NITROUS OXIDE
• “It is a fact that women in the United States have fewer options for childbirth pain management than women in Canada, Australia, and most of Western Europe.”

• “Women in the United States need alternative ways to relieve labor pain.”

• (Leeman et al., 2003; Marmor and Krol, 2002; Rooks, 2011)
• 61% of women receive regional anesthesia for labor pain.

• Many women do not need or want regional anesthesia and are often denied accessibility due to lack of competition among anesthesia professionals and lack of access in rural areas.

• (Books, 2007)
“Women should have access to a variety of approaches to promote comfort and reduce pain throughout labor”

—POSITION STATEMENT ON NITROUS OXIDE (2010)
“Remove your shoes and socks. We ran out of laughing gas.”
HISTORICAL

• First recognized and synthesized in 1700s, Sir Humphrey Davy

• Used for dental analgesia 1850 England

• 1881 first used for labor analgesia (Russia)

• 1930s became popular in United States (70/30 blend)

• Fell into disuse in America with rise in popularity of epidurals
NITROUS IN THE PRESENT

• Most utilized gaseous anesthetic worldwide
• #1 utilized modality for labor analgesia worldwide
• UK- 60% of laboring women utilize N20
• Australia- 50% utilization
• Norway- offered at 85% of birthing centers
• Finland- 48% utilization
• More common than regional anesthesia worldwide
• In the US, Vanderbilt, Univ. of Colorado, UCSF
• NVH and KRMC, plus about a dozen other, including OOH centers
WHY NOT HERE?

- Epidural monoculture
- Not well researched in U.S.
- Billing issues
WHAT IS NITROUS OXIDE?

• N2O

• Colorless, odorless gas, non-flammable, liquid at room temperature

• Dental analgesia – variable blends

• Labor analgesia – 50/50 (Bishop, 2007; Rosen, 2002)
MECHANISM OF ACTION

- Stimulates release of
  - endogenous endorphins
  - corticotropin releasing hormone (CRH)
  - dopamine
- Equals mild analgesic and anxiolytic
CORTICOTROPIN RELEASING HORMONE (CRH)

- CRH – secreted by hypothalamus in response to stress, also serves as a marker to determine the length of gestation and the timing of parturition (when made in the placenta)

- It both inhibits labor prior to term and helps trigger contractions at term via prostaglandin release
DOPAMINE

- Neuropeptide and Neuromodulator manufactured by brain and kidneys, simplest catecholamine
- Can be both excitatory and inhibitory depending on cell receptors
- Involved in pleasure, reward (Meth increases dopamine levels)
- Decreases sensation of pain
- Stimulates prolactin release
FEEL THE RUSH...

- Endorphins are endogenous opioid neuropeptides – function to inhibit the transmission of pain signals and produce a feeling of euphoria.
BENEFITS

• Onset of action in 30-60 seconds
• Clearance from mother in 1-2 minutes after stopping
• Self-administered
• Crosses placenta but does not affect fetus
• No effect on labor progress or 2nd stage
• Does not decrease uterine contractility
• Does not require additional nursing interventions
COMMERCIAL OPTIONS

- Nitronox
- Pronox
COST

- About $5000 per unit
- Disposable tubing, masks
- N2O and O2 tanks
- Secure cabinet for storage
- Free trials
ADDITIONAL BENEFITS

• The woman is the boss

• Can be used in ob triage, for external cephalic version, labor (pain anxiety, emotional dystocia) postpartum repairs, manual removals or after pains
DISADVANTAGES

• May not work
• mild nausea
• Might be too effective
CONTRAINDICATIONS

• Patient cannot hold her own mask
• Recent inner ear surgery or deep sea diving
• Impaired LOC
• B12 deficiency
• Compromised fetus
• Hemodynamic instability
BARRIERS

• Anesthesia may not approve
  (Concern for fewer epidurals, false idea that they must administer it)

• Administration may not approve
  (cannot bill for it)
PROBLEM SOLVING

• standing orders
• practice guidelines
• borrow policies and redesign
• engage nurses
• do a trial
• advertise
AHRQ SUMMARY

• Few studies of good or fair quality
• Maternal harms reported were related to side effects (nausea, dizziness, drowsiness)
• Apgar scores did not differ
• No occupational harm noted
• Need more research about patient satisfaction and use
WHAT ABOUT STAFF EXPOSURE AND RISK?

- Theoretical risk - N2O is scavenged back
- Safety threshold per OSHA is 25 to 50 PPM for direct inhalation
- Average annual exposure in dental facilities is 15PPM
- Each facility should have a system in place to monitor exposure of employees
IMPLEMENTATION

• Research and prepare

• Present concept to involved players: Nursing, Management, Physicians, Anesthesia

• Nursing education

• Patient education and consents

• Free trial

• Survey patients and staff

• Advertise to community

• Purchase
NORTH VALLEY HOSPITAL STATS

- April 1 2015 – February 1 2015 (Almost a year)

- 591 total deliveries including RLTCS

- 159 patients used Nitrous (27%)

- 74 of these went on to get an epidural (46%)

- Of the nitrous users 9 infants had one minute Apgar’s less than 7

- 2 – meconium associated (Apgar’s 5,6)

- 1 PTB (Apgar’s 6)

- 4 tight nuchal cords (Apgar’s 6,2,5,6)

- 1 GHTN (Apgar’s 4)

- 1 precipitous birth (Apgar’s 6)
POSITION STATEMENTS

• American College of Nurse Midwives
  www.midwife.org/siteFiles/position/Nitrous_Oxide_12_09.pdf

• American Society of Anesthesiologists
  www.asahq.org/For-Members/Clinical-Information/Nitrous-Oxide.aspx

• Agency for Healthcare Research and Quality
  www.effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?productid=675&pageaction=displayproduct
QUESTIONS?