Intravenous and intramuscular opioids provide only very modest efficacy in reducing the intensity of pain during labour\(^1\), but do result in clinically meaningful relief for about 30% of women\(^2,3\).

Patient-controlled intravenous analgesia (PCIA) with opioid is a method that may also produce satisfactory analgesia for a proportion of labouring women. PCIA with remifentanil is more effective and reliable than intramuscular or intravenous morphine and pethidine or nitrous oxide inhalation\(^4-6\). The fetal and neonatal effects of repeated maternal opioid exposure must be considered and staff skilled in neonatal resuscitation available.

**Medical contraindications include**

1. Allergy to the proposed opioids (usually fentanyl or remifentanil).
2. The presence of clinically significant maternal respiratory depression from previous exposure to opioids and sedatives.

**Intravenous patient-controlled analgesia Management**

This patient-controlled intravenous analgesia (PCIA) approach is used infrequently during labour at King Edward Memorial Hospital (KEMH) but is widely used postoperatively and patient-controlled epidural analgesia (PCEA) is frequently used during labour.

PCIA is most commonly used for women who have poorly controlled pain and who have contraindications to, are unsuitable for, or who refuse to have, epidural analgesia.

Opioids without active metabolites and with less adverse clinical effect on the neonate are preferable for PCIA. Currently those of choice are fentanyl\(^7\) and remifentanil (which has had substantial recent investigation in this setting, although this is not an approved indication).

**General Principles**

Patient controlled analgesia has some inherent advantages in allowing the woman to titrate analgesia against the fluctuating pattern and changing intensity of labour pain. Nevertheless, as with nitrous oxide inhalation, it is not possible to time self-
administration such that peak analgesic effect coincides with peak pain intensity during a contraction, even with an extremely rapidly and short acting drug such as remifentanil.

The potential exists for maternal respiratory depression, particularly between contractions, mandating continuous monitoring of oxygen saturation\(^8\)\(^9\). In addition, the very high potency of remifentanil can cause an overdose after inadvertent administration of a very small volume of remifentanil solution (1 mL to 2 mL). **Meticulous attention to intravenous cannula function and administration sets is necessary** to avoid back-flow of solution into intravenous tubing or flushing of dead-space solution.

There have been documented cases of severe maternal respiratory depression associated with remifentanil use in situations where the usual pregnancy related hormonal respiratory drive may be decreased (for example, fetal death in utero). In these situations, fentanyl is the preferred agent for PCIA over remifentanil.

**Intravenous patient-controlled analgesia is available when there is sufficient anaesthetic cover to meet all hospital service requirements**

The anaesthetist should be contacted by the obstetrician or midwife. An adequate history should be provided to the anaesthetist.

**Only an anaesthetist should program the PCA pump or adjust variables**

The choice of opioid, dosing and drug delivery method is the decision of the anaesthetist, in consultation with the woman, obstetrician and midwife.

**Equipment**

- CADD Solis pump (Available in cupboard outside of Theatre Recovery)
- Clear CADD administration line

**Preparation and Monitoring**

- Remifentanil PCIA should be administered via a DEDICATED small gauge (e.g. 20 or 22 G) intravenous cannula.

- The PCIA administration set should be connected directly to this cannula with a one-way valve to prevent a back-up.

- No other fluids or medications are to be given through this administration set or cannula.

- Blood pressure measurements should be taken on the opposite arm to the PCIA to ensure unimpeded flow of remifentanil/fentanyl into the systemic circulation.

- Anaesthetist must provide continuous visual patient monitoring for at least 5 minutes after administration of the first dose.
• Room lighting should be appropriate to allow early detection of sedation and respiratory depression.

**Naloxone should be available in the room.**

Continuous maternal respiratory monitoring should be used. This includes

• Continuous pulse oximetry
• Continuous presence of a registered nurse/midwife or medical staff in the room
• Observation of conscious state and respiratory rate 30 minutely.

An oxygen source must be readily accessible and naloxone should be available within the labour and birth room.

The following algorithm is suggested:

1. If maternal oxygen saturation is 85% - 94%, respiratory rate is above 8, and the woman is awake, then oxygen should be administered via Hudson mask at 6 L/min and the woman should be encouraged to take deep breaths. Oxygen delivery may be changed to nasal prongs at 2 to 3 L/min to maintain saturation above 94%.

