Waikato District Health Board	Type: **Drug guideline**	Document reference: **1868**	Manual Classification: **Waikato DHB Drug guidelines**
Title: **Methoxyflurane (Penthrox®) Analgesia**			Effective date: **31 March 2013**
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1. Purpose and scope

Penthrox can be administered in specially designated areas of the hospital by nursing/medical staff that have undergone specific training in its use. If you would like to establish your work area as a place where methoxyflurane can be administered and/or you need personal training in the use of the methoxyflurane inhaler please contact the Inpatient Pain Service (IPS).
Methoxyflurane can only be prescribed by the IPS (or prescribers authorised by the IPS). Once prescribed, the chart has to be faxed to Pharmacy Services for individual supply of methoxyflurane (there are no ward stocks of methoxyflurane)

The Methoxyflurane Key person in your area is:

AREA _____PERSON _____

2. Drug

Drug	**Methoxyflurane (Penthrox®)**
Drug action	Methoxyflurane is an inhalational anaesthetic agent that provides profound analgesia at concentrations that do not cause unconsciousness. It is no longer used for general anaesthesia because prolonged exposure to anaesthetic doses is associated with renal toxicity. No cases of renal toxicity have been reported with analgesic doses. Methoxyflurane alters the perception of pain and reduces suffering. Patients describe 'floating separately from the pain' or feeling 'discomfort rather than pain'. There is a degree of amnesia related to the painful event. At analgesic doses there is no clinical depression of respiration or the circulation. Methoxyflurane is <u>self-administered</u> via a Penthrox inhaler only. It enters the lungs in the form of a vapour. It is rapidly distributed into the blood and tissues. 50-70% of the dose is metabolised in the liver and kidneys, the remaining drug is exhaled unchanged. Analgesia commences after 8-10 breaths. As the drug is self-administered, the patient spontaneously ceases administration should excessive drowsiness occur and restarts if required. Methoxyflurane is not flammable or explosive.
Indications	Dressing Changes: Burns/ necrotising fasciitis/ surgical wounds Minor procedures: Superficial abscess drainage/ Manipulation of greenstick fractures/ Biopsies/ Adjunct to local anaesthesia for termination of early pregnancies/ Chest drain insertion or removal Radiation Oncology: Removal of brachytherapy rods Interventional radiology: Vascular access/ drainage of collections Physiotherapy: Mobilisation post- joint replacements, other fractures, burns Anaesthesia: Insertion of regional anaesthesia blocks and

	vascular access
Presentation	3 mL bottle to be added to Penthrox inhaler as directed. "Combination Pack" contains 1x 3ml bottle of methoxyflurane, 1x Penthrox inhaler and 1x AC chamber
Route	Inhalation
Dose	12 years and over: Maximum volume of 6mL/ day and 15mL/week. Under 12 years: Maximum volume of 3mL/day and 9mL/week. 3 mls will last approx 20-25 min of continuous use; 6 mls will last 50-60 min Administration on consecutive days is generally not recommended.
Contraindications	• Inadequate patient cooperation/understanding • Pts < 8yr/age • Known moderate to severe renal dysfunction • Previous liver dysfunction related to volatile anaesthesia • Malignant hyperpyrexia (MH) / Family history of MH without negative personal test • Decreased level of consciousness • Raised intracranial pressure • Significant cardiovascular compromise • Concurrent administration of drugs with known nephrotoxic potential, in particular: tetracyclines, gentamycin, kanamycin, colistin, polymyxin b, cephalodrine, amphotericin B. • Pre-eclampsia • Psychosis If in doubt discuss with Inpatient Pain Service
Precautions	• Concurrent sedative drugs • Mild renal impairment or suspected renal impairment- use of methoxyflurane generally not recommended in patients with any degree of renal dysfunction but should be assessed on a case by case basis. Discuss with Inpatient Pain Service. • Concurrent administration of drugs with know enzyme inducing properties, in particular barbiturates • Concurrent use of beta-blocking drugs (increased risk of hypotension) • Do not expose to temperatures >40ºC
Incompatibilities	• Not applicable
Adverse effects	• Headache • Nausea • Marked sedation • Coughing • Dizziness • Malignant Hyperpyrexia (MH)

