

PHARMACOLOGIC BEHAVIOUR MANAGEMENT- I (NITROUS OXIDE)



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WHAT ALL SHOULD WE KNOW ?

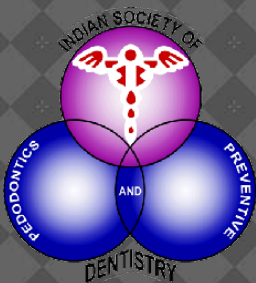
- ◉ What is pharmacological behaviour management
- ◉ What is sedation - definition /guidelines/ levels
- ◉ Terminologies - Conscious sedation/ Relative analgesia/Anxiolysis
- ◉ Objectives, rationale and technique of nitrous oxide
- ◉ Nitrous oxide equipment & its safety features
- ◉ History of nitrous oxide

“although the operative dentistry may be perfect, the appointment is a failure if the child departs in tears.” The tooth may be saved but the patient’s developing psyche is damaged in the process, if a child centered care was not provided.



McElroy CM. Dentistry for Children: Calif Dent Assoc Trans 1895:85

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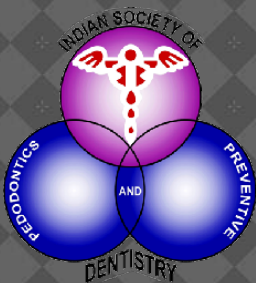


WHAT IS PHARMACOLOGICAL MANAGEMENT

- It is a broad term that is used to describe the use of drugs to manage the behaviour in pediatric population undergoing dental procedures.
- Routes - Inhalation, oral, intranasal, IM, IV
- Does it mean sedation or GA

McDonald and Avery's Dentistry for the Child and Adolescent

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WHAT IS SEDATION

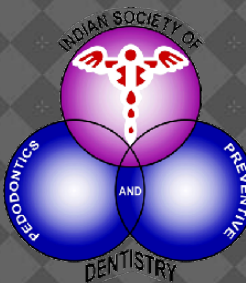
Sedation usually implies a modification of the level of consciousness of an individual, ideally resulting in a state of lessened anxiety or fear, relaxation, and sometimes favorable mood enhancement. (Wilson S)

Pharmacological sedation is mediated by the administration of an agent or combination of agents causing alterations in the level of consciousness, cognition, motor coordination, degree of anxiety, and physiological parameters.

Sedative medications alter the level of consciousness of an individual. The level of consciousness is represented as a continuum ranging from full wakefulness to complete coma and is dependent, to a degree, on the number and dose of pharmacological agents administered to the individual. Hence, the level or depth of sedation is often referred to as an indirect, continuous index of the patient's level of consciousness at any given point in time.

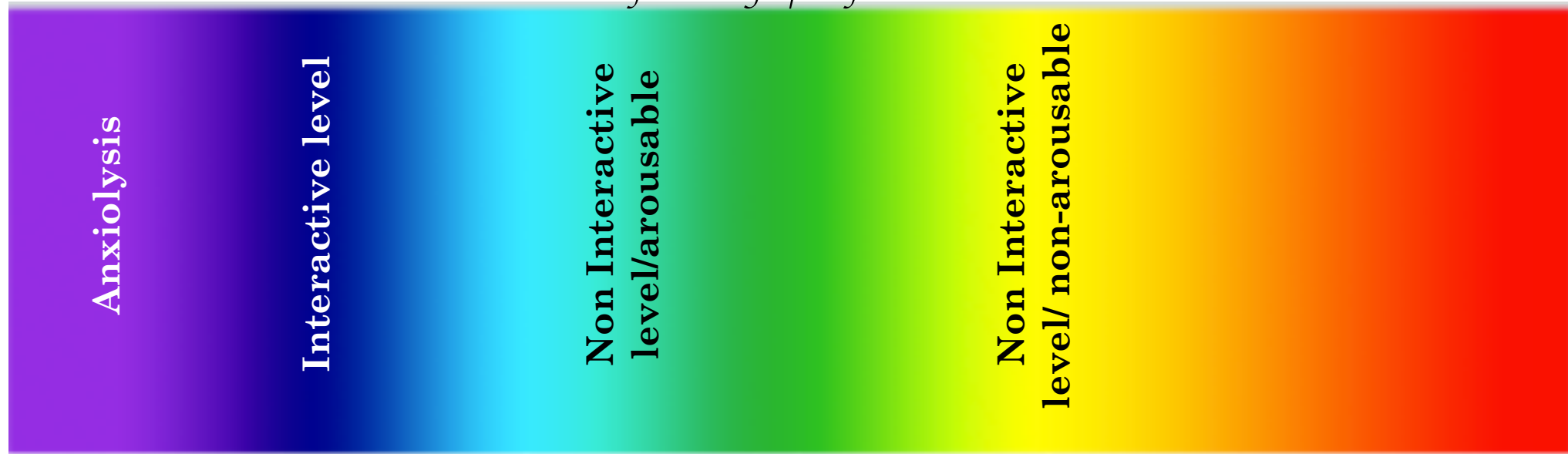
*Behavior Management in Dentistry for Children, Second Edition. Edited by Gerald Z. Wright and Ari Kupietzky.
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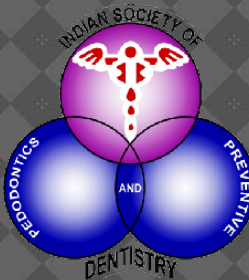
SPECTRUM OF PHARMACOLOGICAL BEHAVIOUR MANAGEMENT

Sedation is not defined by specific medications



1985	Conscious sedation		Deep Sedation	General Anesthesia
2002	Minimal Sedation	Moderate Sedation/ Conscious sedation	Deep Sedation	

Practice Guidelines for Sedation and Analgesia by Non-Anesthesiologists. Anesthesiology 2002;96(4): 1004-1017.
Nitrous oxide in pediatric dental patients. Reference Manual of Pediatric Dentistry. 2018. 293-298
Wilson S. Pharmacological Management of Pediatric dental patient. Pediatr Dent.2004;26:131-136
Wilson S. Pharmacologic behavior management for pediatric dental treatment. Pediatr Clin North Am. 2000;47(5):1159- 1175.



			Level of Consciousness	Responsiveness
Anxiolysis		Minimal Sedation (drug induced state)	Awake	un interrupted interactive ability
Interactive	Conscious sedation	Moderate Sedation (drug induced depression of consciousness)	Minimally depressed, eyes open or temporarily closed	responds appropriately to verbal commands accompanied by light tactile stimulus
Non interactive/ arousable			Moderately depressed, mimics sleep,	
Non interactive/ non arousable		Deep sedation	Deep Sedation	depression of consciousness

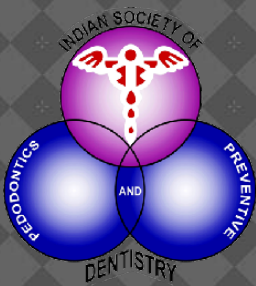




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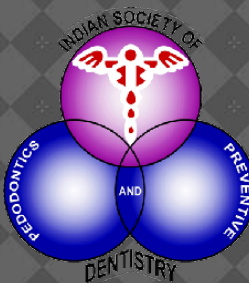
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	Minimal Sedation (drug induced state)	Moderate Sedation (drug induced depression of consciousness)	Deep Sedation (drug induced depression of consciousness)	General Anesthesia (drug induced loss of consciousness)
Responsiveness	Normal to verbal stimulus, coordination may be impaired	Purposeful response to verbal alone or accompanied by tactile stimulus	Purposeful to repeated verbal or painful stimulus	Unarousable, even to painful stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular function	Unaffected	Usually maintained	Usually maintained	May be impaired



"Continuum of Depth of Sedation: Definition of general anesthesia and levels of sedation/analgesia". American Society of Anesthesiologists. 21 October 2009. Retrieved 2010-11-29



■ SPECIAL ARTICLE

Anesthesiology 2002; 96:1004-17

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Practice Guidelines for Sedation and Analgesia by Non-Anesthesiologists

An Updated Report by the American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists

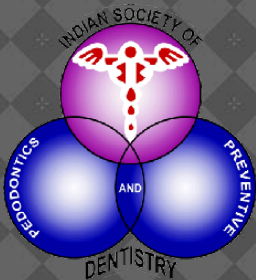
ANESTHESIOLOGISTS possess specific expertise in the pharmacology, physiology, and clinical management of patients receiving sedation and analgesia. For this reason, they are frequently called on to participate in the development of institutional policies and procedures for sedation and analgesia for diagnostic and therapeutic procedures. To assist in this process, the American Society of Anesthesiologists (ASA) has developed these "Guidelines for Sedation and Analgesia by Non-Anesthesiologists."

