Mid Essex Hospital Services NHS
NHS Trust

ADMINISTRATION OF ENTONOX IN LABOUR	**CLINICAL GUIDELINES** **Register No: 10108** **Status: Public**

Developed in response to:	Intrapartum NICE Guidelines RCOG guideline
Contributes to CQC Standards No	C5a Outcome 4

Consulted With	**Post/Committee/Group**	**Date**
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Related Trust Policies (to be read in conjunction with)	04071 Standard Infection Prevention 04072 Hand Hygiene 06036 Guideline for Maternity Record Keeping including Documentation in Handheld Records 09079 Management of Normal Labour and Prolonged Labour in Low Risk Patients 10008 Dissemination of information to patients in Maternity

Review No	Reviewed by	Review Date

It is the personal responsibility of the individual referring to this document to ensure that they are viewing the latest version which will always be the document on the intranet

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1.0 Purpose of the Guideline

1.1 To advise Health Care Professionals (HCP) regarding the use and administration of entonox.

1.2 To provide information regarding usage, storage and transportation.

2.0 Equality and Diversity

2.1 Mid Essex Hospital Services NHS Trust is committed to the provision of a service that is fair, accessible and meets the needs of all individuals.

3.0 Aim

3.1 To achieve safe administration of entonox.

3.2 To comply with the rules and regulations regarding storage and transportation, particularly with regard to use of portable entonox cylinders used by the Community Midwives.

4.0 Introduction

4.1 Entonox is the brand name for a product containing 50% nitrous oxide and 50% oxygen. It is an inert, colourless gas that is non flammable, but supports combustion above 450 degrees centigrade. It is used for its sedative or analgesic effects. Entonox is often referred to as “gas and air”.

4.2 Entonox can be administered via a cylinder, or via piped apparatus. Entonox is designed to be self administered by the patient, under medical supervision. HCP’s should not hold the mask or mouthpiece for the patient during use, due to the risk of anaesthetising the patient.

4.3 If a patient receives more gas than necessary, they will become drowsy causing them to drop the mouthpiece or mask and the gas will stop flowing. As the patient breathes ambient air, the Entonox effects rapidly wear off and the patient will regain consciousness.
(Refer to Appendix A)

4.4 Inhalation tubing is fixed to the cylinder, or to the piped wall apparatus, via a demand valve system. A hand piece (with a purge button) is connected to the tubing, and a single use, disposable filter and mouthpiece or mask, are attached to the hand piece. By the patient breathing normally through the mouthpiece the demand valve is opened and the gas delivered. The gas is absorbed through the lungs. The valve closes when the patient stops inhaling.

4.5 The analgesic effect of entonox is seen almost immediately after four to five breaths and reaches its maximum effect within two to three minutes. Inhalation should commence shortly before the desired analgesic effect is required, for example at the beginning of a contraction. It should continue throughout the painful aspect of the procedure, or for as long as the analgesic effect is desired. The effects wear off within a few minutes. When administration has ended, the patient should be allowed to recover under calm and controlled conditions – until the patient’s degree of consciousness has recovered satisfactorily.

5.0 Uses of Entonox

- Pain relief in labour
- Short term pain relief during painful clinical procedures, such as suturing.

6.0 Adverse Side Effects

- Dry mouth
- Light headedness
- Inactive vitamin B12
- Vomiting

6.1 Entonox should not be used with any condition where air is entrapped within the body, and where its expansion might be dangerous such as:

- Artificial, traumatic or spontaneous pneumothorax, head injuries with impairment of consciousness
- Air embolism
- Decompression Sickness
- Following a recent dive
- Following air encephalography
- Severe emphysema
- During myringoplasty
- Gross abdominal distension
- Maxillofacial injuries
- Compromised respiratory function

6.2 Entonox should not be used for more than 24 hours without monitoring peripheral blood for megaloblastic anaemia and leucopaenia.

