Royal Cornwall Hospitals NHS Trust

Policy Under Review

Please note that this policy is under review. It does, however, remain current Trust policy subject to any recent legislative changes, national policy instruction (NHS or Department of Health), or Trust Board decision. For guidance, please contact the Author/Owner.

Information Category	Detailed Information
Document Title:	Penthrox (Methoxyflurane) in the Emergency Department Clinical Guideline V2.0
This document replaces (exact title of previous version):	Penthrox (Methoxyflurane) in the Emergency Department Clinical Guideline V1.0
Date Issued / Approved:	November 2022
Date Valid From:	November 2022
Date Valid To:	May 2026
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. Urgent, Emergency and Trauma Governance. Group, Pharmacy group.
Manager confirming approval processes:	Johanna Floyd

Information Category	Detailed Information
Name of Governance Lead confirming consultation and ratification:	Paul Evangelista
Links to key external standards:	None required
Related Documents:	None required
Training Need Identified:	No
Publication Location (refer to Policy on Policies – Approvals and Ratification):	Internet and Intranet
Document Library Folder/Sub Folder:	Clinical / Emergency Department

This document is only valid on the day of printing.

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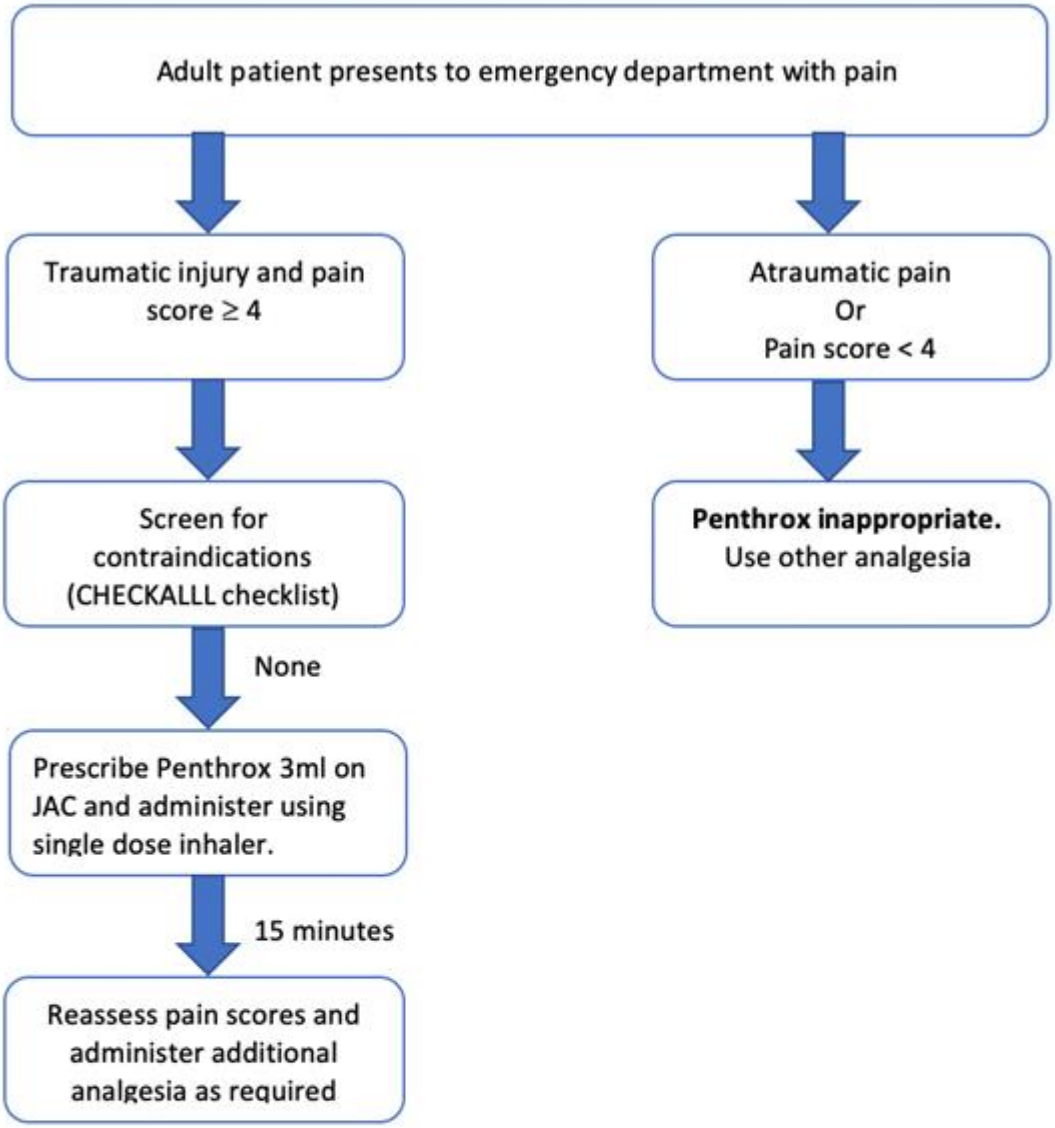
Penthrox (Methoxyflurane) in the Emergency Department Clinical Guideline

