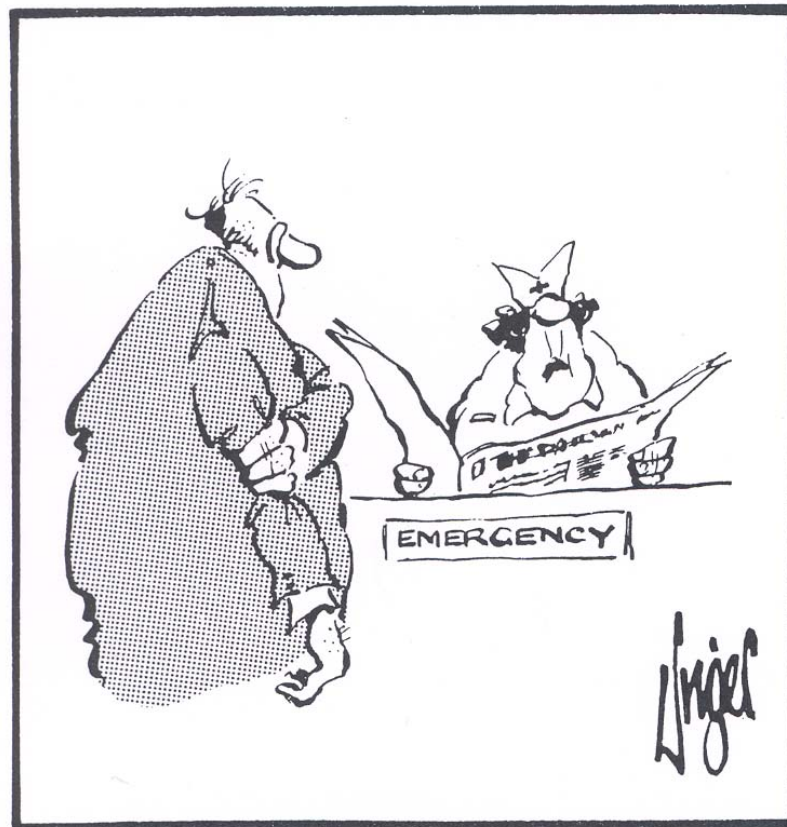


# Nitrous Oxide/Oxygen

## Nitronox use in EMS

Shawn Heidinger, PA-C/RRT/EMT-P



"We're training to ignore pain and suffering during coffee breaks."

# Objectives

- Review pharmacology of Nitrous Oxide/Oxygen gas mixture
- Discuss medication and non medication treatments for pain management
- List indications and contraindications for use of Nitronox in EMS setting
- Identify potential side effects
- Discuss proper dosing and administration
- Demonstrate proficiency with the Nitronox administration system

# Dilemma of analgesia

- Which agent/technique should I use?
- What is the risk-benefit ratio?
- How much should I administer?
- When is analgesia required?

