## 1. Introduction and Who Guideline applies to

This guideline describes the safe use of penthrox (methoxyflurane) – a potent analgesic delivered by a patient-administered inhaler device. Penthrox is **NOT** a controlled drug. Particular benefits include rapid onset and recovery, and a reduced need to use strong opiates or procedural sedation. [1-3] There is also some evidence of reduced length of stay (LOS) in certain patient groups managed with Penthrox. [4] The potential for abuse has been found to be low. [5] The guideline applies to clinicians (doctors and nurse practitioners) and qualified nursing staff working in the Adult Emergency Department, Professor Harper Trauma Clinic and Fracture Clinic.

## 2. Guideline Standards and Procedures

2.1 The guideline is presented in the format of a proforma, shown in Appendix A and Appendix B.
2.2 Patients may continue to use penthrox during imaging and transfers within the ED but must remain on a trolley as they may become unsteady

## 3. Education and Training

- Sufficient numbers of ED and Fracture Clinic staff have been trained in the safe use of the penthrox inhaler by the pharmaceutical company representative prior to the implementation of this guideline, and further ad hoc training sessions will be arranged as necessary
- Staff already familiar with the device should cascade training to other staff on an opportunistic basis
- Radiographers and porters working with the ED have been informed that patients will be using penthrox during imaging / transfers within the ED

## 4. Monitoring Compliance

| What will be measured to monitor compliance | How will compliance be monitored | Monitoring Lead | Frequency | Reporting arrangements |
|---|---|---|---|---|
| • Appropriate proforma completion<br>• Adverse reactions<br>• Failure rate / need for alternative technique | Audit of first 30 cases managed in Professor Harper Trauma Clinic and Fracture Clinic after updated guideline approval | Alwyn Abraham | Within 3 /12 of guideline re-approval | TAS (Therapeutic Advisory Service) |

## 5. Supporting References

1. CoffeyF, WrightJ, HartshornS et al. STOP!: a randomised, double-blind, placebo-controlled study of the efficacy and safety of methoxyflurane for the treatment of acute pain. EMJ 2014;31:613-8.
2. NguyenNQ, ToscanoL, LawrenceM et al. Patient-controlled analgesia with inhaled methoxyflurane versus conventional endoscopist-provided sedation for colonoscopy: a randomized multicenter trial. Gastrointest Endosc 2013;78:892-901.
3. Gray StephensC, DiasA, SkinnerE et al. Penthrox enables quicker management of fractures, dislocations and more: learning lessons from expedited care of trauma patients during the COVID-19 pandemic. Ann R Coll Surg Engl 2023;105(S2):S22-S27.
4. Young L, Bailey GP, McKinlay JAC. Service Evaluation of Methoxyflurane Versus Standard Care for Overall Management of Patients with Pain Due to Injury. Adv Ther. 2020 May;37(5):2520-2527.
5. FrangosJ and MikkonenA. (2013). Penthrox - Assessment of Potential for Abuse & Dependency. Richmond, Australia: Golder Associates. Retrieved from https://tinyurl.com/y63qdwxp.

## 6. Key Words

Analgesia, pain, procedure, procedural, trauma, injury, fracture, inhaled, inhaler, burn, dislocation, amputation, chemical, penthrox, methoxyflurane, emergency, ED, A&E, sedation, Fracture Clinic.

| CONTACT AND REVIEW DETAILS | |
|---|---|
| **Guideline Lead (Name and Title)**<br>Martin Wiese – Emergency Physician | **Executive Lead**<br>Andrew Furlong, Medical Director |
| **Details of changes made during review:**<br>• Contemporary reference 3 added<br>• Audit requirements updated<br>• Proforma changes<br>  ○ ED users signposted to penthrox dose sentence within Nervecentre Meds ED formulary<br>  ○ Analgesia failure to be recorded in adverse effects free text box | |

# LRI ED and Fracture Clinic

## Penthrox (methoxyflurane) inhaled analgesia for adults

Intended to aid safe prescribing of procedural analgesia and/or immediate bridging analgesia prior to systemic pain relief in patients with traumatic injuries and a pain score of 7-10 or obvious severe pain

DO NOT use penthrox in non-traumatic conditions

**Patient details**

Full name

DoB

Unit number

(use sticker if available)

**Indication (tick as applicable)**

- ☐ Bridging analgesia for
  - ☐ Fracture ☐ Dislocation
  - ☐ Burn ☐ Chemical injury
  - ☐ Amputation ☐ Soft tissue injury
- ☐ Procedural analgesia

