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## Medicine Guideline for the Safe Use of Methoxyflurane Inhaler for Acute Pain Management



<b><i>Methoxyflurane IS A HIGH-RISK MEDICINE</i></b>	
<b>USE WITH CAUTION AND ENSURE THE DIRECTIONS WITHIN THIS PROTOCOL ARE FOLLOWED CAREFULLY</b>	
<b>Areas where Protocol/Guideline applicable</b>	SESLHD
<b>Authorised Prescribers:</b>	SESLHD Medical Officers and other authorised prescribers.
<b>Important Safety Considerations</b>	<p><b>Methoxyflurane must be administered with the attached Activated Charcoal chamber in a <u>well-ventilated area</u> to reduce occupational exposure.</b></p> <p>There is limited evidence showing that occupational exposure to ambient levels of methoxyflurane, arising from prescribed use of the Pentrox® 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 exposures create additional risks.</p> <p>A risk assessment <b>MUST</b> be undertaken to mitigate the risk associated with occupational exposure. This should include:</p> <ul style="list-style-type: none"> <li>• Always using the Activated Carbon (AC) chamber.</li> <li>• Ensuring the patient is educated on how to breathe through the inhaler to minimise passive exposure to staff and others in the vicinity.</li> <li>• Administration in a well-ventilated room.</li> <li>• Pregnant or breastfeeding staff not to supervise the administration of methoxyflurane to limit or avoid their exposure to the volatile agent.</li> </ul>
<b>Indication for use</b>	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 <b>OR</b> for prompt pain relief before opioid analgesia can be established.
<b>Contra-indications</b>	<ul style="list-style-type: none"> <li>• Use as an anaesthetic agent</li> <li>• Renal impairment, including glomerular filtration rate (GFR) &lt; 45 mL/min, reduced urine output and reduced renal blood flow.</li> <li>• Hypersensitivity to fluorinated anaesthetics or any ingredients in PENTHROX</li> <li>• Cardiovascular instability</li> <li>• Respiratory depression, airway obstruction or airway burns</li> <li>• Head injury or loss of consciousness</li> <li>• A history of possible adverse reactions to methoxyflurane of inhaled anaesthetics in either patient or relatives</li> <li>• Malignant hyperthermia: patients with known or genetically susceptible to malignant hyperthermia</li> <li>• Patients unable to hold the inhaler due to impaired consciousness/cooperation</li> <li>• Patients who are intoxicated with alcohol or illicit drugs.</li> </ul>

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<b>Precautions</b>	<ul style="list-style-type: none"> <li>• Liver disease – including underlying hepatic conditions or with risks for hepatic dysfunction</li> <li>• Renal impairment</li> <li>• Diabetic patients. The likelihood of developing nephropathy is also increased if patients have impaired renal function or polyuria, are obese or their diabetes is not optimally controlled</li> <li>• Daily use of methoxyflurane is not recommended because of nephrotoxic potential.</li> <li>• 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 toxicity</li> <li>• Caution should be exercised in the elderly due to possible reduction in blood pressure or heart rate</li> <li>• The minimum effective dose should be administered, particularly in paediatric populations</li> </ul> <p><b>Pregnancy:</b> Considered safe to use</p> <p><b>Lactation:</b> Considered safe to use</p>
<b>Important Drug Interactions</b>	<p>As methoxyflurane is used only for short periods at subanaesthetic concentrations, <b>drug interactions are unlikely.</b></p> <ul style="list-style-type: none"> <li>• Concurrent use of gentamicin, colistin, polymyxin B, amphotericin B, tetracyclines and other antibiotics of known <b>nephrotoxic potential</b> are not recommended as it may result in fatal renal toxicity.</li> <li>• Intravenous adrenaline or noradrenaline should be employed cautiously during methoxyflurane administration</li> <li>• Concomitant use of Pentrox with CNS depressants e.g. opioids may produce additive depressant effects. If opioids are given concomitantly with Pentrox, the patient should be observed closely, as is normal clinical practice with opioids.</li> <li>• Use with <b>beta blockers</b> may cause hypotension</li> <li>• Concomitant use with <b>contrast agents</b> due to nephrotoxic effect.</li> </ul>
<b>Dosage</b>	<p><b>3 mL for a single episode of severe pain</b> 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 minutes. <b>Maximum dose 6 mL per 24 hours.</b> <b>Administration on consecutive days is not recommended.</b> The total weekly dose should not exceed 15 mL.</p>
<b>Duration of therapy</b>	<b>Stat.</b>
<b>Prescribing Instructions</b>	<p>Methoxyflurane must be prescribed on the eMR, eRIC, or in Mosaik/ARIA. In the absence of eMM systems, the appropriate paper medication chart may be used.</p> <p>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”.</p>
<b>Administration Instructions</b>	<p>Methoxyflurane should only be administered by inhalation using the equipment as specified in this procedure. It must not be injected or swallowed.</p>

