PAIN MANAGEMENT IN LABOUR

NITROUS OXIDE (N\textsubscript{2}O+O\textsubscript{2}) ADMINISTRATION

Key words: nitrous oxide, pharmacological analgesia, labour gas, labour analgesia, entonox, nitrous, N2O

AIMS

- To assist women to manage pain during established labour or during uncomfortable procedures.
- To provide women with a degree of self-control for their pain management.

BACKGROUND INFORMATION

Nitrous oxide is an inorganic colourless inhalation agent with a sweetish odour.\textsuperscript{1,2} It is non-flammable but will support combustion.\textsuperscript{1-3} Nitrous oxide is eliminated mostly via the lungs,\textsuperscript{1} not the liver, so the effect is transient, it does not accumulate, and has no known adverse effects for the neonate.\textsuperscript{4} Nitrous oxide crosses the placenta\textsuperscript{1} causing no effect on the fetal heart rate, and if present in fetal circulation at birth is eliminated quickly when the neonate breathes. Following inhalation it has a rapid onset and recovery,\textsuperscript{1} and has been shown to leave the maternal system within 5 minutes.\textsuperscript{5}

The full effect after inhalation of nitrous oxide and oxygen (N\textsubscript{2}O+O\textsubscript{2}) is approximately 50 seconds, therefore careful timing and noting of contraction intervals assists the woman to ensure commencement of gas inhalation approximately 30-50 seconds prior to the onset of a contraction.\textsuperscript{6} N\textsubscript{2}O+O\textsubscript{2} appears effective in reducing pain intensity and for providing pain relief in labour, although it can lead to more side effects such as nausea, vomiting and drowsiness.\textsuperscript{7} Nitrous oxide is considered a safe agent for women in labour and is administered by inhalation.\textsuperscript{8} Evidence indicates a high percentage of women are satisfied with this method of pain relief.\textsuperscript{9}

KEY POINTS

1. Nitrous oxide is classified as a Schedule 4 (prescription only) medication therefore requires a doctor’s order for use.
   Document use on the MR270 ‘Partogram’ and the MR810.04 ‘Medication Administration for Labour and Birth’.
2. Careful coaching of the woman is essential for successful use of self-administered nitrous oxide.\textsuperscript{9}
3. Prior to use of N\textsubscript{2}O+O\textsubscript{2} the woman should be advised of possible side-effects.
4. The woman should be advised that only she should self-administer the N\textsubscript{2}O+O\textsubscript{2} to prevent risk of loss of consciousness that can result from gas overdose.
5. Prolonged inhalation of nitrous oxide for more than 6 hours can inactivate vitamin B\textsubscript{12} interfering with DNA synthesis. This can cause adverse haematological and neurological effects.\textsuperscript{8}
6. Due to the high combustion ability of N₂O, the use of oils and greases should be avoided whilst nitrous oxide is in use.² Ensure any alcohol based gels/substances have evaporated prior to using N₂O+O₂.²

7. Staff should ensure the entonox circuit has no leaks, and the room well ventilated to decrease risk of excessive occupational exposure to staff.¹

8. Inappropriate use may lead to overdosage. Signs and symptoms include passing through stages from light headedness, intoxication to unconsciousness. Other signs include bradycardia, respiratory depression, cardiovascular depression and severe hypotension. If occurs, discontinue N₂O +O₂, provide oxygen and basic life support as required.¹

9. Diffusion hypoxia may occur on cessation due to lowering oxygen partial pressure in the alveoli with continued nitrous oxide elimination. Treat with oxygen.¹

CONTRAINDICATIONS TO USE

N₂O+O₂ is contraindicated for women who have:

- an inability to hold a facemask or mouthpiece³,¹¹ e.g. maxillofacial fracture
- impaired consciousness or intoxication¹,¹,¹¹
- impaired oxygenation¹¹ e.g. upper respiratory tract infection or respiratory disease³, deviated nasal septum, nasal polyps, allergic rhinitis³, chronic obstructive pulmonary disease³
- received excessive amounts of intravenous opioids¹¹, or morphine derivatives and/or benzodiazepines as sedation may be increased.¹³
- vitamin B₁₂ deficiency or are receiving vitamin B₁₂¹¹,¹² (N₂O+O₂ use can inhibit an enzyme essential for normal cell activity leading to megaloblastic anaemia¹²)
- recent ear surgery³
- a compromised fetus¹,¹¹
- are haemodynamically unstable¹¹
- hypersensitivity to nitrous oxide or any other component in the gas¹
- any condition where air is entrapped within a body and expansion may be dangerous (e.g. occluded middle ear, cysts, gross abdominal distension, maxillofacial injuries)¹

Note: N₂O+O₂ should be used cautiously with patients diagnosed with schizophrenia or bipolar disorders.³

PRECAUTIONS

- Use with caution in women with severe hypotension or those at risk of vitamin B₁₂ deficiency.¹
If there are disorders affecting oxygenation, the required nitrous oxide concentration will vary.¹
Nitrous oxide should be administered with at least 30% oxygen, as when used alone it may increase pulse rate and have respiratory depressant effects.¹