V2.0

November 2022

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.

Data Protection Act 2018 (General Data Protection Regulation – GDPR) Legislation

The Trust has a duty under the Data Protection Act 2018 and General Data Protection Regulations 2016/679 to ensure that there is a valid legal basis to process personal and sensitive data. The legal basis for processing must be identified and documented before the processing begins. In many cases we may need consent; this must be explicit, informed, and documented. We cannot rely on opt out, it must be opt in.

Data Protection Act 2018 and General Data Protection Regulations 2016/679 is applicable to all staff; this includes those working as contractors and providers of services.

For more information about your obligations under the Data Protection Act 2018 and General Data Protection Regulations 2016/679 please see the Information Use Framework Policy or contact the Information Governance Team

Royal Cornwall Hospital Trust rch-tr.infogov@nhs.net

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 then 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/24hrs or 15mls/7 days, should not receive doses on consecutive days)

2.4. Side Effects

- Cough
- Dry mouth
- Hypotension
- 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 Penthorx

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 6-10 inhalations. Continuous inhalation provides analgesia for 25-30 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**

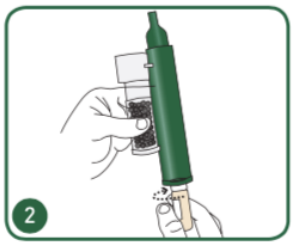
2.7.1. Penthrox is delivered by a single used Penthrox inhaler. Penthrox is self-administered by patients under the supervision of a person trained in its administration.

2.7.2. Patient using Penthrox do not require monitoring.

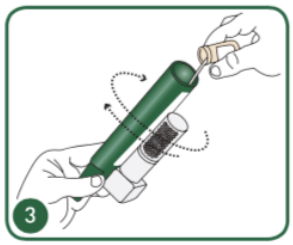
METHOD OF ADMINISTRATION

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.

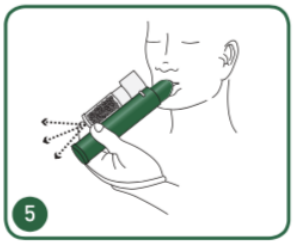


Remove the cap of the bottle by hand. Alternatively, use the base of the PENTHROX Inhaler to loosen the cap with a ½ turn. Separate the Inhaler from the bottle and remove the cap by hand.

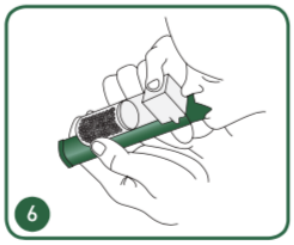


Tilt the PENTHROX Inhaler to a 45° angle and pour the total contents of one PENTHROX bottle into the base of the Inhaler whilst rotating.

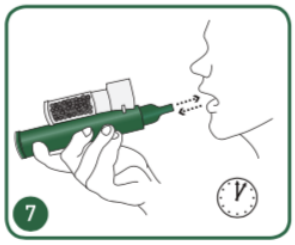
Place wrist loop over patient's wrist. Patient inhales through the mouthpiece of the PENTHROX Inhaler to obtain analgesia. First few breaths should be gentle and then breathe normally through Inhaler.



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.

