

# **Sri Aurobindo College of Dentistry**

**Indore, Madhya Pradesh**  
**INDIA**



# Module plan

- Topic : **PHARMACOLOGICAL BEHAVIOR MANAGEMENT**
- Subject: DEPARTMENT OF PEDIATRIC AND PREVENTIVE DENTISTRY
- Target Group: Undergraduate Dentistry
- Mode: Powerpoint – Webinar
- Platform: Institutional LMS
- Presenter: **DR. ABHILASHA MANKER**

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Nitrous oxide- oxygen sedation
- Definition of GA
- Indication and contraindications of GA
- Stages of GA
- General Anesthetic drugs
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# INTRODUCTION

- To perform the highest quality dental care in pediatric patients, the practitioner may need to use pharmacologic means to obtain a quiet, cooperative patient.
- Pharmacologic management  
2 subcategories :

Conscious  
sedation

General  
anesthesia



## DEFINITION

According to American Dental Society of Anesthesiology, a patient is said to be **conscious** if he is capable of rational response to command and has all protective reflexes intact, including the ability to clear and maintain his airway in a patent state.

***MINIMAL SEDATION (ANXIOLYSIS):***

A drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.

***MODERATE SEDATION (CONSCIOUS SEDATION OR  
SEDATION/ANALGESIA):***

- a drug-induced depression of consciousness during which patients respond purposefully to verbal commands.
- With moderate sedation, no intervention is required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.



➤ ***DEEP SEDATION (DEEP ANALGESIA):***

A drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully after repeated verbal or painful stimulation (eg, purposefully pushing away the noxious stimuli).

## ***GENERAL ANESTHESIA :***

A drug-induced loss of consciousness during which patients are not arousable, even by painful stimulation.

- The ability to independently maintain ventilatory function is often impaired.
- Patients often require assistance in maintaining a patent airway, and positive-pressure ventilation may be required because of depressed spontaneous ventilation or drug-induced depression of neuromuscular function.

*The UK Department of Health (2003); National Dental Advisory Committee, (2006) General Dental Council and the Dental Sedation Teachers Group (2005) accept the following definition of conscious sedation,*

“A technique in which the use of a drug or drugs produces a state of depression of the central 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 unintended loss of consciousness unlikely. The level of sedation must be such that the patient remains conscious, retains protective reflexes and is able to understand and respond to verbal commands.”

## HISTORY OF SEDATION & ANAESTHESIA

- Egyptians
- Hickman – 1824 – explored methods of painless surgery on animals using both CO<sub>2</sub> and nitrous oxide gases.
- Wells – 1844 – Credit for advent of sedation in dentistry – Utilized nitrous oxide for dental extractions.
- Demonstrated but failed.

- 1846 – Dr. William Green ( Dr. Well’s partner) – administered ether - for removal of tumor – great success – milestone in the field of sedation and anaesthesia.
- Nitrous oxide was not used until 1863, when Colton reintroduced the gas into dentistry.
- Colton dental institutes – specialized in dental extractions under nitrous oxide anaesthesia

# OBJECTIVES OF SEDATION IN PEDIATRIC DENTISTRY

## For child

- Reduce fear & perception of pain, control behavior
- Facilitate coping with the treatment
- Prevent development of dental fear & anxiety
- Minimize physical discomfort, Psychological trauma, Maximize potential for amnesia

## For dentist

- Facilitate accomplishment of dental procedure
- Reduce stress and unpleasant emotions



## INDICATIONS

- Preschool children who cannot understand or cooperate for definitive treatment
- Cannot cooperate due to lack of physiological or emotional maturity.
- Cannot cooperate due to a cognitive, physical and medical disability.
- Fearful and anxious
- Extensive dental care and benefit from prolonged visit



## CONTRAINDICATIONS

- Sedation below the age of 1 year is said to be contraindicated, and hardly ever relevant in the dental setting.
- Chronic obstructive pulmonary disorder (COPD), pregnancy, myasthenia, epilepsy, obesity, bleeding disorders
- Uncooperative patients, unwilling, unaccompanied
- Dental difficulties prolonged surgery, inadequate personnel.



