



PHARMACOLOGICAL BEHAVIOUR MANAGEMENT

WHAT IS PHARMACOLOGICAL MANAGEMENT

It is a broad term that is used to describe **the use of drugs to manage the behaviour** in pediatric population undergoing dental procedures.

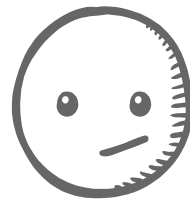
CONSCIOUS SEDATION

“A technique in which the use of a drug or drugs produces a state of **depression of the nervous system** enabling treatment to be carried out, but during which **verbal contact with the patient is maintained throughout the period of sedation**. The drugs and techniques used to provide conscious sedation for dental treatment should carry a margin of safety wide enough to render loss of consciousness unlikely”

Indications:

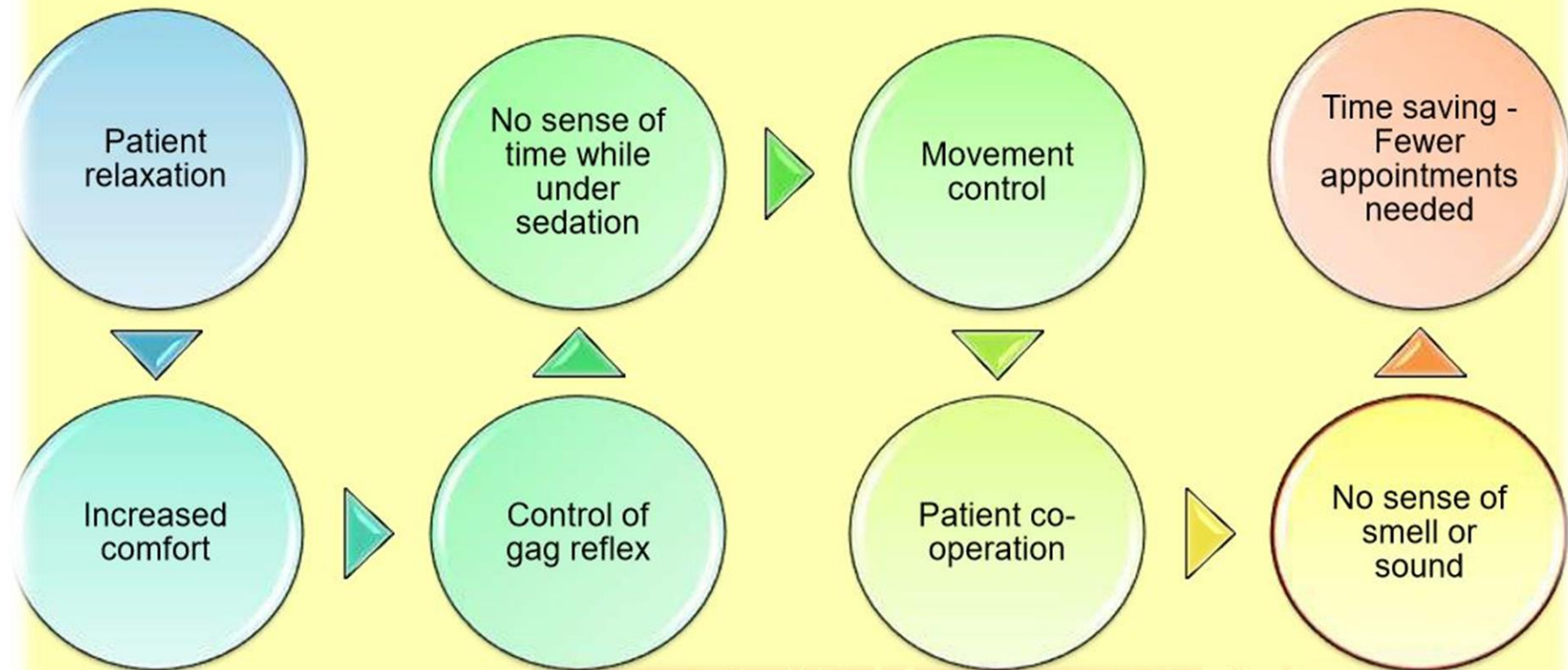
- In anxious or phobic patients or those with movement disorder or with physical and/or mental disability who are unlikely to otherwise allow safe completion of treatment and who would thus be denied access to dental care
- For patients with a severe gag-reflex
- To enable an unpleasant or prolonged procedure to be carried out without distress to the patient, for example, surgical extraction of third molars or extirpation of an acutely inflamed dental pulp.
- To avoid general anaesthesia.
- Medical conditions potentially aggravated by stress
- Medical conditions affecting the patient's ability to cooperate
- Special needs