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 form to be completed for all patients receiving Penthrox during trial period (appendix 3)
Frequency	Audit form will be completed for all patients receiving Penthrox during the trial period (12 months). At the end of the trial period the audit results will be presented at emergency department clinical governance meeting.
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, Inclusion and Human Rights 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
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This document replaces (exact title of previous version):	Penthrox (Methoxyflurane) in the Emergency Department Clinical Guideline V1.0
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Date Valid To:	November 2025
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
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Executive Director responsible for Policy:	Chief Medical Officer
Approval route for consultation and ratification:	Emergency Department Governance Group Urgent, Emergency and Trauma Governance Group, Pharmacy group
General Manager confirming approval processes:	Johanna Floyd
Name of Governance Lead confirming approval by specialty and care group management meetings:	Paul Evangelista
Links to key external standards:	None
Related Documents:	Educational material supplied by Galen pharmaceuticals
Training Need Identified?	Yes. Teaching in the emergency department on the use of Penthrox and correct administration method.

Information Category	Detailed Information
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

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

This document is to be retained for 10 years from the date of expiry.
This document is only valid on the day of printing

Controlled Document

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Appendix 2. Equality Impact Assessment

Section 1: Equality Impact Assessment (EIA) Form

The EIA process allows the Trust to identify where a policy or service may have a negative impact on an individual or particular group of people.

For guidance please refer to the Equality Impact Assessment Policy (available from the document library) or contact the Equality, Diversity and Inclusion Team rcht.inclusion@nhs.net

Information Category	Detailed Information
Name of the strategy / policy / proposal / service function to be assessed:	Penthrox (Methoxyflurane) in the Emergency Department Clinical Guideline V2.0
Directorate and service area:	Emergency Department
Is this a new or existing Policy?	Existing
Name of individual completing EIA (Should be completed by an individual with a good understanding of the Service/Policy):	Dr J Bareham, ED Consultant
Contact details:	01872 252452

Information Category	Detailed Information
1. Policy Aim - Who is the Policy aimed at? (The Policy is the Strategy, Policy, Proposal or Service Change to be assessed)	To promote the safe use of Penthrox in the emergency department
2. Policy Objectives	To identify standards required for the safe use of Penthrox in the emergency department
3. Policy Intended Outcomes	To improve the management of patients with traumatic injuries and associated moderate to severe pain in the emergency department
4. How will you measure each outcome?	Audit process Investigation of serious adverse events
5. Who is intended to benefit from the policy?	Adult patients (aged 18 years and older) with traumatic injuries and moderate to severe pain (pain score ≥ 4)

Information Category	Detailed Information
6a. Who did you consult with? (Please select Yes or No for each category)	• Workforce: Yes • Patients/ visitors: No • Local groups/ system partners: No • External organisations: No • Other: Yes
6b. Please list the individuals/groups who have been consulted about this policy.	**Please record specific names of individuals/ groups:** Emergency department consultant team Anaesthetic department consultant team Mike Wilcox, Head of Prescribing Support Unit
6c. What was the outcome of the consultation?	Ratified
6d. Have you used any of the following to assist your assessment?	**National or local statistics, audits, activity reports, process maps, complaints, staff or patient surveys: No**

7. The Impact

Following consultation with key groups, has a negative impact been identified for any protected characteristic? Please note that a rationale is required for each one.

Where a negative impact is identified without rationale, the key groups will need to be consulted again.

Protected Characteristic	(Yes or No)	Rationale
Age	No	Policy for patients aged 18 years and older. Additional consideration for elderly patients
Sex (male or female)	No	
Gender reassignment (Transgender, non-binary, gender fluid etc.)	No	
Race	No	
Disability (e.g. physical or cognitive impairment, mental health, long term conditions etc.)	No	Considering mental capacity act and consent issues, consider associated health conditions

Protected Characteristic	(Yes or No)	Rationale
Religion or belief	No	
Marriage and civil partnership	No	
Pregnancy and maternity	No	Additional consideration for pregnant patients
Sexual orientation (e.g. gay, straight, bisexual, lesbian etc.)	No	

A robust rationale must be in place for all protected characteristics. If a negative impact has been identified, please complete section 2. If no negative impact has been identified and if this is not a major service change, you can end the assessment here.

I am confident that section 2 of this EIA does not need completing as there are no highlighted risks of negative impact occurring because of this policy.

Name of person confirming result of initial impact assessment: Dr J Bareham

If a negative impact has been identified above OR this is a major service change, you will need to complete section 2 of the EIA form available here:
Section 2. Full Equality Analysis