Policy: Nitrous Oxide Use in the Intrapartum/Immediate Postpartum Period

Applicable to

- [x] VUH
- [ ] Children’s Hospital
- [ ] VMG
- [ ] VMG Off-site locations
- [ ] VPH
- [ ] VUSN
- [ ] VUSM

Team Members Performing

- [ ] All faculty & staff
- [ ] Faculty & staff providing direct patient care or contact
- [ ] MD
- [ ] House Staff
- [ ] RN
- [ ] LPN
- [x] Other: L&D Staff, Anesthesia Providers

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SPECIFIC EDUCATION REQUIRED: [x] YES [ ] NO
If yes, see section on “Additional Competencies Required”

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I. Policy and Purpose Statement:

To provide analgesia via a self-administered inhaled nitrous oxide delivery system for women in the intrapartum/immediate postpartum period. The use of nitrous oxide as an analgesic is standardized according to current practices and guidelines to provide safe, consistent administration for women who desire such and are appropriate candidates. This policy applies to the therapeutic use of nitrous oxide analgesia for certain other peripartum clinical situations such as manual removal of the placenta, extensive perineal repair and other painful procedures which is addressed specifically in Section VII.E.8.

II. Guiding Principle:

Many labor patients presenting to Vanderbilt University Medical Center (VUMC) express the desire to give birth without an epidural. A recent American College of Nurse Midwives position statement reads “Women should have access to a variety of approaches to promote comfort and reduce pain throughout labor.”¹ Currently, at our institution, analgesia alternatives to an epidural are limited to intravenous narcotics which are limited in effectiveness and carry significant maternal, fetal and neonatal side effects.² Inhaled nitrous oxide is a modestly effective analgesic option for parturients (women in labor) desiring non-regional analgesia that has a better safety profile than narcotics and a long history of use in laboring patients.

Nitrous oxide by inhalation is used as a major method of labor analgesia in countries with high standards for safe and effective health care including Australia, Canada, Finland, Sweden and the United Kingdom.³ A questionnaire survey of all Norwegian labor units in 2005 reported that 86% of labor units utilize nitrous oxide.⁴ Australia’s mothers and babies report of 2008 identified nitrous oxide as the most commonly employed mode of analgesia in that country, being used by 50.3% of women (epidural or caudal being used by 28.2%).⁵

In the United States, this modality has been available and extensively utilized at the University of California at San Francisco for approximately 30 years under the direction of the UCSF Division of Obstetric Anesthesia. The nitrous oxide program at UCSF serves as the clinical model for our institution and guides our policy and intended practice with regard to nitrous oxide for labor.⁶
III. Definitions:

Nitrous oxide (50%) by inhalation without co-administration of narcotics is defined as minimal analgesia. This classification is based upon the clinical practice worldwide and at UCSF and corroborated by available literature. Additionally, inhaled nitrous oxide has a long history of dental use in the United States where it is used routinely at concentrations of up to 70% without medical monitoring.

IV. Additional Competencies Required:

A. Initial Competence

1. Staff involved in the care of patients receiving inhaled nitrous oxide shall attend a clinical teaching program developed and taught by the division of Obstetric Anesthesia. Those attending the teaching program shall include all labor and delivery nurses, midwives, obstetricians and anesthesiologists. This teaching program will assist care staff in providing patient support and observation for those patients utilizing nitrous oxide analgesia under the clinical guidance and supervision of the obstetric anesthesia division.

2. The initial training of labor and delivery staff and faculty shall be provided in designated training sessions prior to implementation of the nitrous program.

3. Teaching of labor and delivery staff will include instruction in:
   a. Patient assessment (including indications and contraindications);
   b. Benefits and risks of nitrous oxide for labor;
   c. Basic setup and use of the equipment;
   d. Protocol for machine checkout and use log;
   e. Patient monitoring and communication with anesthesia team;
   f. Potential side effects and their management;
   g. Patient support and education to enhance effectiveness of the therapy.

4. An ongoing teaching program shall be provided monthly for anesthesia residents and student nurse anesthetists beginning their obstetric anesthesia rotation. The content of this teaching session will be similar to staff teaching with an additional emphasis on issues relevant to anesthesia providers.
B. Continued Proficiency

1. Nursing staff and obstetric providers will receive updates on the use of nitrous oxide from the obstetrical anesthesia team.
2. Orientees to labor and delivery will attend a teaching session on nitrous oxide. This shall be available once monthly as part of the teaching session for residents and students beginning their obstetric anesthesia rotation. Completion of training shall be documented on check skills checklist.