## ADVANTAGES

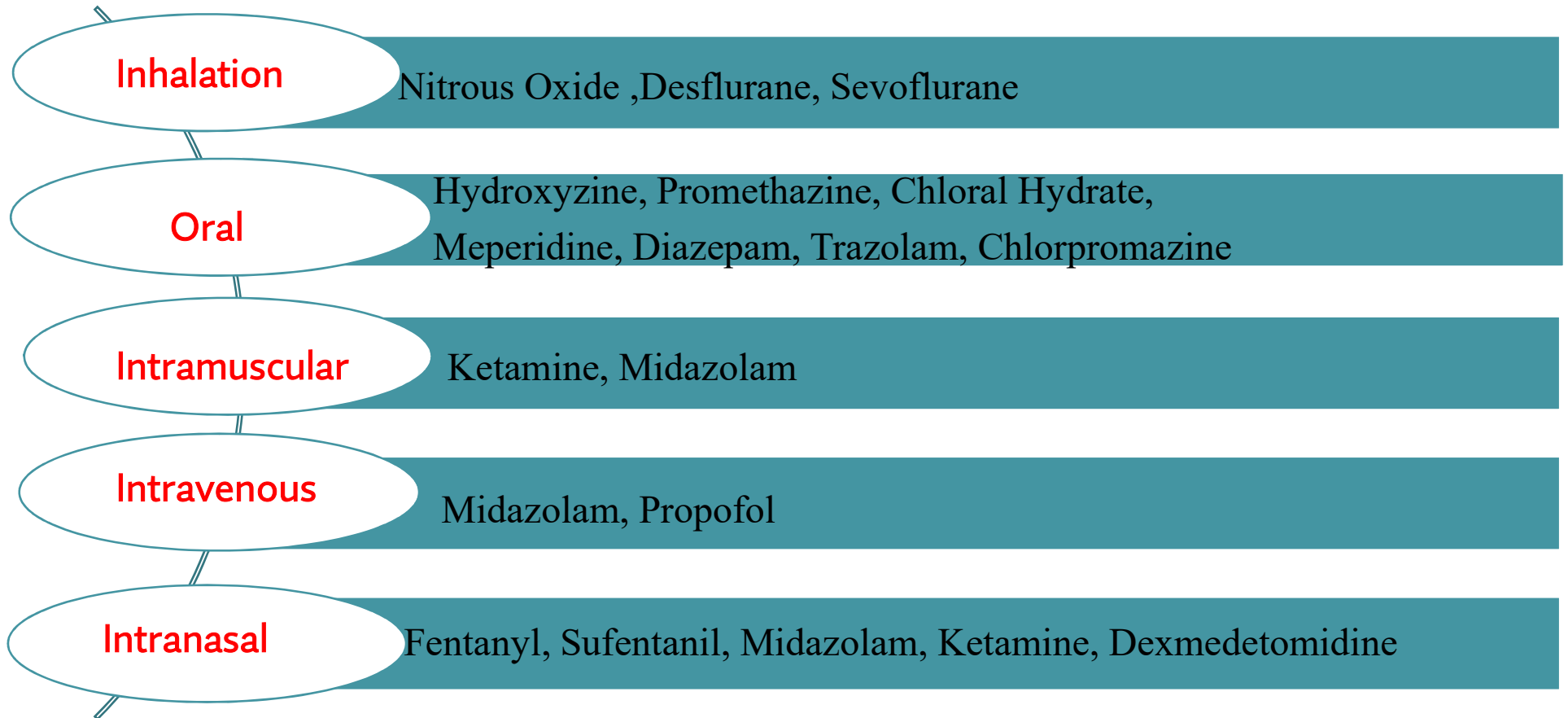
- Patient is conscious
- Relatively safe
- Least disturbing to metabolic functions
- Vital reflexes intact
- Communicable and cooperative patient
- Rapid onset and recovery
- Ease of dose control
- Produces euphoric effect



## DISADVANTAGES

- No positive dental attitude
- Weak agents – not effective in moderate and severe anxious patients
- Lack of patient acceptance
- Inconvenience – nasal mask
- Technique sensitive
- Potential chronic toxicity

# Drugs used in sedation



# INHALATION SEDATION



## IDEAL INHALATION SEDATION AGENT

The following characteristics are desirable in an ideal inhalation sedation agent:

- It should be either a gas or a liquid. If it is a gas, it should be easily liquefied at moderate pressures.
- The blood/ gas solubility coefficient should be low so that a high partial pressure is obtained quickly in the alveoli. This will provide a rapid induction and equally the rapid elimination of the agent.

# **NITROUS OXIDE-OXYGEN SEDATION**

- Nitrous oxide is an inorganic inhalation agent that is colourless, odourless to sweet-smelling, and non-irritating to the tissues.
- It is non-flammable but will support combustion.
- Rapidly absorbed



## ADVANTAGES

- No needles
- Level of sedation easily altered
- Minimal impairment of reflexes
- Rapid induction and recovery
- Some analgesia

# STAGES

## **PLANE I : MODERATE SEDATION & ANALGESIA**

- Conc. Of 5 – 25% N<sub>2</sub>O
- Light feeling , dizziness
- Tingling in fingers, toes , cheeks ,tongue , back of head or chest
- Marked sense of relaxation , pain threshold is raised
- Diminution of fear & anxiety
- Hearing, vision impaired but pupils – normal & contract when light is shown.
- Perioral musculature is relaxed

## **PLANE II :**

- N<sub>2</sub>O conc. 25 – 40 %
- Psychological symptoms (dissociation / detachment are felt)
- Euphoric state felt
- Suffused by a warm wave ; experience slight humming or buzzing in ear with floaty feeling
- Reduction in blink rate
- Conscious , responds to questions ( mental effort involved in thinking)