6.3 It is recommended that driving and use of machinery should not be undertaken until 12 hours have elapsed since administration of entonox. Therefore patients should not be allowed to try entonox during parent craft classes and partners are not allowed to sample the entonox whilst they are on the labour ward. This would also be in contravention of NMC Standard for Medicines Management regulations and the NMC Midwives Rules and Standards.
(Refer to the guideline for the 'Dissemination of information to patients in Maternity'; register number 10008)

7.0 Safety of HCP Administering Entonox

7.1 Warning notices prohibiting smoking or naked lights must be clearly posted.

7.2 There is evidence that the following are potential risks to HCP's:

- Chronic exposure to nitrous oxide can cause impairment of vitamin B12- dependent enzyme, which may in turn result in bone marrow depression, megaloblastic changes, and neurological dysfunction

- Prolonged occupational exposure to nitrous oxide may affect a patient's ability to become pregnant

- May have an adverse effect on the developing fetus as determined by the Health and Safety Executive in it's setting of the Occupational Exposure Standard (OES): developmental toxicity

7.3 Effective ventilation and/ or scavenging systems should reduce waste gas levels in the ambient air of treatment rooms to acceptable levels. Levels in these environments should be tested to ensure they are below the workplace exposure limits (WEL) as listed in the HSE publication
(Refer to Appendix B)

8.0 Care and Storage of Entonox

8.1 Delivery systems must be stored away from public view, in a designated place. Precautions should be taken to protect cylinders from theft.

8.2 Cylinders should be kept out of the reach of children.

8.3 Cylinders should be handled with care and not knocked violently or allowed to fall.

8.4 F size cylinders and larger should be stored vertically with the valve uppermost. Cylinders should only be moved with the appropriate size and type of trolley.

8.5 Entonox cylinders must be stored separately in a safe place, in a temperature above 10 degrees centigrade. Nitrous oxide begins to separate out from entonox if the temperature falls below about -6 degrees centigrade.

8.6 Entonox equipment must be serviced quarterly or more frequently if necessary.

8.7 Delivery systems must be consistent with Trust requirements.

9.0 Community Midwifery and the Use and Storage of Entonox

9.1 Green hazardous gas entonox sticker should be displayed on rear windscreen of Community Midwife's car when entonox cylinders are being transported.

9.2 Entonox portable cylinders should be stored in the cases provided. Secure, and not knocking each other.

9.3 The cylinders should be in a separate compartment from the driver.

9.4 The cylinders should not be subjected to extremes of heat or cold. Community Midwives storing cylinders in the car should take extra care overnight during freezing weather. Cylinders should be stored under cover, preferably inside, kept dry and clean.
(Refer to Appendix B)

9.5 When transporting the cylinders they should be turned off. E size cylinders and smaller should be stored horizontally. Ensure the cylinder valve is properly closed, that the tubing is disconnected and that the equipment is carried securely in the cases provided, in the vehicle.

9.6 Midwives should ensure they attend training days on the transportation of entonox, as per the Management of Health and Safety at Work Regulations and the Provision and Use of Workplace Equipment Regulations.

9.7 Midwives using their own cars for transporting entonox must ensure they inform their car insurance company of this fact.

10.0 Administration

10.1 Entonox must be administered in conjunction with the terms and conditions of the following documents:

- NMC Standards for medicines management
- NMC Midwives Rules and Standards
- BOC Gases Medical data sheet for use of Entonox
- MEHT guideline on the administration and transportation of Entonox

10.2 Entonox may be administered by qualified Midwives registered with the NMC, who have received appropriate training, and have been assessed as competent. Ambulance crew may also administer entonox to Maternity patients. A patient needs to be continuously monitored whilst using entonox, to ensure there are no adverse effects.

10.3 Under no circumstances may a patient be given entonox to use in their own transport, for example when being transferred to a Consultant-led Unit, from a Midwife-led Unit or home confinement, whilst in labour, or at any other time. If a patient needs to use entonox she must be transferred by ambulance, where she can be monitored by the ambulance crew or a midwife escort.

11.0 Method of Administration

11.1 Cylinder - check if there is gas in the cylinder, by turning on, and examining the gauge. Ensure that the cylinder is not frosted.

11.2 Piped entonox - check the flow of entonox by pressing the purge button.

11.3 Check there are no contra-indications prior to administration.

11.4 Ascertain how much the patient knows about entonox. Explain the use of the inhalational gas, and how to use the apparatus effectively.

11.5 Encourage the patient to start using the entonox at the beginning of a contraction and throughout the duration of the pain.

