Pharmacologic Management of Patient Behavior

Pharmacologic management is a broad term that describes the use of **drugs to manage the behavior of pediatric patients undergoing dental procedures.**

The types of drugs used include inhaled gases, oral medications, drugs administered via intravenous infusion, intramuscular injection, and other routes of administration.

Pharmacologic management is further divided into two subcategories,

sedation and general anesthesia

Degree of sedation

- **Minimal sedation(anxiolysis) -** normal response to verbal stimuli. minimally depressed level of consciousness , airway independently and continuously, ventilator and cardiovascular functions are unaffected
- **Moderate sedation(Conscious Sedation) -** purposeful response to verbal/tactile stimulation. (This is usually referred to as "conscious sedation") No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained
- **Deep sedation (Analgesia)-** purposeful response to repeated or painful stimulation. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained
- **General anesthesia** – unarousable even with painful stimulus. The ability to maintain ventilatory function independently is often impaired. Cardiovascular function may be impaired .

Indications For Pharmacological Behavior Management Technique:

1. Very young children.
2. Children with reduced (psychological or emotional) maturity or those with (cognitive, physical or mental) disability.
3. Children who are intensely fearful and anxious.
4. Children who require extensive dental care and would benefit from prolonged dental visit.
5. Children who have allergy to local anesthesia.

Pre-treatment Documentation And Assessment Documentation

1. Rationale for sedation or general anesthesia: the dental surgeon should briefly document the reason for the need for sedation or G.A .

2. Informed consent: each patient, parents or other responsible individual is entitled to be informed regarding benefits, risks, alternatives to sedation or G.A. and the patient record should document that appropriate informed consent was obtained .

3. Instructions to parents or responsible individual: The dental surgeon should provide verbal and written instructions (to parents and responsible individual) which should include clear explanation of pre and post anesthesia precautions potential or anticipated behavior, and limitation of activities.

4. Dietary instructions: food and liquids intake should be limited prior to treatment .

Anatomically Differences In The Pediatric Airways Include:

- The vocal cords positioned higher and more anterior.
- The smallest portion of pediatric airway is at the level of the subglottis (below cords) at the level of the cricoid ring.
- Children have relatively larger tongue and epiglottis.
- Possible presence of large tonsillar/adenoid mass.
- Larger head to body size ratio in children.
- The mandible is less developed and retrognathic in younger children and infants.
- Children have smaller lung capacity and higher metabolic rate resulting in a smaller oxygen reserve. Hence, children desaturate more quickly than adults do.

A Thorough Medical And Dental History That Include :

1. Allergies or adverse drug reaction that might increase the potential for airway obstruction, such as a history of snoring or obstructive sleep apnea.

2. Current medications (if any including the dose, time, rout and site of administration

3. Previous hospitalization and past operations (date and purpose)

4. History of previous treatment under general anesthesia or sedation and any associated complications.

5. Family history of diseases or disorders especially those might affect sedation and general anesthesia.

6. Patient medical status (diseases, disorders or physical abnormalities)

The Physical Evaluation Which Should Include The Following:

a. Height and weight in kilograms or pounds .

b. Vital signs, including heart and respiratory rates and blood pressure.

c. Evaluation of airway patency, to include tonsillar size and anatomic abnormalities that may increase the risk of airway obstruction (e.g., mandibular hypoplasia, large, short neck, limited mandibular range of motion .

d. Physical abnormalities or conditions that may affect routine intraoperative monitoring (e.g., recent orthopedic injuries to arms or legs, active skin rashes)

e. ASA classification .

**Note: American Society of Anesthesiologists' Physical Status (ASA)Classification System

- P1 A normal healthy patient
- P2 A patient with mild systemic disease
- P3 A patient with severe systemic disease
- P4 A patient with severe systemic disease that is a constant threat to life
- P5 A moribund patient who is not expected to survive without the operation
- P6 A declared brain-dead patient whose organs are being removed for
- donor purposes

Routes Of Drug Administration

- ✓ Inhalational Route
- ✓ Enteral Route
- ✓ Rectal Route
- ✓ Intramuscular Route
- ✓ Submucosal and Subcutaneous Routes
- ✓ Intravenous Route