2. If saturations remain 85% - 94% or respiratory rate is 5 – 8 breaths/min or the woman is drowsy (sleepy but responds to verbal stimulation) stop the PCA pump and notify the duty anaesthetist immediately. The anaesthetist may choose to modify or cease the PCA regimen or to administer higher concentrations of oxygen or naloxone.

3. If the saturation is less than 85% or respiratory rate less than 5 breaths/min or the woman does not respond to verbal stimulation give naloxone 400 microgram intravenously, call a “code blue medical” and support airway and ventilation as required.

**Neonatal Care**

A person skilled in neonatal resuscitation must be present at the time of birth. In cases in which large doses of opioid have been administered, it may be appropriate to ensure that a neonatology staff member is present.

Opioids may cause neonatal respiratory depression (sedation, apnoea, slow establishment of respiration and hypoventilation). Remifentanil may rarely cause neonatal chest wall rigidity making positive pressure ventilation difficult. Naloxone may be required.

**PCIA Regimens**

**Fentanyl**

*20 microgram/mL solution (2000 microgram in 100mL Sodium chloride 0.9%)*
• Commence with a demand only approach using the pharmacy-prepared bags of 20 microgram/mL, using 1 mL bolus and a 5 minute lockout time.
• If ineffective, the anaesthetist may choose to increase the bolus dose, shorten the lockout time or add a continuous infusion (e.g. 20 microgram/h).

Remifentanil

20 microgram/mL solution (2 mg in 100mL Sodium chloride 0.9%)
• May be more effective than fentanyl
• More rapid onset and offset.
• Minimal accumulation of maternal plasma remifentanil and thus possibly lower incidence of neonatal respiratory depression.\(^{12,13}\)
• Remifentanil 2 mg is in the Labour and Birth Suite Schedule 8 cupboard.
• Reconstitute the vial with 2 mL of sodium chloride 0.9% or water for injection. Shake well to dissolve. Dilute with sodium chloride 0.9% to 100 mL (20 microgram/mL)
• If the maternal weight is > 100kg, calculate dosing at 100kg.
• Use a demand bolus of 30 microgram (1.5 mL) with a lockout of 2 minutes
• The bolus dose must be delivered over 60 seconds.

If analgesia is unsatisfactory, consider adding a background infusion of 0.05 microgram/kg/min (15 ml/h for 100 kg woman), then increasing the bolus dose to a maximum of 80 microgram (4 mL)\(^{14,15}\). The background infusion can be increased to a maximum of 0.1 microgram/kg/min (30 ml/h for 100kg woman).

Ketamine

Rarely, a ketamine infusion may be used in conjunction with PCIA\(^16\). Indications include severe uncontrolled pain and PCIA in an opioid-tolerant patient.
An appropriate regimen is ketamine 100mg in 100mL Sodium chloride 0.9% via an intravenous infusion pump, at 0.1 mg/kg/hour (for a 100kg woman, 10mL/hour)\(^17\).

References and resources


16. Maroof M, Hakeem S, Khan RM. Ketamin 0.25mg/kg/hr infusion is effective in relieving labor pain without incoherence. *Anesthesiology*. 1999;ASA abstracts: A1073.


---

**Related policies**

**Related WNHS policies, procedures and guidelines**

<table>
<thead>
<tr>
<th>Keywords:</th>
<th>PCIA, Intravenous Patient Controlled Analgesia, analgesia in labour, Fentanyl, Remifentanil, Ketamine, PCIA regimen,</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document owner:</td>
<td>Anaesthetic Consultants</td>
</tr>
<tr>
<td>Author / Reviewer:</td>
<td>Anaesthetic Consultants</td>
</tr>
<tr>
<td>Date first issued:</td>
<td>08/2007</td>
</tr>
<tr>
<td>Last reviewed:</td>
<td>17/07/2017</td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>Endorsed by:</td>
<td>PSMSC</td>
</tr>
<tr>
<td>Standards Applicable:</td>
<td>NSQHS Standards: │Governance, 4 Medication Safety, 9 Clinical Deterioration,</td>
</tr>
</tbody>
</table>

**Printed or personally saved electronic copies of this document are considered uncontrolled.**

*Access the current version from the WNHS website.*