ContraIndications:



- ✓ Only patients in ASA classes I and II should normally be considered suitable for sedation in the primary care dental setting.
- ✓ Chronic obstructive pulmonary disease (COPD), epilepsy, & bleeding disorders.
- ✓ Uncooperative or unwilling patients.
- ✓ Unaccompanied patients
- ✓ Prolonged surgery
- ✓ Pregnancy
- ✓ Allergic to Sedatives (benzodiazepines)
- ✓ Alcohol intoxicated
- ✓ Neurological disorders
- ✓ Patient taking CNS depressants
- ✓ Lack of equipment or inadequate personnel.

BENEFITS OFFERED FROM SEDATION DENTISTRY



Continuum of Depth of Sedation

Definition of General Anesthesia and Levels of Sedation / Analgesia

(Developed by the American Society of Anesthesiologists)
 (Approved by ASA House of Delegates on October 13, 1999)
 amended on 27 October 2004



Useful Spectrum

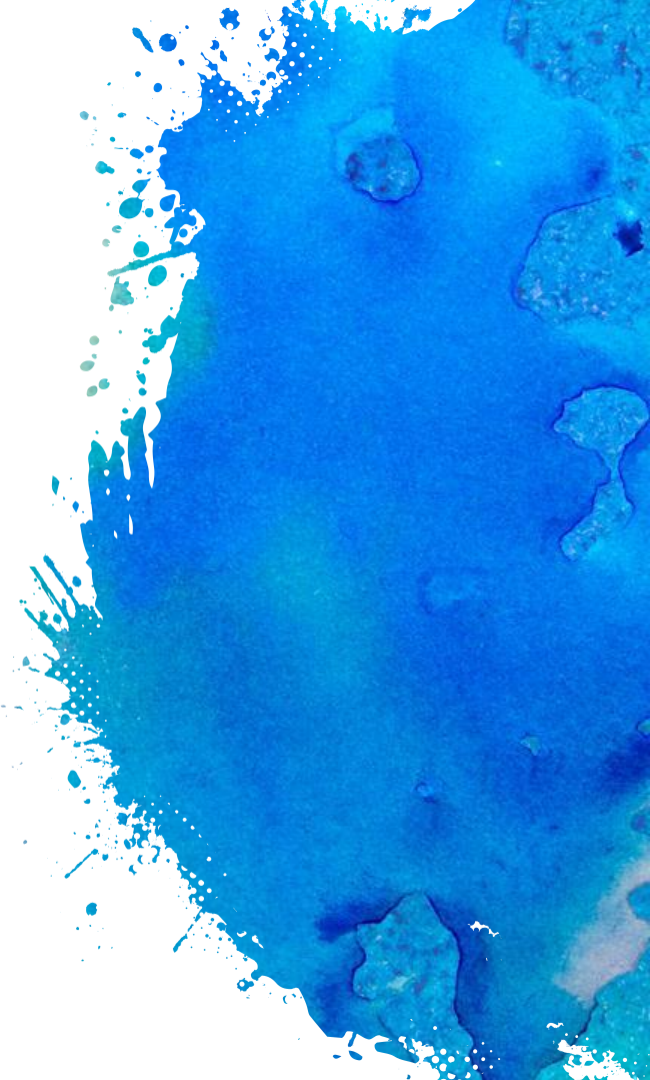
	Minimal Sedation ("Anxiolysis")	Moderate Sedation / Analgesia ("Conscious Sedation")	Deep Sedation / Analgesia	General Anesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful* response to verbal or tactile stimulation	Purposeful* response following repeated or painful stimulation	Unarousable, even with painful stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous Ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

* Reflex withdrawal from a painful stimulus is NOT considered a purposeful response

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Conscious sedation is recommended to anxious patients who have dental and needle phobia, to patients that present an increased vomiting reflex and also to patients with special needs but capable of communicating.