Onset of action

Oral	30 min
Inhalation	2-3 min
IM	5-10 min
IV	20 to 40 seconds

Peak clinical effect

Oral	60 min
Inhalation	3-5 min
IM	30 min
IV	1-10min

Titration . Ability to administer small increments of a drug to achieve a desire clinical effect

Oral	Titration not possible
Inhalation	Titration posssible
IM	Titration not possible
IV	Titration possible

Recovery . Need for an escort (somebody) to leave the office

Oral recovery	not complete even after 2-3hrs
Inhalation	recovery almost always complete, may discharged alone
IM	not complete need escort

Enteral Route

- Enteral sedation is achieved by drugs that are swallowed and absorbed through the digestive or enteric system.
- **with peak effect noted by 60 minutes**

- Advantage
- Universally accepted
- Ease of administration
- Low cost

- Decreased incidence and severity of adverse reactions
- No pricks (needles, syringes),
- No equipment is required.
- No special training
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Disadvantages

Reliance

Prolonged latent period

Erratic & incomplete absorption drugs from GIT

Inability to titrate

Prolonged duration of action

Inability to radially lightened

Or deepened the level of sedation

Rectal route

- Rectal administration of sedative drugs with suppositories has a limited history in pediatric dentistry.

Absorption is often irregular and incomplete

Complication

Rectal mucosal irritation

Initiation of bowel movement

Risk of over sedation

Indications

Unwilling to take orally

Nausea & vomiting

Patient objecting injection

Post-op control of pain

Advantages	Disadvantages
Low cost	Inconvenience to the administer
Ease of administration	Variable absorption
No pricks	Inability to reverse
Absorb directly into systemic	Inability to titrate
circulation (rapid onset of action)	Possible intestinal irritation
Bypassing entero hepatic circulation	Prolonged recovery

Intra muscular route

- Intramuscular administration relies upon the high vascularity of muscle tissue to **achieve a moderately rapid onset of action**, usually within 5 to 10 minutes. When properly administered, intramuscular injection provides a **more rapid onset** and offset as compared with enteral techniques.

Indications

- Other controllable routes are unavailable or have proved

ineffective .

- Prior to IV sedation or general anesthesia .

Complications

- Nerve injury
- Intra-vascular injection
- Air embolism
- Hematoma
- Abscess
- Cyst
- Necrosis

Intravenous Route

The IV route of drug administration represents **the most effective method** of ensuring predictable and adequate sedation in virtually all patients.

Effective blood levels of drugs are **achieved quite rapidly**

Advantages	Disadvantages
Rapid onset of action	more monitoring necessary
Easily titrated	venipuncture is required
Rapid recovery	heamatoma
minimal side effect	most agent can not be reversed

Inhalation

The inhalational route is a **highly effective route of administration**, allowing nonirritating gases and volatile drugs to be inhaled and absorbed directly through the **pulmonary epithelium and mucous membranes of the respiratory tract into the circulation**

Indications

Anxiety

Medically compromised patients

Gagging

Contraindications

Severe behavioral problems

Acute respiratory conditions

Inability to communicate and Learning difficulties

Very young children

Fear of the mask

Advantages	Disadvantages
Rapid onset	High cost equipment
Peak clinical actions	Space in dental office
Titration possible	Potency
Depth of sedation can be altered	Training of staff
Rapid and complete recovery	Occupational hazard
Duration at discretion of administration	Cooperation is required
No injection	
Raise pain reaction	
Threshold	
Safe and no systemic effects	Potential problems with
Can be used instead of topical anesthesia	chronic exposure

Drugs And Agents Used For Sedation

Hydroxyzine (Atarax, Vistaril)

Antihistamine with weak sedative, anticholinergic, and antiemetic properties. It produces sedation by inhibiting the hypothalamic H-1 histamine receptors involved in governing the sleep-wake cycle in humans.

Preparation: tablets, elixir

Dosage: 0.5 to 1.0 mg/kg

Also available as IM inj. 1mg/kg

Side effects: prolonged drowsiness, ataxia, dry mouth. In children, paradoxical reactions may occur at sedative doses

Benzodiazepine Agonists And Antagonists:

Midazolam (Versed)

It is a water soluble type of benzodiazepine. The clinical potency of midazolam is estimated to be 2 to 5 times the potency of diazepam. **Onset of action 3-5 minutes** after IV administration and recovery take place in **2-6 hrs.**

Adverse drug reaction

Respiratory depression dose, defendant risk of apnea, more often when used with narcotics, Hypertension has also been reported when used in combination.