11.6 Observe the effects (both desired and adverse) on the patient and ensure she is using the equipment correctly.

11.7 Entonox can be used in conjunction with other forms of pain relief, for example pethidine injection 50 -100mg intramuscularly, 2-4 hourly in labour.
(Refer to the guideline for the ‘Management of Normal Labour and Prolonged Labour in Low Risk Patients’; register number 09079)

11.8 The filter and mouthpiece are single use only and should be disposed of when finished with.

12.0 Staffing and Training

12.1 All midwifery and obstetric staff must attend yearly statutory training which includes skills and drills training.

12.2 All midwifery and obstetric staff are to ensure that their knowledge and skills are up-to-date in order to complete their portfolio for appraisal.

13.0 Infection Prevention

13.1 All staff should follow Trust guidelines on infection prevention by ensuring that they effectively 'decontaminate their hands' before and after each procedure.

13.2 All staff should ensure that they follow Trust guidelines on infection prevention. All invasive devices must be inserted and cared for using High Impact Intervention guidelines to reduce the risk of infection and deliver safe care. This care should be recorded in the Saving Lives High Impact Intervention Monitoring Tool Paperwork (Medical Devices).

14.0 Audit and Monitoring

14.1 The risk management lead will review all risk event forms and complaints. Any immediate training or educational issues relating to lack of compliance with this guideline will be addressed on a one to one basis.

14.2 All incidents and trends analysis will be reviewed at the Maternity Risk Management Group meeting.

14.3 An Audit of compliance with this guideline will be considered annually in accordance with the Maternity annual audit work plan. If considered for audit, the Audit Lead in liaison with the Risk Management Group will identify a lead for the audit.

14.4 The findings of the audit will be reported to the Risk Management Group and an action plan developed to address any identified deficiencies. Performance against the action plan will be monitored by this group on a monthly basis.

14.5 A survey will be undertaken by the Lead Midwife for Guidelines and Audit, at least annually, to establish staff awareness of how policies should be accessed and the document management process. Any deficiencies identified will inform the staff training programme.

15.0 Guideline Management

15.1 As an integral part of the knowledge, skills framework, staff are appraised annually to ensure competency in computer skills and the ability to access the current approved guidelines via the Trust's intranet site.

15.2 Quarterly memos are sent to line managers to disseminate to their staff the most currently approved guidelines available via the intranet and clinical guideline folders, located in each designated clinical area.

15.3 Guideline monitors have been nominated to each clinical area to ensure a system whereby obsolete guidelines are archived and newly approved guidelines are now

downloaded from the intranet and filed appropriately in the guideline folders. 'Spot checks' are performed on all clinical guidelines quarterly.

15.4 Quarterly Clinical Practices group meetings are held to discuss 'guidelines'. During this meeting the practice development midwife can highlight any areas for further training; possibly involving 'workshops' or to be included in future 'skills and drills' mandatory training sessions.

16.0 Communication

16.1 A quarterly 'maternity newsletter' is issued to all staff with embedded icons to highlight key changes in clinical practice to include a list of newly approved guidelines for staff to acknowledge and familiarise themselves with and practice accordingly. Midwives that are on maternity leave or 'bank' staff have letters sent to their home address to update them on current clinical changes.

16.2 Approved guidelines are published monthly in the Trust's Staff Focus that is sent via email to all staff.

16.3 Approved guidelines will be disseminated to appropriate staff quarterly via email.

16.4 Regular memos are posted on the 'Risk Management' notice boards in each clinical area to notify staff of the latest revised guidelines and how to access guidelines via the intranet or clinical guideline folders.

17.0 References

Barlow, J. (2006) Guidance for Health and Safety Representatives: Nitrous Oxide COSHH www.hse.gov.uk

Bennett V, Brown L. (1999) Inhalational analgesia: Entonox. Myles Textbook for Midwives Thirteenth edition. pp. 442; Churchill Livingstone.

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Department of Transport (2007)The Carriage of Dangerous Goods and use of Transportable Pressure Equipment Regulations. Health & Safety regulation no. 1573

Health & Safety (2008) Medical gases. Executive Carriage of Dangerous Goods Manual www.hse.gov.uk

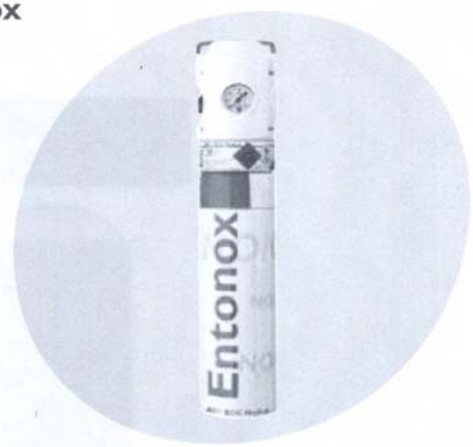
Nursing Midwifery Council (2007) Standards for medicines management. NMC Standards 08.07 NMC:London.