General anesthesia is indicated for non-cooperating patients under the age of four, in mouth breathers, in children ASA III or higher and in pediatric patients who do not communicate



Clinical guidelines (ADA 2012)

Patient assessment:

Obtaining patient history & information. →
Age, weight, height , Health history, Systems
review

Airway evaluation

Informed consent



Patient evaluation

ASA Physical Status Classification

Class I - A normal health patient

Class II - A patient with mild systemic disease

Class III - A patient with severe systemic disease

Class IV - A patient with severe systemic disease that is a constant threat to life

Class V - A moribund patient who is not expected to survive without the operation

Class VI - A declared brain-dead patient whose organs are being removed for donor purposes

E -Emergency operation of any variety (used to modify one of the above classifications)

- × ASA I, II- review of their current medical history and medication use.
- × ASA III, IV- consultation with their physician or consulting medical specialist

Preoperative Preparation

- × Preoperative dietary restrictions

- × Preoperative verbal and written instructions must be given to the patient, parent, escort, guardian or care giver.

- × Determination of adequate oxygen supply and equipment necessary to deliver oxygen under positive pressure must be completed

■ **TABLE 22.1:** Appropriate intake of food and liquids before elective sedation*

<i>Ingested material</i>	<i>Minimum fasting period (h)</i>
Clear liquids, water, fruit juices without pulp, carbonated beverages, clear tea, black coffee	2
Breast milk	4
Infant formula	6
Nonhuman milk because nonhuman milk is similar to solids in gastric emptying time, the amount ingested must be considered when determining an appropriate fasting period	6
<i>Light meal:</i> A light meal typically consists of toast and clear liquids. Meals that include fried or fatty foods or meat may prolong gastric emptying time. Both the amount and type of foods ingested must be considered when determining an appropriate fasting period.	6

* American Society of Anesthesiologists. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: Application to healthy patients undergoing elective procedures. A report of the American Society of Anesthesiologists. Available at "<http://www.asahq.org/publicationsAndServices/npoguide.html>".

Preparation and Setting-up for Sedation Procedures

- × Part of the safety net of sedation is to use a systematic approach so as to not overlook having an important drug, piece of equipment, or monitor that should be immediately available at the time of a developing emergency.

A commonly used acronym useful in planning and preparation for a procedure is SOAPME:

S = Size-appropriate suction catheters and a functioning suction apparatus

O = An adequate oxygen supply and functioning flow meters/other devices to allow its delivery

A = Airway: Size-appropriate airway equipment

P = Pharmacy: All the basic drugs needed to support life during an emergency, including antagonists

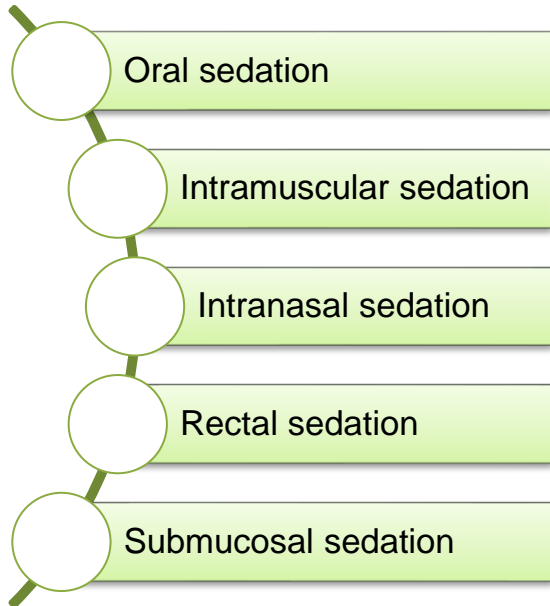
M = Monitors: Functioning pulse oximeter and other monitors as appropriate like capnograph

E = Special equipment or drugs for a particular case.

