Medicine Guideline for the Safe Use of

Methoxyflurane Inhaler for Acute Pain Management

Health
South Eastern Sydney
Local Health District

Methoxyflurane IS A HIGH-RISK MEDICINE **USE WITH CAUTION AND ENSURE THE DIRECTIONS WITHIN THIS PROTOCOL ARE FOLLOWED CAREFULLY**	
Areas where Protocol/Guideline applicable	SESLHD
Authorised Prescribers:	SESLHD Medical Officers and other authorised prescribers.
Important Safety Considerations	**Methoxyflurane must be administered with the attached Activated Charcoal chamber in a well-ventilated area to reduce occupational exposure.** There is limited evidence showing that occupational exposure to ambient levels of methoxyflurane, arising from prescribed use of the Penthrox® inhaler to produce analgesia, has caused harm or has produced unpleasant health issues in healthcare professionals supervising its administration. It should be noted that multiple exposure creates additional risks. A risk assessment MUST be undertaken to mitigate the risk associated with occupational exposure. This should include: • Always using the Activated Carbon (AC) chamber. • Ensuring the patient is educated on how to breathe out through the charcoal inhaler to minimise occupational staff exposure. • Administration in a well-ventilated room. • Pregnant or breastfeeding staff not to supervise the administration of methoxyflurane to limit or avoid their exposure to the volatile agent.
Indication for use	Patients (5 years and over) who require analgesia for the short- term management of acute pain, where an alternative cannot be used, in conscious hemodynamically stable patients **OR** for prompt pain relief before opioid analgesia can be established.

Contra-indications	• Use as an anaesthetic agent • Renal impairment, including glomerular filtration rate (GFR) < 45 mL/min, reduced urine output and reduced renal blood flow. • Renal failure • Hypersensitivity to fluorinated anaesthetics or any ingredients in PENTHROX • Patients susceptible to or having a family history of Malignant Hyperthermia. • Cardiovascular instability • Respiratory depression, airway obstruction or airway burns • Head injury or loss of consciousness • A history of possible adverse reactions in either patient or relatives • Malignant hyperthermia: patients with known or genetically susceptible to malignant hyperthermia • Patients unable to hold the inhaler due to impaired consciousness/cooperation • Patients who are intoxicated with alcohol or illicit drugs.
Precautions	• Liver disease • Diabetic patients • Daily use of methoxyflurane is not recommended because of nephrotoxic potential • In patients under treatment with enzyme inducing drugs (e.g. barbiturates, alcohol, isoniazid or rifampicin) the metabolism of methoxyflurane may be enhanced resulting in increased risk of nephrotoxicity • Intravenous adrenaline or nor-adrenaline should be employed cautiously during methoxyflurane administration • Caution should be exercised in the elderly due to possible reduction in blood pressure or heart rate
	Pregnancy: Considered safe to use
	Lactation: Considered safe to use
Important Drug Interactions	As methoxyflurane is used only for short periods at subanaesthetic concentrations, **drug interactions are unlikely.** Concurrent use of gentamicin, colistin, polymyxin B, amphotericin B and other antibiotics of known **nephrotoxic potential** are not recommended as it may result in fatal renal toxicity. Concomitant use of Penthrox with CNS depressants e.g. opioids may produce additive depressant effects. If opioids are given concomitantly with Penthrox, the patient should be observed closely, as is normal clinical practice with opioids. Use with **beta blockers** may cause hypotension
Dosage	**3 mL for a single episode of severe pain** 3 mL dose will provide 25 – 30 minutes of analgesia. A further 3 mL (maximum 6 mL) can be administered if required 30 minutes post first dose to extend analgesia to 60 min. **Maximum dose 6 mL per 24 hours.** **Administration on consecutive days is not recommended.** The total weekly dose should not exceed 15 mL.

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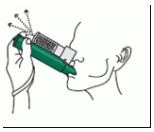
Duration of therapy	**Stat.**
Prescribing Instructions	Methoxyflurane must be prescribed on the eMR, eRIC, or in Mosaiq/ARIA. In the absence of eMM systems, the appropriate paper medication chart may be used. The prescription must ensure that the recommended dose is not exceeded *e.g., "Methoxyflurane, via inhaler, 3-6 mL, max 15 mL/week and once only in 48 hours, for pain with dressing change".*
Administration Instructions	Methoxyflurane should only be administered by inhalation using the equipment as specified in this procedure. It must not be injected or swallowed.
	**Equipment required to administer** • disposable inhaler, • Methoxyflurane 3 mL bottle, • Activated Carbon (A/C) chamber. **Preparation and administration:** • **Ensure the Activated Carbon (A/C) Chamber is inserted into the dilution hole on the top of the inhaler. A new Activated Carbon Chamber and inhaler MUST be used for each bottle** • Tilt the methoxyflurane inhaler and pour the contents of one 3 mL bottle into the base whilst rotating the inhaler. Do not use a plastic syringe to transfer bottle contents into the inhaler • Shake gently to ensure that methoxyflurane is evenly dispersed within the inhaler and wipe the mouthpiece before giving it to the patient • The patient must be on a bed or trolley when using methoxyflurane • The methoxyflurane inhaler is not to be used between the times of the painful procedure for which it was prescribed. For example: it is not to be used to manage pain while ambulating • **The methoxyflurane inhaler should be self-administered** and should not be held to the face/mouth by anybody other than the patient • The methoxyflurane inhaler can be attached to a standard facemask. If a facemask is used, it must be held by the patient i.e., not fastened on the face • Advise the patient to aim for relief of discomfort rather than completely eliminating pain • Place wrist loop over patient's wrist. Identify the mouthpiece and the "diluter" hole for the patient