3. Administration

Competency for administration	Doctor or Registered Nurse - must hold current certification for administration of Methoxyflurane
Preparation	**Patient advice/ explanation** Offer the patient a copy **of** *Penthrox Consumer Information* leaflet to read. **Ensure the patient:** • Knows how to use the inhaler (you can demonstrate with unprimed inhaler). • Expects characteristic smell/ taste. • Knows how to use the dilutor hole to get a stronger analgesic effect. • Is alert to potential contraindications/side effects. • Understands that they should not drive or operate complex machinery for at least 12hr after using device. **Prepare Inhaler** a. Ensure access to a supply of oxygen (wall/ cylinder) b. Know how to access the emergency trolley should it be required c. Check baseline temperature d. Do the baseline observations e. Check activated charcoal (AC) chamber is pre-inserted into dilutor hole of inhaler (it will absorb exhaled vapour). f. Tilt inhaler to 45 degrees and slowly pour all of the contents of the 3ml bottle into base of inhaler while rotating the inhaler g. Shake lightly to ensure even distribution throughout inhaler h. Place wrist loop around patient's wrist.
Observations and Management	Blood Pressure, O_2 Saturation, Heart Rate, Sedation level (verbal contact must be maintained at all times) prior to commencing then every 5 minutes until stable post procedure. Take the patient's temperature just before starting methoxyflurane, and then take it again 15min and 30 min post procedure. **Inhaler Technique** a. Advise patient to inhale *and* exhale through mouthpiece of inhaler slowly at first, then deeper breaths. b. Pain relief should be obtained in 8-10 breaths; if stronger pain relief is required advise patient to cover dilutor hole on top of AC chamber with a finger when inhaling. c. Patient can use inhaler continually or intermittently. d. For procedures lasting over 20-25mins a further 3 mls of methoxyflurane may be needed. e. If the patient becomes over-sedated (verbal contact is lost) remove the inhaler device from patient, keep the patients' airway clear so that they continue to breathe well. Once their level of consciousness improves they can continue to use the inhaler but check the dilutor hole <u>is not</u> covered. **Note:** **<u>At any time</u>** during or within 60minutes of the administration of methoxyflurane a temperature increase of more than 2ºC per hour or cardiovascular instability (especially sustained tachycardia), may indicate malignant hyperpyrexia. Contact the acute pain service (IPS ph 021759512) urgently if one of these changes happens. If the IPS is not contactable within a few minutes then ring the duty Anaesthetist (ph23322). **<u>At no time</u>** leave the patient unattended while they are using the inhaler.

	Never deliberately attempt to induce unconsciousness with the inhaler. **After procedure** a. If no further procedures are anticipated for this patient place used inhaler in supplied sealed plastic bag and dispose of into clinical waste bin. b. If further procedures are likely attach patient identification sticker onto inhaler and place the inhaler in the sealed bag provided. c. Store the device in an appropriate environment e.g. Locked dispensary d. Continue observations every 5 mins until stable e. Recheck temperature at 15 min and 30 min post-procedure **Follow-up** Once patient has recovered from procedure ask them to rate the effectiveness of the analgesia as instructed in the Methoxyflurane data collection form. Complete the rest of the form and fax/send to Inpatient Pain Service (fax/send via anaesthetic dept. ext. 98761). Retain a copy of the completed form in the patients' notes. The information is important both as a record of administration and to allow the APS to optimise the use of methoxyflurane analgesia in the hospital.
Special considerations (audit, funding, storage)	Follow-up Documentation Complete the Methoxyflurane data collection form as instructed above. See storage note above if patient will need to reuse the device. • Prescribing of methoxyflurane is restricted to the Inpatient Pain Service (or prescribers authorised by the Inpatient Pain Service). • Supplies of methoxyflurane are obtained from Pharmacy (no ward based stock). Charts must be faxed to Pharmacy to obtain supply.
Rescue medication	Dantrolene for Malignant Hyperpyrexia under direct instruction of medical staff from the Department of Anaesthesia or Intensive Care

4. Associated documents

- Methoxyflurane Data Collection Form

5. References

- Penthrox (Methoxyflurane) inhalation product information, Medical Developments International Ltd
- Penthrox Consumer Information leaflet, Medical Developments International Ltd

TOP HINTS FOR METHOXYFLURANE ADMINISTRATION

Go slow: "see double"
Allow sufficient time for drug to work-varies from patient to patient. Can take up to a couple of minutes. Patients may describe 'seeing double' or become a bit disinhibited.

