

Canterbury

District Health Board

Te Poari Hauora o Waitaha

Pain Management

Entonox Administration Self Learning Package

Adults and Children over 12 years.

Entonox Administration Self Learning Package

The Entonox learning package has been developed as the administration of entonox is seen as an advanced nursing skill

To complete the self learning package

1. Read Entonox Self Learning Package and obtain a minimum of 80% in associated test.
2. Successfully demonstrate entonox administration, to your Nurse/Midwifery Educator or Clinical Nurse Specialist.
3. At the completion of the learning package three hours will be credited to your staff training record

This teaching package has been developed based on the best evidence and knowledge of practice at the time, however as a living document this maybe subject to change in the future

Reviewed by the Acute Pain Management Service.

General Information for Entonox Delivery

Drug Information

- Nitrous Oxide is an odourless, colourless gas that provides short acting potent analgesia for procedures that may cause pain, discomfort and anxiety.
- It is a weak anaesthetic agent.
- In addition to analgesia it may cause dizziness, euphoria, slight hallucinations and with frequent prolonged use, neurotoxicity.
- Nitrous oxide's lower solubility in blood means it has a very rapid onset and offset, providing analgesia within minutes of commencing administration.
- Nitrous oxide diffuses more rapidly than nitrogen and can expand enclosed air contained spaces within the body (see contraindications below). 100% is excreted unchanged through the lungs.
- During recovery from nitrous oxide, the movement of nitrous oxide from the circulation into the lungs may dilute the oxygen in the lungs (diffusion) hypoxia. This is important for patients with respiratory disease.
- For this reason it is usual for patients to receive oxygen at the end of the procedure to clear the nitrous oxide from the lungs
- Patients requiring daily to twice daily use of Nitrous Oxide for longer than 2-3 weeks should be prescribed prophylaxis of Vitamin B12 as some patients in this group are at risk of developing Bone Marrow Depression.
- **CAUTION: - Nitrous Oxide is not a flammable gas, however it will support combustion. It must be stored and used with caution like oxygen.**
- Nitrous can be delivered in two different concentrations by a nitrous mixer machine or Entonox cylinder.

Entonox

- Provides a mixture of 50% nitrous + 50% oxygen
- It is delivered by demand flow (requires patient to have a coordinated suck)

Indications for Use

Analgesia delivered via an Entonox machine is often useful for painful procedures: E.g. insertion of an IV line, fracture manipulation, dressings, insertion of a nasogastric tube. It is also commonly used for labour pain.

For children entonox is not meant to replace, but may act as an adjunct to the use of EMLA cream, which will still be the mainstay of pain relief for procedures like IV insertion.

Contraindications

Absolute: ie: If present do not use entonox.

- Impaired level of consciousness
- Head injury
- Intoxication
- Chronic neurological disease
- Severe obstructive airway disease, lung cysts, acute asthma
- Obstruction of middle ear or sinus cavities
- Recent vitreoretinal surgery e.g. vitrectomy
- Acute airway obstruction or airway burns.
- Pneumothorax without effective chest drain.
- Severe bone marrow depression or similar haematological disorder e.g. known homocystinaemia
- Undiagnosed abdominal pain, bowel obstruction, ileus or gas embolism
- Patient unable or unwilling to use nitrous oxide.
- Patient aged less than 12 months
- Inability to obtain a coordinated suck and or be able to hold the mask/mouthpiece independently. Children under 12 years usually cannot achieve this (prescriber can consider alternative administration via the nitrous mixer).
- First trimester of pregnancy
- Decompression sickness
- Pulmonary Hypertension.

Relative: ie: If present, the use of nitrous oxide must be discussed first with a Senior Registrar or Consultant

- Concurrent sedatives/analgesic agents (e.g. Benzodiazepines, opioids)
- Patient who is already oxygen dependent, or has an oxygen saturation on air of less than 95%
- Patient with known Vitamin B12 deficiency(e.g. vegetarians)

- The prolonged use of Entonox from early labour should be avoided.