V. Specific Information:

A. Administration of Nitrous Oxide is Under Direction of Division of OB Anesthesia

1. Patient assessment and consent, set-up of equipment and initial patient teaching is performed by the anesthesia provider under the direct supervision of the anesthesia attending staff.
2. Patients expressing a desire for nitrous oxide are evaluated by the anesthesia team and informed consent obtained for this as well as other modes of anesthesia. A specific consent form for nitrous oxide analgesia is signed and witnessed.
3. Complete an anesthetic history and physical in StarPanel prior to administering nitrous oxide.
4. Prior to start of therapy, a GasChart record is opened at by the anesthesia team and remains open for the duration of nitrous oxide therapy.
5. Patients receiving nitrous oxide therapy are followed by the obstetric anesthesia team for the duration of administration.
6. The anesthesia team is immediately available to nursing staff to assess patient and address any concerns for the duration of nitrous oxide administration.
7. Initial patient teaching is performed by the anesthesia team and ongoing patient teaching is provided as needed by labor nurse and/or midwife to maximize patient satisfaction and efficacy.

B. Background - Setting:

1. Nitrous oxide for labor is a clinical activity within the Obstetric Department and the Obstetric Anesthesia Division at VUMC.
2. Supervision of the program is under the direction of the Chief of Obstetric Anesthesia.
3. Teaching of Labor and Delivery staff and anesthesia providers is performed by the Director of the Nitrous Oxide for Labor Analgesia Program under the supervision of the Chief of Obstetric Anesthesia.

C. Indications

1. Women in painful labor.
2. Women undergoing extensive perineal repair where local anesthesia may not meet all analgesic needs.
3. Women requiring painful postpartum procedures such as manual removal of the placenta and dilation/curettage.

D. Precautions/Contraindications

1. Patients who cannot hold their own facemask.
2. Patients who are acutely intoxicated or have impaired consciousness.
3. Patients who have received intravenous opioids in the last two hours.
4. Patients with pernicious anemia or documented B12 deficiency
   Note: Patients taking B12 as a nutritional supplement without a deficiency are not contraindicated from this therapy.
5. Patients with a history of pneumothorax, bowel obstruction, increased intra-cranial pressure or intra-ocular surgery might not be candidates for nitrous oxide and will be assessed by the anesthesia team for appropriateness of therapy.
6. Fetal heart tones are assessed by the obstetric provider in accordance with the Fetal Heart Rate monitoring policy. (see References)
   a. The appropriateness for nitrous oxide analgesia in light of fetal heart tone category is documented in the chart by the obstetric provider.
   b. As a general guideline, patients with a category 1 and selected patients with a category 2 tracing will be acceptable candidates for nitrous oxide as determined by the obstetric provider.

E. Materials

1. Nitrous Oxygen Delivery System
   a. The Nitronox® unit is a portable gas blender device with scavenging capability delivering 50% nitrous oxide in
combination with 50% oxygen. This unit is equipped with a demand valve, preventing flow of the gas mixture while the mask is not in use.

b. The unit is equipped with a scavenging system that attaches to wall suction at the bedside. The scavenging system is connected to wall suction as part of machine set-up prior to use of the machine.

c. The unit uses standard E-size cylinders.

d. This device is equipped with disposable tubing and facemask which is changed each time the equipment is used by a patient.

e. Nitrous administration equipment and tank is stored in locked cabinet when not in use. The on-call OB anesthesia attending and the Labor & Delivery nurse will have key to this cabinet.

2. Nitrous Oxide Tanks

a. Nitrous oxide tanks are stored in locked and secure area.

b. Certified anesthesia technologists inventory and maintain adequate supply as per standard Perioperative Services practices.

c. Gas tanks are stored in compliance with all Vanderbilt Environmental Health Services (VEHS) specifications.

F. Setup and Administration of Nitrous Oxide

1. Pre-treatment Evaluation

a. Assessment of patient suitability and absence of contraindications.

b. Vital signs including blood pressure, heart rate, oxygen saturation, and fetal heart rate evaluation are recorded in GasChart prior to initiation of therapy.