Preparation: syrup, parenteral injection solution.

Pediatric dose: 0.05 - 0.1 mg/kg (IV. IM.)

0.03 - 0.75mg/kg orally

0.4 - 1mg/kg rectally

0.2 - 0.3mg/kg nasally

Sedative-Hypnotics

- **Barbiturate**

Can produce **all levels of CNS depression**, ranging from mild sedation to general anesthesia and deep coma. Their use are of **very limited value for pediatric patients.**

- Chloral Hydrate

Chloral hydrate is an aldehyde compound that is metabolized in the liver. It is a **chemical irritant to the skin and mucous membranes and is associated with a high rate of nausea and vomiting**, particularly when administered on an empty stomach, so it should be diluted in a flavored vehicle. After oral administration, the drug was characterized by a slow onset time (30 to 60 minutes) and had a duration of action of 4 to 8 hours, with an elimination half-life of 8 to 11 hours.

Narcotics

Demerol (Meperidine)

Meperidine is a synthetic opiate agonist, closely related to fentanyl in chemical structure. It is water-soluble but is incompatible with many other drugs in solution.

- Supplied: oral tablets—50 and 100 mg; oral syrup—50 mg /5 mL;
- parenteral solution—25, 50, 75, and 100 mg/mL
- Dosage: oral, subcutaneous, or intramuscular—1.0 to 2.2 mg/kg, not to exceed 100 mg when given alone or 50 mg when in combination with other CNS depressants.

Nitrous oxide N2O

It is the most frequently inhalation agent used in pediatric sedation Nitrous oxide is a slightly **sweet-smelling, colorless, heavier than air, and inert gas.**

It is compressed in metal cylinders as a liquid that vaporizes on release.

The gas is nonflammable but will support combustion. Very **potent analgesic** but **weak anesthetic**. It is absorbed quickly from the alveoli of the lungs and is physically dissolved in the blood with no chemical combination anywhere in the body. It is carried in the serum portion of the blood and excreted through the lungs without any biotransformation, small amount may be found in the body fluids and intestinal gas .

Objectives

The objectives of nitrous oxide sedation, as stated by the American Academy of Pediatric Dentistry, include the following :

- Reducing or eliminating anxiety
- Reducing untoward movement and reaction to dental treatment
- Enhancing communication and patient cooperation
- Raising the pain threshold
- Increasing tolerance for longer appointments
- Aiding in the treatment of a patient with mental and/or physical disabilities or a medically compromised patient
- Reducing gagging
- Potentiating the effects of sedatives

Disadvantages of nitrous oxide-oxygen inhalation may include:

- Lack of potency
- Dependence on psychological reassurance
- Interference of the nasal hood with injection to the anterior maxillary region
- Need for the patient to be able to breathe through the nose
- Nitrous oxide pollution and potential occupational exposure health hazards .
- Create an altered state of awareness without impairment to the motor function and it is a CNS depressant .
- Increase the respiratory rate and decrease the tidal volume .
- Cardiac output is decreased and peripheral vascular resistance is increased (important in the cardiac patients(.
- Rapid induction and reversal may induce vomiting .

Requirements of the equipment used for the induction of N2O:

1 .Should have a continuous flow design with flow meters capable of accurate regulation .

2 .Automatic shut down if the O2 level falls < 20 .%

3 .Flush level for easy and immediate flushing of the system with 100% O2 .

4 .Can be either mobile units or operating from a central supply to a wall mounted with mobile head.

5 .Good and efficient scavenger system .

6 .Nasal hood should be of adequate size for adults and children

Components of the continuous flow unit

1 -Compressed gas cylinders and pressure gauge .