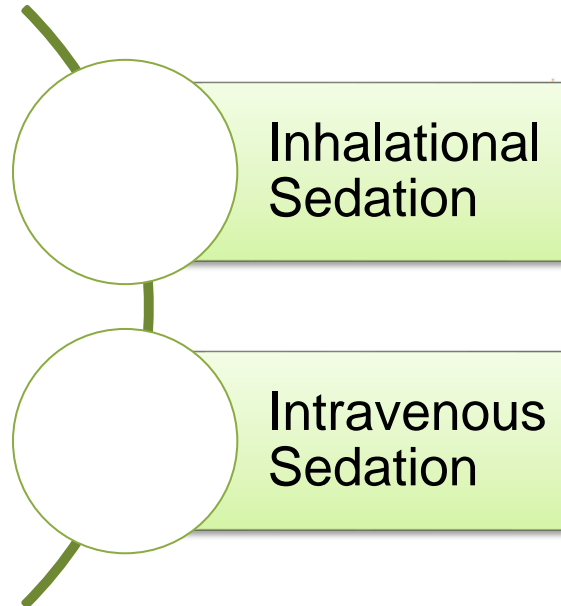
INSTRUCTIONS TO PARENTS

- × Eating and drinking
- × Change in health
- × Arriving
- × Medication
- × Activities
- × Getting home
- × After treatment
- × Temperature
- × Seek advice

