

Penthrox™

The leader in emergency pain relief

There is more to basic pre-hospital and emergency first aid than basic life support

- The standard pre-hospital & emergency first aid treatment is focused on basic life support:

A – Airway

B – Breathing

C – Circulation

- Basic emergency and pre-hospital treatment usually stops here, but one further element of patient care must be addressed:

Pain management

Pain management is the biggest unresolved issue in pre-hospital and emergency treatment

- In the context of pre-hospital and emergency treatment, pain relief must be:
 - Easy to administer
 - Portable
 - Storable in numbers, not deteriorate
 - Safe –
 - Minimal side effects / no scope for abuse
 - Acceptable to patients
 - Inexpensive
- This set of attributes is difficult to satisfy, and is why pain management has been a major unresolved issue in pre-hospital and emergency treatment

There are a number of existing options for pre-hospital and emergency pain relief

- To be useful in a pre-hospital and emergency setting, analgesic agents must have a very rapid onset
- Commonly used pre-hospital and emergency analgesic agents are:
 - Inhaled agents:
 - Entonox™ (50:50 nitrous oxide & oxygen)
 - **Penthrox™ (Inhaled Methoxyflurane)**
 - Injected agents:
 - Opioids (i.e. Morphine)

Penthrox™ (Inhaled Methoxyflurane)

- Methoxyflurane is the only volatile anaesthetic agent with significant analgesic properties at low sub-anaesthetic concentrations
- Methoxyflurane is inhaled via the custom-designed Penthrox™ Inhaler



Features of Pentrox™ Inhaler



- The **Pentrox™ Inhaler** is a tubular light-weight disposable polyethylene device containing a:
 - polypropylene pad (to act as a wick, absorbing the methoxyflurane)
 - one-way valve (to prevent blow-back into wick)
 - dilutor hole (to vary the concentration of inspired methoxyflurane)
 - oxygen inlet
 - 22mm mouthpiece can be fitted to all ISO international standard mask

Key Usage Features:

- Self-administered
- Hand-held
- Can be connected to oxygen supply
- Wrist strap for support
- Dilutor hole allows two inspired methoxyflurane concentrations
- Disposable – single use (prevents cross infection)
- Accepts standard ISO face mask

Features of Pentrox™ (Inhaled Methoxyflurane)

- Potent analgesic effect in low concentrations
- Pain relief commences after 3-4 breaths
- Pain relief continues for 3-4 minutes after use
 - Important when extricating trapped victim
- Two inspired methoxyflurane concentrations:
 - Diluter hole open: 0.2%
 - Diluter hole closed: 0.4%
- Duration of action in Pentrox™ Inhaler:
 - 3mL: analgesia for up to 25 minutes
 - 6mL: analgesia for up to 50 minutes
 - May be extended by use of a simple plastic storage bag for the inhaler intermittently
- Dosage limits: maximum 6mL/day and 15mL/week

Available in a variety of packaging options

- **Pre-packaged and ready to use**
- Combination pack (“blister packs”)
 - Single dose (1 x 3mL bottle)
 - Pack of 10
 - Dual dose (2 x 3mL bottles)
 - Pack of 10
- Dual pack
 - 10 x 3mL bottles of Methoxyflurane and 10 x Pentrox™ Inhalers
- Individual packs (sold together)
 - 10 x 3mL bottles of Methoxyflurane
 - 10 x Pentrox™ Inhalers



Penthrox™ has uses beyond emergency pain relief

- Minor procedures such as:
 - Manipulating or splinting fractures
 - Applying and changing of dressings (burns) etc
 - Dislocations
 - Suturing
 - Draining
 - Obstetrics
 - ... and many others
- Patient can be treated immediately without significant preparation
- Ideal solution in this period of increasing terrorism, mass casualty and disaster relief incidences

Penthrox™ has a number of advantages for emergency pain relief situations

Advantages of Penthrox™:

1. Potent analgesic (pain relief) properties
2. Easy to train and simple to use
3. Inhaled (no need for injections)
4. Small, light and portable (easily given to inaccessible patients)
5. Disposable – single patient use only (prevents cross infection)
6. Easy to administer, handle and manage
7. Safe – no adverse reactions
8. No unsafe pollution in enclosed environments
9. Can be simultaneously administered with oxygen therapy
10. Inexpensive

The key advantages are discussed on the following pages

1. Pentrox™ has potent analgesic properties

Benefits

- Methoxyflurane is a very potent analgesic
- Rapid onset, after 3-4 breaths
- Consistent analgesia response

Compared to:

Entonox™ (inhaled)

- Analgesia is equal to or less than methoxyflurane*
- Disorientation not infrequent

