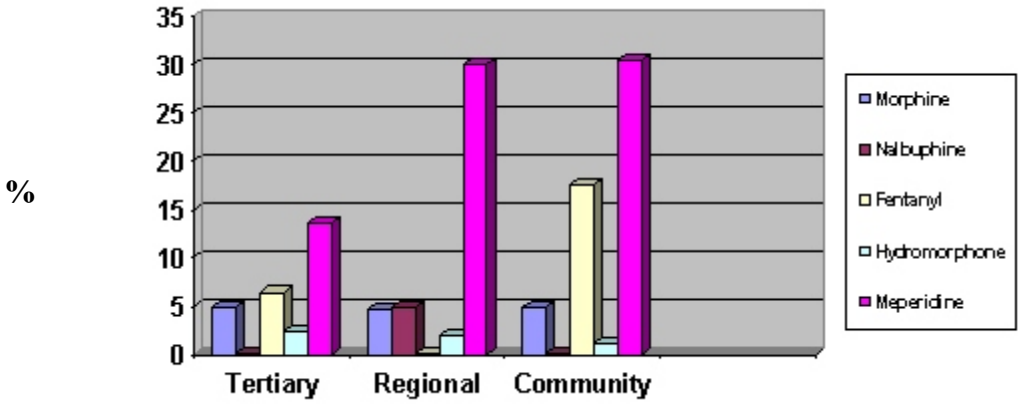
From: Compendium of Pharmaceuticals and Specialities, 2004; The Canadian Drug Reference for Health Professionals. Canadian Pharmacists Association; Manufacturers Drug information package inserts; Paser & McCaffery, 2001

Graph 2

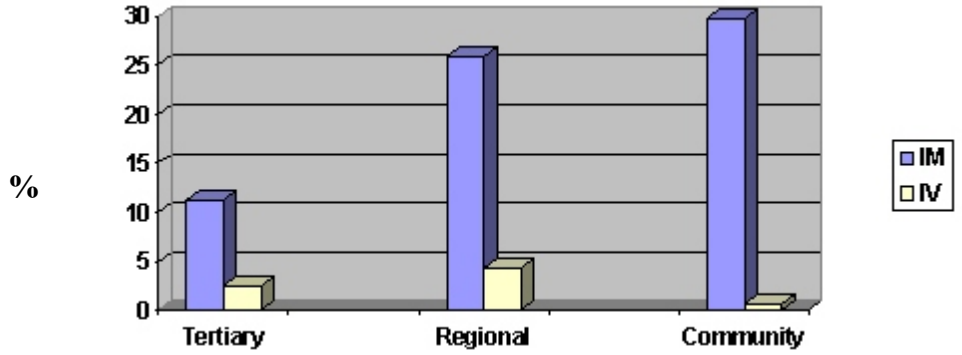
Opioid Use without Epidural during Labour in Nova Scotia by Facility Type 1998-2002



Graph 3
Specific Opioid Use without Epidural in Nova Scotia by Facility Type 1998-2002



Graph 4
Meperidine (without Epidural) Route of Administration by Facility Type in Nova Scotia
1998-2002



Summary of Recommendations for Opioid Use in Labour

1. **There are a number of viable opioid choices for labour analgesia. It is imperative that health care providers provide complete information regarding potential maternal and neonatal side effects to patients so they can make informed decisions about pain management in labour.**

2. **Health care providers should consider a subcutaneous route of administration for opioids (where multiple doses will be provided) to minimize tissue trauma, discomfort for the patient and enhance absorptability.**

3. **If meperidine is chosen as a labour analgesic, health care providers should provide an optimal dose for pain management (typically 100-150mg for labouring women , dependent on maternal weight). For optimal pain relief with meperidine, an intravenous dose of 25mg together with an intramuscular dose of 1-1.5mg/kg has been used with good effect.**

4. **If meperidine is chosen as a labour analgesic, health care providers should consider the effects of its active metabolite, normeperidine, in an effort to anticipate possible neonatal respiratory depressive effects beyond the half-life of the original drug. It may be necessary to administer several doses of naloxone.**

