

Clinical Pathway

Nitrous Oxide Administration

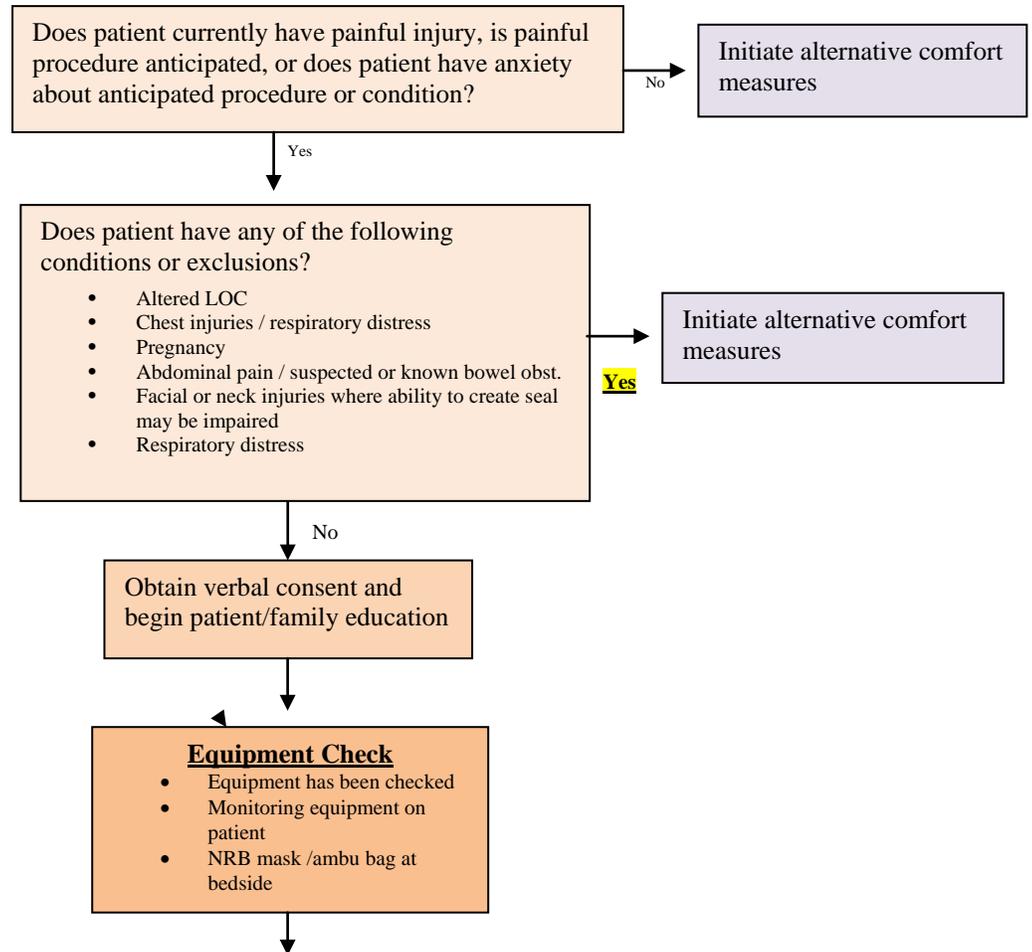
February 2013

Outcomes/Goals	<ol style="list-style-type: none"> 1. To Treat pain associated with injuries such as fractures and burns 2. Prevent/decrease pain associated with painful procedures 3. To relieve anxiety associated with painful procedures and conditions 4. Increase patient throughput with reduction of full procedural sedations and recovery time
NURSE documentation	Vital signs, development stage, ability to participate, parent's consent to participate, injury or procedure causing pain, anticipated pain or anxiety. Documentation that excludes the following contraindications: altered LOC, face or neck trauma, chest trauma, compromised respiratory status, B12 deficiency, suspected or known bowel obstruction or severe abdominal pain of undetermined origin, pregnancy or pneumothorax.
INTERVENTIONS	<ol style="list-style-type: none"> 1. Evaluate for appropriateness of use / obtain verbal consent 2. Coordinate care to correspond with procedure 3. Turn on oxygen until the grey reservoir bag is inflated. 4. Select mask or nasal hood per patient preference and/or situation. <ol style="list-style-type: none"> a. For Masks: Instruct patient to form a tight seal with the mask or mouthpiece and take slow deep breaths as oxygen begins to flow, slowly add nitrous oxide up to and not to exceed 65% b. For Nasal Hood: Assure tight fit and ability to breath through nose and keep mouth closed during procedure. Instruct patient to take slow deep breaths as oxygen begins to flow, slowly add nitrous oxide up to and not to exceed 65% 5. Instruct patient to exhale into the mask or nosepiece to keep exhaled gas collected by scavenger 6. Allow patient to inhale gas for 3-4 minutes before beginning any procedure. Begin distraction/visual imagery with patient. 7. Avoid unnecessary conversation to limit exhalation of nitrous oxide into room 8. Discontinue and notify MD if nausea, light-headedness or other side effects occur, or pain relief has not been achieved 9. Discontinue nitrous oxide and provide 100% oxygen for 3-5 minutes following procedure. Key nitrous tank off immediately following procedure. 10. Document total time of nitrous oxide use in minutes. Limit total nitrous administration to 30 minutes 11. Monitor throughout procedure, document vital signs and response to medication as patient condition warrants 12. Refer to Nitrous Oxide Policy for equipment storage, care of equipment and inclusion/exclusion criteria
