Nitrous Anesthesia Course Outlines

INTRODUCTION: 3min.

Organization of the Seminar Series

Goal: Review Anesthesia with Nitrous Oxide

Audience: Health Care Providers

Format: Recorded video seminars with participation of students and residents

Requires: Access to relevant recommended literature

Suggested: On site knowledgeable clinician available for discussion of the presented subject

Seminar Length: Each topic could be covered in less than 45 minutes

Faculty: responsible for production for production
Raymond White DDS, PhD
Dalton L McMichael Distinguished Professor
UNC Oral and Maxillofacial Surgery

William Proffit DDS, PhD
Kenan Distinguished Professor
UNC Orthodontics
SEMINAR ONE: Depths of Sedation/ Anesthesia and the Central Nervous System 32min.

REFERENCES

Outline
History of nitrous oxide is the history of anesthesia:
Jos Priestley, Humphry Davy, James Watt, Horace Wells, Gardner Colton
Sedation / Anesthesia and Central Nervous System

Objectives
Explain how anesthesia evolved
Differentiate among the changes in the CNS with sedation/anesthesia drugs

Evaluation Seminar One
1) Administration of oral drugs for sedation may render a patient unable to respond to verbal stimulation
   a-True
   b-False

2) Nitrous oxide is the only anesthetic drug discovered in the 19th century still commonly administered today.
   a-True
   b-False

3) Levels of Sedation / Anesthesia should be determined by the route of administration of the drugs
   a-True
   b-False
**SEMINAR TWO:** Routes for Drug Administration, Pharmacology of Nitrous Oxide, and Benzodiazepines *41min.*

**REFERENCES**

* Dionne et al: Balancing efficacy and safety in the use of oral sedation in dental outpatients. JADA 137:502, ‘06

**Outline**

Options for Administration of Drugs for Sedation / Anesthesia
- Enteral (PO), Transmucosal, Intravenous, Inhalation, Intramuscular, Multiple routes
- Review of pharmacology of Nitrous Oxide and Benzodiazepines

**Objectives**

- Compare sedation and general anesthesia by physiologic outcomes
- Compare drug administration by access, control of dosage
- Relate drug administration to elimination; alpha half-life (redistribution) and beta half-life (elimination)
- Describe possible clinical outcomes associated with choice of drug administration

**Evaluation Seminar One**

1) The blood/gas ratio of Nitrous oxide enables a rapid induction of anesthesia and then elimination of the drug at procedure’s end.
   a-True
   b-False

2) Redistribution of a sedative drug implies
   a-The drug may no longer have a pharmacologic effect
   b-Metabolic degradation in the liver
   c-Excretion by the kidney in urine
   d-Dispersal throughout the body from the primary pharmacologic site of action
   e-A and D

3) All Patients usually respond to similar doses of drugs in the same manner
   a-True
   b-False
**SEMINAR Three:** Pulmonary/Respiratory Physiology: A Review 43min.

**REFERENCES**

*Krauss et al: Capnography for procedural sedation and analgesia in the emergency department.*

*Ann Emerg Med 50:172, '07*

www.howequipmentworks.com Carbon Dioxide monitoring—capnography,

Oxygen monitoring-Pulse Oximetry

**Outline**

Gas mixtures in respiration
Gas exchange across alveolar-blood interface
Monitoring arterial Oxygen levels: Arterial blood gases vs. Pulse Oximetry
Monitoring exhaled Carbon Dioxide: Capnography

**Objectives**

Discuss relationship between lung function and gas exchange at the alveolus
Discuss relationship between monitoring with pulse oximetry and arterial Oxygen levels
Compare monitoring: Pulse Oximetry vs. Capnography
Describe how sedative drugs might affect blood Oxygen levels

**Evaluation Seminar Three**

1) Oxygen is very soluble in blood plasma
   a-True
   b-False

2) Respiratory rates, number of breaths and depth of breaths, is driven by carbon dioxide levels in healthy patients
   a-True
   b-False

3) A rapid decrease in Oxygen saturation during conscious sedation measured by pulse oximetry from 97% to 89% is usually the result of
   a-Malfunction of the monitor
   b-Airway obstruction
   c-Allergic response to drugs
   d-Pain from the procedure
   e-Carbon dioxide build-up in the blood

4) Capnography, a measure of exhaled Carbon Dioxide, offers an estimate of pulmonary gas exchange
   a-True
   b-False
**SEMINAR Four**: Evaluation of patients for sedation / anesthesia **19min.**

**REFERENCES**

Lee A et al: A systematic review (meta-analysis) of the accuracy of the Mallampati tests to predict the difficult airway”. Anesthesia and analgesia 102:1867, 2006


**Outline**

American Society of Anesthesiologists Classification: ASA I to V

Pertinent medical History

History related to nitrous oxide side effects

Examination targeted to airway / Malampati Score / Body Mass Index

**Objectives**

Classify patients by Health Status

Assess patients specifically as candidates for inhalation anesthetics

**Evaluation Seminar Two**

1) A history of sleep apnea is not a relative contraindication for sedation with nitrous oxide

a-True

b-False

2) A patient classified as ASA III because of uncontrolled hypertension might benefit from nitrous oxide sedation within limits.

a-True

b-False

3) The difference between classifications ASA II and ASA III could be based on

a-medications the patient is taking

b-a patient’s disease impact on lifestyle

c-a primary care physician’s consultation

d-medical history

e-all of the above

4) A Body Mass Index at least 30 is often associated with a compromised airway

a-True

b-False
**SEMINAR Five: Anesthesia / Monitoring Equipment 25min.**

**REFERENCES**

www.howequipmentworks.com (capnography, pulse oximetry, vaporisers)