5. **Health care facilities throughout Nova Scotia must have the opioid antagonist, naloxone readily available for administration if neonatal respiratory depression occurs due to maternal opioid administration for labour analgesia**

6. **As the duration of action of naloxone is shorter than most opioids, neonates who have received naloxone MUST be closely observed for at least 2 hours post-administration for signs of respiratory depression.**

7. **Neonates who have not received naloxone at birth but whose mothers received opioid analgesia within four hours of delivery, MUST be observed for at least 2 hours post-delivery.**

8. **It is important to remember that neonates who are not adequately warmed may not show the signs of respiratory depression as readily.**

9. **Infants of mothers receiving long-term narcotics, methadone or who are suspected of narcotic abuse should not receive nalaxone but should instead have appropriate respiratory support and montoring.**

-CHAPTER THREE-
EPIDURAL ANALGESIA

Epidural Analgesia

Introduction

This form of pharmacological analgesia has become the mainstay in labour pain management, especially in tertiary care facilities. It involves lumbar access (L2-3, L3-4, L 4-5) into the epidural space using 16 or 18 gauge needle with subsequent insertion of an 18 to 20 gauge flexible catheter. An anesthesiologist performs the procedure. Either intermittent or continuous infusion of local anesthetic can be administered with a possible patient controlled epidural anesthesia (PCEA) option. Larger doses of local anesthetic via the epidural catheter may be required to provide adequate pain relief for instrumental vaginal deliveries. There are variations in the drugs used dependent on patient pain requirements and anesthesiologist preference. In Nova Scotia the most common are a combination of local anesthetic (bupivacaine or ropivacaine) and an opioid (fentanyl or sufentanil). Spinal analgesia or a combined epidural-spinal analgesia may be provided. The latter involves a double needle setup in which one needle enters the spinal space while a shorter needle allows access to the epidural space. An opioid is administered in a one-time dose into the spinal space and then the longer needle is removed leaving the epidural needle available for catheter placement. The spinal analgesia offers rapid onset of pain relief (1-2 minutes) with a short duration of action (1-2 hours). The most common side effect for spinal anesthesia is maternal hypotension therefore adequate prophylactic volume expansion and appropriate maternal positioning is required (ACOG, 1996; Eltzschig, Lieberman & Carnann, 2003).

Indications for Use

Typically the indication for insertion of an epidural is patient preference. In addition, it may be recommended in high-risk situations such as anticipated difficult intubation, malignant hyperthermia, cardiovascular or respiratory diseases or high spinal cord lesion. There are a variety of possible obstetrical indications, such as: malpresentation, multiple gestation, or increased risk of emergent cesarean section (ACOG, 1996). Its analgesia, possible control of maternal blood pressure and resultant avoidance of intubation, make it preferable for preeclamptic women.

Recommendation

1. **The primary indication for epidural analgesia is patient preference. In addition, it may be recommended in high-risk anesthetic or obstetrical situations.**

Post- Epidural and Spinal Monitoring

In the immediate post-administration of epidural or spinal analgesia, close monitoring of maternal vital signs, especially blood pressure is indicated. One-to-one labour support from a professional care provider is recommended. Institutional policies regarding fetal health surveillance immediately after epidural insertion varies. Often a period of continuous electronic fetal heart rate monitoring (20 minutes to 1 hour depending on facility policy) is performed to assess for reflexive decelerations in the fetal heart rate related to maternal hypotension. However, epidural analgesia does not require continuous electronic fetal heart rate monitoring unless there are specific labour, maternal, placental or fetal risk factors present, changes in maternal status and/or fetal heart rate via intermittent auscultation is non-reassuring (ACOG, 1996; SOGC, 2002).

