



AIMS AND OUTCOMES

The majority of patients presenting with acute pain aren't provided with adequate analgesia (11,12,35).



To potentially address this, we set out the below aims and outcomes – evaluating the benefits and efficacy of methoxyflurane in comparison to the current pre-hospital analgesics.



PENTHROX

Pentrox provides a therapeutic dosage of self-administered inhaled Methoxyflurane – a volatile liquid providing that can provide anaesthesia and analgesia.

Primary use:

Acute emergency relief of moderate to severe musculoskeletal trauma pain in conscious adults

Indicated uses:

- Dislocations
- Fractures
- Lacerations
- Burns
- NOF fracture
- Abdominothoracic injury

Contraindications:

- Hepatorenal impairment
- Cardiovascular instability
- Respiratory depression

Common side-effects:

- Drowsiness
- Nausea
- Headaches
- Dizziness

Dosage

3 - 6ml as required via inhaler device
Max Dose: 6ml/day OR 15ml/week (2,4).

METHOD

Five medical databases were to source papers - Medline, Embase, APA Psychinfo, Cochrane and Pubmed. We used the below search-string:

((Pentrox) OR (methoxyflurane))
AND
(prehospital) OR (out-of-hospital) OR (out of hospital) OR (emergency)
AND
((analgesia) OR (analgesic))
AND
(trauma)

Papers found were then subject to inclusion and exclusion criteria to ensure recent, relevant Randomised Control Trials were evaluated and finally the remaining papers were CASP checked and bias reviewed.

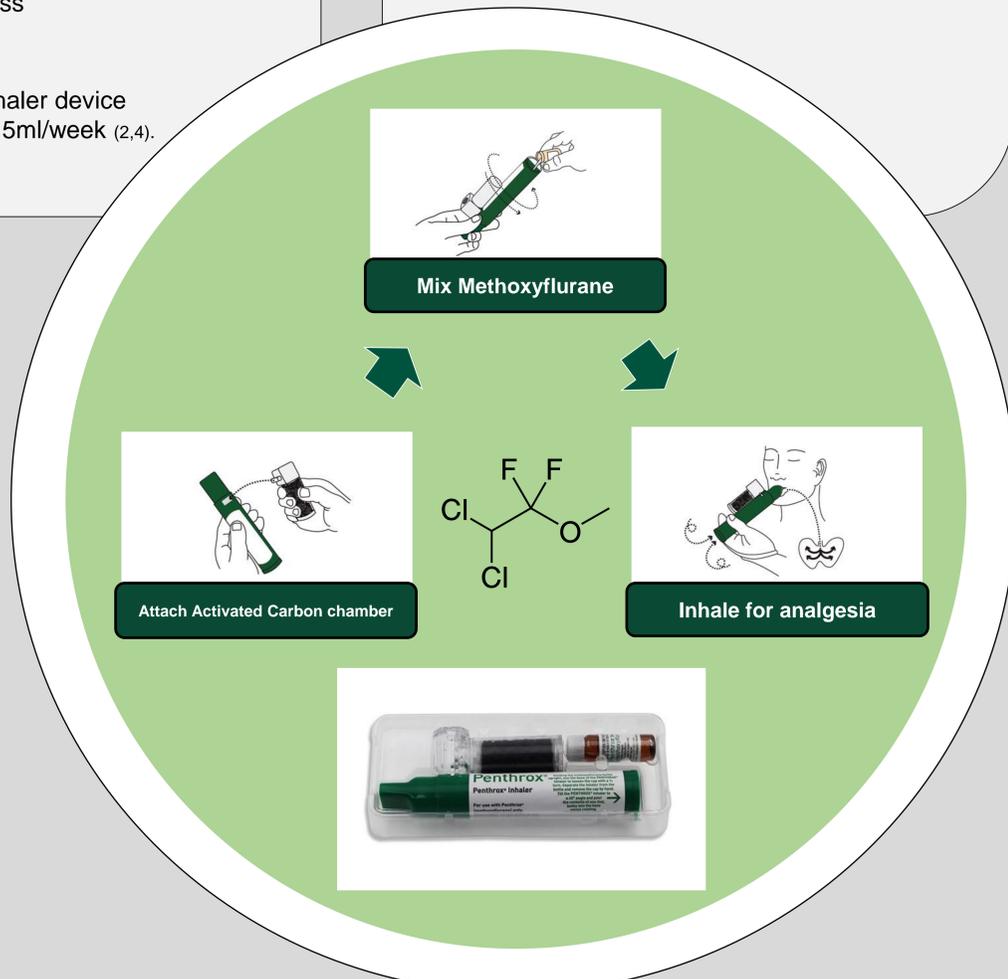
LIMITATIONS AND FURTHER RESEARCH

The greatest limitation preventing the role out of methoxyflurane in all emergency settings is the lack of evidence regarding side effects across a wider patient demographic. There is a general weakness in existing literature as it fails to include the elderly population, for which this medicine could be very beneficial due to the high incidence of falls and major trauma with relatively benign mechanisms, as well as other vulnerable patient groups.