Narcotics (injected)

- Opioid – very potent analgesic
- Rapid onset

• **Source:** Tomlin PJ, Jones BC, Edwards R, & Robin PE: Subjective and objective sensory responses to inhalation of nitrous oxide and methoxyflurane. Brit J Anaesth 45:719-725,1973

2. The Pentrox™ Inhaler is small, light and portable

Benefits

- Made of light-weight plastic
- Portable, easy to transport
- Enables mobility for both the treater and the patient
- Does not take up much room
- Easy to store in large quantities – can be stockpiled

Compared to:

Entonox™ (inhaled)

- Must be held under pressure in a steel cylinder
- Difficult to store in remote areas
- Mobility is difficult

Narcotics (injected)

- Portable, easy storage

3. It is very easy to administer the Pentrox™

Benefits

- Minimal training required to administer
- Self-administered by patient
 - Can be used by inaccessible patients eg. Disaster (load & throw)
- The patient controls their rate of intake via the diluter hole – two concentration levels
- Can be used with a face-mask

Compared to:

Entonox™ (inhaled)

- Easily self-administered via face mask
- Dosage not variable, controlled from cylinder
- Cannot be used with inaccessible patients

Narcotics (injected)

- Restricted use as a narcotic agent
- Must be administered by trained staff
- Dose set by injection

4. The Pentrox™ Inhaler is easy to handle and manage

Benefits

- Single patient use – no sterilisation required
- No cumbersome assembly required
- Can be stored for up to 3 years – can be stockpiled
- No narcotic restrictions, minimal abuse potential
- Does not support combustion greater than oxygen

Compared to:

Entonox™ (inhaled)

- Must be cleaned and sterilised after use
- Care to reassemble correctly
- Bacterial filter essential
- Combustion greater than oxygen
- Cylinder must be inverted in cold weather

Narcotics (injected)

- Restricted use as narcotic agent
- Single patient use needle

5. Pentrox™ is safe to use – there are no side-effects

Benefits

- There are no side-effects at the low concentrations for analgesia (0.2 - 0.4%),
- The dose of methoxyflurane is inherently limited (3ml or 6ml)

Compared to:

Entonox™ (inhaled)

- Disorientation is not infrequent

Narcotic (injected)

- Potent respiratory depressant
- Dose set by injection
- Nausea and/or vomiting common

- **Source:** Komesaroff D: Pre-hospital pain relief: penthrane or entonox? Australian Journal of Emergency Care 2:28-29,1996

Reports of renal toxicity from methoxyflurane **do not apply** at the analgesic doses used in Pentrox™

- There have been reported cases of renal toxicity from the excessive use of methoxyflurane, usually in anaesthesia.
- There is **NO** risk of renal toxicity from the use of methoxyflurane in the recommended analgesic doses via the Pentrox™ Inhaler (6mL/day and 15mL per week)
 - Renal toxicity has never been reported in the recommended analgesic doses
 - No reports in over 29 years of use in Australia
- The dose for each individual treatment is inherently limited by the size of the bottle (3ml)

- **Source:** Cousins M.J., Mazze R.I.: Methoxyflurane Nephrotoxicity: A Study of Dose Response in Man. JAMA 225:1611-1616, 1973
Mazze R.I.: Fluorinated Anaesthetic Nephrotoxicity: An Update, Canadian Anaesthetists' Society Journal, 31:16-22, 1984.

6. No unsafe pollution levels in enclosed environments from use of Pentrox™

Benefits

- The use of Pentrox™ in an enclosed environment (such as an ambulance) does not exceed the recommended maximum pollution level of 0.5ppm TWA
- Pollution from Pentrox™ is within this recommended maximum

Compared to:

Entonox™ (inhaled)

- Pollution many times the recommended max. of 25ppm
- Exceeds 25ppm in almost every case

Narcotics (injected)

- No pollution

• **Source:** Environmental studies of New South Wales Ambulance Service

7. The Pentrox™ Inhaler can be used with oxygen therapy

Benefits

- The Pentrox™ Inhaler can be used with or without oxygen
- Two inspired oxygen concentrations:
 - Oxygen flow 3L/min: 32-41%
 - Oxygen flow 8L/min: 50-60%



Compared to:

Entonox™ (inhaled)

- Provides 50% oxygen

Narcotics (injected)

- Can be used with oxygen therapy

Summary:

- A fast, convenient and effective analgesic for emergency pain relief
- Lightweight, portable and easily stored or stockpiled
- Safe, with no adverse reactions
- Self administered
- Disposable to prevent cross infection
- Requires minimal training
- Cost effective