Appropriate maternal positioning preferably in a left or right lateral position or supine with the head of the bed raised at least 30 degrees with a slight left lateral tilt is recommended to prevent aortocaval compression. Frequent change in maternal position (q 30minutes to 60 minutes) is suggested. Current research is inconclusive as to the effects of fluid pre-loading to prevent maternal hypotension (Hofmeyr, Cyna & Middleton, 2004; Holte, Foss, Svenson, Lund, Madesen, & Kehlet, 2004; Kubli, Shennan, Seed & O'Sullivan, 2003). Some studies have indicated a possible decrease in uterine contractility with fluid pre-load. This may potentially protect against a non-reassuring fetal heart rate pattern in suspected or actual cases of fetal compromise (Kinsella, Pirlet, Mills, Tuckey & Thomas, 2000). Therefore, as the research is inconclusive and it is currently common practice, it is recommended that 500-1000ml of isotonic solution is provided intravenously prior to insertion of an epidural. IV access should remain available post-administration in case of any maternal or fetal complications. It is imperative that appropriate documentation is completed for fluid input and output and that the patient is frequently assessed for fluid overload. Caution should be taken in providing extra fluid to patients at risk for fluid overload such as those with pre-eclampsia or cardiac disease. Analgesic effect typically occurs with an epidural only within 10-20 minutes and with a spinal or combined spinal-

epidural procedure within 1-2 minutes. Ongoing, regular assessment of maternal pain relief, maternal vital signs, fetal responses and any adverse side effects should be maintained until after delivery and subsequent removal of the epidural catheter. (Long –term side effects in the post-partum period such as muscle weakness, headache or signs and symptoms of infection at the insertion site should also be monitored).

Recommendations:

2. **In the immediate post-administration of epidural or spinal analgesia, close monitoring of maternal vital signs, especially blood pressure is indicated.**

3. **One-to-one labour support from a professional care provider is recommended**.

4. **Institutional policies regarding fetal health surveillance immediately after epidural insertion varies. Often a period of continuous electronic fetal heart rate monitoring (20 minutes to 1 hour depending on facility policy) is performed to assess for reflexive decelerations in the fetal heart rate related to maternal hypotension**.

Potential Side Effects

According to an ACOG bulletin released in 1996, the most common side effect is maternal hypotension. Therefore, epidural analgesia is preceded by a prophylactic bolus of 500 mls of isotonic IV fluid (usually Ringer's lactate). IV ephedrine may be required if the hypotensive episode cannot be resolved by volume expansion. Patient positioning to the left lateral is recommended to prevent aortocaval compression. There is minimal/nil possibility of local anesthetic toxicity and high or total spinal anesthesia with labour analgesia but these complications are possible with larger doses used for cesarean section. Signs and symptoms of toxicity may include: drowsiness, lightheadedness, tinnitus, circumoral paresthesias, metallic taste in the mouth, slurred speech, blurred vision, unconsciousness, convulsions, cardiac dysrhythmias and arrest. Treatment of this includes administration of 100% O_2 with positive-pressure ventilation if needed, possible intubation, anticonvulsants, muscle relaxants, maternal positioning to prevent aortocaval compression, IV fluids, vasoactive drugs and cardioresusitative measures if necessary. Signs and symptoms of high spinal anesthesia may include numbness and weakness of upper extremities, dyspnea, whispered speech, inability to speak and then apnea and loss of consciousness. Test dosing before therapeutic dosing of local anesthetic, ongoing verbal contact with the patient, minimal doses and dilute solutions may minimize these complications. Treatment includes:

administration 100% O_2, positive-pressure ventilation, maternal positioning to prevent aortocaval compression, IV fluids, and vasoactive drugs

Cardiac arrest in all anesthesia is uncommon (1 in 10 000 to 40 000 anesthetics) (American Heart Association, 1997). However, if maternal cardiac arrest occurs, it is imperative to consider immediate delivery of the infant and begin cardiopulmonary resuscitative measures. Other possible side effects may include: urinary retention, and in less than 0.5-1% of cases, postpartum headache (if dural puncture occurred). Treatment measures include: caffeine, bed rest, oral theophylline or for dural puncture, an autologous epidural blood patch. Long-term effects may include: paralysis due to epidural hematoma or abscess requiring laminectomy or surgical drainage. The true incidence of epidural hematoma and abscess is unknown but the usually quoted numbers for all epidurals and spinals are somewhere between 1 in 150, 00-210, 000. There are usually factors like coagulation problems including low platelets or it was a difficult or traumatic procedure.

