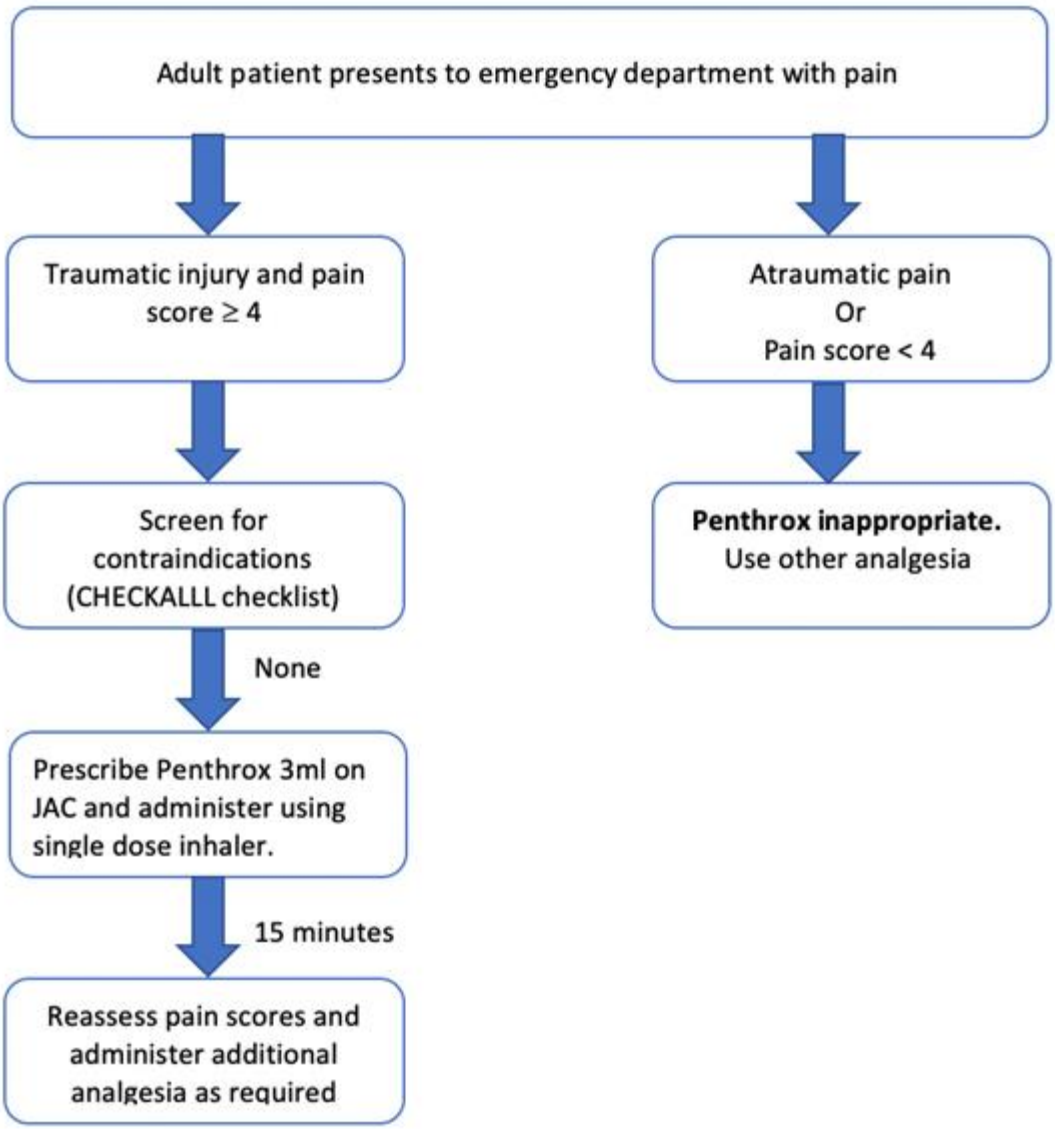
Royal Cornwall Hospitals
NHS Trust

Penthrox (Methoxyflurane) in the Emergency Department Clinical Guideline

V3.0

June 2026

Summary



CHECKALLL Checklist for Penthrox Contraindications

- C cardiovascular instability
- H hypersensitivity to methoxyflurane or any fluorinated anaesthetics
- E PHx or FHx of elevated temperature from anaesthetic or malignant hyperthermia
- C consciousness reduced (including alcohol)
- K kidney impairment or nephrotic drugs
- A age below 18 years
- L lung or respiratory impairment
- L liver impairment or CYP450 inducers
- L last ministration of methoxyflurane (>6mls/24hrs or 15mls/7 days or consecutive days use)

- Nephrotoxic Drugs: Tetracycline, Gentamicin, Colistin, Polymyxin B, Amphotericin
- CYP450 inducers: Alcohol. Carbamazepine, Isoniazid, Phenobarbital, Phenytoin, Primidone, Rifampicin

1. Aim/Purpose of this Guideline

1.1. This aim of this guideline is to improve the management of patients with acute pain associated with traumatic injuries by setting standards for the safe use of Penthrox (methoxyflurane) in the emergency department.

1.2. This version supersedes any previous versions of this document.

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2. The Guidance

2.1. What is Penthrox?

Penthrox (methoxyflurane) is an inhaled vapour that is used for the relief of moderate to severe pain in conscious adults with trauma and associated pain. Methoxyflurane is a fluorinated anaesthetic however Penthorx is used in significantly lower doses than required for a general anaesthetic.

2.2. Indications for Penthrox

Penthrox (methoxyflurane) is licensed for conscious adult patients (18 years and older) with moderate to severe pain (pain score >4) with traumatic injuries such as:

- Fractures.
- Dislocations.
- Lacerations.
- Burns.
- Chest injuries (pneumothorax is not a contraindication).
- Abdominal injuries.

2.3. Contraindications for Penthrox

Penthrox is contraindicated in patients with ATRAUMATIC PAIN and patients with mild pain (pain score <4).

