University Hospitals of Leicester NHS
NHS Trust

Policy for the Administration of Entonox To Adult Patients

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Board Director Lead:	Medical Director
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SAFE USE OF ENTONOX FOR PATIENT CARE

MINIMISING EXPOSURE IN THE CLINICAL AREA

KEY WORDS

Entonox: Gas and Air

1 INTRODUCTION

1.1 This document sets out the University Hospitals of Leicester (UHL) NHS Trust policy for the administration of Entonox Gas. The gaseous mixture consists of 50% oxygen/ 50% nitrous oxide, and has been found to be a powerful analgesic when inhaled. It has a rapid onset of action and is of short duration.

1.2 Entonox is administered through a mouthpiece, which is connected to an Entonox supply through a demand valve system. The valve is operated by the act of inhalation by the patient and closes down when the patient ceases to inhale. In all cases Entonox is self-administered under the direct supervision of a registered practitioner. The demand apparatus is such that it safeguards the user from overdose from nitrous oxide because should the patient become drowsy, the mouthpiece drops away, the flow of gas ceases and the Registered Practitioner evaluates the patient.

1.3 The criteria for the success of Entonox as a pain control agent will be the satisfaction expressed by the patient on conclusion of the procedure and the removal of apprehension felt by the patient on subsequent treatment.

2 POLICY SCOPE

2.1 This policy gives directives for the safe and effective provision of patient care whilst using Entonox.

2.2 All professionals who administer Entonox Gas must be on a statutory register and employed by the Trust. Also they must have successfully achieved the Trust criteria or a recognised competency based training programme as outlined in section 6 to administer Entonox inhalation analgesia.

2.3 The following professionals may administer Entonox gas to adults:

- Registered Nurses
- Registered Nursing Associates who have completed medicines management
- Registered Midwives
- Registered Physiotherapists who have completed medicines management
- Registered Medical Practitioners
- Paramedics (EMAS trained)

3 DEFINITIONS

Entonox- analgesic gas 50% oxygen 50% nitrous oxide

4 ROLES AND RESPONSIBILITIES

4.1 Executive Lead (Medical Director) is responsible for

a) Ensuring all CMG Staff are made aware of and comply with this policy

b) Address any concerns raised regarding practice through their CMG incident reporting systems.

4.2 Clinical Management Groups (CMG) (Lead Nurse, Head of Service, Matron's) are responsible for

c) Ensure their CMG Staff are made aware of and comply with this policy

d) Address any concerns raised regarding practice through the UHL incident reporting systems.

4.3 Healthcare Professional Prescribing Entonox (Includes Anaesthetists, Surgical Doctors, Acute Pain Nurse Specialists who are Non-Medical Prescribers) are responsible for

a) Assessing the patient as suitable for Entonox

b) Prescribing the use of Entonox on the patients medication chart for outpatients and critical care and eMeds for inpatients in line with this Policy

c) Ensuring that the Ward using Entonox have suitably trained staff available to administer

4.4 Department Managers and Ward Sisters are responsible for

a) Ensuring all appropriate/relevant staff are competent to care for a patient using Entonox

4.5 All Healthcare professionals who administer Entonox are responsible for:

a) Ensuring training needs are satisfied (section 7)

b) Successfully completing the relevant training and be assessed as competent to administer Entonox

c) Ensure that they keep up to date with their practice

d) Monitoring the patient to ensure safe administration

4.6 Acute Pain Team are responsible for:

a) Providing education and training for all healthcare professionals on all aspects of administration of Entonox through the acute pain study day and supervised practice and input information into HELM

b) Recording attendance at training and competencies

c) Ensuring all Entonox equipment is available for use

d) Monitor all patients on Entonox for side effects, patient satisfaction through audit

e) Monitoring compliance with this policy through audit

f) Supporting CMG's with incident investigation and complaint management

5 POLICY IMPLEMENTATION AND ASSOCIATED DOCUMENTS

5.1 Consent

Verbal Patient Consent must be obtained to be able to administer Entonox" and documentation of this consent should be made in the medical/nursing notes

5.2 Indications for Entonox use

a) Childbirth

b) Short painful procedures: Fracture manipulation,

c) Urinary catheter changes including supa-pubic catheter changes,

d) wound drain removal,

e) physiotherapy, turning and moving patients

f) Suturing

g) painful wound dressings changes (burns treatment, painful wounds)

h) Sigmoidoscopy and Colonoscopy including those used for Bowel cancer screening within the Endoscopy Services.