2 -Reducing valve (regulator)

3 -Flow meter

4 -Reservoir bag

5 -Conducting tubing

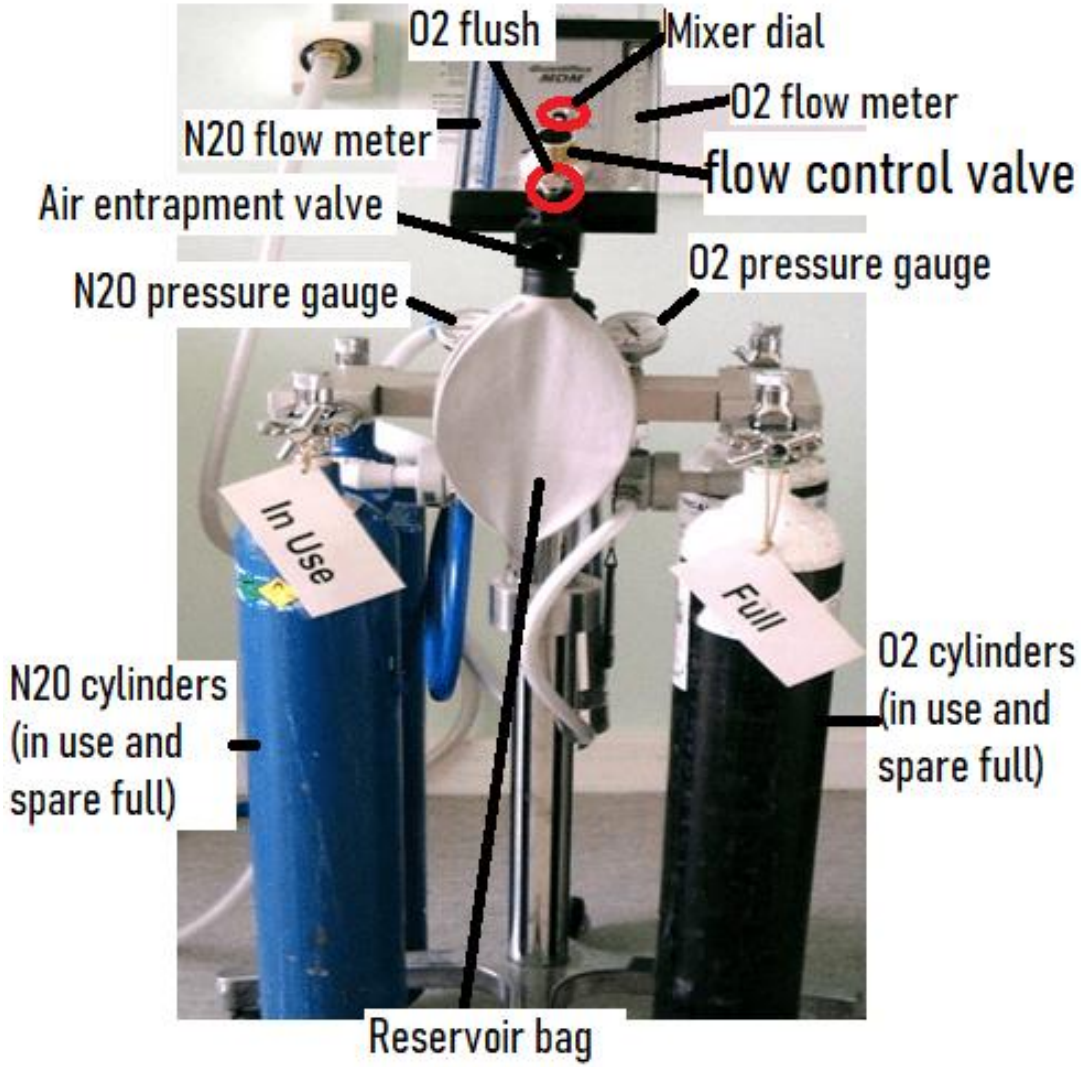
6 -Nasal hood, full face mask or nasal cannula