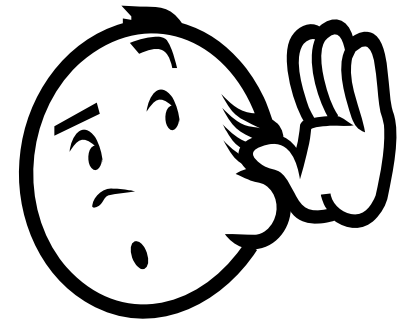


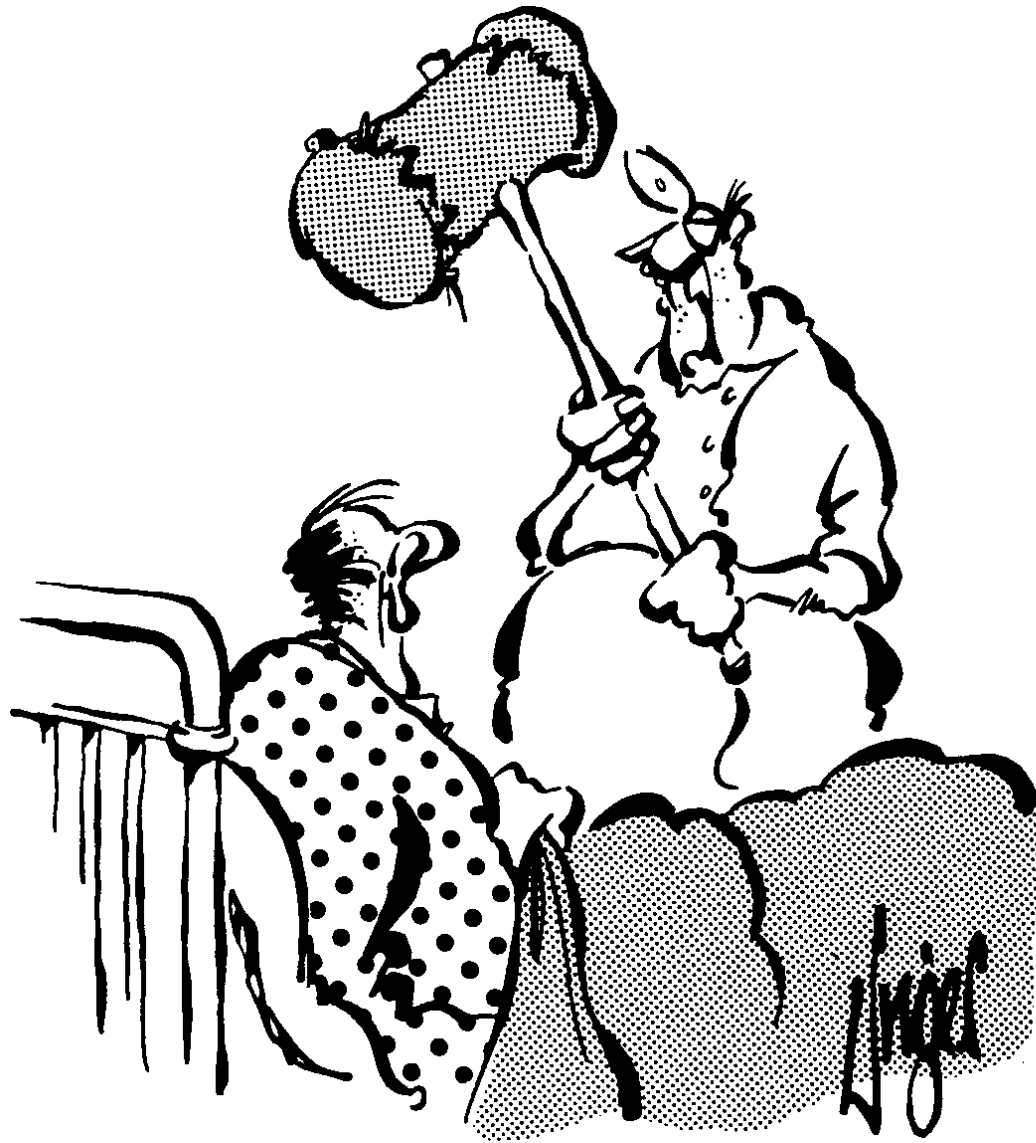


**“D’you want me to pull  
it off fast or slow?”**

# Techniques (non medication)

- Recognition and empathy
- Distraction
- Muscle relaxation
- Position of comfort
- Temperature regulation
- Splints, padding, ice, elevation





**“If we can break up the kidney stones, we won’t have to operate.”**

# Medications

- Non narcotic analgesics- aspirin, acetaminophen
- Narcotic and opioid analgesics- morphine, fentanyl
- NSAIDs- Ibuprofen, Ketorolac (Toradol)
- Antidepressants- TCAs, SSRIs
- Anxiolytics- valium
- Anticonvulsants- chronic pain
- Inhaled agents- nitrous oxide





**"I feel a lot better since I ran  
out of those pills you gave me."**

# The Ideal Analgesic

- Safe with few side effects
- Effective and rapid acting
- Easy to administer, store, and carry
- Of short duration and easily reversible
- Not easily abused