## **TOTAL ANAESTHESIA (ANALGESIA )**

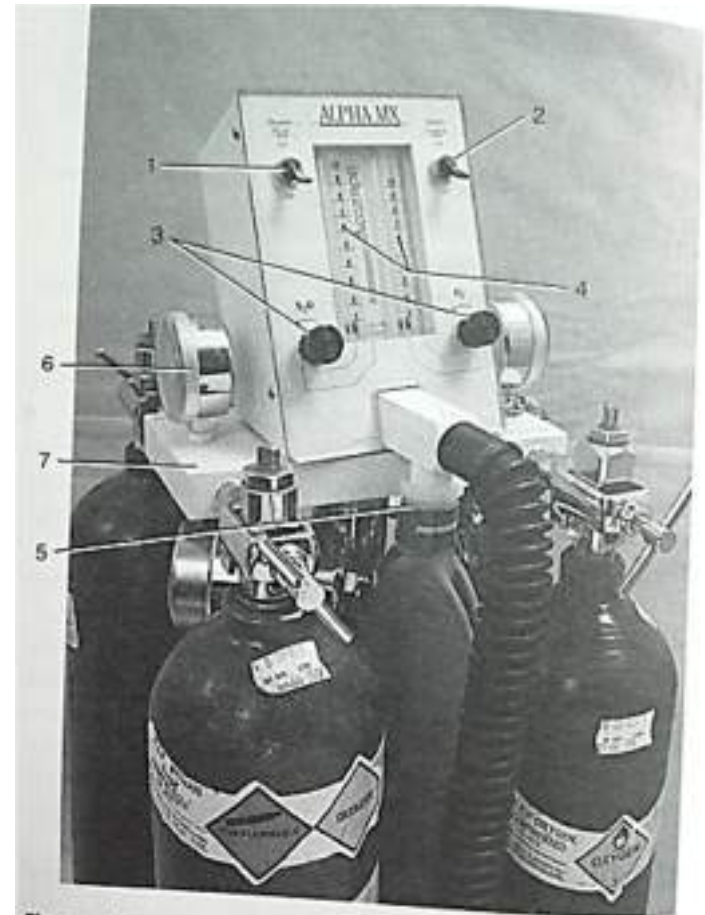
- 45-65% conc.
- Analgesia is complete ( for extraction)
- Marked amnesia develops
- Zone b/w analgesia & light anaesthesia

# **INHALATION SEDATION UNIT**



## FLOW UNITS

- The basic components of a typical continuous flow unit include:
- Compressed gas cylinders
- Pressure gauge
- Reducing valves
- Flow meters
- Reservoir bag
- Conducting tube
- Nasal hood/nasal cannula/full face mask



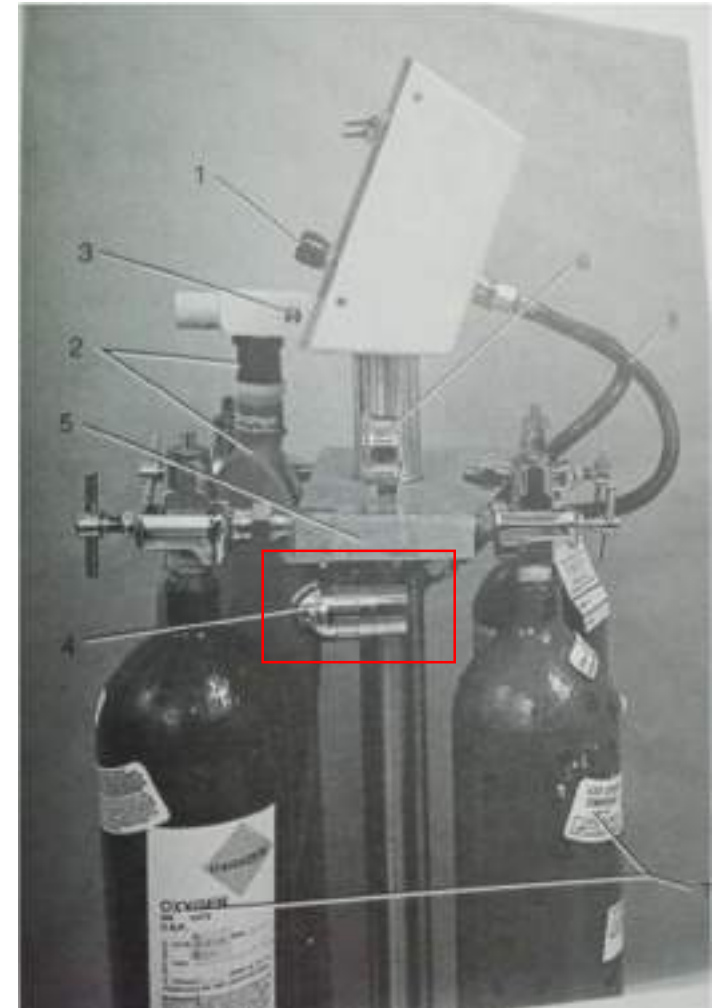
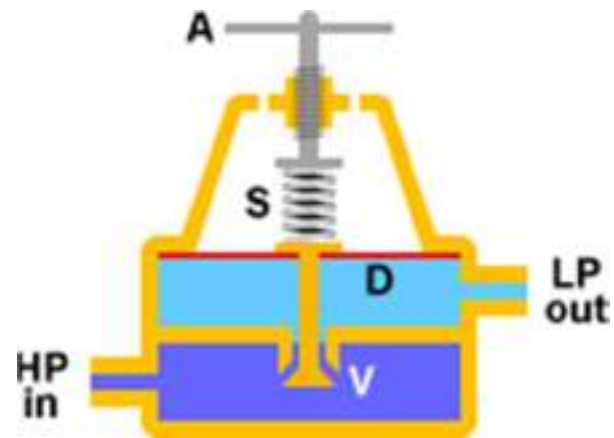
**Figure 14-3** Continuous-flow inhalation sedation unit (portable, front view). 1, Oxygen flush button; 2, master control (on/off); 3, control knob for N<sub>2</sub>O and O<sub>2</sub>; 4, flowmeters; 5, reservoir bag/tee; 6, pressure gauge; and 7, yoke assembly.