The 'CHECK ALLL' checklist should be used to screen for contraindications.

C Cardiovascular instability.

H Hypersensitivity to methoxyflurane.

E Elevated temperature from anaesthetic (history or family history of malignant hyperthermia).

C Consciousness reduced due to any cause including head injury, alcohol, Drugs.

K Kidney impairment (clinically significant) or nephrotoxic drugs (tetracycline, gentamicin, colistin, amphoertericin, polymxin B).

A Age < 18 years.

L Lung/ respiratory impairment.

L Liver impairment or CYP450 inducers (carbamazepine, isoniazid. phenobarbital, phenytoin, primidone, rifampicin).

L Last administration of methoxyflurane (maximum dose 6mls/24 hours or 15mls/7 days, should not receive doses on consecutive days).

2.4. Side Effects

- Cough.
- Dry mouth.
- Hypotension.
- Central Nervous System (CNS) symptoms including dizziness, drowsiness, amnesia, somnolence.

Side effects are increased if used concomitantly with other CNS depressants.

2.5. Special Warnings

2.5.1. Nephrotoxicity

Methoxyflurane causes nephrotoxicity at high doses due to inorganic fluoride ions, a metabolic breakdown product. Nephrotoxicity is associated with serum levels greater than 40 umol/l, following a single

dose 3ml dose of methoxyflurane levels are below 10 umol/l. Despite this significant safety margin, the lowest dose of methoxyflurane should be used especially in the elderly and patients at risk of renal disease.

2.5.2. Hepatotoxicity

Methoxyflurane is metabolised in the liver. Patients with hepatic impairments and at risk of hepatic impairment, including patients receiving CYP450 enzyme inducers, should not receive Penthrox.

2.5.3. Elderly Patients

Potential effects on blood pressure and heart rate are not significant at analgesic doses, but elderly patients may be at increased risk and caution should be exercised in the elderly.

2.5.4. Occupational Exposure

To reduce occupational exposure the Penthrox inhaler should always be used with the activated carbon filter which absorbs exhaled methoxyflurane.