	**<u>Instruct the patient to inhale through mouthpiece:</u>** • Firstly, to take a couple of gentle breaths to get used to the fruity smell/taste • After this, breathe normally through the inhaler, analgesia will take effect in approximately 6-10 breaths • The patient exhales into the inhaler. The exhaled vapour passes through the A/C chamber to absorb any exhaled methoxyflurane • If the analgesia is inadequate, the patient should be instructed to occlude the diluter hole in order to inspire a higher concentration • Instruct the patient to use the inhaler intermittently as required, using deep breaths to prolong the analgesia. This also allows the patient to have control over their analgesic requirements. • Self-administration ensures that if the patient becomes drowsy then they will no longer be able to hold the mouthpiece and will cease to receive any further methoxyflurane. It will then begin to wear off and drowsiness will resolve • A second dose of 3 mL methoxyflurane bottle, if required and prescribed, can be added to extend the analgesia to approximately 50-60 minutes. **NB. Ensure a new A/C chamber and inhaler is used for the second dose** • Pain relief should continue for a few minutes after cessation of use of methoxyflurane inhaler. • Patient can continue concurrent oxygen therapy if required. See below. • The patient MUST not leave the ward or unit with the Methoxyflurane inhaler.
	Concurrent Oxygen Therapy If the patient is currently requiring oxygen due to their clinical condition, it should continue to be administered during the use of the methoxyflurane inhaler. Oxygen tubing can be attached to the nipple of the base cap of the inhaler and run at the appropriate flow that the patient was previously on. Alternatively, if the patient is currently receiving oxygen via nasal prongs, then they may continue to do so and use the inhaler without additional oxygen being attached to the inhaler.

Monitoring requirements	Observations **pre and post procedure** are to be recorded on the Between The Flags (BTF) on eMR: • pain score • respiratory rate • sedation score • oxygen saturation levels • blood pressure • pulse rate • Constant visual observation of the patient's level of consciousness, airway patency, respirations, oxygen saturation levels, nausea, and pain levels throughout procedure. • Maintaining constant verbal contact to ensure the patient is receiving adequate analgesia and is rousable • If the patient's consciousness level deteriorates remove the methoxyflurane inhaler. Ensure the patient's airway is supported until they can maintain by themselves, consider administering supplemental oxygen • Activate clinical review, rapid response, or medical emergency if observations meet calling criteria or other clinical condition of concern • If nausea occurs, discontinue, and administer antiemetic as prescribed • The patient is **not** to be left unattended during methoxyflurane use • If patient is known to have respiratory disease, use continuous pulse oximetry • The patient must not leave the ward or unit with the methoxyflurane inhaler • Renal function should be monitored in patients who have frequent use and/or at risk of renal impairment.
Patient Discharge	When discharged after methoxyflurane administration, patients should be advised not to drive motor vehicles or bicycles, operate machinery, make important decisions or engage in hazardous sports for 24 hours. Patients should be discharged into the care of a responsible adult.
Adverse Effects	<u>Common (>1%):</u> • Nausea, vomiting. • Drowsiness. • Headache. • Respiratory depression. • Coughing. • Amnesia. • Dizziness. • Fever. • Polyuria. <u>Rare (<0.1%):</u> • Hepatic toxicity • Malignant hyperthermia
Management of Complications	If signs of an allergic reaction, anaphylaxis, or adverse drug reaction present, cease medication and call for urgent medical review.

Storage requirements	Store below 30°C. <u>Disposal</u> • Dispose the used inhaler and chamber in a sealed zip-lock style plastic bag (to prevent evaporation) into a contaminated waste non-sharp rubbish container • Methoxyflurane glass bottles must be sealed with a lid and disposed of in the sharps container.
Additional Resources	There is a My Health Learning module available which takes approximately 10 minutes and is applicable for all clinicians that administer Methoxyflurane for pain management. **The course code is: 398948285 – Methoxyflurane.**
Basis of Protocol/Guideline: (including sources of evidence, references)	1. Coffey, F., Dissmann, P., Mirza,K & lomax, M(2016) Methoxyflurane Analgesia in Adult Patients in the Emergency Department: A Subgroup Analysis of a Randomized, Double-blind, Placebo-controlled Study (STOP!) Advances in Therapy.33(11):2012-2031. 2. NPS (2010) Methoxyflurane (Penthrox) for analgesia. NPS Radar 3. AMH (2021) Australian Medicines Handbook Online 4. MIMS Online (2021) MIMS Australia Online 5. Ministry of Health Policy Medication Handling in NSW Public Health Facilities. 6. Therapeutic Guidelines (2020) eTG Complete General principles of acute pain management. 7. Pregnancy and Breastfeeding Medicines Guide. The Royal Women's Hospital
Groups consulted in development of this guideline	Pain Management, Ambulatory Care, Haematology, Nursing, Pharmacy

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GOVERNANCE	
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