Preparation of Patient

Patient in reclined position

Use TSD

Describe sensations in advance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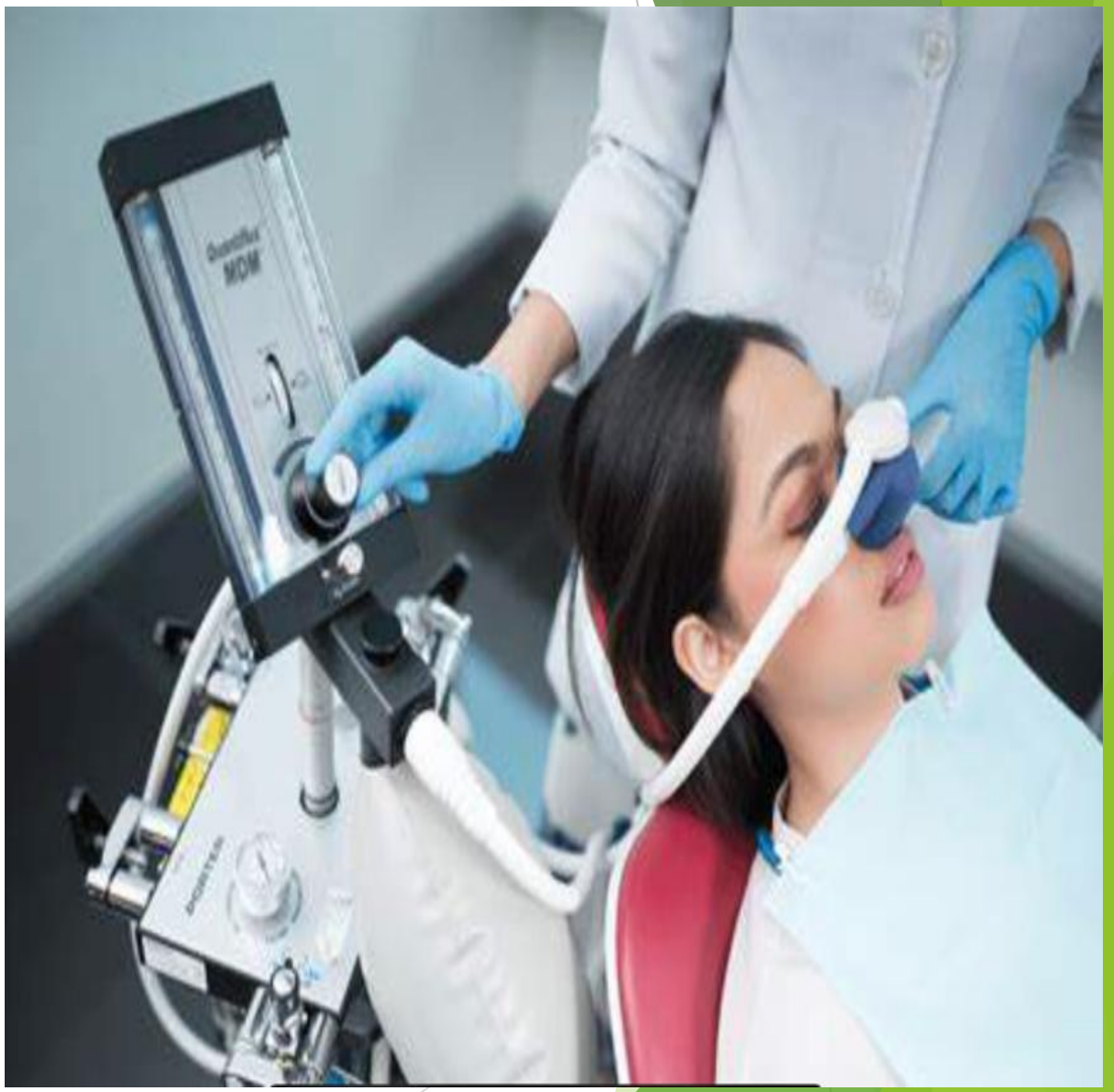

Four Plateaus of Analgesia with N2O (Stages of Sedation) :

1 .Tingling sensation (Paresthesia - tingling of hands, feet) .

2 .Followed by a warm feeling (Vasomotor - warm sensations).

3 .Feeling of well-being, hearing may dissolve into electronic throbbing. (Drift - euphoria, pupils centrally fixed sensation of floating .)

4 .Sleepiness, Nausea sets in, dream can occur (Dream - eyes closed but will open in response to questions, difficulty in speaking, jaw sags open)

After the treatment :

- **Inhalation of 100% O2 for not less than 5 min** should be continued to allow diffusion of nitrogen from the venous blood into the alveoli, which will be then exhaled as N2O through the respiratory tract and also allow the patient to return to the pretreatment activities, with any incident inadequate oxygenation may produce: nausea, headedness or dizziness .
- The child should be kept in supine position or **in his side** to

maintain air way patency. Upon arriving home, the child should be placed on his side and observed carefully for the first hour and if he wishes to sleep, he can be allowed to do so.