*Record specific indication*

**Contraindications include**

- ☐ **C** Cardiovascular instability (shock)
- ☐ **H** Hypersensitivity to methoxyflurane or any other inhaled anaesthetic
- ☐ **E** Elevated temperature from an anaesthetic (i.e. personal or family history of malignant hyperthermia)
- ☐ **C** Consciousness reduced e.g. from head injury, illness, drugs causing drowsiness such as opiates, or alcohol
- ☐ **K** Kidney impairment (i.e. regular renal OPD patient, very dehydrated, or taking nephrotoxic antibiotics such as tetracycline, amphotericin B gentamicin, colistin, or polymyxin B)
- ☐ **A** Age below 18 years
- ☐ **L** Lung or respiratory impairment, including obstructive sleep apnoea and current respiratory depression
- ☐ **L** Liver impairment due to jaundice or chronic liver disease, or at risk from alcohol misuse or from taking enzyme inducers such as isoniazid, rifampicin or phenobarbital, or history of liver damage after use of methoxy-flurane or other inhaled anaesthetic
- ☐ **L** Last penthrox administration – 6mL already used today, used yesterday or 15mL total used within last 7 days

**Any unwanted effects or analgesic failure observed?**

☐ No

Is penthrox contraindicated? Y / N

Inform patient of potential **TEMPORARY** unwanted effects:

- Dizziness,
- Headache
- Tiredness
- Nausea (and, rarely, vomiting)
- Taste disturbance
- Dry mouth
- Coughing
- Restlessness or agitation
- Altered state of consciousness
- Blurred vision

Does patient consent to using penthrox? Y / N

Clinician to prescribe penthrox

- In the ED, use NC Meds; go to Emergency Medicine (ED) > Analgesia (ED) > Inhaled analgesia > Penthrox (Methoxyflurane)
- In Professor Harper Trauma Clinic / Fracture Clinic, on a paper chart as shown below:

| Medicine | Dose | Route |
|---|---|---|
| Methoxyflurane | 3mL | inhaled |

(Rarely, a second dose might be needed later)

- ☐ Take a penthrox pack and a Patient Alert Card
- ☐ Hand the completed alert card to the patient
- ☐ Deliver penthrox analgesia, following the administration instructions on the next page
- ☐ **For procedural** analgesia, staff trained in penthrox administration must remain present
- ☐ Record any unwanted side effects/failure in box
- ☐ Institute follow-on analgesic strategies, e.g. nerve blocks, splinting and systemic analgesics
- ☐ File this proforma in patient's record when done

Penthrox **NOT** appropriate

Patient was managed by

| Print name | Signature | Position | Date | Time completed |
|---|---|---|---|---|

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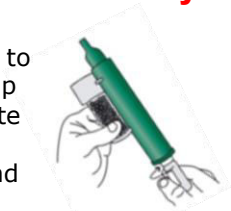
## Administration instructions **Registered, trained staff only**

1. Insert the activated carbon chamber into the dilutor hole on the top of the inhaler

2. Use the base of the inhaler to loosen the vapour bottle cap with a ½ turn, then separate the bottle from the inhaler and remove the cap by hand



3. Tilt the inhaler to a 45° angle and pour the total contents of the bottle into the base of the inhaler whilst rotating it

4. Replace bottle cap bottle and place it in plastic bag from pack. Place bag on patient's trolley so it can later be used to safely dispose of inhaler.

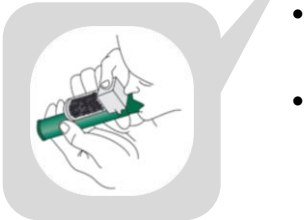
5. Place loop over patient's wrist

6. After use, place inhaler in the plastic bag already containing the vapour bottle, seal and dispose of it in sharps bin

### For spontaneous pain

*Instruct patient as follows:*

- Breathe in and out through the inhaler so the exhaled vapour is captured in chamber
- Breathe gently for the first few breaths and then breathe normally through inhaler (i.e. big breaths are **NOT** required)
- You will feel pain relief after 6-10 breaths
- Continuous inhalation provides pain relief for up to 25-30 minutes, but it is usually **NOT** necessary to inhale constantly and this might also cause unwanted drowsiness
- Inhale intermittently, at the lowest possible dose to achieve pain relief – you will soon get the hang of it!



**NB: Patient must remain on trolley including during imaging or transfer as they might become unsteady**

### For procedural analgesia

*Instruct patient as follows:*

- Breathe in and out through the inhaler so the exhaled vapour is captured in chamber
- Breathe gently for the first few breaths and then breathe normally through the inhaler (i.e. big breaths are **NOT** required)
- Keep going like this for a few minutes to ensure the vapour reaches its maximum effect; we will then start the procedure

*If patient becomes uncomfortable, stop procedure, deepen analgesia then restart; instruct them to do the following*:

- Take deeper breaths now while covering the dilutor hole of the chamber with one finger
- Hold each breath in your lungs for a few seconds before breathing out
- You might become drowsy and loose awareness, but this will make you stop inhaling the vapour and you will then become fully conscious again very rapidly

**NB: Trained staff to remain with patient throughout Penthrox use**

**Remove inhaler from their mouth if they are getting too sedated (recovery should then be rapid)**

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