Practice guidelines are systematically developed recommendations that assist the practitioner and patient in making decisions about health care. These recommendations may be adopted, modified, or rejected according to clinical needs and constraints. Practice guidelines are

data and recommendations for a wider range of sedation levels than was previously addressed.

Definitions

"Sedation and analgesia" comprise a continuum of states ranging from minimal sedation (anxiolysis) through general anesthesia. Definitions of levels of sedation-analgesia, as developed and adopted by the ASA, are given in table 1. These Guidelines specifically apply to levels of sedation corresponding to moderate sedation (frequently called conscious sedation) and deep sedation, as defined in table 1.



to clinical needs and constraints. Practice guidelines are not intended as standards or absolute requirements. The use of practice guidelines cannot guarantee any specific outcome. Practice guidelines are subject to revision as warranted by the evolution of medical knowledge, technology, and practice. The guidelines provide basic recommendations that are supported by analysis of the current literature and by a synthesis of expert opinion, open forum commentary, and clinical feasibility data.

This revision includes data published since the "Guidelines for Sedation and Analgesia by Non-Anesthesiologists" were adopted by the ASA in 1995; it also includes

Focus

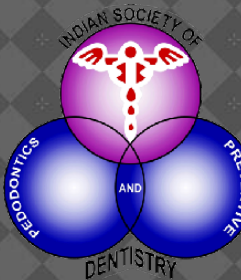
These Guidelines are designed to be applicable to procedures performed in a variety of settings (e.g., hospitals, freestanding clinics, physician, dental, and other offices) by practitioners who are not specialists in anesthesiology. Because minimal sedation (anxiolysis) entails minimal risk, the Guidelines specifically exclude it. Examples of minimal sedation include peripheral nerve blocks, local or topical anesthesia, and either (1) less than 50% nitrous oxide (N₂O) in oxygen with no other sedative or analgesic medications by any route, or (2) a single, oral sedative or analgesic medication administered in doses appropriate for the unsupervised treatment of insomnia, anxiety, or pain. The Guidelines also exclude patients who are not undergoing a diagnostic or therapeutic procedure (e.g., postoperative analgesia, sedation for treatment of insomnia). Finally, the Guidelines do not apply to patients receiving general or major conduction anesthesia (e.g., spinal or epidural/caudal block), whose care should be provided, medically directed, or supervised by an anesthesiologist, the operating practitioner, or another licensed physician with specific training in sedation, anesthesia, and rescue techniques appropriate to the type of sedation or anesthesia being provided.

Additional material related to this article can be found on the ANESTHESIOLOGY Web site. Go to the following address, click on Enhancements Index, and then scroll down to find the appropriate article and link. <http://www.anesthesiology.org>

Developed by the American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists: Jeffrey B. Gross, M.D. (Chair), Farmington, CT; Peter L. Bailey, M.D., Rochester, NY; Richard T. Connis, Ph.D., Woodinville, WA; Charles J. Coté, M.D., Chicago, IL; Fred G. Davis, M.D., Burlington, MA; Burton S. Epstein, M.D., Washington, DC; Lesley Gilbertson, M.D., Boston, MA; David G. Nickinovich, Ph.D., Bellevue, WA; John M. Zerwas, M.D., Houston, TX; Gregory Zuccaro, Jr., M.D., Cleveland, OH.

Submitted for publication November 30, 2001. Accepted for publication November 30, 2001. Supported by the American Society of Anesthesiologists under the direction of James F. Arens, M.D., Chairman, Committee on Practice Parameters. Approved by the House of Delegates, October 17, 2001. A list of the references used to develop these Guidelines is available by writing to the

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What is Minimal Sedation

Peripheral nerve block /local or topical anaesthesia



Nitrous oxide less than 50%
with no other sedative or
analgesic

OR



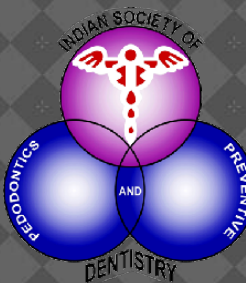
Single, oral sedative or
analgesic medication
administered in doses
appropriate for the
unsupervised treatment of
insomnia, anxiety or pain



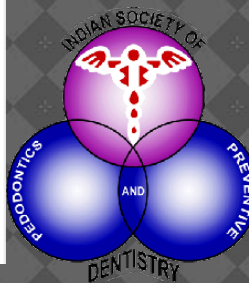
Guidelines for Monitoring and Management of Pediatric Patients Before, During, and After Sedation for Diagnostic and Therapeutic Procedures

Charles J. Coté, MD, FAAP • Stephen Wilson, DMD, MA, PhD • American Academy of Pediatric Dentistry • American Academy of Pediatrics

Abstract: *The safe sedation of children for procedures requires a systematic approach abstract that includes the following: no administration of sedating medication without the safety net of medical/dental supervision, careful presedation evaluation for underlying medical or surgical conditions that would place the child at increased risk from sedating medications, appropriate fasting for elective procedures and a balance between the depth of sedation and risk for those who are unable to fast because of the urgent nature of the procedure, a focused airway examination for large (kissing) tonsils or anatomic airway abnormalities that might increase the potential for airway obstruction, a clear understanding of the medication's pharmacokinetic and pharmacodynamic effects and drug interactions, appropriate training and skills in airway management to allow rescue of the patient, age- and size-appropriate equipment for airway management and venous access, appropriate medications and reversal agents, sufficient numbers of appropriately trained staff to both carry out the procedure and monitor the patient, appropriate physiologic monitoring during and after the procedure, a properly equipped and staffed recovery area, recovery to the presedation level of consciousness before discharge from medical/dental supervision, and appropriate discharge instructions. This report was developed through a collaborative effort of the American Academy of Pediatrics and the American Academy of Pediatric Dentistry to offer pediatric providers updated information and guidance in delivering safe sedation to children. (Pediatr Dent 2019;41(4):E26-E52)*



variety of painful procedures in children.^{14,36,49,98,465-493} The use of nitrous oxide for minimal sedation is defined as the administration of nitrous oxide of $\leq 50\%$ with the balance as oxygen, without any other sedative, opioid, or other depressant drug before or concurrent with the nitrous oxide to an otherwise healthy patient in ASA class I or II. The patient is able to maintain verbal communication throughout the procedure. It should be noted that although local anesthetics have sedative properties, for purposes of this guideline they are not considered sedatives in this circumstance. If nitrous oxide in oxygen is combined with other sedating medications, such as chloral hydrate, midazolam, or an opioid, or if nitrous oxide is used in concentrations $> 50\%$, the likelihood for moderate or deep sedation increases.^{107,197,492,494,495} In this situation, the practi-



Definitions

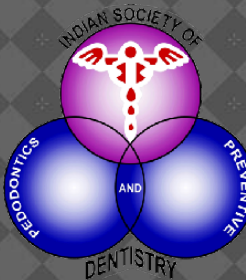
Minimal Sedation (Anxiolysis) a drug-induced state during which patients respond normally to verbal commands. Although cognitive function and coordination may be impaired, ventilatory and cardiovascular functions are unaffected.

Moderate Sedation/Analgesia (Conscious Sedation) a drug-induced depression of consciousness during which patients respond purposefully* to verbal commands, either alone or accompanied by light tactile stimulation. No interventions are required to maintain a patent airway, and spontaneous ventilation is adequate. Cardiovascular function is usually maintained.

Deep Sedation/Analgesia a drug-induced depression of consciousness during which patients cannot be easily aroused but respond purposefully* following repeated or painful stimulation. The ability to independently maintain ventilatory function may be impaired. Patients may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate. Cardiovascular function is usually maintained.

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. Cardiovascular function may be impaired.