Equipment:

Entonox Cylinders

Entonox is a high pressure mixture of oxygen and nitrous oxide in a concentration ratio of 50%:50%. It is stored in cylinders (blue body with white and blue shoulders) which are stable at room temperature.

A delivery unit is attached to the cylinder which contains a reducing valve to reduce the pressure from the cylinder and a demand valve which allows gas to flow only when the patient applies a negative pressure by sucking. This is achieved by having an airtight mask fit on the patient's face or use of a mouthpiece.

A filter element and a non return valve is incorporated into a disposable circuit attached to the mask / mouthpiece and allows the patient to exhale without removing the mask / mouthpiece from their face.

In order for the patient to benefit from entonox they must be able to suck effectively to inhale the gas.

Mouthpiece

A disposable mouthpiece may be used if the patient can seal their lips around the mouthpiece and coordinate a sucking mechanism.

Mask

The correct sized disposable mask must be used. It should fit snugly onto the patient's face over the nose and mouth. A firm seal allows the patient to inhale the gas mixture undiluted by room air.

Some children may be frightened by the use of a mask. It is important to allow time for children to familiarise and touch the equipment prior to use. Gaining their co-operation and lessening their anxiety will improve success rates and pain control during the procedures.

A single patient use disposable circuit is available for administering entonox via Supply department, Oracle No: 160027. Please double click on the image below:



Disposable Single
Patient Use Entonox (

The disposable circuit comes complete with tubing, a filter element and a non return valve and mouthpiece. A range of mask sizes are available if required.

For patients requiring ongoing entonox use, the disposable circuit may remain with that patient **for their use only** and must be kept in a clean, sealed plastic bag with a patient label attached.

When no longer required, the disposable circuit should be disposed of in the infectious/medical waste stream.

Maintenance of Equipment

- The responsibility for turning off of the cylinders and machine at the end of each session lies with the last person to use the machine.
- When no longer required, the disposable circuit is disposed of in the infectious/ medical waste stream.
- Disposable circuits are available from Supply Dept. (Oracle number 160027) and should be kept with the entonox cylinder in the original wrapping and opened immediately prior to use.
- The responsibility for maintenance and cleaning of all equipment lies with each department. A detergent wipe may be used on a weekly basis to wipe over the outside of the entonox cylinder or when visibly soiled.
- Full cylinders of the gases are kept at the Orderlies Lodge.

Administration

Only performed by: Registered Nurses/Midwives who have successfully completed the Self learning package as although the risk is low, there is a possibility of unconsciousness, respiratory and consequent cardiac arrest in patients receiving nitrous oxide via an entonox machine. Thus nitrous oxide can only be administered where there is immediately available, **suitable resuscitation equipment** this includes suction, oxygen and positive pressure ventilation, drugs and staff to deal with this possibility. It is envisaged that administration of entonox usually will be delivered in the treatment room.

- There are **no** fasting requirements.
- It is possible that exposure to nitrous oxide via an entonox machine may present a risk to staff. When appropriate technique is used the risk is extremely low. Staff who may be in the first trimester of pregnancy **should exclude** themselves from procedures involving nitrous oxide. The same applies to members of the patient's family who may wish to be present during a procedure involving nitrous oxide.
- Generally, 'on demand' Entonox is not suitable for children under 12 months of age.