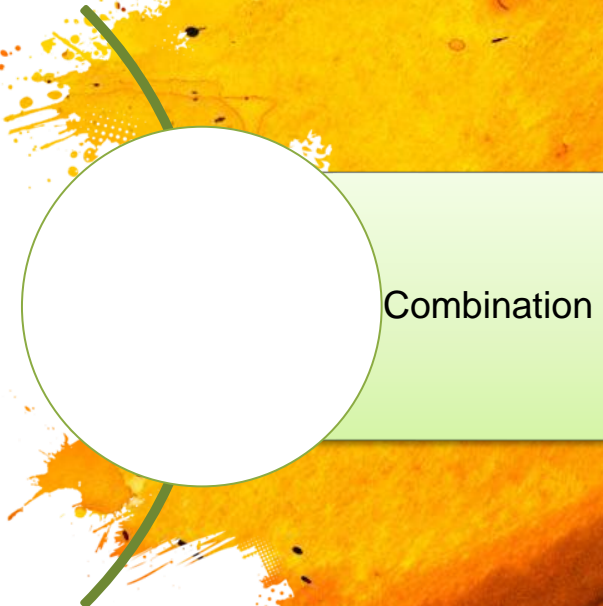
SEDATION TECHNIQUES



Non - Titrable



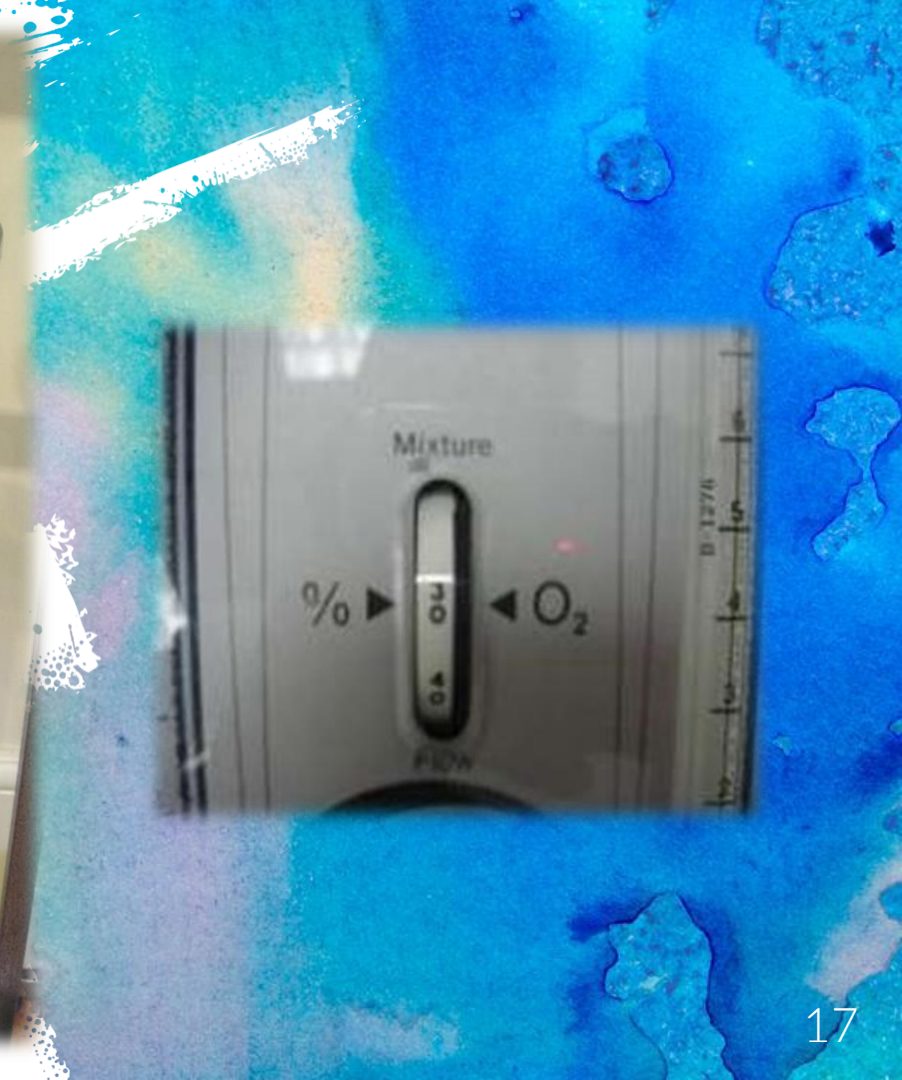
Titrable



Nitrous oxide sedation

- × It is the most frequently used sedation agent by pediatric dentists.
- × Nitrous oxide is sweet smelling, colorless, non-inflammable, inert gas and is compressed in cylinders at 750 psi as a liquid that vaporizes on release. It has a blood gas coefficient of 0.47 and has rapid onset and recovery time due to low solubility in blood.

- × It has low tissue solubility and a minimum alveolar concentration (MAC) value in excess of one atmosphere, rendering full anesthesia without hypoxemia impossible at normal atmospheric air pressure. Poor tissue solubility ensures its effect is characterized by rapid onset and fast recovery.
- × Is a weak analgesic, although this effect can be influenced by the psychological preparation of the patient.
- × **CONTRAINDICATION** : Children having common cold, tonsillitis, nasal blockage



Thorough inspection of equipment

Place the mask over nose

Bag is filled with 100% oxygen and delivered to patient for 2–3 minutes

Slowly introduce nitrous oxide

Encourage the patient to breathe through nose

Explain the sensation to be felt – floating, gibby, tingling of digits

Adjust the concentration to 30% nitrous oxide and 70% oxygen

Carry out the procedure with continuous monitoring

After completion of procedure give 100% oxygen for 5 minutes



The patient should be allowed to sit. Even though psychomotor effects return to normal within 5 to 15 minutes, it is not advisable to allow teenage patients to drive themselves

Plane 1

Slight Analgesia and Amnesia

- loss of fear and anxiety
- warm tingling sensation

Plane 3

Complete Analgesia and Amnesia

- mandible rigid and mouth closed
- sensation of flying or falling
- appear sleepy
- dazed/ staring look
- does not follow directions
- hallucinations

Langa, 1968

Plane 2

Moderate Analgesia and Amnesia

- relaxed euphoric
- can maintain open mouth and follow directions
- voice changes character
- eyes appear glassy
- not concerned with surroundings/ sounds/ smell
- decreased motor coordination



Clinical Signs of Sedation

× Objective Signs

- × Prior to and 5 minutes after
- × clinical features and condition of the patient's face, hands, legs, and feet to determine the effects of nitrous oxide
- × (1) open or closed eyes; (2) tears; (3) trance-like expression; (4) smile; (5) speaking; (6) laughing; (7) open or closed hands; (8) limp legs; and (9) abducted feet.

× Subjective Symptoms

- × child's perception of the nitrous oxide effects
- × The questions were: How do you feel; Do you feel different; How does your head feel; How do your fingers feel.