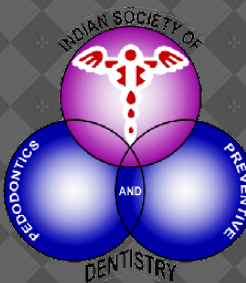
Practice Guidelines for Sedation and Analgesia by Non-Anesthesiologists. Anesthesiology 2002;96(4):1004-1017.



WHAT IS CONSCIOUS SEDATION

A minimally depressed level of consciousness that retains the patient's ability to independently and continuously maintain an airway and respond appropriately to physical stimulation or verbal command and that is produced by a pharmacological or non-pharmacological method or a combination thereof.

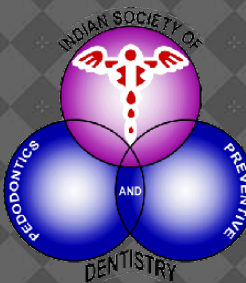
Malamed SF. Sedation: A guide to patient management. 2009



SEDATIVE DRUGS CLASSIFIED BASED ON BEHAVIOUR

- Classified sedation drug and route based on the level of child's cooperative behaviour
 - Preventative premedication - child is stressed by the dental situation but is still communicative (scared, timid, apprehensive)
 - Management medication (unable to control their behaviour or lack cooperative ability)

Musselman, R.J. and McClure, D.B. (1975). Pharmacotherapeutic approaches to behavior management. In: Behavior Management in Dentistry for Children, (Wright, G.Z. ed), 147. W.B. Saunders Co., Philadelphia, PA, USA.



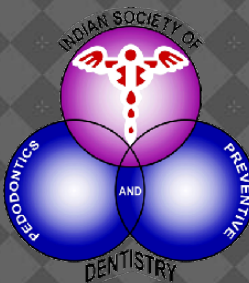
SEDATION TECHNIQUES

Standard sedation techniques*	<p>Also known as 'basic' techniques. Includes:</p> <ul style="list-style-type: none"> ▪ For a child, young person or adult, inhalation sedation with nitrous oxide/oxygen <p>and</p> <ul style="list-style-type: none"> ▪ For a young person or adult, midazolam by any route (intravenous, oral or transmucosal)
Advanced sedation techniques [†]	<p>Also known as 'alternative' techniques. Includes:</p> <ul style="list-style-type: none"> • For a child, young person or adult: <ul style="list-style-type: none"> ◦ certain drugs used for sedation (e.g. ketamine, propofol, sevoflurane); ◦ combinations of drugs used for sedation (e.g. opioid plus midazolam, midazolam plus propofol, sevoflurane plus nitrous oxide/oxygen); ◦ combined routes of administration (e.g. oral plus intravenous)^{6,†} <p>and</p> <ul style="list-style-type: none"> • For a child, midazolam by any route

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 loss of consciousness unlikely.

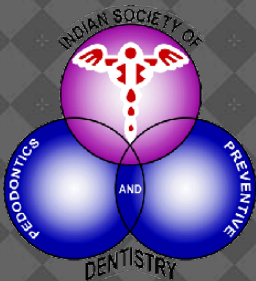
Any technique resulting in the loss of consciousness is defined as general anaesthesia and in the UK deep sedation requires the same level of care as GA

Conscious sedation in Dentistry :Dental clinical guidance. 3rd ed. Scottish Dental Clinical Effectiveness Program. 2017



RELATIVE ANALGESIA

- The specific technique of Relative Analgesia is described fully by Langa (1968).
- It is a technique in which the dose of nitrous oxide is titrated to the need of the individual patient, and the inspired concentration is always kept to the minimum necessary.
- Suggestion and encouragement are also titrated to the need of the individual patient.
- This emphasizes the fundamental point that Relative Analgesia is not a simple pharmacological technique (Allen, 1976).



Discuss the importance of nitrous oxide oxygen analgesia in pediatric dentistry for management of children-

Define sedation. Discuss the level of goals of sedation as defined by AAPD guidelines (2008). 1) Name the emergency drugs that may be needed to rescue a sedated child patient.

Pharmacological management of children in pediatric dentistry -100

Discuss in detail nitrous oxide conscious sedation

Define conscious sedation. Write in detail the agents used for conscious sedation. Explain the indications, steps and complications of nitrous oxide sedation with emphasis on delivery systems with a note on safety measures to be followed.

Write the importance of relative analgesia in pediatric dentistry in managing behaviour problem in a child.

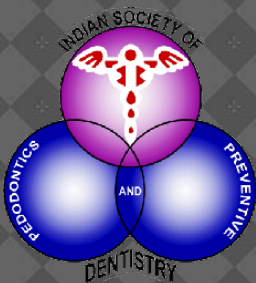
Record various agents and methods used for nitrous oxide sedation.

Describe the methods of induction of moderate sedation using Nitrous oxide unit. Illustrate the preoperative, intraoperative and postoperative monitoring and care of patient during inhalational sedation. Compare and contrast the inhalational mode with parental route of induction of moderate sedation.

Write in detail history of nitrous oxide analgesia

Conscious sedation, objectives, rationale and technique.

Define conscious sedation and list various methods used for conscious sedation, Interpret stages of conscious sedation, Critically analyze the feasibility of use of nitrous oxide in apprehensive child.

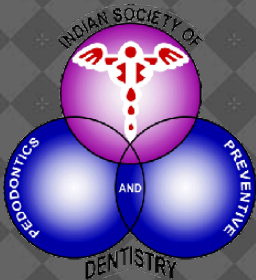


IMPORTANCE/ RATIONALE

- Reduce dental fear and anxiety of child as well as parents
- Enhances child communication and cooperation
- Prevent untoward movement during dental treatment
- Reduced gagging
- Decreased number of visits
- Build a positive dental attitude

- Improved efficiency
- Improved quality of dental treatment provided
- Less fatigue
- Increased productivity
- Increased trust and faith of parents and children

Gupta K, Emmanouil D, Sethi A. Nitrous oxide in paediatric dentistry: A clinical handbook



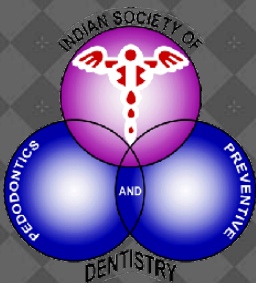
ADVANTAGE OF ANALGESIC PROPERTY

At levels of 40% N₂O it is suggested that it may produce good hard and soft tissue analgesia¹

Two major factors causing inadequate anaesthesia are²

- (1) the pH of the tissue bed into which the local anesthetic diffuses
- (2) anatomic variations in nerve distribution.

1. Yagiela JA, Dowd FJ, Neidle EA. *Pharmacology and therapeutics for dentistry*. 5th edition. St. Louis (MO): Elsevier Mosby; 2004. p. 287–9, 773–5. 30. Yagiela J. *The pediatric patient and nitrous oxide*. *Dimens Dent Hyg* 2008; 20–2.
2. Wilson S. *Pharmacologic behavior management for pediatric dental treatment*. *Pediatr Clin North Am*. 2000;47(5):1159- 1175.

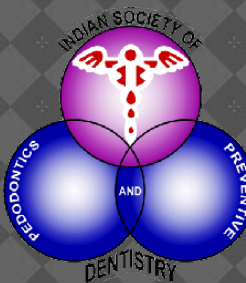


SHOULD WE ADOPT PHARMACOLOGIC APPROACH?

- Success in patient management requires both pharmacological and non pharmacological techniques; the individual dentist's training and experience makes the difference in choice and efficacy of techniques employed. This is especially true when using a minimal or preventive medication
- Prevent situational psychic trauma/anxiety

1. Phero, J.C. (1993). *Pharmacologic management of pain, anxiety, and behavior: conscious sedation, deep sedation and general anesthesia. Pediatric Dentistry, 15, 429–433.*

2. Wilson S. *Pharmacologic behavior management for pediatric dental treatment. Pediatr Clin North Am. 2000;47(5): 1159- 1175.*



DIFFERENCE IN PERSPECTIVE

Griffin and Schneiderman (1992)

AGAINST

should be based on the urgency of treatment.

- deferral of treatment until the use of nonpharmacologic techniques is appropriate.
- weighing the benefit versus the risk.