**Outline**

Anesthesia machines for administering N₂O  
Monitoring options for Minimal Sedation-Anxiolysis, Moderate Sedation:  
    - Pre-cordial auscultation, Pulse oximetry, Capnography  
Monitoring arterial Oxygen levels: pulse oximetry  
Monitoring exhaled Carbon Dioxide: Capnography

**Objectives**

Sequence technical steps for administration of N₂O  
Select monitoring protocol for individual patient  
Compare clinical uses of Pulse Oximetry and Capnography

**Evaluation Seminar Four**

1) Administration of 100% Oxygen at the start of the procedure  
a- Removes carbon monoxide from the ambient room air  
b- Offers protection to staff from leaking N₂O  
c- Reduces the Nitrogen content in the patient’s lungs  
d- Facilitates transfer of N₂O to the bloodstream  
e- Answers C and D

2) Monitoring with pulse oximetry provides an estimate of the Oxygen content of the blood  
a- True  
b- False

3) Anesthesia machines with “Fail Safe” alarms detect a decreasing concentration of Nitrous Oxide  
a- True  
b- False

4) Capnography outcomes can be observed before outcomes of oxygen desaturation/hypoventilation with Pulse Oximetry  
a- True  
b- False
**SEMINAR Six:** Administration of Nitrous Oxide **17.5min.**

**REFERENCES**

White PF et al: New criteria for fast-tracking after outpatient anesthesia:
A comparison with the modified Aldrete’s scoring system. Anesth Analg 88:1069, 1999
http://www.meddentsafety.com/catalog/safe_sedate (Safe Sedate Nasal Masks)
http://http://www.flexicare.com then search nasal hoods (Masks with Capnography port)

**Outline**

Preparation of the patient for N₂O anesthesia/diet modifications
Levels of N₂O appropriate for the patient
Signs of N₂O effects on the patient
Recovery from N₂O anesthesia / Discharge protocol
Anesthetic complications: Nausea, Excitability, Loss of Airway

**Objectives**

Prepare patient for planned anesthesia: Diet, Care giver responsibility
Decide levels of anesthesia based on the patient’s responses
Sequence steps if patient becomes agitated, disoriented, nauseated
Sequence steps if airway blocked
Implement discharge protocol after anesthesia

**VIDEO CLIPS**

Flexcare Mask (Length 4min.)
Safe Sedate Mask (Length 4Min.)

**Evaluation Seminar Six**

1) Restricting solid food intake 6hr prior to anesthesia minimizes nausea and vomiting
   a-True
   b-False

2) On repeat dental visits most patients respond similarly to the same levels of N₂O anesthesia
   a-True
   b-False

3) After N₂O anesthesia it is advisable to have the patient accompanied home
   a-True
   b-False

4) The Aldrete Scoring System is very useful, but not the only consideration in discharge of patients after a procedure under sedation.
   a-True
   b-False
SEMINAR Seven: Side Effects / Hazards to Staff of Nitrous Oxide 47min.

REFERENCES
Sanders et al: Biologic Effects of Nitrous Oxide. Anesthesiology 109:707, ’08
Yagiela JA: Health Hazards and Nitrous Oxide: A Time for Reappraisal Anesth Prog 38:1, ’91
Tramer M et al: British Journal of Anaesthesia Omitting nitrous oxide in general anaesthesia:
  meta-analysis of intraoperative awareness and postoperative emesis in randomized
  controlled trials 76:186 ’96; 76
Gan TJ et al: Society for Ambulatory Anesthesia Guidelines for the Management of
  Postoperative Nausea and Vomiting Anesth Analg 105:1615, ’07

Outline
Nitrous oxide levels in ambient air with/without scavenging
Patients at risk for acute Nitrous oxide exposure, mechanisms
Staff at risk for chronic Nitrous oxide exposure, mechanisms
Monitoring for chronic Nitrous oxide exposure

Objectives
Evaluate patients for high risk of nausea / vomiting
Evaluate patients for high risk of vitamin B_{12} deficiency
Explain hazards to staff
Understand mechanisms of reducing N_2O in ambient air

VIDEO CLIPS
Nausea (Length 3min.)
Stage Two Anesthesia (Length 7min.)
Deep Sedation with Airway Compromise (Length 4min.)
Evaluation Seminar Seven
1) Which of the following does not pose an increased risk of nausea and vomiting with nitrous oxide anesthesia?
   a-History of “car sickness”?
   b-Nausea and vomiting with a previous anesthetic?
   c-Female gender
   d-Anesthetic with propofol
   e-Opioids as a component of the anesthetic regimen

2) A patient’s previous history includes anesthetics with N₂O and no nausea and vomiting. This suggests a low risk with future anesthetics.
   a-True
   b-False

3) A history of inflammatory bowel disease suggests the possibility of a vitamin B₁₂ deficiency.
   a-True
   b-False

4) Chronic exposure to Nitrous Oxide even at low levels
   a-Affects immune cell development
   b-Retards red cell proliferation
   c-Affects myelin maintenance on peripheral nerves
   d-Inhibits Ovulation similar to the effect of intensive exercise
   e-All of the above
SEMINAR EIGHT: NC State Board of Dentistry Regulations for Sedation / Anesthesia
Pending Regulation Changes-Coming Soon

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