# COMPRESSED GAS CYLINDERS

- Hazardous materials regulations of the U.S. department of transportation (DOT) – COMPRESSED GASES –
  - >25 psig
  - 25° C
- 3/8 inch thick steel (some made of aluminium)
- Tested in every 5 yrs to ensure the integrity

## REGULATORS

- Location – b/w cylinders & flow meter
- Reduces high pressure
- Maintains constant pressure of gas
- Actual delivery pressure – 50psi





## YOKES (PORTABLE SYSTEM)

- The yoke stand of the portable machine is the backbone and supporting structure on which the equipment rests.



# DISS ( DIAMETER INDEX SAFETY SYSTEM )

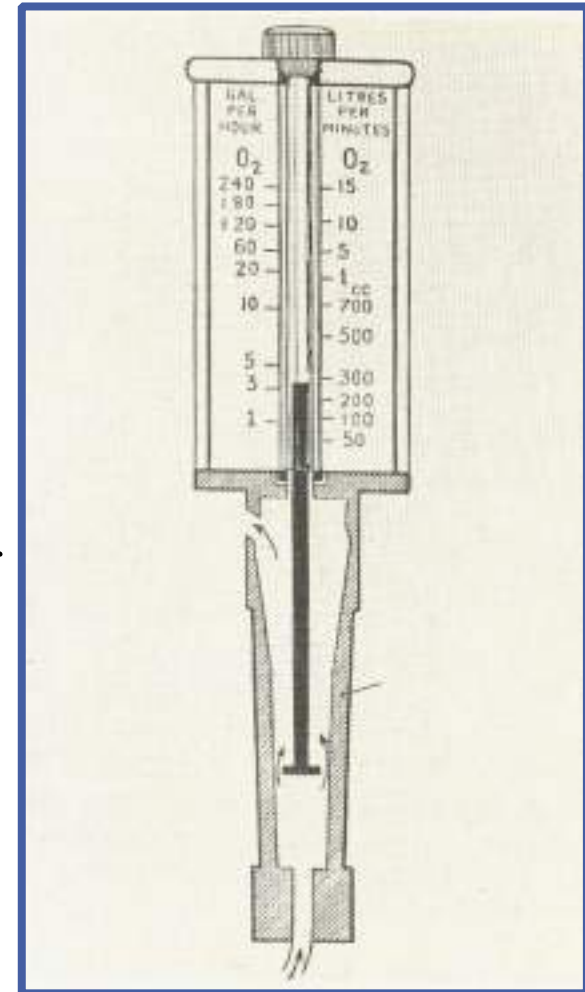
Diameter of attachment

Threading of attachment



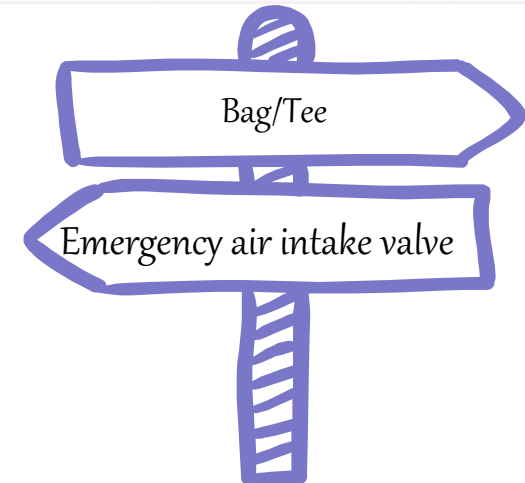
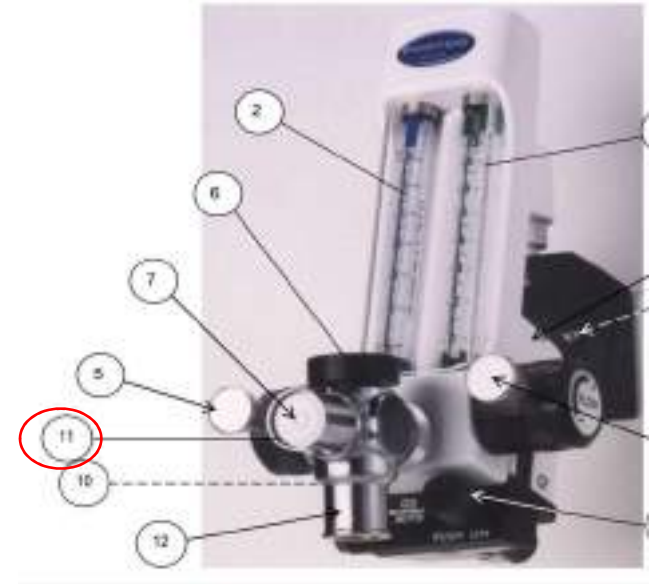
# FLOWMETERS

- From Regulators individual gases are carried through low pressure tubing into the back of unit.
- Measures actual quantity of gas in motion rather than static cylinder pressure
- Permits delivery of precise volume of gas
- Flow of gas interrupted – flowmeter read zero



## BAG/ TEE

- As the anesthetic gases leave through the top of their respective flowmeters, they are combined in the mixing chamber, which is found within the head of sedation unit.
- From this point combination of gases flows through the machine
- These gases now exit the sedation unit through the outflow tube- *Bag/ Tee* & are carried to the patient



## RESERVOIR BAG

- Bladder type bags
- Rubber / silicone
- Size – 1 to 8 L
- Dentistry – 3L
- Attaches to base of bag /tee