Davis (1988)

FAVOR

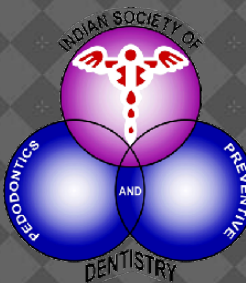
54% of pediatric dentists claimed they now treated more difficult patients, and many (32%) felt the need to provide more efficient care due to economic pressures.

a) ensure that the child is peaceful in demeanor and responds favorably during the procedure

b) harbors enough working memory to retain the impression of a pleasant experience at the dental office,

c) is minimally affected by invasive dental interventions from physiological, behavioral, and emotional perspectives

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EVOLUTION OF PHARMACOLOGICAL APPROACH

General anesthesia least acceptable of all techniques (Lawrence et al. 1991)

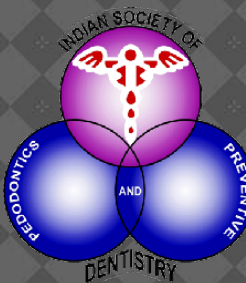
Third-most acceptable of all techniques (Eaton et al. 2005)

Tell-show-do > nitrous oxide sedation > general anesthesia > active restraint > oral premedication > voice control > passive restraint > hand-over-mouth.

Reason:

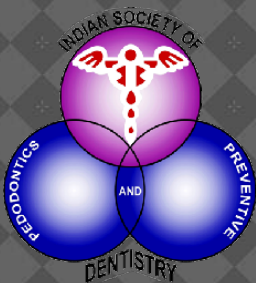
Casamassimo et al. (2002) reported the effects of changing parenting styles on dental practices in the United States.

Adair (2004) parenting styles had changed and may have contributed to an increase in need for behavior management.



EVOLUTION OF NITROUS OXIDE

- 1973 - Wright and MacAulay 44% using nitrous oxide
- 1996 - Wright 66.3% using nitrous oxide
- 2002- Houpt 61% using nitrous oxide
- 2007 - Lynch 74% using nitrous oxide
- 2011 - Wilson and Alcaïno's recent international survey, based on 311 replies, revealed that at least 56% of the respondents used nitrous oxide in their practices.

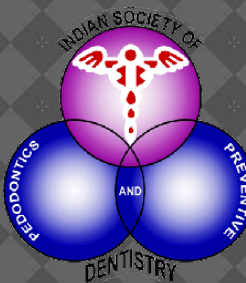


NITROUS OXIDE

- INDICATIONS
- CONTRAINDICATIONS
- TECHNIQUE
- COMPLICATIONS
- SAFETY OF NITROUS OXIDE DELIVERY
- PREOPERATIVE, INTRAOPERATIVE AND POST OPERATIVE MONITORING

MECHANISM OF ACTION

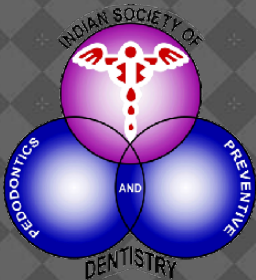
- Analgesic action
 - stimulates release of endogenous opioids
 - opioid receptors stimulates pain inhibitory signals
- Anxiolytic action
 - activation of GABA receptor through benzodiazepine binding site
- Anesthetic action
 - related to antagonism of NMDA receptor



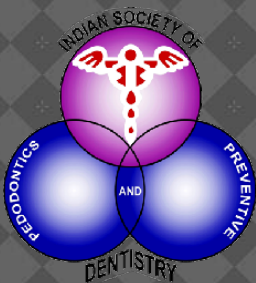
Advantages

- Fast onset (does not bind to any molecule)
- Ease of administration
- Sedation level can be adjusted based on response
- Duration can be adjusted
- Quick recovery
- Ability to communicate during procedures
- Safe compared to other agents
- No impact on daily activities

Gupta K, Emmanouil D, Sethi A. Nitrous oxide in paediatric dentistry: A clinical handbook



Route of administration	Disadvantages over nitrous oxide sedation
Oral	<ul style="list-style-type: none"> • cannot titrate the drug, • delay in onset • varying response due to difference in gastric absorption • no oral reversal drug present • longer pre procedural fasting required
Intramuscular	<ul style="list-style-type: none"> • difficult for patients who are needle phobic • can cause muscular pain • over sedation possible • longer pre procedural fasting required
Intravenous	<ul style="list-style-type: none"> • difficult for patients who are needle phobic • over sedation possible • longer pre procedural fasting required
Intranasal	<ul style="list-style-type: none"> • difficult to administer • can cause burning sensation in nasal mucosa • over sedation possible



Contraindications

A. Systemic

- Difficulty in breathing through nose/ upper respiratory infection
- lower respiratory acute or chronic conditions
- bowel obstruction/ abdominal pain
- Impaired cognitive ability
- Recent surgery of middle ear or retina
- B12 deficiency
- undergoing treatment with bleomycin sulphate
- Psychiatric disorders

B. Local

- surgery involving anterior part of maxilla
- Mouth breathers

(Berge TI. Nitrous oxide in dental surgery. Best Practice & Research Clinical Anaesthesiology Vol. 15, No. 3, pp. 477±489, 2001)

Plane 1

Slight Analgesia and Amnesia

- loss of fear and anxiety
- warm tingling sensation

Plane 3

Complete Analgesia and Amnesia

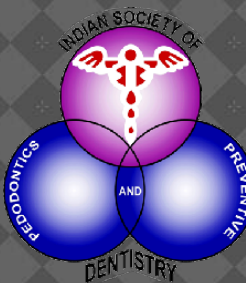
- mandible rigid and mouth closed
- sensation of flying or falling
- appear sleepy
- dazed/ staring look
- does not follow directions
- hallucinations

Langa, 1968

Plane 2

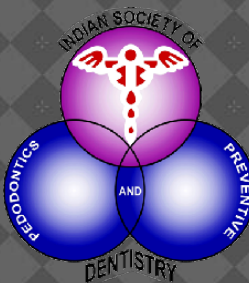
Moderate Analgesia and Amnesia

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



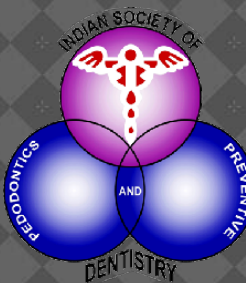
Appropriate minimal sedation- clinical signs

- General appearance
 - Comfortable and relaxed
 - General reduction of spontaneous movements
 - Arms, shoulders relaxed, deeper respirations
 - Acknowledges reduced fear and anxiety
 - may be categorized as happy, pleasant and ambivalent
- Eyes
 - Awake, eyes open though showing less movement
 - Eyes become less active and glazed appearance
 - Blink rate is reduced



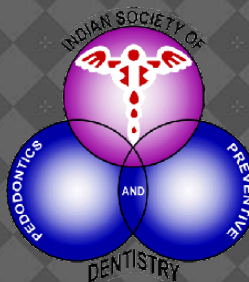
Clinical signs of minimal sedation

- ▶ *Response*
 - ▶ *Intact response to verbal command.*
 - ▶ *Mouth is kept open on request*
 - ▶ *tongue movement reduced*
- ▶ *Physiological responses*
 - ▶ *Normal laryngeal reflex and reduction of gag reflex.*
 - ▶ *Normal blood pressure, heart rate, respiratory rate, skin colour and oxygen saturation level*



Stages of Inhalation Sedation (Carnow, 1969)

- Paresthesia
- Vasomotor
 - lethargy, humming, droning or vibratory sensation
- Drift
 - Euphoria
 - Floating
 - Eyes fixed
 - Dazed look
- Dream
 - Sleep



TECHNIQUE

- ◉ Case selection - ASA I & II, communicative, no signs of URTI, not highly anxious
- ◉ Introduce the technique
- ◉ Pre operative instructions- 2 hours fasting, no URTI
- ◉ Informed consent
- ◉ Titration
- ◉ Monitoring
- ◉ Recovery