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	<p>The methoxyflurane inhaler should be self-administered and should not be held to the face/mouth by anybody other than the patient. Can be attached to a standard facemask, however it must be held to the mask by the patient and not fastened on the mask.</p>
	<p><b>Equipment required to administer</b></p> <ul style="list-style-type: none"> <li>• Disposable Pentrox Inhaler</li> <li>• Methoxyflurane 3 mL bottle</li> <li>• Activated Carbon (A/C) chamber</li> </ul>
	<p><b>Preparation and Administration</b></p> <ol style="list-style-type: none"> <li>1. Ensure patient is on bed or trolley</li> <li>2. Ensure the AC chamber is inserted into the dilutor hole on the top of the Pentrox Inhaler. A new AC chamber and inhaler <b>MUST</b> be used for each bottle.</li> <li>3. Holding the methoxyflurane bottle upright, use the base of the Pentrox inhaler to loosen the cap with a ½ turn. Separate the inhaler from the bottle and remove the cap by hand.</li> <li>4. Tilt the Pentrox inhaler to a 45° angle and pour the contents of one bottle into the base whilst rotating. Do not use a plastic syringe to transfer bottle contents into the inhaler.</li> <li>5. Shake gently to ensure the methoxyflurane is evenly dispersed within the inhaler and wipe the mouthpiece before giving it to the patient.</li> <li>6. Place the wrist loop over the patient's wrist.</li> </ol> <p><b>Instruct the patient to inhale through the mouthpiece:</b></p> <ol style="list-style-type: none"> <li>1. Inhale and exhale through the mouthpiece of inhaler to obtain analgesia. The first few breaths should be gentle to get used to the fruity smell/taste and then breathe normally through inhaler. Analgesia will take effect in approximately 6-10 breaths.</li> <li>2. Patient exhales into the inhaler. The exhaled vapour passes through the AC chamber to adsorb any exhaled methoxyflurane.</li> <li>3. If stronger analgesia is required, patient can cover dilutor hole with finger during inhalation to inspire a higher concentration</li> <li>4. Instruct the patient to use the inhaler intermittently to achieve adequate analgesia. This allows the patient to have control over their analgesic requirements. Continuous administration will reduce the time of analgesia</li> <li>5. A second dose of 3mL Methoxyflurane if required, may be prescribed to extend the analgesia to approximately 50-60 minutes. NB: Ensure a new AC chamber and inhaler is used for the second dose. Refilling must be conducted in a well-ventilated environment.</li> <li>6. Replace cap onto Pentrox bottle. Place used Pentrox inhaler and used bottle in sealed plastic bag and disposed of responsibly.</li> </ol> <p><b>Practice points:</b></p> <ul style="list-style-type: none"> <li>• 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 should resolve.</li> <li>• Pain relief should continue for a few minutes after cessation of use</li> <li>• Patient can continue concurrent oxygen therapy if required (see below)</li> <li>• The patient <b>MUST NOT</b> leave the ward or unit with the Methoxyflurane inhaler.</li> <li>• 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 for pain while ambulating.</li> </ul>

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<b>Concurrent Oxygen Therapy</b>	<p>If the patient is currently requiring oxygen due to their clinical condition, it should continue to be administered during the use of 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.</p> <p>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.</p>
<b>Monitoring requirements</b>	<p>Observations <b>pre and post procedure</b> are to be recorded on the Between The Flags (BTF) on eMR:</p> <ul style="list-style-type: none"> <li>• pain score</li> <li>• respiratory rate</li> <li>• sedation score</li> <li>• oxygen saturation levels</li> <li>• blood pressure</li> <li>• pulse rate</li> </ul> <ul style="list-style-type: none"> <li>• Constant visual observation of the patient's level of consciousness, airway patency, respirations, oxygen saturation levels, pallor, muscle relaxation, nausea, and pain levels throughout procedure.</li> <li>• Maintaining constant verbal contact to ensure the patient is receiving adequate analgesia and is rousable</li> <li>• 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</li> <li>• Activate clinical review, rapid response, or medical emergency if observations meet calling criteria or other clinical condition of concern</li> <li>• If nausea occurs, discontinue, and administer antiemetic as prescribed</li> <li>• The patient is <b>not</b> to be left unattended during methoxyflurane use</li> <li>• If patient is known to have respiratory disease, use continuous pulse oximetry</li> <li>• Renal function should be monitored in patients who have frequent use and/or at risk of renal impairment.</li> </ul> <p>The <b>cumulative dose</b> received by patients receiving intermittent doses of Pentrox for painful procedures (such as wound dressings) must be carefully monitored to ensure the recommended dose of Methoxyflurane is not exceeded.</p>
<b>Patient Discharge</b>	<p>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.</p>

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<b>Adverse Effects</b>	<p><u>Common (&gt;1%):</u></p> <ul style="list-style-type: none"> <li>• Nausea, vomiting.</li> <li>• Dry mouth.</li> <li>• Toothache.</li> <li>• Drowsiness.</li> <li>• Headache.</li> <li>• Somnolence.</li> <li>• Euphoria</li> <li>• Coughing.</li> <li>• Amnesia.</li> <li>• Dizziness.</li> <li>• Fever.</li> <li>• Polyuria.</li> </ul> <p><u>Rare (&lt;0.1%):</u></p> <ul style="list-style-type: none"> <li>• Hepatic toxicity</li> <li>• Malignant hyperthermia</li> </ul>
<b>Management of Complications</b>	If signs of an allergic reaction, anaphylaxis, or adverse drug reaction present, cease medication and call for urgent medical review.

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<b>GOVERNANCE</b>	
Enactment date <i>Reviewed</i> (Revision 1) <i>Reviewed</i> (Revision 2)	Replaces SESLHDPR/325 Pain Management - Methoxyflurane Inhaler for Adult Patients – original December 2010 <i>Revision 1</i> - August 2023 <i>Revision 1</i> - August 2025
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