# BREATHING APPARATUS

## Full face mask

Obstructs the access to mouth  
O<sub>2</sub> delivery during emergency



## Nasal cannula

- can't provide air tight seal
- >volume of N<sub>2</sub>O required
- Useful in claustrophobic pts & procedure on max anteriors



## Nasal hood

- Designed to fit comfortably & securely over the pt nose

- Rubber / silicone – several sizes





## Double Mask Scavenger Breathing Circuit:

- Outer hood and the option for either a flexible autoclavable or single-use-disposable inner liner.
- The inner liner creates a complete- comfortable seal around the patient's nose
- Adult or pedo autoclavable hood (with 3 inner liners) i.e. vaccum line



## TECHNIQUES OF ADMINISTRATION



*Patient is positioned in a comfortable, reclined position*



*Nasal hood is placed on patient.*



*Nasal hood is secured by adjusting slip ring behind back of chair*



*Folded 2 × 2-inch gauze on bridge of nose prevents leaks.*

- Bag is filled with 100% oxygen and delivered to the patient for 2/3 minutes at an appropriate flow rate of 5-6 L /minute.
- Once the proper flow rate is achieved, the N<sub>2</sub>O can be introduced by slowly increasing the concentration at increments of 10% to 20% to achieve the desired level.
- SENSATIONS- Felt are floating, giddy feeling with tingling of digits. The eyes will take on a distant gaze with sagging eyelids.

- When this state is reached, the local anaesthetic may be given. Once this is completed, the concentration can be reduced to 30% nitrous oxide and 70% oxygen or lower. The patient can now be maintained and monitored & procedure can be carried out.
- Recovery can be achieved quickly by turning N<sub>2</sub>O flow to 0 L/min (zero). Once the sedation is reversed, the patient should be allowed to breathe 100% oxygen for 3-5 minutes.

## ADVERSE EFFECTS

- Nausea and vomiting are the most common adverse effects, occurring in 0.5 percent of patients.
- A higher incidence is noted with longer administration of nitrous oxide/oxygen, fluctuations in nitrous oxide levels, and increased concentrations of nitrous oxide.
- **Diffusion hypoxia**

# GENERAL GUIDELINES

# PHYSICAL STATUS CLASSIFICATION

## **ASA modified (October 15, 2014)**

ASA I : Pt without systemic disease ; normal, healthy pt.

ASA II : Pt with mild- moderate systemic disease

ASA III : Pt with severe systemic disease

ASA IV : Have severe or life threatening disease or disorder

ASA V : Moribund patient who is unlikely to survive without the planned procedure

ASA VI : A pt declared brain dead whose organs are being removed for donor purposes.

E : Pt requiring emergency procedure



**ASA classes I and II** - minimal, moderate, or deep sedation & in office anaesthesia for dental procedures.

**ASA class III** – can be treated under ambulatory anaesthesia ,provided their medical conditions were stable for atleast 3 months.

**ASA class IV** – best managed in a hospital setting after appropriate medical consultations

## INFORMED CONSENT

- Parent or guardian
  - Agreeable
  - Foreseeable risks
  - Benefits
  - Agents being used
  - Alternate method available
  - Explanation – clear , concise terms
  - Consent form – signature of all parties

# ADMINISTRATION OF NITROUS OXIDE

2 techniques:

1

1) Standard titration

2

Rapid titration

## STANDARD TITRATION TECHNIQUE

- Firstly O<sub>2</sub> is administered at 100% for 2 min
- For next 2 min Adjust N<sub>2</sub>O- 20% & O<sub>2</sub>- 80%
- Incrementally ↑ conc of N<sub>2</sub>O by 10% & ↓ O<sub>2</sub> by 10% every 2 min to maintain conc of N<sub>2</sub>O at the level of 35-40% depending on child's response



## RAPID TITRATION TECHNIQUE

- Used for pts who are extremely anxious or fearful or not ready to accept the mask
- Mask should be kept 2-3 inches above the nose of the child with N<sub>2</sub>O conc at a level of 50-60% & O<sub>2</sub> at 50-40%
- Flow rate -7-8 L/min (instead of 3-5)-to enable more gas available for inhalation
- After few min if child feels comfortable than place the mask onto the nose & adjust the conc of N<sub>2</sub>O to 35-40%



Administration can be divided into 5 phases

- 1) Introduction phase
- 2) Induction phase
- 3) Injection phase
- 4) Maintenance phase
- 5) Withdrawal phase

**Introduction Phase**  
**(Fig. 18.2.13a)**

**Objective**

Make the child accept the nasal mask

**Dosage**

100% Oxygen at  
3–5 L/min

**Procedure**

1. Introduce the mask to the child.
2. If the child is apprehensive use tell show do and modeling by applying mask to the parent and making the child observe the breathing bag.
3. Tell the child "do exercise by breathing from your nose and show me how strong you are by inflating the breathing bag."
4. You may also tell the child that "with this magic gas all the germs will start floating and fly away from your mouth."



## Objective

### Induction Phase (Fig. 18.2.13b)

Familiarize the child with the sensations of nitrous oxide

## Dosage

Incremental increase in nitrous oxide level from 0% to 40% with 2–3 min for each increment

## Procedure

1. Make the child comfortable and relaxed.
2. Keep reassuring the child and you may inform the child about feelings which child may experience.
3. E.g.: You may tell the child that you may begin to feel tingling in your hands and feet.