Psychomotor Effects – **BERRY CRITERIA**

- These were evaluated by asking the patient to draw four figures from the Bender Visual Motor Gestalt Test before and 5 minutes after nitrous oxide was administered.
- This determines the visiomotor capacity of the child

Triangle

1. Three clearly defined sides
2. One corner higher than others



Open square and circle

1. No more than slight separation of forms
2. No major distortions or circle or open square fairly equal size
3. Circle and two cornered square
4. Bisector of circle passing through corner of square must project into square



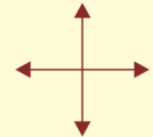
Three lines cross

1. Three continuous, intersecting lines
2. Intersection fairly accurate
3. One horizontal and two diagonals



Directional arrows

1. Absence of reversed or "floating" tips
2. Sharp points on tips
3. No indication of directional confusion
4. Fairly equal length of "legs"



Advantages

- × • It is a viable and cost effective alternative to general anesthesia.
- × • Nitrous oxide sedation has minimal effect on cardiovascular and respiratory function and the laryngeal reflex.
- × • Using nitrous oxide inhalation sedation in conjunction with other sedatives may rapidly produce a state of deep sedation or general anesthesia.


- × • Acute adverse effects associated with this type of sedation are nausea.
- × • Chronic effects may be impotence, liver toxicity and recreational abuse.
- × • Exposure to nitrous oxide can result in depression of vitamin B12 activity resulting in impaired synthesis of RNA.

Disadvantages 22

Precautions

- × • Nitrous oxide is heavier than air, and if the gas were colored, which it is not, it would tend to descend from the patient's level in the reclined position to the floor. This gas should be ejected out of the operator using an **efficient scavenging system**. In this installation of **laminar air-flow systems** could be used to flush out the used gases from the bottom of the operator and fresh air pumped in from the ceiling.
- × • The gas itself does not have an odor, although the **tubing and nasal hood** may have some **odor that the child dislikes**. Hence, the dental surgeon would be wise to flavor the inside of the nasal hood by using fluoride foam or drops of flavored liquid to produce vapors that the child finds quite pleasant.

- × • Diffusion hypoxia may occur as the sedation is reversed at the termination of the procedure. **The nitrous oxide escapes into the alveoli with such rapidity that the oxygen present becomes diluted;** thus the oxygen-carbon dioxide exchange is disrupted and a period of **hypoxia** is created. However, this phenomenon is reported not to occur in healthy pediatric patients. Nonetheless, to minimize this effect, **the patient should be oxygenated for 3 to 5 minutes after a sedation procedure**, if for no other reason than to allow for proper nasal hood evacuation of the exhaled gas.



Special indications nitrous oxide-oxygen inhalation sedation

Cardiovascular disease	N ₂ O-O ₂ inhalation sedation can minimize the risk of myocardial infarction
Cerebrovascular disease	Patient who has cerebrovascular disease, can receive N ₂ O-O ₂ for stress/anxiety reduction
Respiratory disease	Patients with bronchial asthma can receive nitrous oxide because it is non-irritating to the bronchial and pulmonary tissues
Hepatic disease	N ₂ O-O ₂ is not bio-transformed anywhere in the body, it can be used in patients with hepatic disease.
Epilepsy and other seizure	N ₂ O-O ₂ can be useful in these patients to avoid stress

(Bowen DM. Aiding in administration of nitrous oxide analgesia. Idaho: Idaho State Board of Dentistry: Jan. 2005)

Monitoring during Sedation

× Monitoring must include oxygenation, circulation and ventilation

Oxygenation - Pulse oximetry- Color of mucosa, skin or blood must be evaluated continuously.

Circulation - Blood pressure and heart rate should be evaluated preoperatively, postoperatively and intraoperatively.

Ventilation- Capnography -digital display of the CO₂ on inspiration and expiration.