Introduction



Explanation to parents



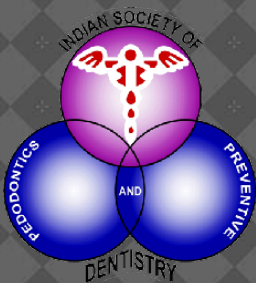
Demonstration to child

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Can use modeling on parents

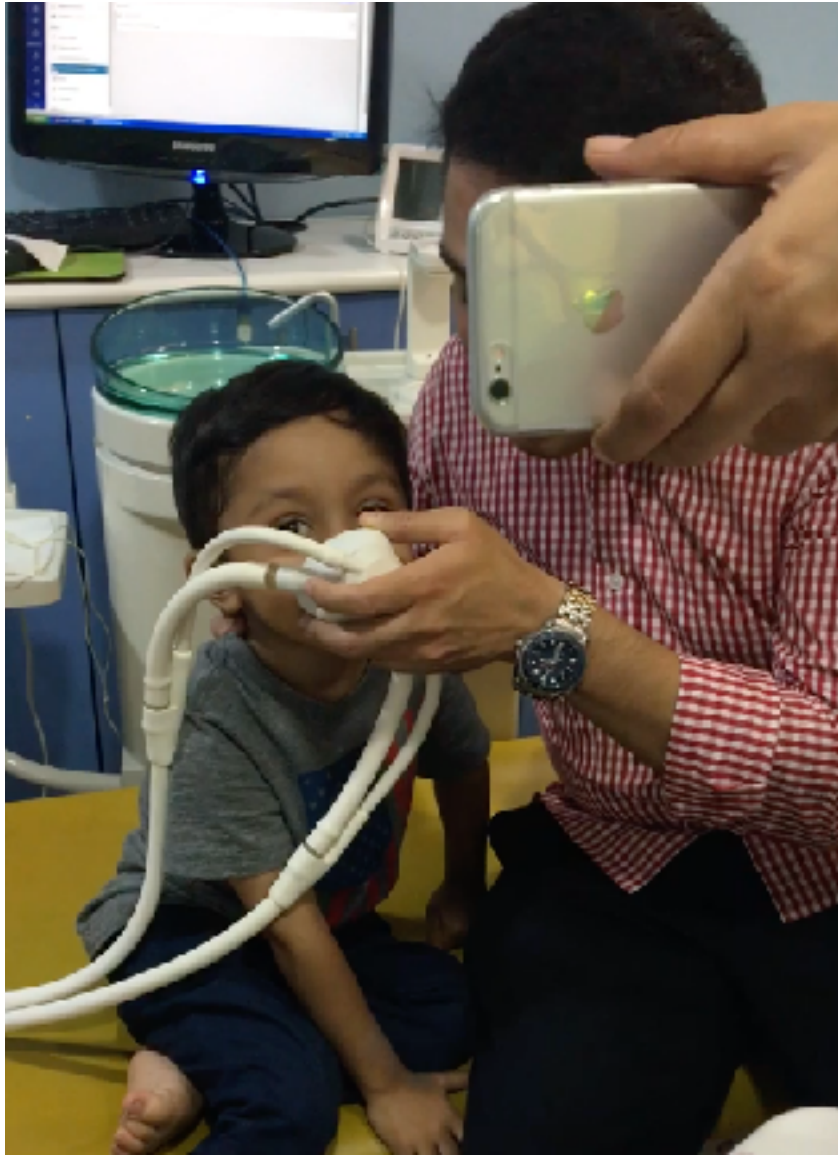
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**Use
Tell Show do
&
Modeling**





Audiovisual distraction

Techniques

- Standard Titration technique
- Rapid titration technique

Titration is the process of determining the medication dose that reduces symptoms to the greatest possible degree while avoiding possible side effects

Standard Titration technique



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Phases of administration

- Introduction phase
- Induction phase
- Injection phase
- Maintenance phase
- Withdrawal phase

Introduction phase

- 100% oxygen
- fill reservoir bag with 100% oxygen
using oxygen flush button
- take slow deep breath



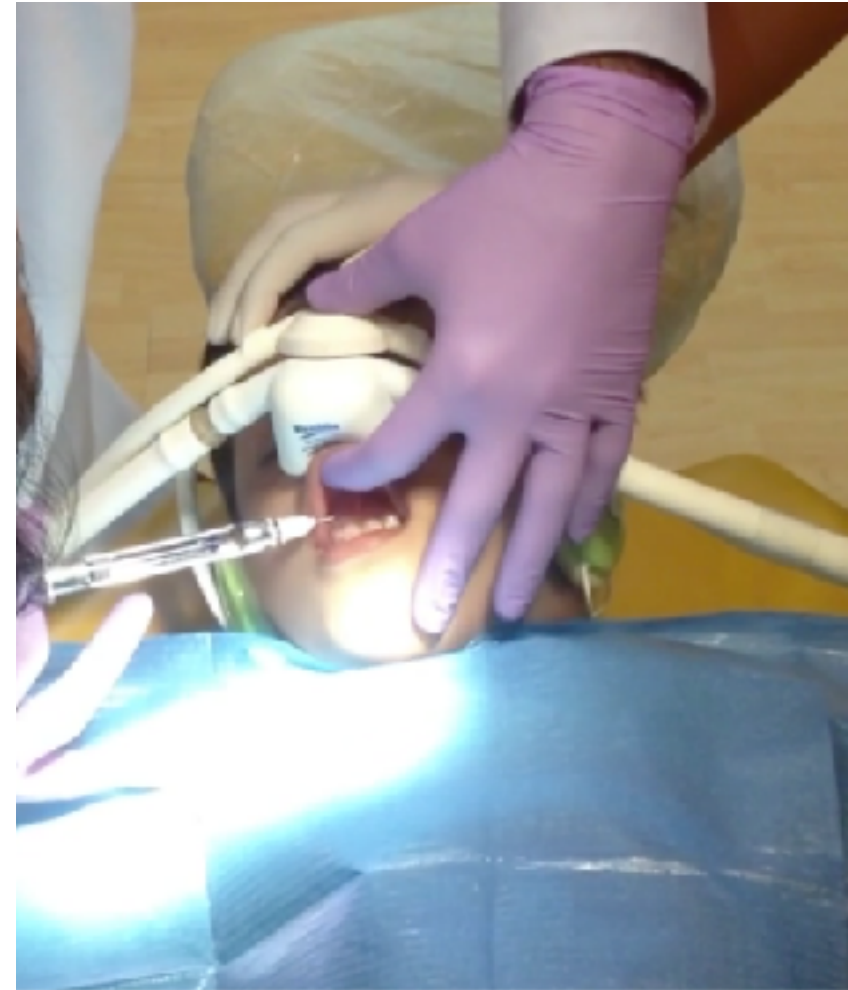
Induction phase

- Incrementally increase nitrous oxide concentration to 35-50%
- Reassuring the child
- Inform about the expected feelings



Injection phase

- 50-60% Nitrous oxide
- Analgesic effect
- Inject slowly
- Distract the child simultaneously



Maintenance phase

- 30-40% nitrous oxide
- Hands drop down
- Feet in abduction

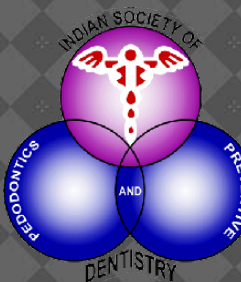
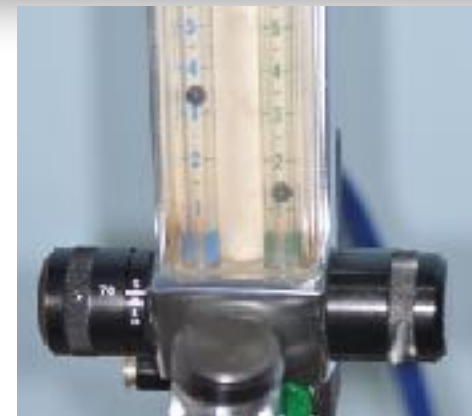