## Objective

## Dosage

## Procedure

### Injection Phase (Fig. 18.2.14)

Administer local anaesthesia

50% oxygen and 50% nitrous oxide at 5 L/min.

Raised level of nitrous oxide will provide analgesic effect, which will help in painless administration of local anaesthesia.

1. Inform the child that you'll be putting medicine to put tooth to sleep but don't let the child see the injection.
2. Tell the child to continue breathing from the nose and should not breathe from the mouth.
3. Administer anaesthesia very slowly at the rate of 1 mL/min.
4. Distract the child by counting numbers, singing rhymes, etc.
5. Praise the child after completion of injection.

## Objective

**Maintenance Phase** Maintaining the sedation at an effective level but avoiding any side effects

## Dosage

30–40% nitrous oxide is maintained depending on the response of the child.

## Procedure

1. Keep observing the child during this phase.
2. The hand of child will drop down and feet will be in abduction (**Fig. 18.2.15a,b**).
3. Observe the breathing pattern (rapid breathing may be indicative of a deeper level of sedation).
4. Observe for other unwanted effects such as dazed look, or pallor, sweating, redness/flushing on face, or agitation, which may be indicative of high level of nitrous oxide for drift or dream phase.
5. Avoid that the child goes off to sleep.
6. Don't abandon the child physically or verbally.



## Objective

## Dosage

## Procedure

### Withdrawal Phase

Recovery from sedative effect of nitrous oxide

100% at 5 L/min

1. Stop administering nitrous oxide as soon as the dental procedure is about to get over. E.g.: nitrous oxide level may be reduced to 0% when the restoration needs to be finished & polished.
2. Maintain the oxygen at 100% for complete recovery of psychomotor responses.
3. Ask the child if the child is feeling dizzy when he stands up.

# PATIENT MONITORING

- Although the use of pulse oximeter is beneficial, but not mandatory or essential
- Pulse oximeter is helpful in constant monitoring of the O<sub>2</sub> saturation of the child
- Most important is constant monitoring of vital signs such as:
  1. Child should be comfortable & relaxed
  2. Breathing pattern should be regular
  3. Should perfectly not go off to sleep
  4. Should respond to verbal stimulus
  5. Should not talk incoherently
  6. There should be no flushing on face
  7. No signs of sweating should be present



# GENERAL ANESTHESIA

## DEFINITION

A controlled state of unconsciousness, accompanied by partial or complete loss of protective reflexes, including inability to maintain an airway independently and respond purposefully to physical stimulation or verbal command.

# INDICATIONS

- Patients with certain physical, mental or medically compromising condition
- Patients wherein local anesthesia is not effective or the patient is allergic to it
- Patients who have sustained extensive oro-facial trauma.
- Fearful, uncooperative, anxious patient with no expectation that behavior will improve

# CONTRAINDICATIONS

- A healthy, cooperative patient with minimal dental needs
- Predisposing medical conditions which would make general anesthesia inadvisable.



# INSTRUCTIONS FOR PATIENTS PRIOR TO GENERAL ANESTHESIA

## **Eating and drinking:**

- Do not eat or drink anything for 6 hours before
- Morning treatment -no food or liquid after midnight
- Afternoon treatment - only liquids at breakfast

## PREMEDICATION BEFORE GA:

To be administered 1 hour before the scheduled procedure.

Most frequently prescribed includes-

anti anxiety drugs such as:

- **diazepam(0.2-0.5 mg/kg) or**
- **midazolam (0.15-0.2 mg/kg) orally or a**
- **barbiturate such as pentobarbital (25-80 mg) i.m ,**

an opioid such as:

**meperidine(1-2 mg/kg) i.m, and**

an anticholinergic such as:

**scopolamine (0.2-0.3mg),**

**atropine or glycopyrrolate(0.001-0.004 mg/kg) i.m.**

- **Flurazepam or triazolam orally before bedtime-** to ensure a good night's sleep.
- **Ondansetron (emset)-** to avoid post operative vomiting.
- **Otrivine nasal drops-** reduces nasal congestion .  
avoids epistaxis during endotracheal intubation.

# STAGES OF GENERAL ANESTHESIA

- Stage I stage of analgesia
- Stage II stage of delirium
- Stage III stage of surgical anesthesia is divided into 4 planes
- Stage IV stage of respiratory paralysis

## STAGE I: STAGE OF ANALGESIA

- Starts from beginning of anesthetic inhalation and lasts up to loss of consciousness. Pain is progressively abolished during this stage.
- Patient remains conscious, can hear and see.
- Feels a dream like state.
- Reflexes and respiration remains normal.

## STAGE II: STAGE OF DELIRIUM:

- From loss of consciousness to beginning of regular respiration.
- Apparent excitement is seen- patient may shout, struggle and hold his breath.
- Muscle tone increases, jaws are tightly closed, breathing is jerky, vomiting, involuntary micturition or defecation may occur.
- Heart rate and BP may rise and pupils dilate due to sympathetic stimulation.
- Eyeballs oscillate involuntarily.

## STAGE III: SURGICAL ANESTHESIA

Extends from onset of regular respiration to cessation of spontaneous breathing.

- **Plane I:** Rolling eye balls, pharyngeal reflexes start diminishing. Swallowing, vomiting reflexes disappear. This stage ends when eyes become fixed.
- **Plane II:** loss of corneal and laryngeal reflexes.
- **Plane III:** Pupils starts dilating and light reflex is lost.
- **Plane IV:** intercostal paralysis, shallow abdominal respiration, dilated pupils, muscles are flaccid, secretions are completely abolished.