Recommendations:

5. **The most common side effect with epidural analgesia is maternal hypotension. Therefore, it is common practice for a prophylactic bolus of isotonic intravenous fluid (500-1000ml) to be administered prior to epidural administration. However, it is important to conduct ongoing assessment for fluid overload, especially in those patients at risk.**

6. **Appropriate maternal positioning preferably in a left or right lateral position or supine with the head of the bed raised at least 30 degrees with a slight left lateral tilt is recommended to prevent aortocaval compression**

Epidural Effects on Labour Progress

There is ongoing debate as to whether epidural analgesia adversely effects labour progression. While some believe that there is a causal relationship between epidural analgesia, prolonged labour and operative deliveries, others believe those women at risk for operative delivery (ie: malpositioning, dysfunctional labour) experience more pain and therefore request epidural analgesia more often (Alexander et al., 2001). In a study by Alexander et al. (2002), the authors found that epidural analgesia significantly slowed labour progress and was associated with increased use of oxytocin and forceps. Ramin et. al (1995) compared the use of epidural bupivicaine-fentanyl versus IV meperidine and found

that although epidural analgesia provides better pain relief, it is associated with prolonged labor, increased incidence of uterine infection and a two to four fold increased risk for cesarean delivery in both nulliparous and multiparous women. In a large meta-analysis of 14 RCTs by Leighton & Halpern (2002), exploring the effects of epidural analgesia on labor, maternal and neonatal outcomes, they found there was no difference in cesarean section rate between women who received parenteral opioids versus epidural analgesia. The first stage of labour however, was slightly longer in the epidural groups however the authors noted that oxytocin was initiated more frequently after an epidural and obstetricians may be more likely to augment with oxytocin when they are aware a patient has an epidural. The second stage of labour was found to be significantly longer and the total incidence of instrumental vaginal delivery was higher in the epidural groups. However, the incidence of instrumental vaginal delivery specifically for dystocia was not. In regards to maternal outcomes the epidural groups tended to have significantly higher rates of hypotension and maternal fever with a similar incidence of nausea in both groups. Studies exploring long-term outcomes showed no association between epidural use and backache or problems with breastfeeding. However, urinary incontinence in the immediate post-partum period was higher in the epidural groups. Neonatally, the outcome measures either favored the epidural group or did not differ. Overall, patients receiving epidural analgesia reported lower pain scores and were more satisfied with pain management. Although there have been a number of observational studies looking at the effect of epidural analgesia on labour or method of delivery, it is difficult to draw any definitive conclusions (Eltzschig, Lieberman & Carnann, 2003).

Recommendations:

7. **There is ongoing debate as to whether epidural analgesia adversely effects labour progression. Consideration of potential influences on labour progression is imperative to appropriate labour management.**

8. **Unless otherwise indicated, epidural analgesia is typically not recommended for women prior to active labour**

Contraindications for Epidural Analgesia or Anesthesia

Patient refusal or inability to tolerate procedure (due to short term immobility required during insertion)
Increased intracranial pressure from mass lesion
Infection at the needle placement site
Coagulopathy
Uncorrected maternal hypotension
Lack of appropriate personnel to perform procedure and to monitor patient afterwards.

Adapted from ACOG, 1996

Recommendation:

9. **A careful anesthetic history is necessary to ensure patients do not have any contraindications to epidural anesthesia.**

Summary of Recommendations for Epidural Analgesia

1. **The primary indication for epidural analgesia is patient preference. In addition, it may be recommended in high-risk anesthetic or obstetrical situations.**

2. **In the immediate post-administration of epidural or spinal analgesia, close monitoring of maternal vital signs (especially blood pressure) is indicated.**

3. **One-to-one labour support from a professional care provider is recommended.**

4. **Institutional policies regarding fetal health surveillance immediately after epidural insertion varies. Often a period of continuous electronic fetal heart rate monitoring (20 minutes to 1 hour depending on facility policy) is performed to assess for reflexive decelerations in the fetal heart rate related to maternal hypotension.**