Nursing Midwifery Council (2004) Midwives rules and standards. NMC standards 05.04 London

Peate I, Lancaster J. (1999) Safe use of medical gases in the clinical setting: practical tips. British Journal of Nursing 2000,vol. 9; No. 4. p. 231 – 236.

factsheet

Integral Valve Entonox Cylinder CD



Features

- 25% lighter (approx.)
- Easy and ready to use
- Permanently live contents gauge allows constant monitoring
- Valve with built-in regulator facilitates quick cylinder changeover
- Complete surround valve guard for protection
- Bespoke handle for easy carrying

BOC has developed an innovative lightweight cylinder designed specifically for ambulance crews and community midwives.

The hoop-wrap cylinder is made from aramid, which offers a significant reduction in weight over conventional steel cylinders. It also features a unique valve design with an incorporated regulator fitted with a BS5682 Entonox Schrader outlet connector, allowing cylinders to be changed over quickly.

The valve guard fitted to this cylinder provides additional protection and helps prevent inadvertent damage. It also provides additional handling methods during transport.

BOC Medical

BOC GASES
Medical

DATA SHEET

Entonox

Mixture of 50% Nitrous Oxide (N_2O) / 50% Oxygen (O_2)

PRESENTATION

Pharmaceutical form

Compressed medical gas (for medicinal use only)

Specification

Individual components comply with European Pharmacopoeia specifications 1985

Purity – Oxygen	50.0% ± 2.0%
– Nitrous oxide	50.0% ± 2.0%
Nitrogen	5000.0vpm (max)
Carbon dioxide	300.0vpm (max)
Carbon Monoxide	5.0vpm (max)
Higher oxides of Nitrogen	1.0vpm (max)
Moisture	60.0vpm (max)

Physical data

Physical state in cylinder	Gas
Specific gravity of gas at 15°C and 1013mb	1.319
Density of gas at 15°C and 1013mb	1.615kg/m^3
Combustion characteristics	Non flammable. Strongly supports combustion

USES

Nitrous oxide is a powerful analgesic in sub-anaesthetic concentrations. It has the special advantage of very rapid onset of analgesia. It is extensively used in obstetrics and in the ambulance service. It has also proved highly effective in controlling the pain of myocardial infarction and various uncomfortable interventions during intensive care. It has also been used for post-operative pain. The duration of its use as an analgesic is limited by its effect on bone marrow.

Entonox is used exclusively for the relief of pain. Common examples of the use of Entonox are:

- acute trauma.
- short-term relief in dental work.
- short-term relief for procedures inevitably involving pain, such as wound and burn dressing, wound debridement and suturing.
- normal labour.
- acute surgical or medical conditions in which the pain is relieved, during exposure only to return on cessation of the analgesia so allowing an unfettered assessment to be made.

DOSAGE AND ADMINISTRATION

Doses may be self regulated in nearly all cases by the use of a face mask connected through a demand valve to the Entonox cylinder.

Entonox may be administered by personnel trained in its use (obstetric units, accident units and accident ambulances).

There is no risk of overdose with Entonox in medical use.

Entonox is administered through a face mask. The mask is connected to an Entonox supply through a demand valve system. The valve is operated by the act of inhalation of the patient and closes down when the patient ceases to inhale.

In nearly all cases, Entonox is self-administered, but it may be administered by attendant medical personnel. Since pain is usually relieved by a concentration of 25% nitrous oxide, continued inhalation does not occur. However, should inhalation continue, light anaesthesia supervenes and the mask drops away as the patient relaxes, or is removed if administration has been by attendant personnel.

CONTRA-INDICATIONS, WARNINGS ETC

There are no contra-indications to the use of Entonox in any age group.