Good seal
Ensure good seal around mouthpiece to reduce entrainment of air and dilution of methoxyflurane on inhalation/ contamination of environment with exhaled methoxyflurane that has not been channeled through charcoal filter on exhalation

Gentle first few breaths
Encourage patient to take gentle first few breathe while they get used to the smell/ taste of the drug. Then gradually deepen breaths (+/- cover dilutor hole) to attain sufficient analgesia for procedure

In-Hold-Out
Deep breaths in, hold in lungs for few seconds then exhale

Reassure- suggestibility
Patients can become disinhibited. They are often suggestible and will settle with reassurance and a calm environment

Pt feedback: stop-deepen-restart
If patient becomes uncomfortable stop procedure and deepen analgesia (deep breaths with dilutor hole covered)

Regular verbal contact with patient
Remove inhaler form patients' mouth if they seem to be getting too sedated- should recover rapidly

R/V afterwards: what remember; satisfaction

Ventilate room
If repeated procedures anticipated ventilate room between procedures to minimize occupational exposure to drug

Rotate staff
If multiple procedures anticipated in same session rotate staff supervising sedation to minimize individual exposure to methoxyflurane in environment

When used to facilitate abscess incision and drainage
Use in conjunction with topical/ infiltrated local anaesthesia as outlined *in Minor Surgery Procedure Template*
Local anaesthetic markedly improves the likelihood of being able to complete these procedures successfully

PATIENT INFORMATION: SEDATION FOR MINOR SURGICAL PROCEDURES

You have been admitted to hospital for a minor surgical procedure.

The surgical team looking after you do not think it is possible to do this under local anaesthesia (a numbing injection to the area that needs to be operated on).

There are 2 alternative ways of providing you with pain relief and sedation for this procedure:

The first involves a general anaesthetic. This involves you being put to sleep by an anaesthetist in an operating theatre. You will have a small needle placed into a vein in your arm. Medication that makes you fall asleep will be injected into the vein and while you are asleep a breathing tube will be placed into your airway to help you to breathe during the operation. This tube will be taken out as you are waking up.

For most people a general anaesthetic is very safe but there are some risks with any anaesthetic and a list of these is shown overleaf.

Some people may prefer the idea of being totally asleep for the procedure (such as young children or people who are particularly anxious).

A general anaesthetic needs to be given in an operating theatre. Each day all the emergency operations that are awaiting surgery are prioritised and patients with the most life threatening problems are operated on before those needing more minor procedures. Unfortunately this can lead to a delay in people needing minor surgery (such as yourself) having their operation done.

On average you would spend about 2 nights in hospital waiting for your surgery, though sometimes this can be 3 or even 4 nights if the operating theatres are particularly busy. Each day you are waiting for your operation you will need to be starved of food and water from 2am. If it has not been possible to do your operation on that day you will be given a meal in the evening and then starved again from 2am the following morning.

Some patients find this wait and the period of starvation frustrating, so recently we have introduced a new technique of sedation that allows patients to be treated in a timelier manner:

If you choose this second option your procedure can be carried out in a procedural room on the surgical ward so there is not the delay associated with waiting for a place to become available in the main operating theatres. You would still need to be starved for a period of 6 hours before the procedure is carried out, but this still means you would usually have your surgery on the morning after your admission and you would be able to go home a few hours later.

You will be sedated with a strong inhaled painkiller (called Penthrox or methoxyflurane) that you are able to administer to yourself. This allows you to give yourself as much or as little pain relief as you feel that you need but does not send you fully to sleep. This medication, when used in combination with the numbing local anaesthetic generally allows patients to have their procedure done with minimal discomfort.

Another advantage is that you recover from the sedation much more quickly than you would recover from a general anaesthetic and you are less likely to feel sick afterwards. This means you will be able to get home sooner after your operation.

There are some patients who will not be suitable for the Penthrox sedation (including patients with kidney problems, patients on particular medications or patients that have had problems with previous anaesthetics including jaundice or a rare condition called malignant hyperpyrexia). The surgical team looking after you will discuss with you if Penthrox sedation is possible for you. In the meantime please read the enclosed information and this will help you to decide which technique you think would be most suitable for you.

Please note that regardless of whether you have a general anaesthetic or the Penthrox sedation, you should not drive, operate complex machinery or drink alcohol for 24 hours.

METHOXYFLURANE DATA COLLECTION FORM

PATIENT ID LABEL

Date:

Time:

Prescribed by:

Administered by:

Department:

Purpose of Administration:

Pre-Administration Checklist

Does your patient…

1.	Have known/possible renal impairment?	Y	N
2.	Take any potentially renal toxic medications? (see protocol for list)	Y	N
3.	Have a personal or family history of malignant hyperpyrexia?	Y	N
4.	Have a history of liver dysfunction related to volatile anaesthetic agents?	Y	N
5.	Have decreased level of consciousness?	Y	N
6.	Have raised intracranial pressure?	Y	N
7.	Have significant cardiovascular compromise	Y	N

If answer is YES to any of these questions your patient is not suitable for methoxyflurane. If uncertain please discuss with acute pain service. Contact: pager 20439 or mobile 021 759 512.