Rapid Titration



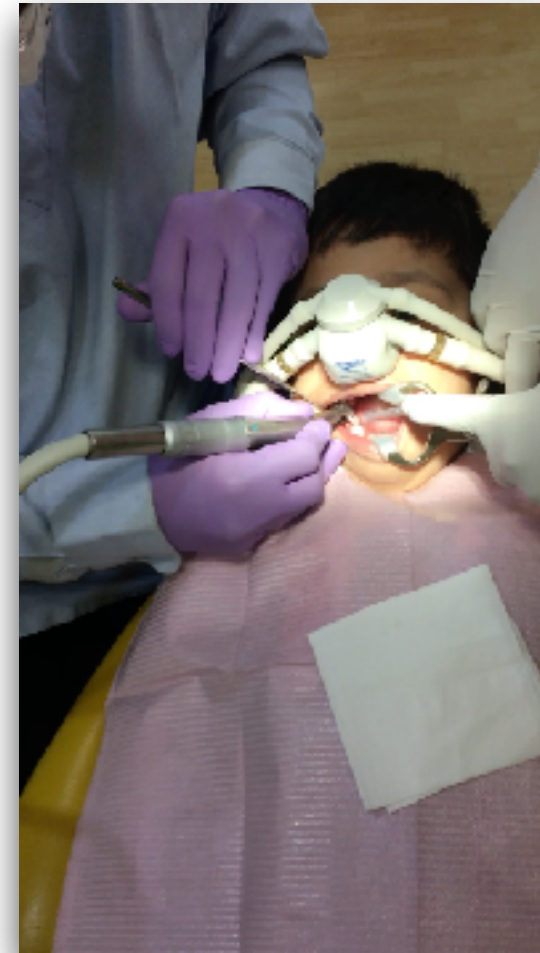
For uncooperative behavior

- Use large sized mask to cover nose and mouth
- Inform parents about restraining child
- Start with high concentration and reduce the concentration
- Can use voice control

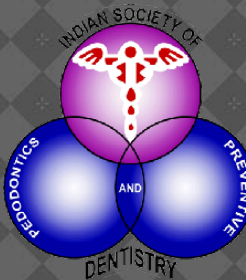


Monitoring during procedure

- level of consciousness
- establish communication regularly
- movement of reservoir bag / respiratory rate
- clinical signs
- any signs of adverse reaction



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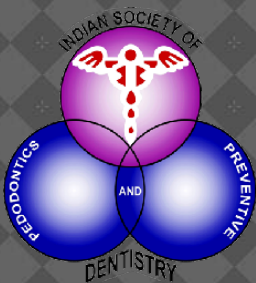
Discharge

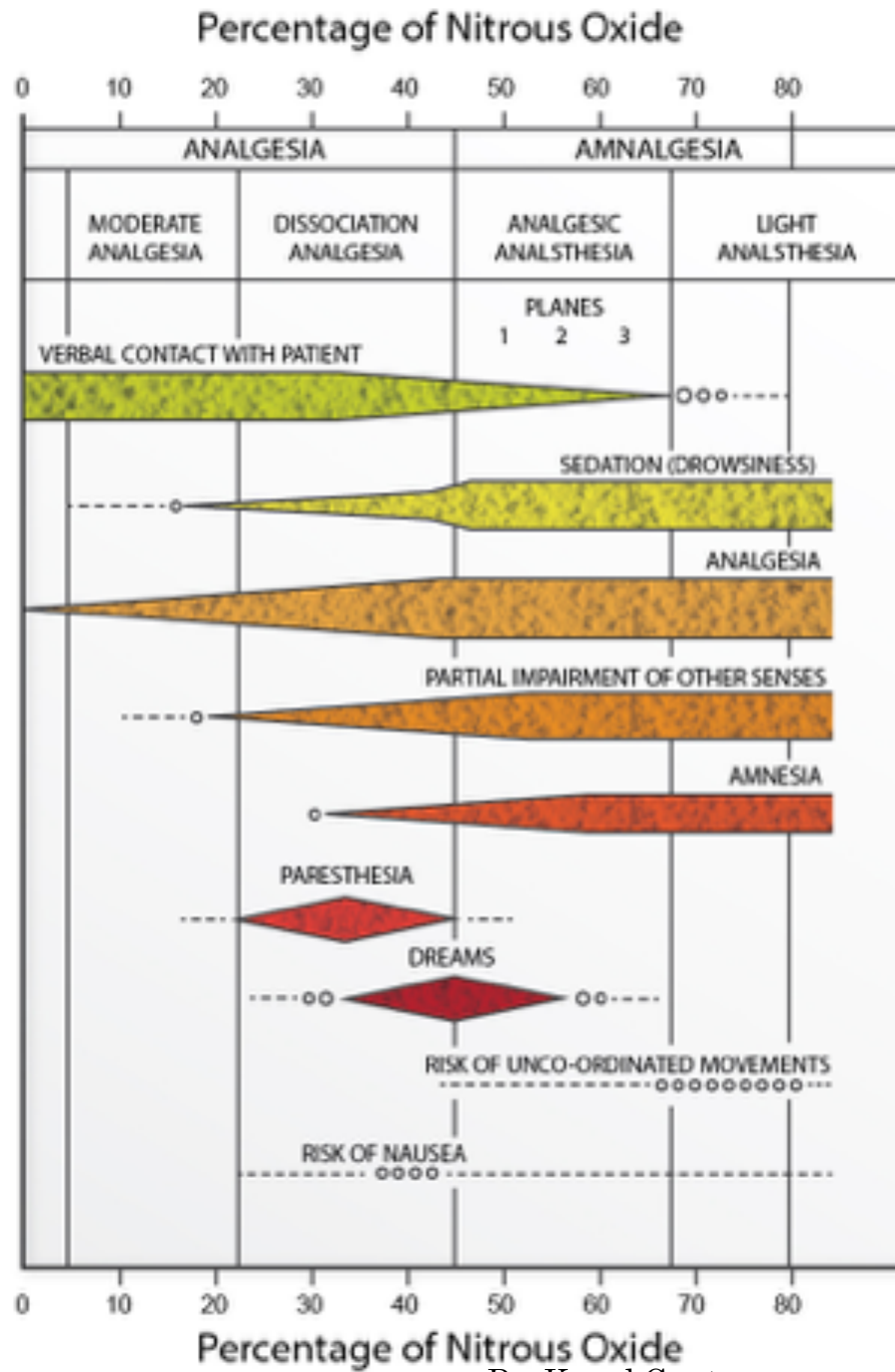
"nitrous oxide sedation does not seem to impair the ability to perform higher cognitive tasks, thus patients can resume normal activities in the post operative period".



Berge TI. Nitrous oxide in dental surgery. Best Practices & Research Clinical Anesthesiology. 2001,Vol.15, No. 3, 477-489.

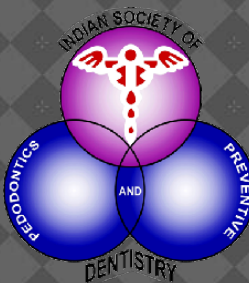
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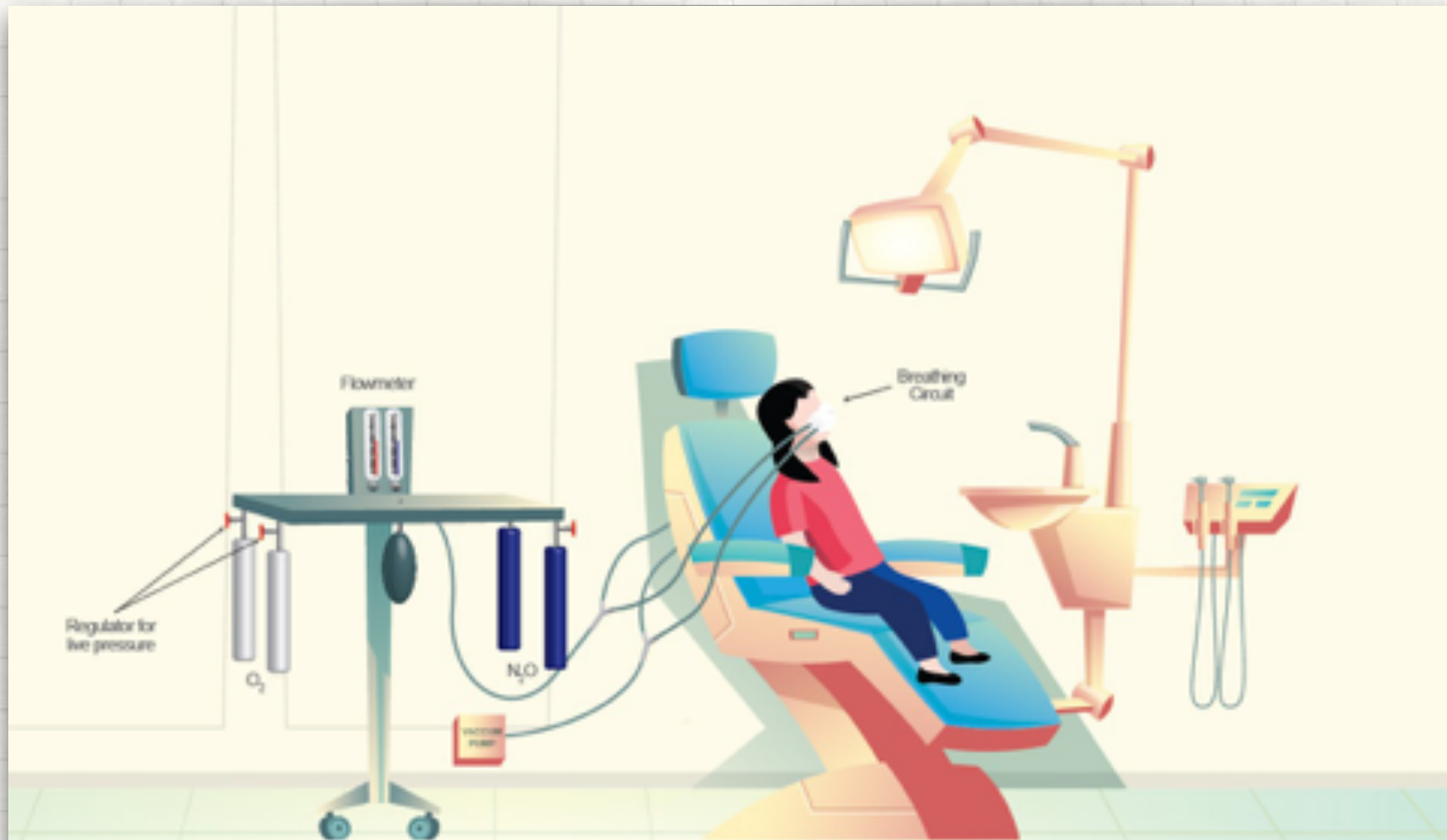