5.3 Contraindications for Entonox use:

a) Patients with pneumothorax, lung abscess or emphysematous bullae and air embolism

b) Gross abdominal distension/bowl obstruction

c) Patients with head injury or suspected intacranial lesions

d) Maxillo- facial injuries.

e) Patients with chronic obstructive airways disease

f) Decompression sickness

g) Recent intraocular injection

h) Recent under water dive.

i) Middle ear infection/surgery

j) Entonox is safe for the mother and foetus, however caution should be exercised in the first trimester of pregnancy for both user and practitioner

5.4 The advantages of Entonox are:

a) Quality analgesia titrated to patients' requirements

b) Short duration of onset and wears off very quickly.

c) Minimal side effects

d) Ease of administration

e) Flexibility of use

f) Cost effective

5.5 Side Effects of Entonox:

a) sedation, nausea and vomiting,

b) drowsiness

c) bad dreams

d) Prolonged continuous use (6-8hrs) can cause vitamin B12 deficiency (although rare)

5.6 Driving a Motor Vehicle following Entonox

a. Where Entonox is to be used in the Outpatient setting, all patients should receive information prior to the day of procedure regarding Entonox to allow them to make an informed choice as to whether they wish to drive their own motor vehicle. Patients should be reminded of this on the day prior to the start of the procedure.

   Information given to patients prior to the procedure should include

   i. How Entonox is used for the relevant procedure

   ii. Contraindications and Side Effects of Entonox

   iii. The possible effects on driving and the need for the patient to consider whether they should drive themselves to the appointment. Should a patient choose to do this, it is done entirely at their own risk.

b. If patients are receiving Entonox in an outpatient setting it is advisable to avoid operating mechanical equipment (including motor vehicles) until the patient feels safe to do so. This may be anything between 30minutes - 24hrs (BOC 2011). Side effects are individual to every patient. Every patient will have different exposure time and different reactions to it use. It is advisable therefore to suggest to patients coming to any OPD/Day Case environment for any test/examination or procedure where Entonox is to be used that they consider whether they wish to drive themselves to and from their appointment.

c. British Oxygen Corporation (2011) state that it is safe the drive after 30 minutes providing that the patient feels capable to do so. This is done entirely at the patients' own risk. The Healthcare professional should have judged the patient is safe to be discharged following their procedure, having returned to a normal mental state. All discharge checks should be clearly documented on the discharge planner.

d. Should a patient seek reassurance about their ability/fitness to drive from a medical professional, then whilst a Doctor (DSA 2013) may be able to assess competence to drive after such a procedure this will not necessarily be the case and no Doctor should act beyond their competence. Where such a reassurance is requested by the patients then the outcome of such request must be clearly documented in the medical notes prior to discharge.

This policy is supported by the following procedures which must be used in conjunction with this policy:

Procedure	Appendix
The Procedure for Administering Entonox	1
Potential problems and actions	2

6 EDUCATION AND TRAINING REQUIREMENTS

6.1 Midwives can administer Entonox to women in Labour under a "midwife exempt drug". Midwives receive training and competency during their Midwifery Training therefore all Midwives on the NMC register can administer Entonox in these circumstances without further training

6.2 All other Healthcare Professionals undertaking the preparation and monitoring of Entonox must:

a) Hold a valid drug administration certificate of competence (Medicines Management) with the exception of the medical staff

b) Successfully complete the Trust approved competency-based training and assessment programme in the form of any of the 3 pathways below:

i. Acute Pain Study Day (Face to Face) up to October 2023,

ii. HELM training (e-learning) Pain Management Team: Module 3: Entonox Inhaled Analgesia for Adult patients in Non-Maternity Settings

iii. Individual area Entonox Training Session carried out by the Acute Pain Service or nominated cascade trainers