5. **The most common side effect with epidural analgesia is maternal hypotension. Therefore, it is common practice for a prophylactic bolus of isotonic intravenous fluid (500-1000ml) to be administered prior to epidural administration. However, it is important to conduct ongoing assessment for fluid overload, especially in those patients at risk.**

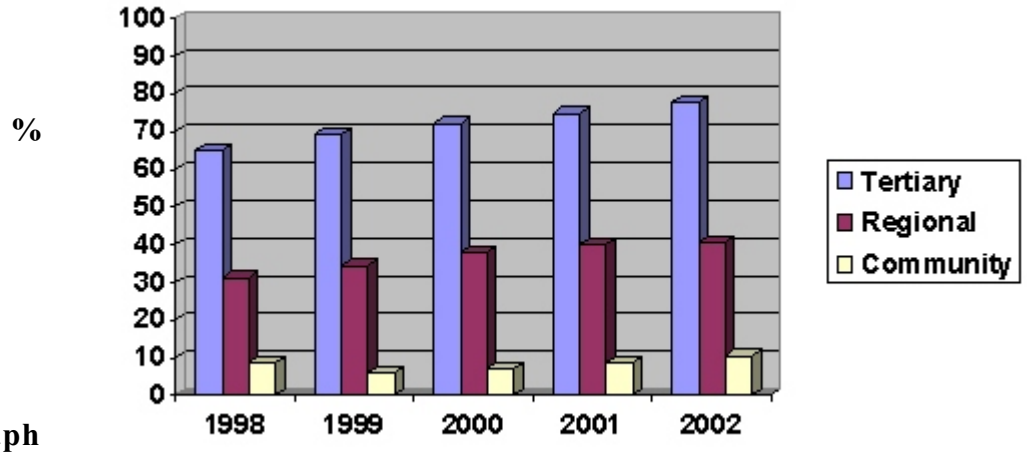
6. **Appropriate maternal positioning preferably in a left or right lateral position or supine with the head of the bed raised at least 30 degrees with a slight left lateral tilt is recommended to prevent aortocaval compression.**

7. **There is ongoing debate as to whether epidural analgesia adversely effects labour progression. Consideration of potential influences on labour progression is imperative to appropriate labour management.**

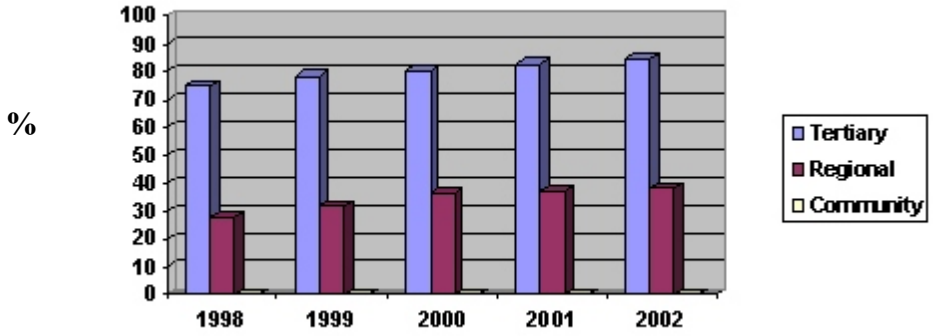
8. **Unless otherwise indicated, epidural analgesia is not offered to women prior to active labour.**

9. **A careful anesthetic history is necessary to ensure patients do not have any contraindications to epidural anesthesia.**

Graph 5
Obstetrical Epidural/Spinal Analgesia use by Facility Type in Nova Scotia
All Deliveries
1998-2002



Graph 6
Obstetrical Epidural/Spinal Analgesia Use for NulliParous Women by Facility Type in Nova Scotia
Vaginal Delivery Only
1998-2002



-ADDENDUM-

Pain Management for Cesarean Section

Spinal-only anesthesia is often used for elective or urgent cesarean section for patients without an epidural in situ. If the patient has an epidural catheter in place, sufficient medication via this route can be administered for cesarean section delivery. Epidural anesthesia may be considered for patients requiring a longer surgical period (ie: due to obesity or numerous previous cesarean sections), as it has a longer duration of action than spinal anesthesia. Anesthesia to the level of T4 is required for surgical delivery. If there is inadequate pain relief, a second epidural or spinal may be performed, supplemental infiltration of local anesthetic may be used, supplemental systemic analgesia such as nitrous oxide or IV medication may be provided or induction of rapid-sequence general anesthetic. Oral antacid is routinely given to all patients undergoing a cesarean section to decrease risk of aspiration pneumonitis.