	Baseline	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45 min	50 min	55 min	60 min
Heart Rate													
Blood Pressure													
Oxygen Saturation													
Respiratory Rate													
Verbal Contact (Y/N)													

Temperature: Baseline _____
Post-procedure 15 min _____
30 min _____

Patient Satisfaction/Comments:

Please fax a copy of this form to the acute pain service on #### and place the original in the patients notes.

Purpose of procedure:

Ward based sedation for minor surgery including drainage of abscesses using a combination of topically and subcutaneously applied local anaesthesia and inhaled methoxyflurane (penthrox)

1. Personnel required:

(1) Surgeon with appropriate experience
(2) Doctor or Registered Nurse that will administer sedation - must hold current certification for administration of methoxyflurane
(3) Assistant to 2 above personnel: Dr/ RN/ EN/ HCA

2. Equipment:

Trolley- able to tilt head down
Adequate light source
Minor surgical theatre pack
Sterile gowns and gloves of appropriate sizes
Syringes: 10 and 20 ml with 24g needles
Local anaesthetic: 30g topical EMLA tube; 1% lignocaine; 2% lignocaine; 2% lignocaine with 1:200,000 adrenaline
Penthrox inhaler with 3+3mls methoxyflurane liquid
Emergency trolley on ward
Oxygen in room and facemask, tubing, ambubag, guedel (oropharyngeal) airway
Suction available if required
Monitoring equipment (BP, HR, Oxygen saturations)

3. Safety:

Patient:
Prior to procedure it should be confirmed that the patient does not have a contraindication to the use of methoxyflurane (see drug guideline) and the pre-administration checklist should be completed.
A maximum of 6 mls of methoxyflurane should be administered to a patient per day and a maximum of 15mls per week. The patient should not be exposed to methoxyflurane on consecutive days
The patient should be starved for a minimum of 6 hrs food and 2 hrs water prior to the procedure being undertaken

Staff:
Most of the exhaled methoxyflurane is absorbed onto the activated charcoal as the patient breathes out through the inhaler's mouthpiece. A small amount of the vapour will escape into the air and staff may be exposed to it. This is thought to be well below levels that are potentially harmful. Despite this the procedural room should be well ventilated (windows open). Staff should satisfy themselves that they do not have a contraindication to methoxyflurane exposure. They

should try to ensure that the patient breaths out through the mouthpiece of the inhaler and avoid being directly breathed on by the patient during exhalation. They should rotate the role of supervising the administration of the agent to the patient to minimise their cumulative exposure to the drug.

PROCEDURE:

ACTION	RATIONALE
Familiarise yourself with "Methoxyflurane Drug Guideline" available on the intranet Satisfy yourself that patient is appropriate for methoxyflurane sedation technique	
Give patient "patient Information" booklet Answer any questions patient may have relating to booklet/ procedure Ensure consent form signed before proceeding	Patients should have the choice of sedation or general anaesthetic for their procedure and understand the implications of each
Patient should be starved for a period of 6 hours prior to the anticipated commencement of the procedure	Reduces the risk of gastric aspiration if the patient becomes deeply sedated during the procedure
ADMINISTRATION OF TOPICAL LOCAL ANAESTHESIA: Ensure patient is not allergic to prilocaine or lignocaine	
EMLA should be applied for a minimum period of 2 hours pre-procedure, but for no longer than 5 hours.	This is the timeframe during which EMLA is optimally effective
Apply over the abscess and to an extended border of 1.5-2cm of non-inflamed skin.	This will allow the subcutaneous injection of local anaesthetic immediately before surgery though skin that has been numbed and should be more comfortable for the patient.
Cover with 1-2 10x12 cm tegaderm film dressings	Improves skin absorption of topical local anaesthetic and stops it being wiped off

