PURPOSE

To facilitate safe and effective use of Nitrous Oxide for analgesia supervised by health care professionals in the Emergency Department and the Orthopedic Clinic.

This document does not reflect ongoing management of persistent pain.

Under-treated pain can lead to serious clinical consequences including delayed healing time, increased hospital stay and decreased quality of life.

As it does not require insertion of an IV and there is a very rapid onset of action it can be an effective method of providing rapid analgesia and anxiolysis before other methods are used.

POLICY STATEMENTS

Patients in the emergency department eligible for use of nitrous oxide must be under the care of the emergency room physician (patients under the care of subspecialties or general pediatricians are exempt).

In the Orthopedic Clinic, patients must have the ability to understand to inhale nitrous oxide without assistance (suggested developmental age 5).

In the Emergency Department, the nurse or physician may administer nitrous oxide to children 1 year and older. Caregivers may assist the child with holding the mask. Patients who have the ability to understand to inhale nitrous oxide without assistance (suggested developmental age 5) should self-administer it.

Patients excluded from using nitrous oxide include:

Patients with conditions that impair their level of consciousness or ability to cooperate:

- Head Injury
- Major facial trauma
- Potential ingestion of alcohol or other psychoactive drugs
- Postictal state
- Developmental age of child
- Anxiety/co-operation level of child
- Meningitis

Patients with potential accumulation of gas within body spaces

- Head Injury
- Facial trauma
- Chest trauma
- Sinusitis
- Respiratory distress
- Bowel obstruction, perforation or trauma
- Otitis Media
- Pneumothorax

Patients with:

- Cardiac Ischemia or Chest Pain
- Pulmonary hypertension or Pulmonary Edema
- Vitamin B12 deficiency
- Phenylketonuria
- Cobalamin disorders
- Immunosuppression
- Known pregnancy: first and second trimester

Patients receiving concomitant IV sedation
ANALGESIA USING 50% NITROUS OXIDE IN 50% OXYGEN FOR PAINFUL PROCEDURES AND REDUCING ANXIETY IN THE EMERGENCY DEPARTMENT AND ORTHOPEDIC CLINIC

SITE APPLICABILITY

BCCH Emergency Department for management of acute pain and anxiety for the following indications:
- Orthopedic trauma: (soft tissue, fracture)
- Burns and burn dressings
- Laceration repair
- IV insertions
- Lumbar puncture
- Urinary catheterization
- Positioning for radiological images
- Subungual hematoma (hematoma under toenail or fingernail)
- Adjunct to other analgesia

BCCH Orthopedic Clinic for management of acute pain and anxiety for the following indications:
- Pin removal
- Dressing changes and wound care
- Wedging of casts and new fractures

PRACTICE LEVEL/COMPETENCIES

Caring for patients who self-administer nitrous oxide is considered an advanced skill for Registered Nurses and is practiced after the nurse has the required education and has had his/her learning validated with the appropriate clinical support person.

DEFINITIONS

Nitrous oxide (eg. Entonox, Pronox): is a mixture of two gases -- Nitrous Oxide ($N_2O$) 50% and Oxygen ($O_2$) 50%.

Mechanism of action: gases are inhaled and they cross the alveolar membrane to arterial system. The oxygen promotes tissue oxygenation and nitrous oxide acts on the pain receptors in the brain reducing the sensation of pain. It is rapidly excreted from the lungs within 3 minutes of discontinuation and is not metabolized in the body. There is also an anxiolytic effect so patients are calmer and less likely to withdraw from painful procedures.

PRECAUTIONS/SPECIAL CONSIDERATIONS

- Pain may not be completely alleviated. The goal is to provide analgesia and decrease anxiety during painful procedures.
- Cognitive impairment, developmental delay and age related factors may hamper a patient’s ability to express pain. It is important that the nurse pay attention to behavioral cues or family perception of child’s pain.
- Effects peak within 2-3 minutes so patient should be self-administering nitrous oxide at least 2 minutes prior to starting a procedure.
- Side effects: dysphoria, nausea and vomiting, dizziness, respiratory depression.
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EQUIPMENT

- Mobile stand unit
- Bacterial filter
- Mouth piece and demand valve
- Nitrous oxide in oxygen tank (50% nitrous oxide/50% oxygen) with attached pressure gauge, key and scavenger unit (change tank when the needle valve on the regulator is 400 PSI – in the red area of the gauge)
- Connect scavenging (suction) tubing to wall suction (see Entonox Set-up Procedure)