General Anesthesia

General anesthesia is avoided whenever possible due to the risk of failed intubation and pulmonary aspiration of gastric contents. These remain the two leading causes of maternal mortality related to anesthesia. However it may be required for patients where regional anesthesia is not possible (please see above for contraindications for regional anesthesia) or in emergent situations when rapid induction of general anesthesia is necessary. Assessment of the airway to determine intubation status should be performed on all patients. Pre-determined alternatives should be available in case of failed intubation or failed ventilation.

Paracervical Block

Paracervical block is rarely used in Nova Scotia. It blocks transmission of pain impulses through the paracervical ganglion during the first stage of labour through the administration of 10-20 mls of local anesthetic. It does not adversely affect labour progress and may provide analgesia without the sensory and motor blockade of an epidural. However, it has a short duration of action and does not relieve second stage labour pain. The major complication is prolonged fetal heart rate deceleration(s) (cause unclear).

Pudendal Block

This technique is also not used often in Nova Scotia. Pudendal block may be indicated for patients without an epidural who require analgesia for spontaneous vaginal delivery or

instrumental vaginal delivery. It does not provide analgesia for mid-forceps or exploration of the upper vagina, cervix or uterus in the postpartum period. Typically, 7-10ml of local anesthetic is injected on each side. Pudendal block has a high rate of failure. Maternal complications may include laceration of the vaginal mucosa, systemic local anesthetic toxicity, hematoma and abscess. Fetal complications are rare but may result from needle trauma or direct injection of local anesthetic into the fetus.

Perineal Infiltration

Several milliliters of local anesthetic are injected into the posterior fourchette to provide rapid perineal anesthesia for episiotomy and/or repair. The total dose of lidocaine should not exceed 4.5 mg/kg.

References

Agency for Health Care Policy and Research (1992). *Acute pain management: operative or medical procedures and trauma.* Rockville (MD): Department of Health and Human Services. AHCPR Pub. No. 92-0032. (Clinical practice guideline).

Alexander, JM., Sharma, SK., McIntire, DD., & Leveno, KJ. (2002). Epidural analgesia lengthens the Friedman active phase of labor. *Obstetrics & Gynecology, 100,* 46-50.

Alexander, J., Sharma, S., McINtrie, D., Wiley, J., & Leveno., K. (2001). Intensity of labor pain and cesarean delivery. *Anesthesia Analgesia, 92*, 1524-8.

American Academy of Pediatrics (2004*). Drugs for Pediatric Emergencies,* Retrieved on December 7, 2004 from http://www.pediatrics.org/cgi/content/full/101/1/e13

American College of Obstetricians And Gynecologists (ACOG). (1996). ACOG technical bulletin Obstetric analgesia and anesthesia. *International Journal of Gynecology & Obstetrics, 54*, 281-292.

American Heart Association (1997). *ILCOR Advisory Statements: Special Resuscitation Situations*. Retrieved October 1, 2004 from http://www.americanheart.org/presenter.jhtml?identifier=1797

Anesthetics, volatile (group 3). In: IARC monographs on the evaluation of carcinogenic risks to humans. Supplement 7. Overall evaluations of carcinogenicity: an updating of IARC monographs volumes 1 to 42. *International Agency for Research on Cancer, 1987*, p. 93-95.

Buck, M. (2002). Naloxone for the reversal of opioid adverse effects. *Pediatric Pharmacotherapy, 8* (8).

Campbell, D. (2003). Parenteral opioids for labor analgesia. *Clinical Obstetrics and Gynecology, 46* (3), 616-22.