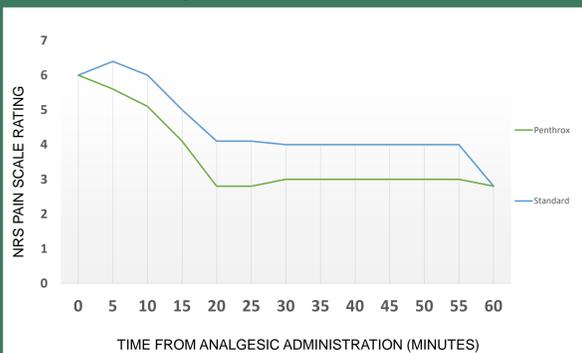
Furthermore, the report found that although patients generally seemed to be in favour of methoxyflurane versus the current standard analgesia (1, 2, 3, 4, 5, 7), only one study produced a statistically significant difference (4). A further area of research is the impact of methoxyflurane on the environment and how sustainable it is for the future - with climate change becoming an ever-bigger issue it is important to consider this.

It should be noted that a large amount of the sourced data was collected in an emergency setting, not specifically pre-hospitally. We do however recognise that this data can be as valuably applied to a pre-hospital setting – this was our intention hence inclusion of outcomes such as ease of use and administration time.

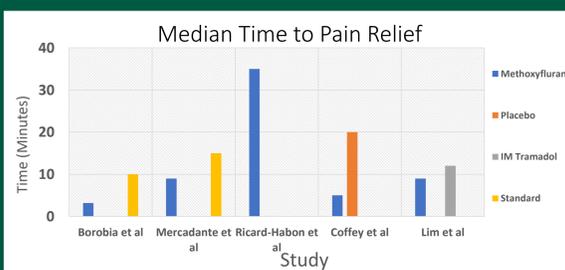
Further research looking at the efficacy of methoxyflurane in comparison to the current standard in the context of assessing economic and environmental burden would help in the decision to include methoxyflurane as part of treatment standards. We found that there was minimal data comparing methoxyflurane to some of the more widely used standards e.g. Entonox and Nitrous Oxide. The data that was used primarily focused on comparing oligoanalgesia – individual drugs as opposed to co-administration e.g. IV morphine alongside IV paracetamol. This would be valuable further research.



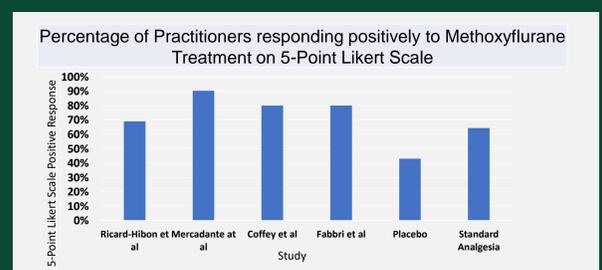
Methoxyflurane showed equal or superior pain relief at all time points recorded (3,5,6).



Methoxyflurane matched or shortened time to analgesia at all times recorded - evidence suggests quicker discharge and faster administration time (6,7).



Methoxyflurane showed equal or greater satisfaction and perceived analgesic effects according to clinicians (1,2,3,4,6).



Outcome 1 Pain Relief

Pain intensity was shown to be notably decreased with methoxyflurane compared to standard analgesia, with all studies showing a greater reduction in Numerical Rating Pain Score at all times recorded; indicating that methoxyflurane provided more effective analgesia than its comparators (6). However, an important limitation to consider is the variety in the pain scores used across the studies. Numerical Rating Scales and Visual Analogue Scales for pain were equivalenced for direct and fair comparison to try and address this.

Outcome 2 Speed of Analgesia

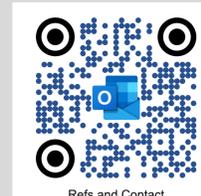
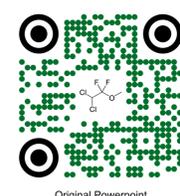
When compared directly to nasal and oromucosal fentanyl, and IV morphine, methoxyflurane displayed decreased time to effective analgesia by 7, 12, and 1 minutes respectively (1). Methoxyflurane is claimed to reduce pain by 5.2 on a visual analogue pain scale within 1 minute of first inhalation (23,24), however, it is important to note that due to the subjectiveness of pain, scoring may vary, leading to possible inconsistencies. Pentrox inhalers can be set up and used to full effect in under 2 minutes (23,24,26,27). This is an important consideration when comparing methoxyflurane to IV analgesia, as this may also reduce time to administration.

Outcome 3 Satisfaction and Safety Profile

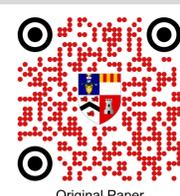
Overall, our report found that practitioners perceptions regarding the use of methoxyflurane as an analgesic were positive. In multiple studies practitioners rated methoxyflurane as superior to other analgesia (1, 4, 7).

Methoxyflurane is widely viewed as a safe drug to use with the most common treatment related adverse effects to be dizziness, mild nausea and drowsiness (3, 5, 8). These studies found that the side effects of methoxyflurane were mild and tolerated by patients (8).

Three studies reported four serious adverse effects from patients who used Pentrox and this is something which requires further research in different patient groups to determine the significance (1, 6, 4).



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