DIAGNOSTICS	No specific diagnostics required prior to use
PHYSICIAN (LIP)	<p>Evaluate patient for appropriateness of use</p> <p>Order Nitrous oxide for procedure</p> <p>If LIP required for procedure, or additional pain or sedation medications have been given prior to or with nitrous administration, LIP is required to be in room during administration</p> <p>Assure oxygen wash-out has occurred and patient return to baseline</p>
ADMISSION	No specific documentation or actions required if patient is admitted following nitrous use in ED.
Special Considerations	<ol style="list-style-type: none"> 1. Nitrous Oxide will not exceed 65% nitrous 2. Administration is discontinued when the acute need for pain and/or anxiety relief has been met 3. The LIP will be notified for additional medications when contraindications exist or pain relief has not been adequately achieved.

Clinical Pathway Decision Making Process

Nitrous Oxide Administration

February 2013



Administration

1. Turn on oxygen and fill reservoir bag with oxygen before beginning.
2. Inform patient to form a tight seal with the mask or nosepiece, instructing pt to take slow deep breaths and begin flow of oxygen, slowly adding nitrous up to 65%
3. Instruct patient to exhale into the mask or nosepiece to keep exhaled gas collected by scavenger
4. Allow patient to inhale gas for 3-4 minutes before beginning any procedure. Begin distraction/visual imagery.
5. Avoid unnecessary conversation to limit exhalation of nitrous oxide into room
6. Discontinue and notify MD if nausea, light-headedness or other side effects occur, or pain relief has not been achieved.
7. Discontinue nitrous oxide and provide 100% oxygen for 3-5 minutes following procedure.
8. Key nitrous tank off immediately following procedure.
9. Document total time of nitrous oxide use in minutes. Limit total nitrous administration to 30 minutes.
10. Monitor throughout procedure, document vital signs and response to medication.

Nitrous Oxide Rationale and Data

Goals of Clinical Pathway

1. To Treat pain associated with injuries such as fractures and burns
2. Prevent/decrease pain associated with painful procedures
3. To relieve anxiety associated with painful procedures and conditions
4. Increase patient throughput with reduction of full procedural sedations and recovery time.