PRIOR TO COMMENCING PROCEDURE:	
Move patient into procedural room	
Open windows –ventilation of expired vapour	
Ensure patient has working IV access in situ	
OBSERVATIONS:	Reduces build-up of exhaled methoxyflurane in procedural room.
Blood Pressure, O_2 Saturation, Heart Rate, Sedation level (verbal contact) prior to commencing then every 5 minutes until stable post procedure Baseline temperature then 15min and 30 min post procedure	To ensure patient is not responding unsafely to the drug. Verbal contact should be maintained with patient to ensure sedation is not becoming too deep. Serial temperature measurements to alert staff to the possibility of malignant hyperpyrexia.
COMMENCE ADMINISTRATION OF METHOXYFLURANE VIA THE PENTHROX INHALER ACCORDING TO METHOXYFLURANE DRUG GUIDELINE	
APPLICATION OF SUBCUTANEOUS LOCAL ANAESTHETIC:	Analgesia usually commences within 6-10 deep breaths. However this is variable and some patients may take longer. At appropriate levels of analgesia patients often describe feeling “lightheaded, and seeing double”. They may seem disinhibited.
Wait until patient sufficiently analgesed Remove tegadrem dressing(s) and wipe EMLA cream from area	
Clean skin with alcohol wipes/ iodine/ chlorhexidine 0.5% assuming no allergy	
Calculate maximum dose of lignocaine to be used: 3mg/kg without adrenaline 7mg/kg with adrenaline (1:200,000)	Eg 70kg adult: Lignocaine WITHOUT adrenaline: 3mg/kg x 70kg=210mg = 21mls 1% lignocaine =10.5 mls 2% lignocaine
Lignocaine 2% with adrenaline 1:200,000 can be diluted 50/50 with normal saline to give lignocaine 1% with 1:400,000 adrenaline.	E.g. 70kg adult: Lignocaine WITH adrenaline: 7mg/kg x 70kg =490mg = 49mls 1% lignocaine& adr =24.5mls 2% lignocaine&adr
Use lignocaine with adrenaline wherever possible, but not when injecting around the nipple or penis (risk of ischaemia). Aim to use ½ to 2/3 of maximum calculated allowable volume. This allows extra to be injected during procedure if local anaesthesia incomplete.	

Inject into non-inflamed skin that has had EMLA previously applied. Use fine bore (24g) needle. After first puncture try to always inject through an area already anaesthetised with local anaesthetic. Always aspirate syringe before injecting to reduce risk of intravascular injection. Continue infiltration around abscess until completely surrounded with infiltrated local anaesthetic. Test level of patient comfort by applying toothed forcep pinch to skin over abscess If patient uncomfortable encourage further breathing on inhaler while occluding hole on AC chamber Once patient judged to be comfortable enough commence surgery If patient becomes uncomfortable during procedure pause surgery to allow patient to re-establish an adequate depth of analgesia to allow procedure to continue If the patient is unable to tolerate the procedure despite appropriate use of the penthrox inhaler the procedure should be abandoned; the wound should be dressed and the patient returned to their ward bed and be booked for a general anaesthetic in the acute operating theatre. Unless the operation is unlikely to be performed that day the patient should continue to be fasted pending surgery.	Reduces discomfort during injection of local anaesthetic Around 10% of patients may be unable to tolerate the surgery using this sedation technique. A patient should not be expected to suffer discomfort while the procedure is being performed. The most common time for the patient to become uncomfortable is during the curetting process. The patient should be encouraged to take deep breaths on the inhaler while covering the hole on the AC chamber. In addition a further 10-20mls of 2% lignocaine can be used to irrigate the cavity prior to curettage to improve the likelihood of obtaining adequate analgesia. Even if the procedure needs to be abandoned the patients should still be advantaged by the incision of the skin overlying the abscess and the release of pus.

POST-PROCEDURE: Place used inhaler in supplied sealed plastic bag and dispose of into clinical waste bin. Continue observations every 5 mins until stable Recheck temperature at 15 min and 30 min post-procedure **FOLLOW-UP DOCUMENTATION:** Once patient has recovered from procedure ask them to rate the effectiveness of the analgesia as instructed in the Methoxyflurane data collection form. Complete the rest of the form and fax/send to Acute Pain Service (fax via anaesthetic secretary ext. 8761). Retain a copy of the completed form in the patients' notes.	A temperature increase of greater than 2ºC per hour or cardiovascular instability, especially sustained tachycardia, may indicate malignant hyperpyrexia – contact the acute pain service (APS ph 021759512) urgently. If the APS is not contactable then ring the duty Anaesthetist (ph23322). The information is important both as a record of administration and to allow the APS to optimise the use of Penthrox analgesia in the hospital.
Patient should be advised: Not to drive, consume alcohol or operate complex machinery for 24 hours post-procedure To re-attend hospital if they feel unwell in the few days following the procedure: symptoms including fever, loss of appetite, vomiting, jaundice, abdominal pain reduced urination or swelling of lower legs or feet.	Patient may continue to be affected by methoxyflurane for up to 24hrs following administration. To exclude serious complications related to administration of the drug, further infection or other complication of the surgery
Patient may be discharged from hospital once surgical team satisfied no further intervention required. Ensure patient has discharge letter and script for medication if required	

4. Associated documents

- Methoxyflurane drug guideline- available on intranet (document reference 1868)
- Patient information leaflet: Sedation for minor surgical procedures