Gupta K, Emmanouil D, Sethi A. Nitrous oxide in paediatric dentistry: A clinical handbook

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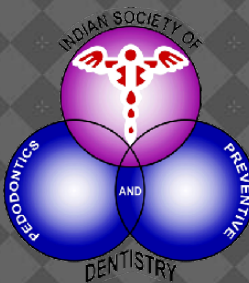
PORTABLE SYSTEM



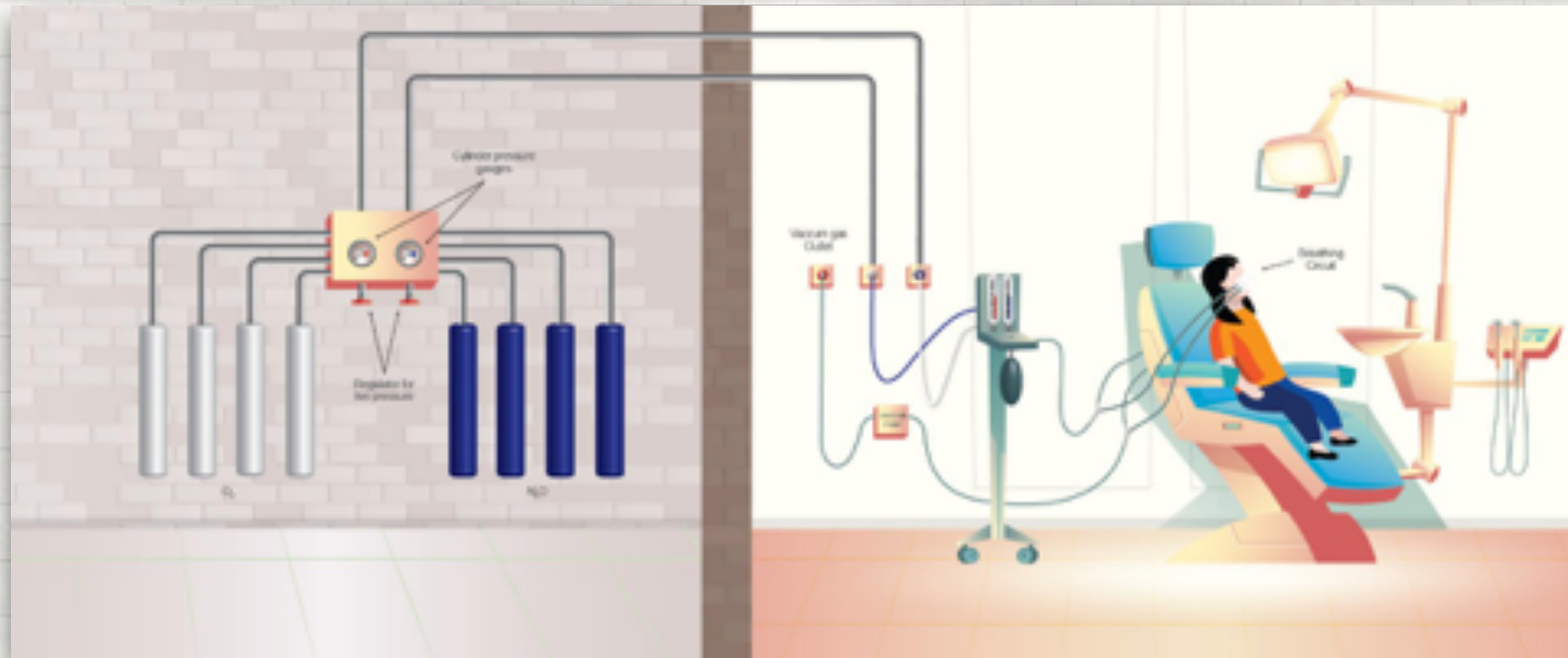
Portable System

Gupta K, Emmanouil D, Sethi A. Nitrous oxide in paediatric dentistry: A clinical handbook

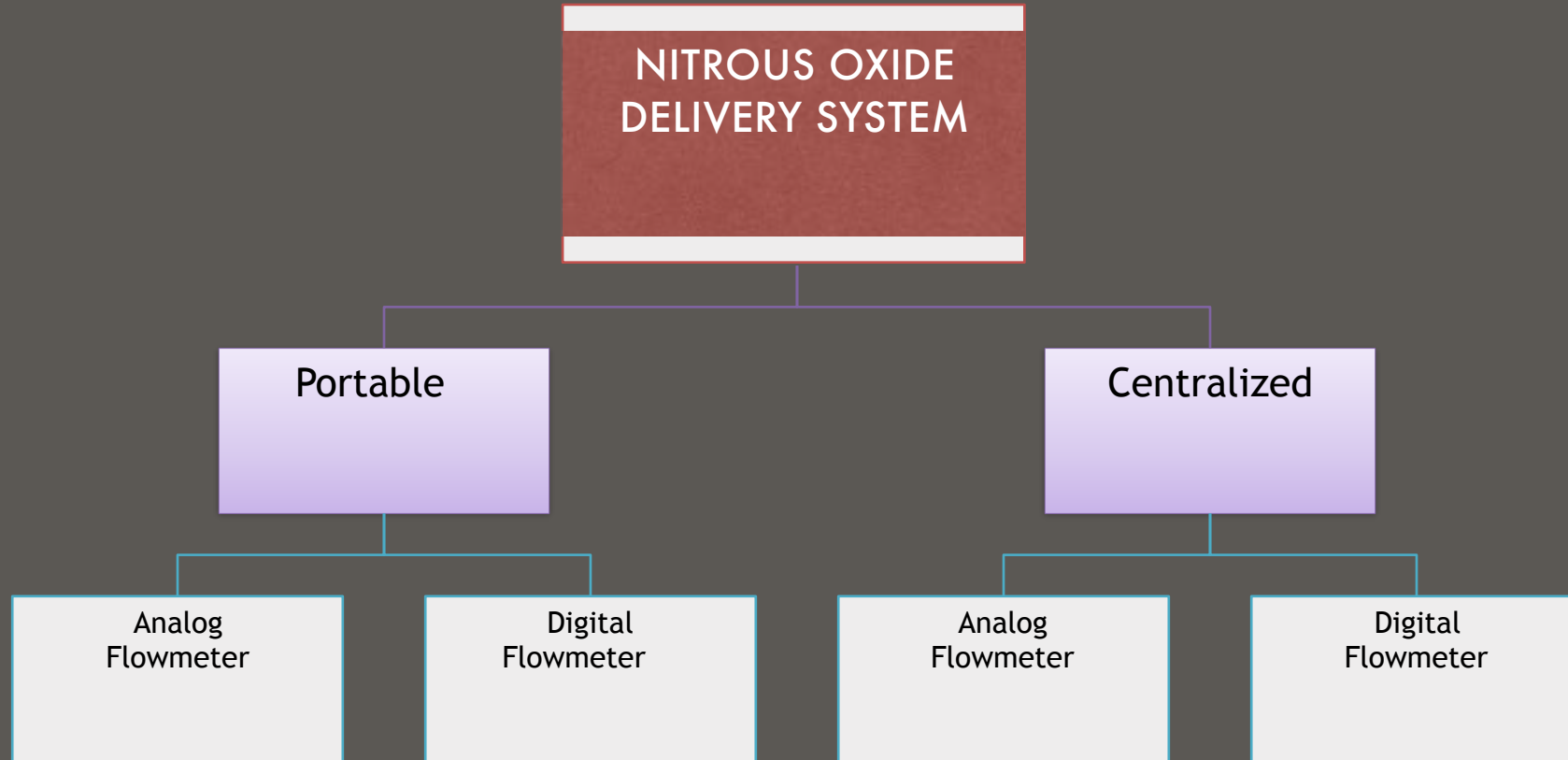
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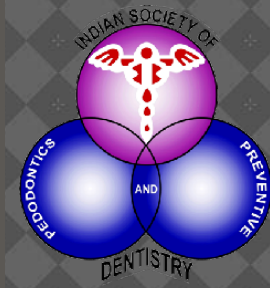
CENTRALIZED SYSTEM