## STAGE IV: MEDULLARY PARALYSIS

- Cessation of breathing to failure of circulation and death.
- Pupils are widely dilated, Muscles are totally flabby, pulse is thready and BP is very low. Accompanied by vasomotor collapse & cardiac arrest.
- This stage is also called as stage of reversible clinical death.



# CLASSIFICATION OF GENERAL ANAESTHESIA DRUGS

## A. INHALATIONAL

<b>GAS</b>	<b>LIQUIDS</b>
Nitrous oxide	Ether
	Halothane
	Enflurane
	Desflurane
	Sevoflurane
	Isoflurane

<i><b>INDUCING AGENTS</b></i>	<i><b>SLOWER acting drugs</b></i>
Thiopentone sodium	Benzodiazepines
Methohexitone sodium	Diazepam
Propofol	Midazolam
	Lorazepam

### **DISSOCIATIVE ANAESTHESIA**

Ketamine

**Neurolept analgesia**

Fentanyl + droperidol

# A. INHALATIONAL ANESTHETICS

## 1. Ether(Diethyl ether):

- Volatile, inflammable & explosive
- Good analgesia & muscle relaxation
- Highly soluble in blood
- Unpleasant
- Not preferred nowadays

## 2. Halothane:

- Sweet odour, non irritant & non inflammable
- Intermediate solubility
- Induction is reasonably quick & pleasant
- Potent anesthetic
- For induction: 2-4% & maintenance: 0.5-1%
- 20% that enters the blood is metabolized in liver & rest is exhaled out
- Recovery is quick n smooth

### 3. Isofluorane:

- Fluorinated anesthetic
- Less soluble in blood
- Rapid induction & recovery
- Fall in B.P. like halothane, but unlike halothane increases HR
- Respiratory depression is prominent
- Adv: Better adjustment of depth of anesthesia & low toxicity

#### 4. Desflurane:

- Recently developed
- Used for outpatient surgery
- High volatility, low solubility in blood
- Pt can be discharged within few hours after surgery
- Somewhat pungent- this disadvantage is not in sevoflurane

## B. INTRAVENOUS INDUCTION AGENTS:

### 1. Barbiturates:

- Ultra-short acting barbiturates- administered IV to produce GA
- most commonly used are:
  - Thyobarbiturates (Thiopental, thiamytal & thiobarbitone) &
  - Methylated oxybarbiturates (Methohexitone & hexobarbitone)are the most frequently administered.
- Compound employed most commonly is Thiopental

### Thiopentone sodium:

- Highly soluble in water (very alkaline solution)
- i.v. 3-5mg/kg produces unconsciousness in 15-20 sec
- Consciousness regained in 8-12 min
- Ultimate disposal- hepatic metabolism
- T1/2- 7-12hrs
- Weak analgesic; painful procedure – with opioid or N2O
- Laryngospasm may occur – Prevented by using Atropine pre-medication



## 2. Propofol:

- Oily liq – as 1% emulsion
- for iv induction & short duration anesthesia
- Acts in 15-45 sec
- Lasts for ~10min
- Distribution time: 2-4min
- T<sub>1/2</sub>: 100min
- Intermittent injection or continuous infusion of propofol has been used for total iv anesthesia when supplemented by fentanyl

### 3. Benzodiazepines:

Apart from being a pre-anesthetic medication also used for inducing, maintaining & supplementing anesthesia as well as conscious sedation.

## Diazepam:

- Onset – 5-10min
- Dosage – 0.2 - 0.5 mg/kg, >10mg
- Advantages
  - Wide safety margin
  - Antidote – flumezenil
- Disadvantages
  - Has active metabolites
  - Excitement in children

## Midazolam:

- Water soluble
- Rapid onset (20-30 min) IM./ IV
- Short acting – <1hrs
- Advantages
  - Better local tissue tolerance
  - Better amnesic property
- Disadvantages
  - Bitter taste
  - Paradoxical reactions- hallucination, agitation, crying
- Dosage – 0.25 - 0.75mg/kg IV - 5mg im

## **Benzodiazepine Antagonist: Flumazenil**

- Reversal agent - administered intravenously and its onset of action is usually within 1 minute.
- The first dose administered is 0.01 mg/kg with a maximum dose of 0.2 mg. Doses should be administered slowly over 15-30 seconds, and may be repeated every minute at 0.01 mg/kg for up to 5 doses or a maximum cumulative dose of 1.0 mg.
- Duration of action - 30 minutes

#### 4. Ketamine:

- Acts as antagonist to NMDA receptors
- Acts on limbic system
- Induces – dissociative anesthesia:
  - Profound analgesia, amnesia with light sleep & feeling of dissociation from one's own body & the surroundings
- Employed for dental & other operations on head & neck, in asthmatics (relieves bronchospasm), for burn dressing.