2.5.5. Pregnancy and Breast Feeding

Caution with the use of Penthrox in pregnancy, especially in the first trimester, and in breast feeding.

2.5.6. Anaesthetics following Penthrox.

Caution using Sevoflurane after Penthrox use.

2.6. Penthrox Dosage

2.6.1. Starting dose one bottle of 3ml Penthrox. Onset of pain relief is rapid and should occur within 6 to 10 inhalations. Continuous inhalation provides analgesia for 25 to 30 minutes. Intermittent inhalation provides analgesia for one hour. Patients should be encouraged to assess their own level of pain and titre the amount of Penthrox inhaled for adequate pain control.

2.6.2. A second bottle (3 ml dose of Penthrox) can be given if needed. No further doses can then be given.

2.6.3. The maximum dose of Penthrox is 6ml (2 bottles) for a single episode. Penthrox should not be administered on consecutive days and the maximum dose is 15ml in 7 days.

2.7. Penthrox Administration

2.7.1. Penthrox is delivered by a single used Penthrox inhaler. Penthrox is self-administered by patients under the supervision of a person trained in its administration.

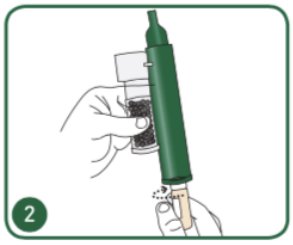
2.7.2. Patient using Penthrox do not require monitoring.

METHOD OF ADMINISTRATION

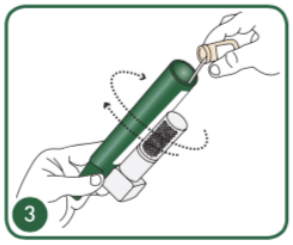
Instructions on the preparation of the PENTHROX Inhaler and correct administration are provided in the Figures below.



Ensure the Activated Carbon (AC) Chamber is inserted into the dilutor hole on the top of the PENTHROX Inhaler.



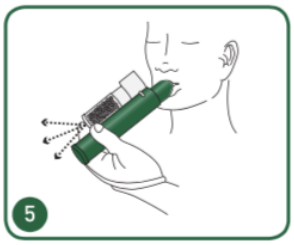
Remove the cap of the bottle by hand. Alternatively, use the base of the PENTHROX Inhaler to loosen the cap with a ½ turn. Separate the Inhaler from the bottle and remove the cap by hand.



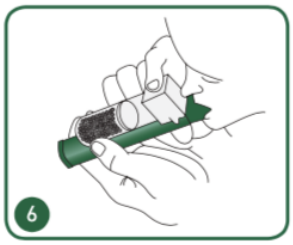
Tilt the PENTHROX Inhaler to a 45° angle and pour the total contents of one PENTHROX bottle into the base of the Inhaler whilst rotating.



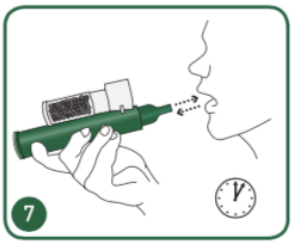
Place wrist loop over patient's wrist. Patient inhales through the mouthpiece of the PENTHROX Inhaler to obtain analgesia. First few breaths should be gentle and then breathe normally through Inhaler.



Patient exhales into the PENTHROX Inhaler. The exhaled vapour passes through the AC Chamber to adsorb any exhaled methoxyflurane.



If stronger analgesia is required, patient can cover dilutor hole on the AC chamber with finger during use.



Patient should be instructed to inhale intermittently to achieve adequate analgesia. Continuous inhalation will reduce duration of use. Minimum dose to achieve analgesia should be administered.



Replace cap onto PENTHROX bottle. Place used PENTHROX Inhaler and used bottle in sealed plastic bag and dispose of responsibly.