6.3 Healthcare Professionals new to the Trust or employed through an agency must provide evidence of training and summative practical assessment to practice within this Trust. These Healthcare Professionals must then complete an equipment competency to ensure they are able to use Entonox. Their Skills should also be recorded on HELM

6.4 The individual Practitioner is responsible for keeping their own competency record. Verification of a professional's competence/copy of record of assessment will be sent to the Adult Acute Pain Service. It will then be recorded on the Clinical Skills Passport on HELM. Once recorded on HELM any paper copy sent for verification will be destroyed.

7 PROCESS FOR MONITORING COMPLIANCE

7.1 Auditing of Entonox is completed at the time of use by the ward nurse or midwife. Entonox administered by the Acute Pain Team is recorded on the Acute Pain Team database. This would be discussed at the Pain Management Department Operational Group

- Key performance indicators / audit standards of Entonox
- Patient Satisfaction
- Analgesic Effectiveness
- Length of time used
- Any adverse incidents

Element to be monitored	Lead	Tool	Frequency	Reporting arrangements	Lead(s) for acting on recommendations	Change in practice and lessons to be shared
Competency Assessments for all users	Acute Pain Nurse Specialist/ Relevant Clinical Area Managers	Audit is incorporated into HELM to check for compliance after the acute pain study day	The registers from Entonox training either face to face or elearning to be monitored against HELM every six months to monitor compliance	Lead Acute Pain Nurse Specialist to liaise with relevant Clinical Area Managers if issues raised around compliance	Lead Acute Pain Nurse Specialists raise issues with Clinical Area Managers and share best practice with the CMG Management teams for their action.	Update study sessions, dissemination of information through clinical area management

7.2 Lead for this Section:

Acute Pain Nursing Team to monitor nursing competency through HELM

Adverse incidents monitored through DATIX reporting system

8 EQUALITY IMPACT ASSESSMENT

8.1 The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs

8.2 As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

9 SUPPORTING REFERENCES, EVIDENCE BASE AND RELATED POLICIES

BOC Healthcare (2011) **Entonox Safety Information. Medical Gas Data Sheet** HLC/5056051/2011

BOC (2015) **Entonox – The Essential Guide** HLC/509940/UK5/0715

BOC Entonox leaflet. **How to provide full benefit from Entonox pain relieving gas.** G2345/bb/9.92/2m

BOC website – www.entonox.co.uk

Driving Standards Agency DSA (2016) **Customer Service Guide for drivers with medical conditions.** INF94

Joint Royal Colleges Ambulance Liaison Committee (2022) **Clinical Guidelines for practice**

Lister S , Dougherty L (2008). **Royal Marsden Manual of Clinical Nursing Procedures.** Entonox Administration. 7th Edition.

Nunn J F, Chanarin L, Tanner A G (1986). **Megaloblastic bone marrow changes after repeated Nitrous Oxide anaesthesia. Reversal with folinic acid.** British Journal of Anaesthesia. Vol 58. Pp 1469-1470

University Hospitals of Leicester (2023) **Management of Medical Gas Pipeline Systems Policy and medical Gas cylinder Management policy Guidance** Version 3 B8/2012

University Hospitals of Leicester (2022) **Leicester Medicines Code UHL Policy** Version 8 B60/2011

University Hospitals of Leicester. (2022) **Policy for Consent to Examination or Treatment(including consent for photography)** Version 13 Ref A16 /2002. Doc 11772

University Hospitals of Leicester (2021**). Infection Control Policy for hand hygiene.** Version 6 B32/2003

University Hospitals of Leicester (2020) **Cleaning and decontamination policy for infection prevention and control** version 6 B5/2006

10 PROCESS FOR VERSION CONTROL, DOCUMENT ARCHIVING AND REVIEW

10.1 This document will be uploaded onto Policy and Guidelines Library and available for access by Staff through INsite and on the Pain management Web site via INsite. It will be stored and archived through this system.