PROCEDURE

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Rationale</th>
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<tbody>
<tr>
<td>1. ASSESS for pain using the following criteria as a guide:</td>
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<tr>
<td><strong>Type of Pain</strong></td>
<td>- Location, intensity, quality, character, onset, duration, variation</td>
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<td>- Relieving or provoking factors</td>
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<td>- How the client expresses pain</td>
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<td>- Pain score</td>
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<td><strong>Expressions of Pain</strong></td>
<td>- Change in behavior, mood, sleep patterns or activity level</td>
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<td>- Decreased appetite</td>
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<td>- Facial grimacing/wincing</td>
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<td>- Changes in gait/need for support</td>
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<td><strong>Physical S&amp;S of Pain</strong></td>
<td>- Changes in vital signs</td>
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<td>- Change in mental status</td>
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<td></td>
<td>- Diaphoresis</td>
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<td>- Nausea and vomiting</td>
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<td>- Muscle tension</td>
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<td><strong>History/effect of Pain</strong></td>
<td>- History of a similar pain</td>
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<td>- Current medical diagnosis/medical history</td>
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<td>- Medication history (including allergies or sensitivities to medications)</td>
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<td>- Perceptions/beliefs about pain (cultural considerations should be noted)</td>
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<tr>
<td><strong>Other</strong></td>
<td>- Diagnostic test to identify pain source or contraindications for medication administration</td>
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<tr>
<td>2. ASSESS patient’s vital signs including temperature, heart and respiratory rate and arousal score.</td>
<td>Baseline information to compare to future assessments.</td>
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<td>3. ASSESS the patient’s ability to comprehend instructions and self administer Nitrous Oxide.</td>
<td>Decrease the risk of hypoventilation if patient holds own device.</td>
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<td>4. OBTAIN written prescriber’s order for Nitrous Oxide inhalation.</td>
<td>Requires prescriber’s order.</td>
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<td>5. COMPLETE pre-procedural safety check including the “Sign-in/Time-out” procedures.</td>
<td>Promotes patient safety by ensuring the correct procedure is performed on the correct patient on the correct site/side (if applicable).</td>
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<td>6. CHECK chart for patient weight, allergies, previous medical conditions and previous medication in past 24 hours.</td>
<td>Reduces risk of medication error.</td>
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<td>7. COMPLETE the 7 rights of medication administration including:</td>
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<td>- Right patient (2 identifiers)</td>
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<tr>
<td>- Right drug</td>
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<tr>
<td>- Right dose</td>
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- Right route
- Right time
- Right indication
- Right documentation

8. **ATTACH** cardio-respiratory and oxygen saturation (SpO₂) monitor to patient. Assists with patient monitoring.

9. **ENSURE** appropriate size self inflating bag and mask at bedside. In case of emergency.

10. **SET UP** Nitrous Oxide equipment as per manufactures’ instructions – Entonox Set-up Procedure. Scavenging unit set to regular suction (at 100 mmHg) to avoid room contamination.

11. **ATTACH** appropriately fitting mouthpiece or mask to delivery system. Nitrous Oxide can be administered as patient control analgesia via the demand regulator which needs a tight fit with mask or mouth piece.

12. **INSTRUCT** patient to inhale deeply through the mouthpiece or through mask. **There should be NO assistance in holding the mouth piece/mask by health care providers or parent/caregiver.** In the Emergency Department only, nurses or physicians may assist or administer nitrous oxide to children 1 year and older. Caregivers may assist the child with holding the mask. Remove mask when child asleep or achieves desired level of sedation. Effects are felt within 30-60 seconds on inhalation and peak effects within 2-3 minutes. Must be self-administered, except in Emergency Department.

13. **CONTINUE** to monitor and record vital signs including oxygen saturation, respiratory status and arousal score every 5 minutes until return to pre-procedural sedation baseline. To monitor for changes in patient status and assess effectiveness of nitrous oxide.

14. **ASSESS** patient for response to medication and tolerance of procedure

**DOCUMENTATION**

**DOCUMENT** in appropriate records:

**ED flowsheet, ED Record:**
- Diagnosis of pain
- Patient response to treatment
- Consultation with physician or other health care provider and any related orders
- Patient/family teaching
- Other pertinent actions or observations

**Prescriber order form**
- Order for Nitrous oxide 50% in Oxygen 50%

**Sedation/Analgesia Record**
- Procedural Safety Check completed (Sign-in, time-out, sign-out)
- Vital signs, oxygen saturation and arousal score pre-, during and post
- Ongoing assessment data
- Date and time nitrous oxide administered and duration of use

**UPDATE** patient caution record if necessary
REFERENCES