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2.8. Penthrox Storage and Disposal

2.8.1. Penthrox will be stored in the emergency department drugs cupboard and will be issued as a single sign out drug.

2.8.2. Lace used methoxyflurane bottles and inhalers into the sealed plastic bag provided and dispose of in a sharps bin.

3. Monitoring compliance and effectiveness

Information Category	Detail of process and methodology for monitoring compliance
Element to be monitored	Monitor safe use of Penthrox in the emergency department according to listed indications and contraindications, incidence of side effects and need for additional analgesia and conscious sedation.
Lead	Dr J Bareham.
Tool	Audit of Penthrox use and adverse events.
Frequency	As adverse events occur.
Reporting arrangements	Report to the emergency department lead and pharmacy team.
Acting on recommendations and Lead(s)	Required changes to practice will be identified and actioned in as rapid timeframe as possible.
Change in practice and lessons to be shared	Required changes to practice will be identified and actioned. A senior member of the emergency department team will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders.

4. Equality and Diversity

4.1. This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the Equality Diversity And Inclusion Policy or the Equality and Diversity website.

4.2. Equality Impact Assessment

The Initial Equality Impact Assessment Screening Form is at Appendix 2.

Appendix 1. Governance Information

Information Category	Detailed Information
Document Title:	Penthrox (Methoxyflurane) in the Emergency Department Clinical Guideline V3.0
This document replaces (exact title of previous version):	Penthrox (Methoxyflurane) in the Emergency Department Clinical Guideline V2.0
Date Issued/Approved:	June 2026
Date Valid From:	June 2026
Date Valid To:	June 2029
Directorate/Department responsible (author/owner):	Dr J Bareham (ED Consultant)
Contact details:	01872 252452
Brief summary of contents:	To give guidance for the safe use of Penthrox in the emergency department.
Suggested Keywords:	Penthrox, Methoxyflurane, trauma, pain, analgesia.
Target Audience:	**RCHT:** Yes **CFT:** No **CIOS ICB:** No
Executive Director responsible for Policy:	Chief Medical Officer.
Approval route for consultation and ratification:	Emergency Department Governance Group. Divisional Governance Group. Pharmacy Group.
Manager confirming approval processes:	Roz Davies
Name of Governance Lead confirming consultation and ratification:	Natasha Andrews.
Links to key external standards:	None
Related Documents:	Educational material supplied by Galen pharmaceuticals.

Information Category	Detailed Information
Training Need Identified?	Yes. Teaching in the emergency department on the use of Penthrox and correct administration method.
Publication Location (refer to Policy on Policies – Approvals and Ratification):	Internet and Intranet.
Document Library Folder/Sub Folder:	Clinical / Emergency Department.

Version Control Table

Date	Version Number	Summary of Changes	Changes Made by
October 2019	V1.0	New document.	Dr J Bareham, ED Consultant.
November 2022	V2.0	Full update.	Dr J Bareham, ED Consultant.
June 2026	V3.0	Full review, transferred to new template – Dr J Bareham confirmed no changes confirmed.	Dr J Bareham, ED Consultant.

All or part of this document can be released under the Freedom of Information Act 2000.

All Policies, Strategies and Operating Procedures, including Business Plans, are to be kept for the lifetime of the organisation plus six years.

This document is only valid on the day of printing.

Controlled Document.

This document has been created following the Royal Cornwall Hospitals NHS Trust The Policy on Policies (Development and Management of Knowledge Procedural and Web Documents Policy). It should not be altered in any way without the express permission of the author or their Line Manager.

Appendix 2. Quality and Equality Impact Assessment (QEIA) Form

The QEIA process allows RCHT to monitor the impact of changes to its policies and services, ensuring that nobody is unduly disadvantaged.

Please ensure you have completed a Quality and Equality Impact Assessment (QEIA) using this link to complete the form:

E11 QEIA Policy

For guidance, please see the QEIA Essentials – Quick Reference Guide or contact as required below:

Equality, Diversity and Inclusion guidance, please contact: rcht.inclusion@nhs.net

Quality Governance guidance, please contact Jillian Tozer: jillian.tozer3@nhs.net