Recovery and Discharge

Discharge criteria

- *Cardiovascular function and airway patency are satisfactory and stable*
- *The patient is easily arousable*
- *The patient can talk (if age appropriate)*
- *The patient can sit up unaided (if age appropriate)*
- *Presedation level of responsiveness achieved*
- *The state of hydration is adequate*

Recommendations for controlling nitrous oxide exposure in the dental office

- ❖ Equipment

- ❖ Ventilation

- ❖ Inspections

- ❖ Clients

- ❖ Dental personnel

DEPT. OF PEDODONTICS & PREVENTIVE DENTISTRY
SAVEETHA DENTAL COLLEGE & HOSPITALS

NITROUS OXIDE-OXYGEN CONSCIOUS SEDATION



DRUGS USED FOR CONSCIOUS SEDATION

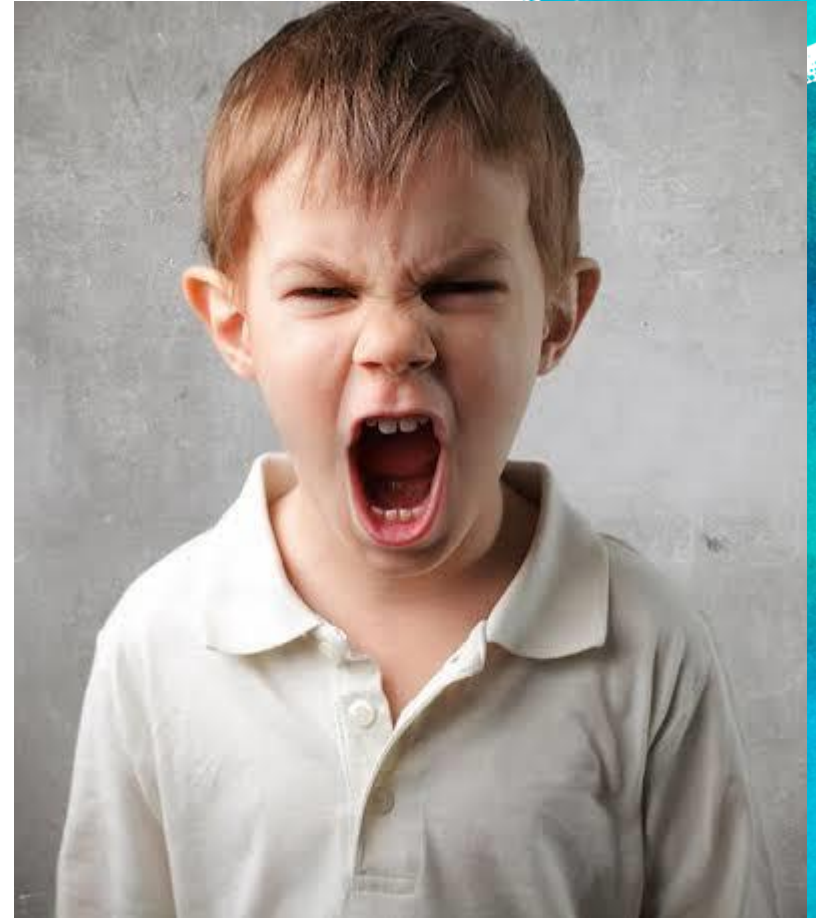
- × Opioids- Morphine, Meperidine, Fentanyl
 - × Benzodiazepines- Diazepam, Midazolam
 - × Barbiturates – Methohexital, pentobarbital
 - × Chloral Hydrate- Marilyn Munroe
 - × Propofol -Michael Jackson
 - × Dexmedetomidine
 - × Ketamine- dissociative anesthesia, post emergence delirium
- Reversal drugs
- × Flumazenil
 - × Naloxone

Midazolam (Versed)

- Midazolam is generally reserved for anxious adolescent or adult dental patients.
- **High lipophilicity** at physiological pH and **very high clearance and elimination** allow **rapidity of onset and speedy recovery**.
- After **oral** administration the peak plasma concentration is reached within **20 minutes**, faster via the **rectal** route in about **10 min**.
After 45 minutes the sedative effect wears off.
The elimination half time is **2 hours**, which facilitates a fast recovery.

IV Midazolam

- × widely used in adults
- × It can also cause a paradoxical excitement in children that is known by many as “Angry Child Syndrome”



Oral Midazolam

- × Tablet form or as a sweetened mixture for delivery either via a drinking cup or drawn into a needleless syringe and deposited in the retromolar area as per explained figures.
- × Tablets are given 60 min before dental treatment, and oral mixtures given approximately 20 to 30 minutes before.
- × **0.5 to 0.75 mg/kg of body weight**
- × **anterograde amnesia**
- × Midazolam is a **short acting anxiolytic agent**, with short duration of action that makes its use **limited to short dental procedures only**.