Observations

Observations

- Baseline: Level of consciousness, (CDHB sedation score for adults/Modified Michigan Sedation score for Children). Airway assessment, respiratory rate, oxygen saturation (SPO2) and pulse.
- Level of consciousness must be continuously assessed for signs of obstruction and or hypoventilation by the administrator, who will maintain rational verbal communication with the patient. The patient may be sedated but not asleep, whilst entonox is being used.
- Continuous pulse oximetry (SPO2) must be used throughout the procedure and continued until the patient returns to their pre-procedural state. For labouring women use of pulse oximetry is advised if administration of Entonox has been prolonged, if opiates are co-administered or any uncertainty with observations exists.
- 6 litres oxygen for 5-10 minutes post procedure as tolerated is required to assist with oxygen saturation levels returning to pre-procedural state.
- Pain score monitored to assess effectiveness of therapy
- Any nausea and or vomiting
- Partogram (labouring women)
- PEWS/EWS score calculation.

Adverse Reaction:

- Unconsciousness, sedation score >or equal to 2, loss of airway control – requires immediate cessation of therapy, institution of appropriate emergency measures and call for help. Refer to the EWS/PEWS Management pathway.
- Call a clinical emergency if Cardiac/Respiratory arrest is imminent.
- Side effects associated with over breathing or hyperventilation with associated dizziness or tingling in fingers/face usually resolve within a short time of cessation of therapy. Monitor until resolved.
- Nausea +/- vomiting may also occasionally occur and resolves with cessation of therapy.

Documentation

- Baseline observations of level of consciousness (as per sedation scales for adults and children), respiratory rate, oxygen saturation and pulse, calculation of PEWS/EWS score along with a brief summary of the procedure, including any difficulties encountered is to be documented in the clinical notes and discussed with a Senior Registrar/Consultant (as soon as possible) at the completion of the procedure. Entonox should not be given again to that patient/woman until this has occurred.

Method of Administration

Pre-Procedure

The staff member undertaking the procedure may also monitor the delivery of entonox if they are also able to achieve the monitoring guidelines (see monitoring guidelines below)

If the staff member performing the procedure is not able to monitor the patient adequately then a second staff member must be called.

- **A prescription for entonox analgesia must be provided by a medical practitioner on the patient's current medication chart and signed for with each usage.**
- If there are any doubts as to the appropriateness or safety of entonox in a particular patient or situation, or if there is the presence of a relative contraindication, medical consultation from a Senior Registrar or Consultant must be obtained prior to its use.
- Check there are no contraindications. (See earlier.)
- The use of the entonox should be explained to, and accepted by the patient (and caregiver if a child) prior to the procedure being performed.
- Ensure the patient is in a comfortable and safe position.
- The patient must be capable of holding on to the mask/mouthpiece to ensure an adequate seal is achieved.
- Check the Entonox is set up correctly. A single patient use disposable circuit should be available for use or where the patient has previously received entonox, their own circuit identified by their patient label may be used. Attach the pulse oximeter and record the baseline reading on room air. (A reading of less than 95% is a relative contraindication.)

Procedure

- Give the patient the mask/mouthpiece. The patient should breathe in and out at a normal rate and depth, holding the mask or mouthpiece themselves if possible. (The valve is heard when the patient is using an effective technique inhaling the entonox).
- The patient will need to breathe the gas mixture for 3 to 5 minutes to ensure maximum analgesia. The painful procedure should not commence before that time has elapsed.

- The patient's level of consciousness must be monitored by observations and verbal interaction to ensure the patient stays alert.
- Airway obstruction is a serious event and if accompanied by oxygen desaturation rapid page medical staff activating **Clinical Emergency**.

Post Procedure

- Administer O₂ at 6L, via a mask, as tolerated, for 5-10 minutes post Entonox administration to prevent transient risk of diffusion hypoxia.
- Record in the patients/women's clinical record the therapy's effectiveness, pre and post pain score and any adverse effects/reactions.
- Continue to monitor vital signs until observations and scores are within preprocedural levels.
- Turn off the Entonox, using the attached key.
- Remove and dispose of the disposable circuit and mouthpiece/mask via the infectious/medical waste stream. Alternatively, the circuit may remain with that patient **for their use only** and must be kept in a clean, sealed plastic bag with a patient label attached.
- Replace the cylinder if less than quarter full at end of procedure (further supplies can be requested via the Orderlies).
- Any fault or irregularity with the Entonox machine contact technical services.