10.2 The Acute Pain Operational Group is responsible for the review of this document every three years

EQUIPMENT

- Entonox cylinder (blue and white) / piped
- Bodock seal
- Inhalation tubing on non positive pressure tubing where demand valve sits on the cylinder (in some areas this may be disposable)
- Demand flow valve and disposable antibacterial filter
- Disposable mouth piece
- Resuscitation equipment available

No.	Action	Rationale
1	**The Procedure is healthcare professional supervised** **Assess patient's suitability for Entonox using** **the assessment criteria.**	To maintain patient safety
	Entonox <u>should not</u> be given in the following instances: • Patients with pneumothorax, lung abscess or emphysematous bullae and air embolism	The Nitrous Oxide diffuses into the body cavity thus increasing its size.
	• Gross abdominal distension/bowl obstruction	
	• Patients with head injury or suspected intacranial lesions • Maxillo- facial injuries.	May be unable to achieve a complete seal using a mouthpiece
	• Patients with chronic obstructive airways disease	Patients depend on a hypoxic stimulus for their respiratory drive.
	• Decompression sickness • Recent under water dive.	The Nitrous Oxide will cause a rise in intra- cranial pressure
	• Intoxicated / confused/ uncooperative patients.	Unable to comply with instructions.

No.	Action	Rationale
	Entonox can be given with caution: • Administration over long periods i.e. continuous use for 24 hours or more frequently than every 4 days may require regular blood cell count for evidence of megaloblastic changes in red cells and hypersegmentation and neutrophilis. • All stages of pregnancy: There is no published evidence that shows that nitrous oxide is toxic to the human fetus. Therefore there is no absolute contraindication to its use in the first 16 weeks of pregnancy.	Interferes with folate metabolism and DNA synthesis, which can impair bone marrow function.
2	Explain and discuss the procedure with the patient. • Obtain verbal consent from patient and document • Be aware of the possible side effects and their expected duration • Give clear instruction on the self-administration of the Entonox gas via the mouthpiece. • Patient to be positioned comfortably.	To ensure patient understands procedure and gives his / her valid consent
3	Ensure that Entonox cylinder has been stored at a temperature above 10 degrees centigrade within the clinical area for at least 24 hours before use. For those areas that permanently store portable Entonox this should be checked daily to ensure adequate supply If this is not possible or practicable, the cylinder must be maintained at a temperature above 10 degrees centigrade for at least 2 hours. The cylinder is then to be inverted 3 or 4 revolutions before use. Ensure the cylinder to secure and safe in its trolley at the patients bed side Turn cylinder valve key slowly anticlockwise until open.	To prevent Nitrous Oxide changing from gas to liquid and falling to the bottom of the cylinder leading to uneven administration of gases.(initially oxygen only would be available to the patient and then Nitrous oxide only, producing a hypoxic mixture. To make Entonox apparatus ready for use and to ensure there is enough gas in the cylinder.

No.	Action	Rationale
	• Wash hands with liquid soap and water using 5 moments of hand hygiene or use alcohol hand rub which you need to allow to dry	Bacterial contamination is most often attributed to inadequate hand washing techniques
	• Fit mouthpiece to anti -bacterial filter. Attach this to the demand valve and inhalation tubing and connect tubing to the cylinder.	To deliver Entonox to the patient and prevent contamination and cross infection of the equipment
	• Ensure a good seal is maintained around mouthpiece	Any gaps mean that the patient breaths air instead of Entonox leading to reduced analgesic effect.
	• Instruct the patient to inhale and exhale until the desired effect has been achieved. Do not start the procedure until the patient is receiving the full effects of Entonox and is able to co-operate. They should continue to breathe Entonox throughout the duration of the procedure.	To allow sufficient time for an adequate circulatory level of nitrous oxide to provide analgesia initially and to then maintain the effect throughout the procedure.
4	At the end of the procedure observe the patient until the effects of the gas have worn off and allow to mobilisation when safe.	Some patients may feel a transient drowsiness or giddiness and should be discouraged from getting out of bed until these effects have worn off.
5	Evaluate the effectiveness of Entonox with the patient throughout, and following procedures, by verbally questioning and encouraging the patient to self assess the analgesic effect.	To establish whether the Entonox has been adequate analgesic for the procedure. This should then be documented to assist any subsequent procedure/dressing changes.
6	Record the use of Entonox in minutes on the drug chart and document any side effect in the nursing notes	To ensure accurate records are maintained
7	Turn off Entonox supply from the cylinder by turning the tap/key in a clockwise direction until closed	To prevent potential seepage from the cylinder
8	Depress the diaphragm under the valve. To expel residual gas from tubing. The gauge should read empty	To prevent misuse and reduce the risk of fire
9	Remove mouthpiece and dispose [if not to be used by the patient again] or wash mouthpiece in hot soapy water if to be used by the same patient again. The mouthpiece should be kept in a clean dry place ready for reuse. The patients name, time and date should be with the mouthpiece	The mouthpieces are for single patient use to prevent cross infection