Canadian Centre for Occupational Health and Safety. (2002*). Hazards of Waste Anesthetic Gases.* Retrieved June 4, 2004 from

http://www.ccohs.ca/oshanswers/chemicals/waste_anesthetic.html

Caton, D., Corry, M., Frigoletto, F., Hopkins, D., Lieberman, E., Mayberry, L., Rooks, J., Rosenfield, A., Sakala, C., Simkin, P., & Young, D. (2002). The nature and management of labor pain: Executive Summary. The Nature and Management of Labor Pain Symposium Steering Committee. *Obstetrics and Gynecology, 186* (5), S1-S15.

Chan, W., Lin C., Sun, W., Tsai, S., Tsai, S., & Hsieh, C., (1999). Comparison of subcutaneous hydromorphone with intramuscular meperidine for immediate postoperative analgesia. *Kaohsiung Journal of Medical Science,15*(7):419-27.

Cope, K., Merritt, W., Krenzischek, D, Schaefer, J., Bukowski, J., Foster, M., Bernacki, E., Dorman, T., & Risby, T., (2002). Phase II collaborative pilot study: Preliminary analysis of central neural effects from exposure to volatile anesthetics in the PACU. *Journal of PeriAnesthesia Nursing, 17* (4), 240-250.

Donaldson, D. & Meechan, JG (1995). The hazards of chronic exposure to nitrous oxide: and update. *British Dental Journal, 178* (3), 95-100.

Elbourne, D. & Wiseman, R. (1999). Types of intra-muscular opioids for maternal pain relief in labour. In: *The Cochrane Library, Issue 2*, 2004. Chichester, UK: John Wiley & sons, Ltd.

Eltzschig, H., Lieberamn, E., Carnann, W., (2003). Regional anesthesia and analgesia for labor and delivery. *New England Journal of Medicine, 348*, (4), 319-332.

Fischer, G., Johnson, R. E., Eder, E., et al. Treatment of opioids-dependent pregnant women with buprenorphine. *Addiction, 2,* 239-244.

Health Canada (2000). *Family-Centred Maternity and Newborn Care: National Guidelines, Chapter 10—Facilities and Equipment, p. 22.* Minister of Public Works and Government Services, Ottawa.

Hoerauf, K., Koller, C., Taeger, K., & Hobbhahn, J. (1997). Occupational exposure to sevoflurane and nitrous oxide in operating room personnel. *International Archives of Occupational & Environmental Health, 69*, 134-138. http://hstat.nlm.nih.gov/hq/Hquest/db/local.arahcpr.arclin.apmc/screen/TocDisplay/s/56168/action/Toc

Hofmeyr, G., Cyna, A., & Middleton, P. (2004). Prophylactic intravenous preloading for regional analgesia in labour. *Cochrane Database Systematic Review*, October 18 (4): CDC000175.

Holte, K., Foss, N., Svensen, C., Lund, madsen, J., & Kehlet, H., (2004). Epidural anesthesia, hypotension, and changes in intravascular volume. *Anesthesiology, 100*(2), 281-286.

Isenor, L. & Penny-MacGillivray, T. (1993). Intravenous meperidine infusion for obstetric analgesia. *Journal of Obstetric, Gynecologic & Neonatal Nursing, 22* (40, 349-356.

Kinsella, S.M., Pirlet M., Mills, M.S. Tuckey M.A. & Thomas, T. A. (2000). Randomized study of intravenous fluid preload before epidural analgesia during labour. *British Journal of Anesthesia, 85* (2), 311-313.

Krenzischek, D., Schaefer, J., Nolan, M., Bukowski, J., Twilley, M., Bernacki, E., & Dorman, T., (2002). Phase I collaborative pilot study: Waste anesthetic gas levels in the PACU. Journal of PeriAnesthesia Nursing, 17 (4), 227-239.

Latta, K., Ginsberg, B., & Barkin, R. (2002). Meperidine: A critical review. *American Journal of Therapeutics, 9* (1). 53-68.

Lavender, L & Bricker, T. (2002). The nature and management of labor pain: Peer-reviewed papers from an evidence-based symposium. *American Journal of Obstetrics and Gynecology, 186* (5), 1-37.

