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

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Labor and Delivery
OB Emergency Services
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

Midwest
- Fairview
- Hennipan
- Unity Point

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

West
- Kaiser
- UCSF
- Legacy
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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\textsubscript{2}O without O\textsubscript{2}

• Patients always receive at least 50\% O\textsubscript{2}
  
  O\textsubscript{2} Enrichment Feature
  Shallow breathing results in higher O\textsubscript{2}\% 

• Audible alarm for gas pressure change outside of calibration or normal operating range

• Visual Pressure Gauges – O\textsubscript{2}, N\textsubscript{2}O, 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 – 200 PPM 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
References