# Nitronox-Properties

- Blended mixture of 50% nitrous oxide and 50% oxygen
- Also known as “laughing gas”
- Produces sedation and analgesia
- Colorless, odorless, heavier than air
- Nonexplosive, nonflammable
- Readily diffuses through membranes (rapid onset, short duration after inhalation is stopped)

# Nitronox- Properties (cont.)

- Provides a sedative effect which decreases the patients perception of pain
- May partially act on opiate receptor systems to cause mild analgesia



# Nitronox- Properties (cont.)

- Diffuses through tissues more easily than oxygen or carbon dioxide
- Should not be used in conditions where there may be abnormal collections of air
- Gas may collect in these areas and make condition worse
- \*COPD (blebs)
- \*pneumothorax
- \*bowel distension due to obstruction/perforation

# Indications

- Fractures
- Burns
- Kidney stones
- Musculoskeletal trauma
- Abdominal pain
- Back Pain
- Acute urinary retention
- Chest pain secondary to angina or infarction  
*after full initiation of ACS protocol*

# Contraindications

- Altered/decreased level of consciousness
- Head injuries
- Chest injuries (blunt or penetrating)
- Intoxication or drug ingestion
- Maxillofacial injuries
- Psychiatric problems
- COPD, emphysema, or any condition that may compromise respiratory efforts including: CHF, respiratory tract burns, other trauma
- < 12 years of age or less than 75 pounds
- OB patient not in the process of delivery
- Respiratory distress
- Bowel obstruction or traumatic abdominal injury
- Inner ear pain



# Side Effects

- Dizziness/headache/confusion
- Apnea
- Cyanosis
- Nausea/vomiting
- Hypotension
- Ambulance crew may experience giddiness if the vehicle is not properly vented



## Side Effects (cont.)

May see transient decrease in pulse ox upon discontinuing use of Nitronox (wash out effect)

*Always monitor with pulse ox and provide appropriate supplemental oxygen if needed!*

# Side Effects (cont.)

- Personnel exposed to repeated doses of nitrous oxide are at increased risk for renal and hepatic diseases as well as birth defects. (unscavenged systems, usually more than 5 hours/week)
- *\*Always administer in well ventilated environment\**