Common problems associated with N2O

1 -Sleep

Patient may go into sleep during the procedure and frequent arousal or communication is required

2 -Air way obstruction

Frequent repositioning of the head is needed to hyper extend the mandible so that the tongue is brought forward .

3 -Vomiting

It could be due to:

Over dose of N2O

Prolonged administration of N2O

Pre-existing GIT infection or influenza

History of motion sickness or vomiting (use antiemetic drugs)

Impurities during delivery (rare)

This (vomiting) can be prevented by :

1. Using min. effective concentration .
2. Avoid prolong procedure .
3. Empty stomach inhalation .
4. Slow return to upright position .
5. Aspiration is unlikely.

4 -Diffusion Hypoxia

Since c has a lower blood solubility, it rapidly diffuse into the alveoli and

dilutes the alveoli air causing fall in the partial pressure of the oxygen in the alveoli, to avoid this **100% O2 for 10 min .**

5 -Increased N2O concentration

This should be avoided otherwise **pressure** will be created in the air filled body cavities especially in the middle ear .

6 -Hallucinations

This can occur when we give **high concentration of N2O** (> 60 %) so reduce the dosage of N2O .

- **Chronic Exposure to N2O**

“ Long-term (chronic) exposure to nitrous oxide in sufficient concentrations can produce **irreversible, toxic changes**, and should be a concern for dental personnel working in environments in which nitrous oxide is administered to patients ”.

Chronic exposure may cause disorders in the :

- Respiratory system
- Hematological, Immunological
- Liver, Kidney
- Neurological such as loss of concentration, numbness and
- paresthesia ,ataxia, loss of bladder control, loss of bowel sphincter control.

ControllingN2O in the operatory :

- To minimize the risk of chronic exposure:
- Good scavenging system
- Adequate circulation of the room air
- Limiting of speech and mouth breathing by the patient
- Chose the proper size of the nasal hood

General anesthesia (Hospital Based Dentistry)

Patients for whom general anesthesia has been the management technique of choice include the following:

1. Patients unable to cooperate due to a lack of psychological or emotional maturity and/or those who have a physical, mental, or medically compromising disability that precludes conscious sedation.

2. Patients with dental restorative or surgical needs for whom local anesthesia is ineffective

because of acute infection, anatomic variations, or allergy.

3. The extremely uncooperative, fearful, anxious, physically resistant, or uncommunicative child or adolescent with substantial dental needs for whom there is no expectation that the behavior will soon improve.

4. Patients who have sustained extensive orofacial or dental trauma and/or require significant surgical procedures.

5. Patients requiring immediate, extensive comprehensive oral or dental needs.

6. Patients requiring dental care for whom the use of general anesthesia may protect the developing psyche and/or reduce medical risks

Advantages of Hospital Dentistry:

1- No need for multiple visits.

2- All the treatments can be accomplished in 1 to 1.5 h.

3- Full mouth rehabilitation can be achieved under ideal circumstances.

Disadvantages:

1- Does not help in behavior management.

2- Does not teach the child about dentistry.

3- Risks of G.A.

4- Need to bring own staff and supplies.

5- Need to close office.

6- Expensive.

Four stages of anesthesia:

1- Analgesia: Pt. is conscious, reflexes are intact.

2- Delirium

3- Surgical anesthesia

4- Respiratory paralysis

****Pt. unconscious in stage 2, 3 and 4**

Ways to minimize the negative effects of G.A. on child and parents:

1. Involving the child in the operating room tour,
2. Allowing the child to bring along a favorite doll or toy,
3. Giving pre-induction sedation,
4. Providing a nonthreatening environment, thorough explanation of the procedure to the parents, mothers receiving G.A. were more stressed.
5. Giving post-procedure sedation as needed, Allowing parents to rejoin their children as early as possible in the recovery area.

Requirements of hospital set up for dental treatment:

1- Well-equipped dental unit.

2- Experience, understanding hospital staff.

3- Availability of adequate operating room time and patients beds.

4- Readily available pediatrician.

Close proximity to the dentist’s private office