Use of nitrous oxide for analgesia in Labor & Delivery and OB Emergency Services

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History of use

- Nitrous oxide has been used in labor and delivery units since the 1930’s.
- Commonly used in Canada, Australia, United Kingdom, and many European countries.
- University of California San Francisco (UCSF) has been using nitrous oxide in L&D over 30 years.
- Rapid increase in use in the U.S. began in the past five years.
- Currently there are over 200 U.S. institutions using nitrous oxide in Labor & Delivery.

Over 200 Hospitals are using nitrous oxide in the US

Northeast
- Yale New Haven
- MedStar
- NYP

Southeast
- WakeMed
- UNC
- Tampa General

West
- Kaiser
- UCSF
- Legacy

Midwest
- Fairview
- Hennipan
- Unity Point

Southwest
- Christa St
- Vincent
- Texas Health
- UC Colorado

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- Includes nitrous oxide as an analgesic option.
- Cites several benefits:
  - Does not preclude mobility for the patient.
  - Does not require additional monitoring.
  - Allows the laboring woman to control the effect.
  - Quick termination of effect once the parturient removes the mask.

Properties of Nitrous Oxide (N20):

- Colorless, odorless gas
- Non-Flammable
- Absorbed by Inhalation
  Not Metabolized
- Eliminated via lungs
- Mild Analgesic with Amnestic Properties
  Will not eliminate pain
- Helps patient disassociate from pain
- Adverse Reactions – dizziness, nausea

Benefits of Use – Labor and Delivery

Benefits for the patient include

- Non-invasive
- Reduced anxiety
- Reduced pain (dissociative)

Multiple peripartal uses

- All stages of labor
- Manual removal of placenta
- Laceration repair
- External cephalic version
- IV starts
- Cervical exams

Benefits of Use

- Long track record of use and safety
- Easy to administer
- Fast acting *<1-2 minutes*
- Short duration of effect *<1-2 minutes*
- Enhanced patient care
    - Offer more options for comfort
    - Improve patient satisfaction scores
- Few contraindications and side effects

Contraindications for Use

- Unable to hold the mask
  - Impaired consciousness or intoxication
- Recent use of narcotics
- Hemodynamic instability
- Documented Vitamin B12 deficiency
- Potential for trapped gas
  - Pneumothorax, intraocular surgery
  - middle ear surgery, bowel obstruction

Clinical Efficacy

- Two systematic reviews have been performed (Rosen, 2002; Likis et al., 2014)
- Many studies exist but are of low quality:
  - Concentration of nitrous oxide varied from 5% to 80%
  - Studies included both self administered and continuous delivery
- N2O not found to affect normal labor progress, rate of SVD, or other measured maternal complications.
- In some studies, N/V was as high as 36%, but effect of labor itself not assessed.
- No adverse effects to the neonate were observed.
- All study authors considered nitrous oxide a useful option for laboring patients due to its rapid onset and offset of action, ease of administration and low cost.

Demand Flow Nitronox

Nitronox = Demand Flow

- Fixed 50/50 (50% N2O and 50% O2)
  - No settings or adjustments
  - Not “pre-mixed” gas
- Controlled by patient
- Patient only receives what they inhale
- Ideal for L&D setting
  - intermittent use over periods of time
- Integrated scavenging

Nitronox Safety Features

- Built in mechanism preventing flow of N_2O without O_2
- Patients always receive at least 50% O_2
  O_2 Enrichment Feature
  Shallow breathing results in higher O_2%
- Audible alarm for gas pressure change outside of calibration or normal operating range
- Visual Pressure Gauges – O_2, N_2O, and Mixture
- Demand valve has quick connect for secure storage

Exposure Prevention

- OSHA – Workplace Safety
  - N2O 25 PPM over 8 hour TWA- NIOSH
    - ACGIH 50 PPM
      - Other countries, 100 – 200PPM or no guidelines
- OSHA (Dental) Recommendations:
  - Connection to gas scavenging vacuum system that vents to the outside environment – non-circulating
    - Vacuum pulls at least 45 LPM
- Periodic testing – Dosimeter Badges

Prevention of Diversion

- Demand Valve has a quick connect attachment for removal and storage
  - System is not functional without demand valve
  - Locked in SureMed when not in use
  - Checked out under patient name
  - Require witness to return
- Patients and families
  - Educated about self-administration
  - Removed from use if non-compliant
- Zero tolerance for abuse

THANK YOU!

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References

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