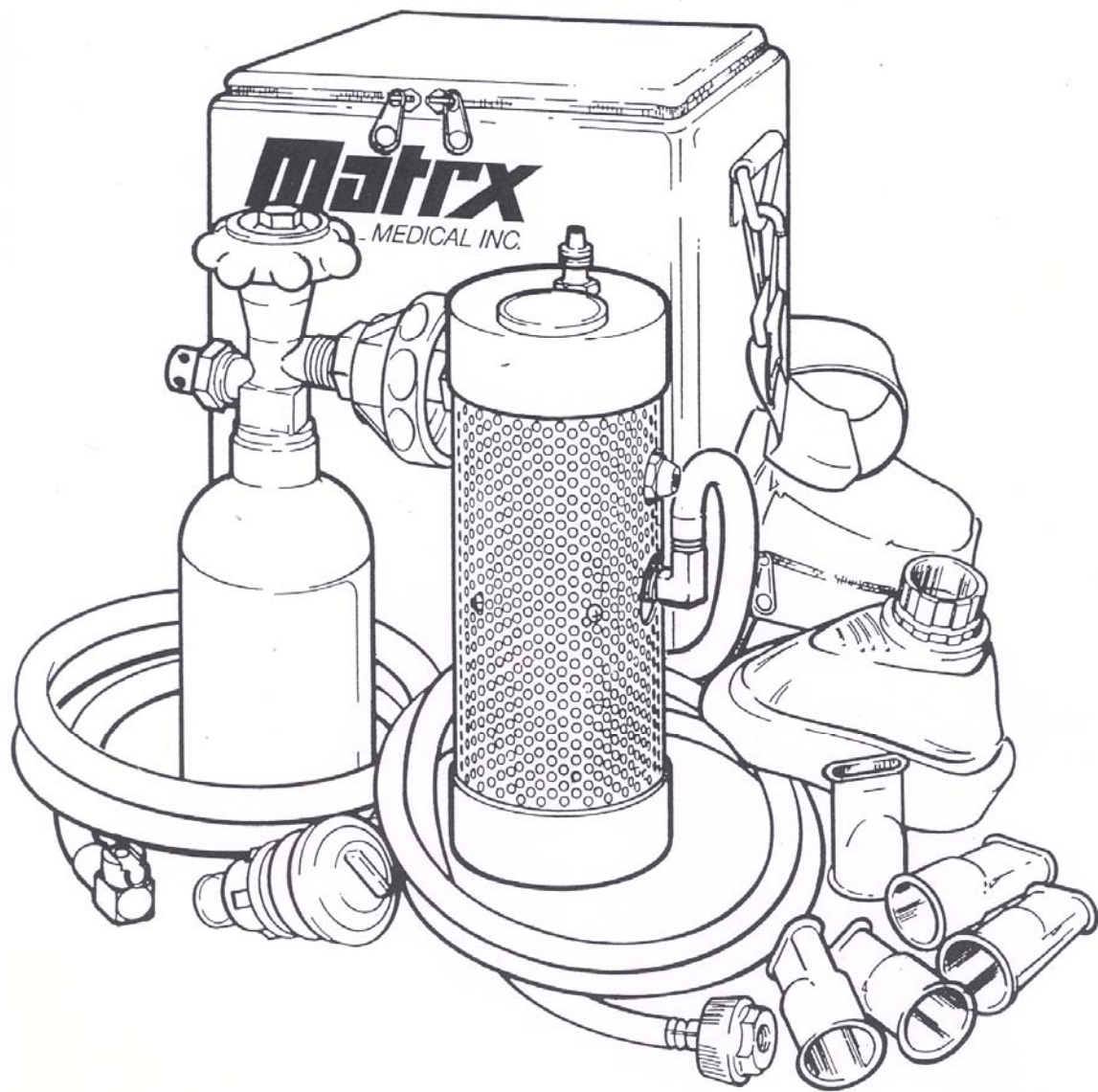
# Nitronox Administration

- ALWAYS SELF – ADMINISTERED BY PATIENT WHO IS AWAKE, ALERT, AND COOPERATIVE!
- Instruct patient to inhale deeply through the patient-held demand valve
- Patient determines number of inhalations and duration of therapy required for adequate pain relief



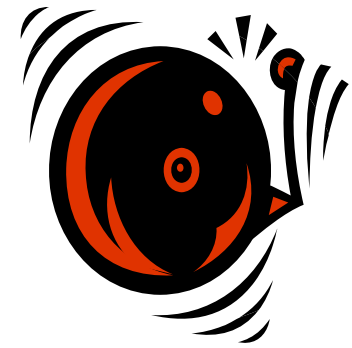
# Delivery Unit

- Supplied in carrying case containing 2 cylinders, 1 nitrous oxide and 1 oxygen
- Mixing valve ensures premixed 50:50 delivery of gas
- Demand valve prevents free flow of gas when not in use by patient
- Negative pressure required to open demand valve (good seal and patient effort)



# Delivery Unit (cont.)

- If oxygen tank runs out- audible alarm and no gas delivery
- If nitrous oxide tank runs out- audible alarm with 100% oxygen delivery to patient



# Summary

- Nitronox is a gas mixture containing 50% nitrous oxide and 50% oxygen
- Indicated for patients that are alert, cooperative, and complaining of severe pain
- Used in cardiac chest pain only after full initiation of ACS protocol
- NEVER administered by EMS personnel- only self-administered by patient
- Should not be given to patients with respiratory compromise or altered level of consciousness

# Summary (cont.)

- May worsen conditions involving abnormal collections of air, ie: pneumothorax, bowel obstruction
- Side effects include dizziness, drowsiness, and occasionally nausea/vomiting
- Use only in well ventilated areas where there is no combustion hazard