Intranasal Midazolam

- × within 5 minutes.
- × large volumes can cause coughing, sneezing and expulsion of part of the drug.
- × It is not recommended in children who have copious nasal secretions or who suffer from an upper respiratory tract infection.
- × 0.2 to 0.4 mg/kg.
- × Onset time is intermediate between the oral and IV routes of administration (10–15 minutes).
- × The effectiveness of this route of administration is well established as a premedication for anesthesia but its use is limited by burning on application to the nasal mucosa which most children find very objectionable, as well as the bitter taste of midazolam reaching the oropharynx.
- × Adverse effects including respiratory depression



Rectal Midazolam

- × • Short duration of onset, required a low dosage and was easily administered according to the explained diagram. • However, adverse reactions such as agitation, excitement, restlessness and disorientation together with significantly reduced blood oxygen levels, nausea and vomiting have been reported. • It is an ethical/human right concern in some countries May necessitate the need of hospital setup. • Children under 25 kilogram of weight shall have 0.3 to 0.4 mg

Reversal drug

- × Benzodiazepines
- × Flumazenil (0.2 mg over 15 seconds, may repeat at 1 min as needed)
- × Opioid antagonist
- × Naloxone (0.4 mg initially followed by 0.1–0.2 mg every 2–3 min as needed)

Complications of Conscious Sedation:

Every practitioner administering moderate sedation/ analgesia should be able to recognize a patient in respiratory distress and be able to rescue that patient. Some of the major complications are:

- Ineffective ventilation resulting from respiratory depression causing **hypoxia and hypercarbia**.
- Problems with the cardiovascular system including **hypotension**.
- **Drug overdose or reaction (anaphylaxis or anaphylactoid reactions)**.
- **Aspiration** associated with loss of protective airway reflexes.
- **Nausea and vomiting**.
- Problems with **equipment** compromising patient safety

Airway Obstruction

- × • Airway obstruction is most common complication associated with moderate sedation.
- × • Signs of airway obstruction include: Inspiratory stridor or snoring, rocking chest movements, absence of breath sounds, hypoxemia (less than 90 percent), hypercarbia (greater than 44 mm Hg).
- × • If airway obstruction is suspected consider: Repositioning the patient's head providing a head tilt, applying a chin lift or jaw thrust, persistent airway obstruction may require the use of airway adjuncts, suspend further drug administration.
- × • Should the above not correct the situation consider bagmask positive ventilation and even intubation

Anaphylaxis and Anaphylactoid Reactions

- × • Anaphylaxis and anaphylactoid reactions are acute and are characterized by wheezing, dyspnea, syncope, hypotension, and upper airway obstruction.
- × • Can be caused by histamine release or latex allergy.
- × • Treatment of anaphylactic or anaphylactoid reactions: Prompt recognition of the clinical situation **and stopping the administration of the suspected offending drug, Ventilation with 100 percent oxygen, Securing the airway with endotracheal intubation, Prompt use of fluids and epinephrine (IV or SQ) and antihistamines**

Aspiration

- × • Risk factors for aspiration are inadequate fasting or recent oral intake, diabetes, pregnancy, obesity, altered consciousness.
- × • Suspect aspiration in patient with the above risk factors having respiratory difficulty, tachypnea, tachycardia, cyanosis and oxygen desaturation.
- × • Blood gases may reveal hypoxemia with mixed metabolic and variable respiratory acidosis.
- × • In severe cases of aspiration, systemic hypotension, pulmonary hypertension and pulmonary edema may occur.

Nausea and Vomiting

- × • Nausea and vomiting can cause hypertension or hypotension, tachycardia, bradycardia and aspiration.
- × • Predisposing factors of nausea and vomiting are: Age (younger patient more susceptible), Female gender, history of postoperative emesis, Presence of hypoglycemia, pain, hypotension, or hypoxia.
- × • Treatment of nausea and vomiting: Evaluate and treat causes of hypoglycemia, pain, hypoxia, or hypotension- metaclopramide