2. Set-up: Anesthesia team verifies equipment is properly connected and operating and attach disposable circuit for single use.

3. Patient Preparation

a. Informed consent of patient to include possible side effects: nausea, vomiting, dizziness, fatigue.

b. Patient counseled and consented that they will move only with assistance for the duration of nitrous therapy.
c. Patient consent form signed and in chart.
d. Instruct patient on self-administration:
i. Placement of mask to create seal;
ii. Timing of breathing for maximum analgesic effect;
iii. Patient is to hold her own mask at all times.

4. Procedure

a. Patient holds mask over nose and mouth, creating a sufficient seal to activate a second-stage regulator to open flow of nitrous oxide up to 50% in nitrous concentration and at least 50% oxygen.
b. Ongoing patient instruction and assistance with the timing of breaths to contractions is provided by anesthesia team, with continued re-enforcement by nursing and obstetric provider as needed.
c. Patient is instructed to begin inhalation as soon as impending contraction is felt in order to optimize therapy.
d. Labor nurse is instructed and orders entered that no additional opioid administration is allowed without direct anesthesiologist supervision while patient uses nitrous oxide (see Section VII:E:8).

5. Termination of Treatment

Use of nitrous oxide is discontinued when patient desires or when need for analgesia is no longer present.

6. Fetal Monitoring: Follow AS 201111-20.01 Fetal Heart Rate Monitoring. (see References)

7. Pulse Oximetry: In contrast to parenteral opioids, studies of nitrous oxide for labor consistently show no statistically significant association between inhaled nitrous oxide and oxygen desaturations. Women utilizing nitrous oxide for labor do not require continuous pulse oximetry monitoring. Monitor maternal vital signs routinely in accordance with current policy #AS 201111-20.06 Epidural Analgesia: Nursing Care of the Pregnant Patient in Labor and Delivery. Nursing and anesthesia staff monitor the patient for any signs of excessive sedation.

8. Special Situations: In selected cases (e.g., manual removal of placenta, extensive perineal repair) where the patient may experience excessive stimulation over a short period of time, the administration of remifentanil or other short acting agents may be
employed in conjunction with nitrous oxide at the discretion of the anesthetist on duty. In such cases, an anesthesia provider remains at the bedside continuously and vital signs are monitored and recorded in GasChart consistent with standard monitoring for Monitored Anesthesia Care.

9. If at any time there is concern for maternal or fetal well-being, nitrous oxide therapy may be discontinued at the discretion of the anesthesia, midwife or OB team.

10. IV access: Vanderbilt’s Obstetric Department has historically allowed laboring patients the discretion to decline IV access when medically appropriate. In consideration of the possible side effects and complications of nitrous oxide inhalation, there does not appear to be a clinical need for intravenous access for the sole purpose of providing nitrous oxide therapy.

11. Labor Tub: At this time it will be policy that laboring patients using nitrous oxide do not use the labor tub concurrently with nitrous oxide therapy.

VI. Documentation:

A. An ongoing GasChart anesthetic record is maintained by the anesthesia provider for the duration of nitrous oxide therapy.

B. Nurses and obstetric providers document in the patient’s chart as part of the peripartum progress notes that nitrous oxide was administered, its efficacy, and any side effects or complications.

C. Use Log: A use log is kept in the equipment cabinet. Each record of use is logged by the anesthesia provider or midwife checking out the machine. Log data includes date and time of each use with patient name and ID number and duration of use.

VII. Environmental Issues:

The Nitronox® machine is equipped with a scavenging device and a demand valve. Flow through the unit into the mask occurs only during active inhalation and exhalation. Exhaled gas enters the scavenging device which is attached to wall suction. Nitrous delivery equipment is inspected quarterly by the anesthesia technician for leaks. Periodic gas monitoring is performed in accordance with current Vanderbilt operating room policy.
VIII. References:


1 ACNM Publication, Position Statement: Nitrous Oxide for Labor Analgesia, ACNM December 2009


IX. Endorsement:

This policy has been approved and endorsed by the OB-PCC committee as of November 2010. Modifications to this policy have been made in accordance with feedback from nursing and anesthesia.

OB-PCC Committee

November 2010
X. Approval:

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