Data Considerations	Rationale
Historical Use	Nitrous oxide is a colorless, virtually odorless gas with anxiolytic, amnestic, and mild-to-moderate analgesic properties. The advantages of this sedation process are invested in its rapid onset of effect and rapid recovery (both typically less than 5 minutes), patient's ability to remain awake and be able to follow commands, and minimal side effects (AAPD, 2005; Kennedy & Luhmann, 1999; Rodriguez & Jordan, 2002; Webb & Moore, 2002). Nitrous oxide use for a variety of pediatric medical procedures, including lumbar puncture, bone marrow aspiration, venous cannulation, dressing changes, bronchoscopy, otomicroscopic examination, and gastrointestinal endoscopy, has been established world-wide (Annequin et al., 2000; Burnweit et al., 2004; Fauroux et al., 2004; Fishman, Botzer, Marouani, & DeRowe, 2005; Kanagasundaram, Lane, Cavalletto, Keneally, & Cooper, 2001; Michaud et al., 1999). There are numerous studies throughout the years on the efficacy and safety of Nitrous oxide (N ₂ O). N ₂ O gas has been known to have analgesic and sedative properties for over two hundred years. The gas was discovered by a Yorkshire chemist named Joseph Priestly and in 1799 the scientist Humphry Davy inhaled the gas and found it gave him rapid pain relief from an infected tooth; on one occasion he reported momentarily losing consciousness, waking up laughing about the pleasurable feelings he had experienced [1]: hence the term 'laughing gas'. As a medicinal gas, it is available as a mixture containing equal parts of N ₂ O and oxygen (O ₂). Since the 1960s has most frequently been associated with childbirth and use by ambulance crews.
Pediatric ED Use	Nitrous oxide has been shown to be an effective analgesic in pediatric laceration repairs, displaying less pain behavior than those receiving a placebo (P<.05). No side effects were encountered during the study. N=34. Annequin et al (2000) completed a nationwide 2 month prospective multicenter study with 1019 nitrous oxide administrations for ED procedures. Staff satisfaction regarding efficacy was 88% satisfied to very satisfied, side effects <3.7% all which were transient and required nothing more than removing inhalation device.
Outpatient Use	From same day surgery clinics to pediatric specialty clinics to EDs, nitrous oxide is growing in use for outpatient procedures. Nitrous, combined with a hematoma block, was found to be a safe and effective treatment for fracture reduction (Henrikus 1995). Outpatient otomicroscopic exams utilizing nitrous oxide in pediatric patients was "beneficial from the patient and family standpoint, but also from the efficiency standpoint for patient flow and scheduling" (Fishman 2005). A study by Zier, 2007, for outpatients undergoing urinary catheterization resulted in the development and expansion of a nurse-administered nitrous oxide program.

Special Considerations	Contraindications
<ol style="list-style-type: none"> 1. Administration is discontinued when the acute need for pain and/or anxiety relief has been met 2. The LIP will be notified for additional medications when contraindications exist or pain relief has not been adequately achieved. 	<ol style="list-style-type: none"> 1. Altered LOC 2. Chest injuries 3. Respiratory distress 4. Pregnancy 5. Abdominal pain (including known or suspected bowel obstructions) 6. Facial or neck injuries where ability to create seal may be impaired 7. Respiratory distress

Children's Hospitals and Clinics of Minnesota

The Nitrous oxide sedation program at Children's of Minnesota, one of the most cited and published programs, was developed using a model of physician-nurse collaboration supported by nurse directors, anesthesia, ED physicians and radiology to improve care for pediatric patients. The program as experienced widespread appeal among patients, families, practitioners, and other pediatric medical facilities throughout the country. The program's success is accredited to a high level of patient, family, and staff satisfaction, as well as increased efficiency in targeted patient care areas. The success of the program has generated interest among pediatric nurse and physician colleagues across the nation and is the topic of several national pediatric nursing conferences in 2010. Phillip Kibort, Chief Medical Officer; Ginger Malone, Chief Nursing Office.

Title: Nitrous Oxide Administration in Pediatric ED

Effective Date: February 2013

Choose policy area: Pediatric Emergency (PEM),

Text: Nitrous oxide is a colorless, virtually odorless gas with anxiolytic, amnesic, and mild-to-moderate analgesic properties. The advantages of 65% nitrous for patients in the pediatric ED are invested in its rapid onset of effect and rapid recovery (both typically less than 5 minutes), patient's ability to remain awake and be able to follow commands, and minimal side effects.

The purpose of this document is to provide appropriate indications, management, administration and monitoring of 65% nitrous oxide/oxygen for painful procedures, conditions, or procedures that may induce anxiety to the pediatric patient who is developmentally and physically able to self-administer.

PROCEDURE:

Staff Requirements	<ul style="list-style-type: none"> A. Nitrous oxide will only be administered by an RN or LIP who has successfully completed the required training program and competency using the Porter fail-safe system. B. Pregnant health care providers should not administer nitrous oxide.
Indications	<p>A. Inclusion criteria</p> <ul style="list-style-type: none"> 1. Evaluate patient for appropriateness of use. Criteria include known painful injuries such as fractures and burns; prevention and reduction of pain associated with painful procedures; and to relieve anxiety associated with painful procedures and conditions. 2. Recommended age guidelines for this is 1 years of age through adolescence. 3. Administration is discontinued when the acute need for pain and/or anxiety relief has been met 4. The RN will notify the LIP when contraindications exist or pain relief has not been adequately achieved. 5. Procedures to consider Nitrous Oxide administration include but not limited to: <ul style="list-style-type: none"> a. Urinary catheterization b. IV access c. Suturing d. Wound care e. Non-invasive procedures (echo, MRI/CT) f. Lumbar punctures g. Abscess incision and drainage h. Nasal gastric tube placement i. Foreign Body (FB) removal j. Vaginal exam/abuse exam k. I&D l. Joint aspiration m. Joint relocations n. Splint placement/traction placement
Exclusions	<p>A. Exclusion criteria</p> <ul style="list-style-type: none"> 1. Altered LOC 2. Chest injuries 3. Pregnancy 4. Abdominal pain (including known or suspected bowel obstructions) 5. Facial or neck injuries where ability to create seal may be impaired 6. Respiratory distress <p>*Pregnant family members may not be present in room during administration of nitrous oxide</p> <p>*history or family history of malignant hyperthermia is not a contraindication or exclusion for nitrous oxide</p>
Administration	<p>A. Patient preparation</p> <ul style="list-style-type: none"> 1. RN evaluates patient's cognitive and developmental stage and appropriateness of use for condition/procedure 2. RN obtains verbal consent from parent 3. LIP writes order for Nitrous Administration, or RN enters as Per Protocol

	<p>4. Coordinate care or procedure to correspond with administration</p> <p>B. Equipment check</p> <ol style="list-style-type: none"> 1. Equipment, supplies and connections must be checked before each use. 2. Standard procedural sedation equipment including bag-valve-mask, suction, and code cart will be readily accessible prior to initiation of administration. <p>C. Administration</p> <ol style="list-style-type: none"> 1. Attach continuous pulse oximetry to patient. Continuously monitor throughout procedure. 2. Turn oxygen on inflating reservoir bag with oxygen. 3. Select flavored mask or nosepiece per patient preference and/or situation. 4. Instruct patient to form a tight seal with the mask or nosepiece and take slow deep breaths beginning with oxygen flow. Slowly add nitrous oxide up to but not to exceed 65%. 5. Instruct patient to exhale into the mask or nosepiece to keep exhaled gas collected by scavenger 6. Allow patient to inhale gas for 3-4 minutes before beginning any procedure. 7. Avoid unnecessary conversation with patient to limit breaking seal and exhalation of nitrous oxide into room. Use imagery and distraction techniques to enhance/compliment administration. 8. Discontinue and notify MD if nausea, light-headedness or other side effects occur, or pain relief has not been achieved 9. Discontinue nitrous oxide and provide 100% oxygen for 3-5 minutes following procedure 10. Key nitrous tank off immediately following procedure.
Monitoring	<ol style="list-style-type: none"> A. Monitor continuous pulse oximetry throughout procedure. B. Monitor patient for response to procedure, pain, and indications of side effects such as nausea. C. Monitor vital signs pre and post procedure per department standard and patient condition.
Documentation	<ol style="list-style-type: none"> A. Document % and total time of nitrous oxide use in minutes. Limit total nitrous administration to 30 minutes B. Document response to procedure in electronic patient record C. Document any adverse reactions or side effects and interventions required
Equipment Care and Storage	<ol style="list-style-type: none"> A. Post Procedure <ol style="list-style-type: none"> 1. Latex-free sedation mask and breathing circuit are disposable and are one time use 2. Non-disposable equipment will be cleaned per hospital standard B. Storage of Equipment <ol style="list-style-type: none"> 1. Sedation mask and breathing circuit will be stored in the supply pyxis to limit access and facilitate tracking and documentation of use. 2. Nitrous tank will be turned (keyed) off immediately following procedure and when not in use. Nitrous tanks will be secured to the mobile stand, in a restricted/locked storage room when not in use. Full nitrous tanks will not be stored in any other location in the ED. 3. Nitrous tanks are supplied through transportation and will be ordered as needed. There should always be 2 tanks available – one in use and one full sealed tank. Empty tanks will be returned to transportation and replaced immediately following a procedure and should not be stored or kept on the unit.
Environmental Testing	<ol style="list-style-type: none"> A. Exposure monitoring, including lab analysis will be conducted on a regular basis per Environmental Health and Radiation Department requirements. Costs involved in the testing and analysis will be the

responsibility of the home department.

- B. Failure of testing or to comply with the testing, or with regulatory requirements will result in immediate cessation of use.

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Related Forms:

- Sedation Policy

Supersedes:

2011

Reviewed: 24 Months

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