Leeman, L., Fontaine, P., King, V., Klein, M., & Ratcliffe, S. (2003). The nature and management of labor pain: Part II pharmacologic pain relief. *American Family Physician, 68* (6), 1115-1120.

Leighton, B. & Halpern , S. (2002). The effects of epidural analgesia on labor, maternal and neonatal outcomes: A systematic review. *American Journal of Obstetrics and Gynecology*, 186 (5).

Levitt, C., Harvey, L., Avard, D., Kaczorowski, J. (1995). *Survey of routine maternity care and practices in Canadian hospitals*. Ottawa: Health Canada and Canadian Institute of Child Health.

Loebstein, R., Lalkin, A., Koren, G., (1997). Pharmacokinetic changes during pregnancy and their clinical relevance. Clinical Pharmacokinetics, 33, 328-343.

Lowe, N. (2002). The nature of labor pain. *Obstetrics & Gynecology, 186* (5), S16-S24.

Marmor, T. & Krol, D. (2002). Labor pain management in the United States: Understanding patterns and the issue of choice. *Obstetrics & Gynecology, 186* (5), S173-80.

Matheson, I & Nylander, G. (1999). Should meperidine still be administered to women in labor? *Tidsskr Nor Laegeforen, 119* (2), 234-36.

Mills, G., Singh, D., Longan, M., et al. (1996). Nitrous oxide exposure on the labour ward. *International Journal of Obstetric Anesthesia, 5*, 160-4.

Misiraca, L (2003). Potential hazards associated with occupational exposure to nitrous oxide. *Odontologiska Fakulteten,* Karolinska Institutet. http://www.ki.se/odont/cariologi_endodonti/exarb/LJILJANA.PDF Retrieved March 11, 2004.

Morley-Forester, P.K. & Weberpals, J. (1997). Neonatal effects of patient-controlled analgesia using fentanyl in labor. *International Journal of Obstetric Anesthesia* (7), 102-107.

Newton, C., Fitz-Henry, J., & Bogod, D. (1999). The occupational exposure of midwives to nitrous oxide: A comparison between two labour suites. *International Journal of Obstetrical Anesthesia, 8*, 7-10.

NIOSH (1994). *Controlling Exposures to Nitrous Oxide During Anesthetic Administration.* Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 94-100.

Quigley, C. (2004). Hydromorphone for acute and chronic pain. *Journal of Pain and Symptom Management, 25* (2), 165-78.

Ramin, S., Gambling, D., Lucas, M., Sharma, S., Sidawai, E., & Leveno, K. (1995). Randomized trial of epidural versus intravenous analgesia during labor. *Obstetrics & Gynecology, 86* (5), 783-9.

Rosen, M. (2002). Nitrous oxide for relief of labor pain: A systematic review. *Obstetrics & Gynecology, 186* (5), S110-26.

Sessler, D. & Badgwell, J. (1998). Exposure of postoperative nurses to exhaled anesthetic gases. *Anesthesia & Analgesia, 87* (5). 1083-88.

Shukla, R. (2004). Personal Communication.

Waitman, J. & McCafferty, M. (2000). Even patients with no known risk factors may develop meperidine-induced toxicity. *American Journal of Nursing, 101*(1).

Watts, R. (2004). Does pethidine still have a place in the management of labour pain? *Australian Prescriber, 27* (2), 34-35.

Wenker, O (1999). Review of Currently Used Inhalation Anesthetics; Part I. *The Internet Journal of Anesthesiology, 13* (2). Retrieved from http://www.ispub.com/journals/IJA/Vol3N2/inhal1.htm

Wiesner, G., Harth, M., Szulc, R., Jurczyk, W., Sobczynski, P., Hoerauf, H., Hobbhahn, J., & Taeger, K. (2001). A follow-up study on occupational exposure to inhaled anesthetics in Eastern European surgeons and circulating nurses. *International Archives of Occupational & Environmental Health, 74*, 16-20.

Wunsch, M., Stanard, V., & Schnoll, S. (2003). Treatment of pain in pregnancy. *Clinical Journal of Pain, 19* (3), 148-155.

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