



## Emergency Department Nitrous Oxide Protocol

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### Background

Nitrous Oxide (N<sub>2</sub>O) is a tasteless colorless gas administered in combination with oxygen via inhalation as an analgesic and sedative agent. N<sub>2</sub>O is rapidly absorbed via the pulmonary vasculature into the bloodstream, and does not combine with hemoglobin or other body tissues. N<sub>2</sub>O rapidly reaches the central nervous system within minutes. Administration of N<sub>2</sub>O can achieve similar analgesia as compared to opioid analgesia, with the added benefit of noninvasive administration, and the ability to titrate up and down to achieve rapid onset and elimination. It has an impeccable safety record with few side effects and requires only minimal monitoring during use.

### Indications

- Reduction of joint dislocations
- Adjunct to other analgesia in fracture reduction
- Splinting
- Adjunct to local anesthetic for laceration repair
- Adjunct to local anesthetic for incision and drainage of soft tissue/bartholin's abscesses
- Advanced wound or burn care
- Foreign body removal
- Adjunct to local anesthetic for Central Venous Access
- Peripheral Venous Access
- Adjunct to local anesthetic for Lumbar Puncture
- Fecal Disimpaction

### Contraindications

Nitrous oxide has 15 times higher solubility ratio as compared to nitrogen, and in high doses can cause gaseous expansion in enclosed air spaces. Additionally, in patients who breathe via a hypoxic drive

secondary to lung disease may have respiratory compromise with the administration of high concentrations of N<sub>2</sub>O.

- Inflammation or obstruction of nasal passages (eg- upper respiratory infection/sinusitis)
- COPD
- 1<sup>st</sup> and 2<sup>nd</sup> trimester pregnancy
- Severe asthma
- Altered level of comprehension secondary to psychiatric disease, intoxication, or head injury
- Complex advanced cardiac disease
- High suspicion of otitis media
- High suspicion of bowel obstruction

#### Maintenance/Serviceing/Storage

Nitrous oxide will be stored and maintained by respiratory therapy. Apply a face mask suitable for the patient's face size; sizes include small, medium, and large. Position patient as needed for procedure or analgesia.

#### Administration

N<sub>2</sub>O is administered along with oxygen at varying levels of concentration. The maximum safe concentration is a 70% N<sub>2</sub>O: 30% mixture oxygen. Titration of the mixture should start at 10% N<sub>2</sub>O: 90% oxygen. The optimal concentration of nitrous oxide to achieve desired analgesia or sedation will vary with each patient, and can vary in the same patient presenting with different pain or sedation needs. The operator can assess when the correct level of analgesia is met by using a verbal pain scale or when the patient no longer adversely responds to the painful stimuli but is still able to communicate. The correct level of sedation can be assessed when the patient appears sedated, has minimal to no response to painful stimuli, but is able to communicate without significant stimulation.

Special Considerations in pediatrics- there is an increase rate of emesis in younger children post-administration. The risk increases with younger age, increased concentration, and increased duration of administration. For complicated lengthy (>30 minutes) procedures prophylactic treatment with an anti-emetic is recommended.

- Set the mixture dial to 100% oxygen and allow the patient to breathe through their nose for one minute

- Turn the mixture dial to 70% oxygen (30% nitrous oxide) and allow patient to breathe through their nose for approximately one minute
- Turn the mixture dial to 50% oxygen (50% nitrous oxide) and allow patient to breathe through their nose for approximately one minute
- Continue to titrate oxygen level down (allowing the nitrous oxide concentration to rise) until desired level of analgesia or sedation is achieved. Be aware that the mixture will not go below 30% oxygen or 70% nitrous oxide
- Continue administration of gas at the desired concentration throughout procedure or as needed for analgesia. If at any point the patient becomes over-sedated titrate oxygen concentration back up. The operator may continue to titrate the gas mixture up and down as needed. The effects of changing the nitrous oxide concentration should be apparent within one to two minutes.
- Once the procedure is completed or the patient's analgesic needs have been met the operator should turn the dial back down to 100% oxygen and allow the patient to breathe through their nose for 2-5 minutes before removing the face mask.
- Allow the patient to remain in a chair or the bed for an additional 2-5 minutes while breathing room air before safely discharging.
- Patients will not require any restriction on activity or driving if only nitrous oxide was administered.