**SIDE EFFECTS OF NITROUS OXIDE**
Side effects may include:
- excessive drowsiness, dizziness² or light headedness¹, ⁶, ⁷, ¹³
- nausea¹, ⁶, ⁸, ¹¹, ¹³ and vomiting¹, ⁶, ⁸, ¹¹, ¹³ dry mouth⁶
- shivering⁸, headache², buzzing in the ears⁶
- rarely 'pins and needles' or numbness⁶
- dreams, hazy memory of labour⁶
Adverse reactions include cardiovascular / respiratory depression, hypotension, hypoxia, raised intracranial pressure and inactivation of vitamin B₁₂.¹

**EQUIPMENT**
- Portable Entonox apparatus 12 (blue cylinder with white quadrants on the shoulders) with a pre-regulated concentration of 50% nitrous oxide and 50% oxygen.
- Corrugated Entonox tubing with mouth piece (dispose after use)

**PROCEDURE**

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<thead>
<tr>
<th>PROCEDURE</th>
<th>ADDITIONAL INFORMATION</th>
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<tbody>
<tr>
<td>1 Prior to commencement</td>
<td>Note: The Entonox apparatus is serviced by a biomedical technician from KEMH every six months. This date should be evident on the machine. Entonox 50% N₂O and 50% O₂ is supplied in a blue cylinder with white quadrants on the shoulder. Cylinders containing 100% N₂O are blue with no white shoulders.</td>
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<td>Ensure that:</td>
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<td>● verbal consent is obtained¹²</td>
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<tr>
<td>● there are no contra-indications</td>
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<td>● a new Entonox tubing set is used</td>
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<td>● there is adequate gas remaining in the Entonox cylinder for required use. Spare cylinders should be available.</td>
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<td>2 Education</td>
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<td>● Explain the effects, risks, benefits and restrictions of using N₂O+O₂.</td>
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PROCEDURE
• Explain the importance of the timing of commencement of inhalation.

• Demonstrate the importance of maintaining a seal around the mouthpiece and instruct the woman to inhale and exhale through the mouthpiece.

• Explain that it is imperative the woman self-administers the N₂O+O₂.¹¹ No one else is to hold the mouthpiece.⁶

• Instruct and supervise the woman until she is confident and proficient in the use of N₂O+O₂.

3 During contractions

• Instruct the woman to begin breathing deeply at a normal rate on the mouthpiece at the onset of the contraction (or 30 seconds prior where possible) and cease when the contraction pain eases or abates.

• Palpate the contractions to assist the woman in recognising early onset.

• Continuously assess the woman’s pain level and conscious state.

• Observe for signs of over-dosage e.g. drowsiness, disorientation, lack of cooperation/ aggressiveness, unconsciousness
  ➢ If overdose occurs cease N₂O+O₂ and protect the woman’s airway until she is

  A time lag of approximately 50 seconds after administration occurs before the full analgesic effect is felt.⁶
  The delayed time lag can be shortened by high-inspired concentrations, and increased ventilation (deep, slow breaths).⁶
  Nitrous oxide may be used at any time in labour as it does not effect uterine contractility.¹⁴
  Concentrations of nitrous oxide around 70% may depress consciousness.¹
  Overdosing is generally prevented by self-administration as the woman’s mouthpiece or mask will fall away if she becomes drowsy.¹¹

  Note: Administration of opioids prior to or with N₂O must be undertaken with caution as the combination of these can more

ADDITIONAL INFORMATION
Ideally, for optimum benefit, the woman should be encouraged to begin inhalation 30 to 50 seconds prior to commencement of the contraction.⁶ This will require timing and monitoring of the contractions.

A poorly used mouthpiece may lead to leakage of the gas which will decrease the concentration that the patient receives³, and increase risk of contamination from the gas to staff.⁴

Self-administration is a safe guard in preventing overdose. As drowsiness increases, the mouth piece will fall away making loss of consciousness unlikely.⁴ ¹¹
## PROCEDURE

- Following recovery, recommence the N₂O+O₂ but at a lower concentration.

## ADDITIONAL INFORMATION

- Easily render a woman unconscious.  

### 4 Between contractions

Ask the woman to remove the mouthpiece and encourage her to breathe normally.

### 5 Documentation

- A medical order for N₂O+O₂ on the 'Medication Administration for Labour & Birth' MR 810.04 form.

- Document the time of commencement, concentration, and ongoing assessments of pain in the woman’s:
  - Medical record MR250
  - Partogram MR270
REFERENCES / STANDARDS


National Standards – 1- Care Provided by the Clinical Workforce is Guided by Current Best Practice; 2- Partnering with Consumers and/or Carers to Design the Way Care is Delivered to Better Meet Patient Needs and Preferences Legislation - Related Policies - WNHS Policy W107 Use of Complementary Therapies

RESPONSIBILITY

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<td>Initial Endorsement</td>
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