If there have been any problems in the administration of entonox for the patient, this must be documented in the patient's clinical record and discussed with a Senior Registrar or Consultant as soon as is practical, and entonox must not be given again to that patient until this has occurred.

References

Australian & New Zealand College of Anaesthetists and Faculty of Pain Medicine. (2005). *Acute Pain Management: Scientific Evidence* (2nd ed.). Australian Government www.nhmrc.gov.au/publications.

Starship Children's Health Clinical Guidelines: Sedation, Paediatric 2008

The Royal Australasian College of Physicians Paediatric & Child Health Divisions. (2005). *Guideline Statement: Management of Procedure-related Pain in Children and Adolescents*. Sydney, New South Wales.

The Blue Book. Management Guidelines for common Medical conditions 13th edition 2009.

Jordan, S. (2002) *Pharmacology for midwives the evidence base for safe practice*. Palgrave MacMillan, UK.

Johnson, R. & Taylor, W. (2004) *skills for Midwifery practice*. Churchill Livingstone Elsevier.

Self learning Package Assessment
**NITROUS-OXIDE ADMINISTRATION VIA ENTONOX
MACHINE**

Participant: _____ **Ward:** _____ **Date:** _____

Assessor & title: _____ **Result** _____

1. What is entonox and what does it do? (2)
2. When may nurses administer entonox? (2)
3. While the minimum age for a child to receive nitrous is 12 months, what age are most children before they are able to obtain a coordinated suck? (2)
4. List three indications for the administration of entonox. (3)
5. State four contra-indications for the administration of entonox. (4)
6. Can a patient/labouring woman be given entonox if they have had concurrent sedatives/analgesic agents such as benzodiazepines or opioids? Explain your rationale (2)
7. During which trimester of pregnancy should nurses not administer entonox? (1)
8. Does the patient require fasting before administration of entonox? (1)
9. Does a prescription need to be written prior to every administration of entonox? (2)
10. What emergency equipment needs to be available? (2)
11. What recordings & monitoring is required when administering entonox? (4)

12. What is the importance of ensuring the patient has a coordinated suck? **(2)**
13. How long should the patient receive entonox for before commencement of the procedure to ensure maximum analgesia? **(1)**
14. Ideally at what rate (L/min) and for how long should the patient receive pure oxygen at the end of the procedure? **(1)**
15. What is the procedure should airway obstruction and/or oxygen desaturation occur during administration of entonox? **(1)**
16. What would you do if the patient you were giving entonox to:
- (a) Vomited during the procedure? **(1)**
 - (b) Became dizzy? **(1)**
 - (c) Was over-sedated? **(1)**
 - (d) Was un-cooperative? **(1)**
17. State three actions required by the nurse to maintain adequate infection control between patients using entonox? **(3)**
18. What documentation is required before and after the administration of entonox? **(3)**

Entonox Administration Practical: Check List

Form ID Ref

Participant: _____ **Ward:** _____ **Date:** _____

Assessor: _____ **Mark** _____

		Meets Standard	
With the Assessor the participant demonstrates:		Yes	No
1.	Knowledge of entonox contraindications (both patient & staff)		
2.	Knowledge of importance of prescription for nitrous oxide		
3.	Explanation to patient, (& parents if child)		
4.	Selection of disposable circuit, mask/mouth piece		
5.	Ability to assess amount of Entonox in cylinder		
6.	Knowledge of monitoring required throughout the procedure		
7.	Knowledge of what emergency equipment must be available		
8.	Appropriate action should side effects occur, especially respiratory compromise		
9.	Steps required to recover patient at the end of the procedure <ul style="list-style-type: none"> ▪ Turns off entonox ▪ Disposes of circuit & mask/mouthpiece 		
10.	Appropriate documentation of procedure		