- In combination with diazepam: used in angiographies, cardiac catheterization & trauma surgeries.
- Dose: 0.5mg/kg im or iv produces adequate analgesia
- Maintained at 0.25mg/kg
- Increases BP & HR; avoided in ischemic heart disease

## Anti Histamines

- **Hydroxyzine** ( Atarax , Vistaril )
  - Effect seen – 15- 30 min , half life – 3 hrs
  - NOT injected SC or IV – tissue necrosis and hemolysis
  - Dosage : oral 1-2mg/kg and IM - 1.1 mg/kg
  
- **Promethazine** ( Phenergan )
  - Onset within 15 – 60 min , duration – 4-6 hrs
  - Caution in children h/o asthma, sleep apnea , seizure prone patients
  - Oral/IM – 0.5 – 1.0 mg/kg
  
- **Diphenhydramine** ( Benadryl )
  - Effect seen– 1 hr , duration – 4-6 hr
  - Oral ,IM , IV – 1.0 – 1.5 mg/kg



## **Triclofos**

- Phosphorylated derivative of chloral hydrate(ethanol derivative), hypnotic
- Children: up to 1 year: 25 - 30 mg / kg  
1 - 5 year: 0.25 - 0.5 g  
6 - 12 year: 0.5 - 1 g
- Oral administration.
- Onset Of Action Within 30 minutes –
- Duration Of Action- 8 - 12 hour.
- Adverse Effect: Gastric irritation, Flatulence, Abdominal distension, Rashes, Headache, Delirium, Dizziness, Nausea, Vomiting

## 5. Opioids :

- Frequently used for the maintenance of GA .
- Most commonly used opioids in GA are morphine, meperidine, fentanyl and its analogs- sufentanil, alfentanil, and remifentanil.
- Opioid antagonist *naloxane* is commonly used when opioids are used in GA, to reverse opioid induced respiratory depression, at the termination of the procedure.

## FENTANYL

- Potent opioid analgesic for Neuroleptanalgesia
- Onset – 7 -15 min - Duration -- 30-50min
- Used for supplement anesthetics in balanced anesthesia.
- Combined with benzodiazepines, it can obviate need for inhaled anesthetics for- diagnostic, endoscopic, angiographic, dental & other minor procedures in poor risk patients, as well as burn dressing.
- Respiratory depression, bradycardia(as it stimulates Vagus)
- Not recommended for children under 2yrs of age
- IV – 2-4  $\mu\text{g}/\text{kg}$  (Pt. remains drowsy but conscious)

## NARCOTIC ANTAGONIST

- NALOXONE ( Narcan )
- Used to counteract persistent respiratory depression & mental clouding
- IV, SC, IM – initial dose – 0.01mg/kg
- subsequent dose 0.1mg/kg every 2-3min

## 6. Muscle Relaxants:

- Provides skeletal muscle relaxation to facilitate intubation of the trachea and controlled mechanical ventilation, and they provide optimal operating conditions.
- Eg. Tubocurarine, pancuronium, metocurine, vecuronium, mivacuronium.
- Succinylcholine and dexamethonium- depolarizing muscle relaxant.
- Usual dose for children, for intubation is 20 mg.

# ANTIDOTAL DRUGS

## *Opioid antagonist –*

- Administered to reverse unwanted respiratory depression produced by opioids.
- i.v. dose of 0.01 mg/kg of **naloxone**.
- Recommended for emergency kit is 0.02 mg/ml of naloxone for paediatric use.

## *Benzodiazepine antagonist-*

- **Flumazenil** reverses the clinical actions of diazepam and midazolam.
- Initial dose of flumazenil is 0.2 mg, administered over 15 secs, and repeated at 60 sec interval, to a maximal dose of 1 mg.

### *Physostigmine-*

- Reversal of muscle relaxant action.
- Dosage is 0.5-1mg i.m or i.v.
- Recommended for emergency kit is two to three ampules of 1 mg/ml of **physostigmine.**

### *Vasodilator –*

- Indicated in an event of an intra-arterial injection of a drug.
- **Procaine**(novocain) – drug of choice.
- Recommended for emergency kit are two to three ampules of 1% procaine.

# COMPLICATIONS OF ANESTHESIA

## ❖ During anesthesia

- Respiratory depression and hypercarbia
- Salivation, respiratory secretions
- Cardiac arrhythmias
- Fall in blood pressure
- Laryngospasm and asphyxia
- Delirium, convulsion



### ❖ After Anesthesia

- Nausea and vomiting
- Persisting sedation :impaired psychomotor function
- Pneumonia
- Organ toxicities :liver , kidney damage
- Emergence delirium
- Cognitive Defects: prolonged excess cognitive decline has been observed in some patients ‘especially the elderly ,who have undergone general anaesthesia , particularly of long duration.

## **MALIGNANT HYPERTHERMIA:**

- Rare, fatal, familial disorder
- Triggered by any potent inhalation synthetic, depolarising muscle relaxant & even by stress.
- In susceptible individuals, these can cause excessive release of  $\text{Ca}^{++}$  from sarcoplasmic reticulum, leading to: hyperpyrexia (temp.  $>42^{\circ}\text{C}$ ), Muscle rigidity, tachycardia.
- IV **dantrolene** (1mg/kg, repeated if required to a maximum total dose of 100mg) is life saving.

## CONCLUSION

- The sedation and general anesthesia can prove to be valuable adjuncts to the regular dental procedures carried out in the operator.
- But the use of pharmacological methods for managing uncooperative children should be done only after all the other behavior management modalities have proved to be unsuccessful



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*Thank  
you*

The image features the text "Thank you" written in a red, cursive script. The word "Thank" is on the top line and "you" is on the bottom line. The text is centered and flanked by two decorative red leafy branches. One branch is positioned above the word "Thank" and the other is positioned below the word "you". The entire graphic is set against a plain white background.