No.	Action	Rationale
10	Dispose of the filter If you are using disposable tubing this should be changed weekly unless used by a known infected patients in which case it should be disposed of immediately after patient use	To reduce the risk of cross infection.
11	Clean all non-disposable equipment in accordance with infection control policy.	To reduce the risk of cross-infection.
12	Record the administration on appropriate documentation.	To promote continuity of care, maintain accurate records and provide a point of reference in case of any queries
13	Remove from bedside and return to its storage point immediately after each use. This must be a secure area suitable for the storage of medical gases and not accessible by the public or patients	Maintain safety for this schedule 5 medication

Potential Problems and Actions

Appendix Two

No.	Problem	Cause	Action
1	Patient not experiencing adequate analgesic effect.	Entonox cylinder empty. Apparatus not properly connected	Check before procedure commenced.
		Patient not inhaling deeply enough.	Encourage the patient to breathe deeply. A hissing noise will be heard from the demand valve when triggered Reassess suitability of patient for Entonox use. The patient may not be strong enough or may have reduced capacity to inhale deeply.
		Patient inhaling pure oxygen i.e. cylinder has been stored below minus 6C and Nitrous Oxide has liquidified and settled at the bottom of the cylinder.	Discontinue the administration of the gas and ensure adequate warming of the cylinder and invert the cylinder three times to mix the gases adequately.
		Not enough time has been allowed for Entonox to exert its analgesic effect.	Allow at least two minutes of Entonox self-administration before recommencing the procedure.
2.	Patient feels nauseated, drowsy or giddy.	Effect of Nitrous Oxide accumulation.	Discontinue Entonox administration and ensure the effects have worn off.
3.	Patient afraid to use Entonox.	Fear of the unknown.	Reassure patient and reiterate instructions for use and the short-term side effects.
4.	Misuse of Entonox	Over use/misuse of Entonox by any one patient	Reduce/Prevent the misuse of Entonox in the Clinical Setting by ensuring patients are supervised by a competent practitioner and it is prescribed by a relevant prescriber or used under a patient group direction with monitoring and record keeping. Portable Entonox should also be stored in a locked room

Clinical areas should consider how they can protect staff by limiting their occupational exposure to nitrous oxide (N20) a component of Entonox. The following should be considered where appropriate

- Environmental Ventilation: Ensure clinical spaces where Entonox is used are well ventilated. Where at all possible. Areas that use Entonox on a regular basis (daily), it is important that the Procedure Room ventilation is maintained at the required 10 air changes per hour for supply and extract ventilation, and the Estates Team should ensure that this is the case.

- Monitoring of staff for the occupational use of nitrous oxide should take place in clinical areas that regularly use Entonox. This is the responsibility of the manager in charge of the area using Entonox.

- Risk assessments should be carried out in areas that use Entonox on a adhoc basis to ensure any risks are minimised

- When using Entonox in practice, it is possible to have high air supply at the foot of the patients with low level extract at the head of the patient to give a clean air path to protect members of staff. Ensure good ventilation when used.