Entonox should not be used with any of the following conditions:

- μ where air is entrapped within a body and where its expansion might be dangerous
- μ head injuries with impairment of consciousness
- μ artificial, traumatic or spontaneous pneumothorax
- μ air embolism
- μ decompression sickness
- μ following a recent underwater dive
- μ following air encephelography
- μ severe bullous emphysema
- μ during myringoplasty
- μ gross abdominal distension
- μ intoxication
- μ maxillofacial injuries

Entonox should not be used for more than twenty-four hours without monitoring of peripheral blood for features of megaloblastic anaemia and leukopenia.

Interactions with other medicaments and other forms of interaction

The nitrous oxide constituent of Entonox inactivates vitamin B12

Effects on ability to drive and to use machines

The nitrous oxide constituent of Entonox is rapidly eliminated but, as a safety precaution, it is recommended that driving, use of machinery and other psycho-motor activities should not be undertaken until 12 hours have elapsed after Entonox analgesia.

Other undesirable effects (frequency & seriousness)

The nitrous oxide constituent of Entonox causes inactivation of vitamin B12 which is a co-factor of methionine synthase. Folate metabolism is consequently interfered with and DNA synthesis is impaired following prolonged nitrous oxide administration. These disturbances result in megaloblastic bone marrow changes. Exceptionally heavy occupational exposure and addiction have resulted in myeloneuropathy and subacute combined degeneration. Theoretically similar adverse results could occur from heavy and prolonged Entonox exposure.

All these effects are well documented, extremely rare and may follow prolonged exposure to levels of nitrous oxide over 5000ppm or to frequent (more than once every two days) exposure to analgesic concentrations. It has been suggested that prolonged occupational exposure to high levels of nitrous oxide may affect a woman's ability to become pregnant.

The nitrous oxide constituent of Entonox passes into all gas containing spaces in the body faster than nitrogen passes out. The main contra-indications which follow from this are listed earlier in this section, but in addition prolonged exposure to Entonox may result in bowel distension, middle ear damage and rupture of ear drums.
Addiction to Entonox has been reported.

Use in pregnancy and lactation

Mild skeletal teratogenic changes have been observed in pregnant rat embryos when the dam has been exposed to high concentrations of nitrous oxide during the period of organogenesis.
However no increased incidence of fetal malformation has been discovered in 8 epidemiological studies and case reports in human beings.
There is no published material which shows that nitrous oxide is toxic to the human fetus. Therefore, there is no absolute contra-indication to its use in the first 16 weeks of pregnancy.

Other special warnings and precautions

Administration of Entonox more frequently than every 4 days should be accompanied by routine blood cell counts for evidence of megaloblastic change in red cells and hypersegmentation of neutrophils.
Thorough ventilation or scavenging of waste gases should reduce operating theatre and equivalent treatment room levels of ambient nitrous oxide to a level below 100ppm (refer O.E.S. below).

Overdose (symptoms, emergency procedures, antidotes)

Inappropriate, unwitting or deliberate inhalation of Entonox will ultimately result in unconsciousness, passing through stages of increasing lightheadedness and intoxication. The treatment is removal to fresh air, mouth-to-mouth rescuscitation and, if necessary, the use of an oxygen resuscitator.

Incompatibilities (major)

There are no major incompatibilities with Entonox.

PHARMACEUTICAL PRECAUTIONS

Cylinders should be kept out of the reach of children.
Nitrous oxide begins to separate out from Entonox if the temperature falls below about -6°C. A homogenous mixture is again obtained when the temperature is raised to above 10°C and the cylinder agitated.
Before use, to ensure it is properly mixed, cylinders should be stored horizontally for 24 hours at a temperature above 10°C. If this is not practicable, before use the cylinders must be maintained at a temperature above 10°C for at least 2 hours and then completely inverted 3 times or placed in warm water at body temperature for 5 minutes and then completely inverted 3 times.
Entonox is non-flammable but strongly supports combustion (including some materials which do not normally burn in air). It is highly dangerous when in contact with oils, greases, tarry substances and many plastics due to the risk of spontaneous combustion with high pressure gases.
The normal precautions required in the storage and use of medical gas cylinders are applicable. These are fully explained in the associated brochure 'Gas Safe — in the hospital' and on the reverse of this Data Sheet.

United Nations Substance Identification (UNSI) No.	3156
Emergency action code (Hazchem)	–
A.D.R. Hazard identification No.	–
C.E.F.I.C. tremcard No.	–