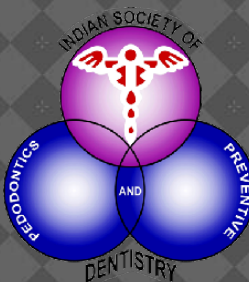
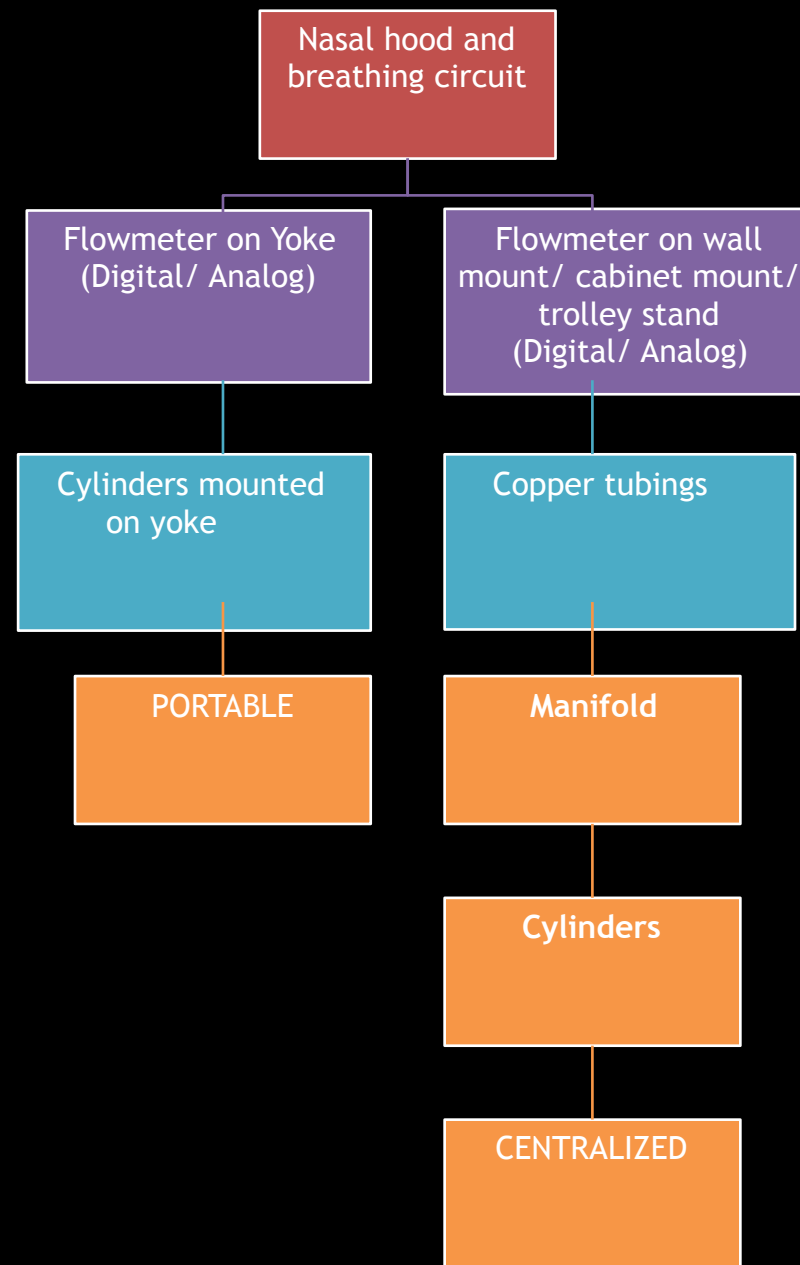


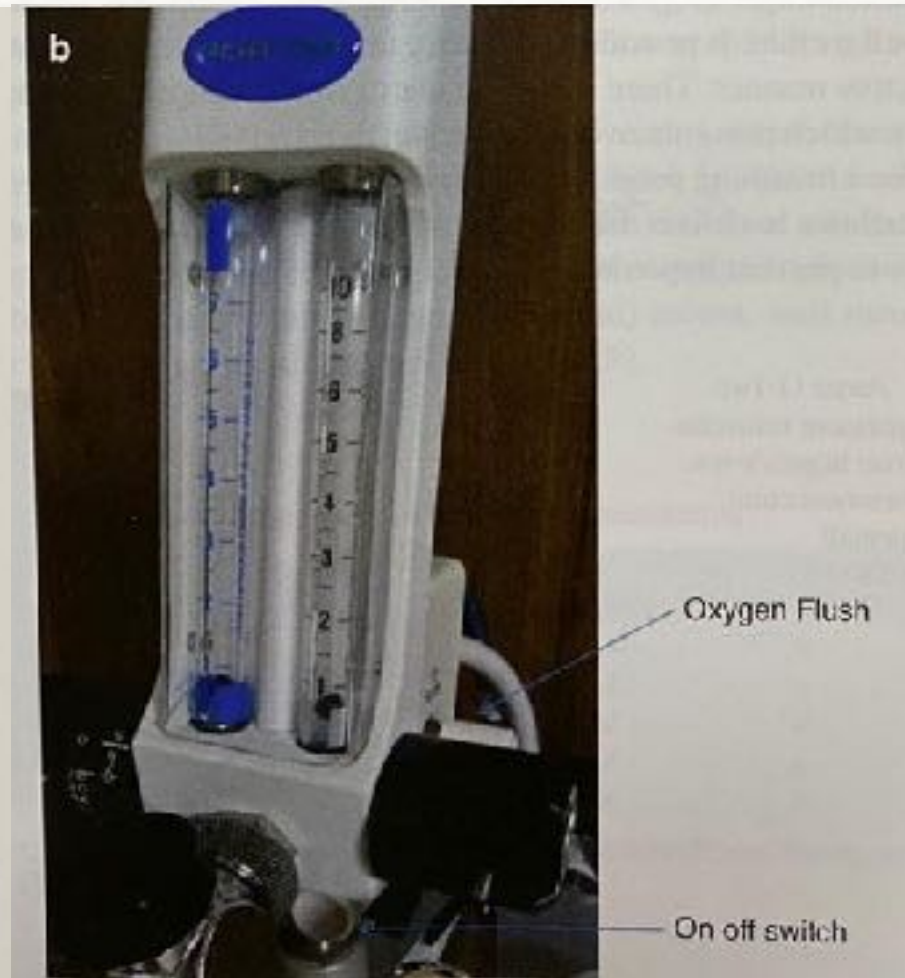
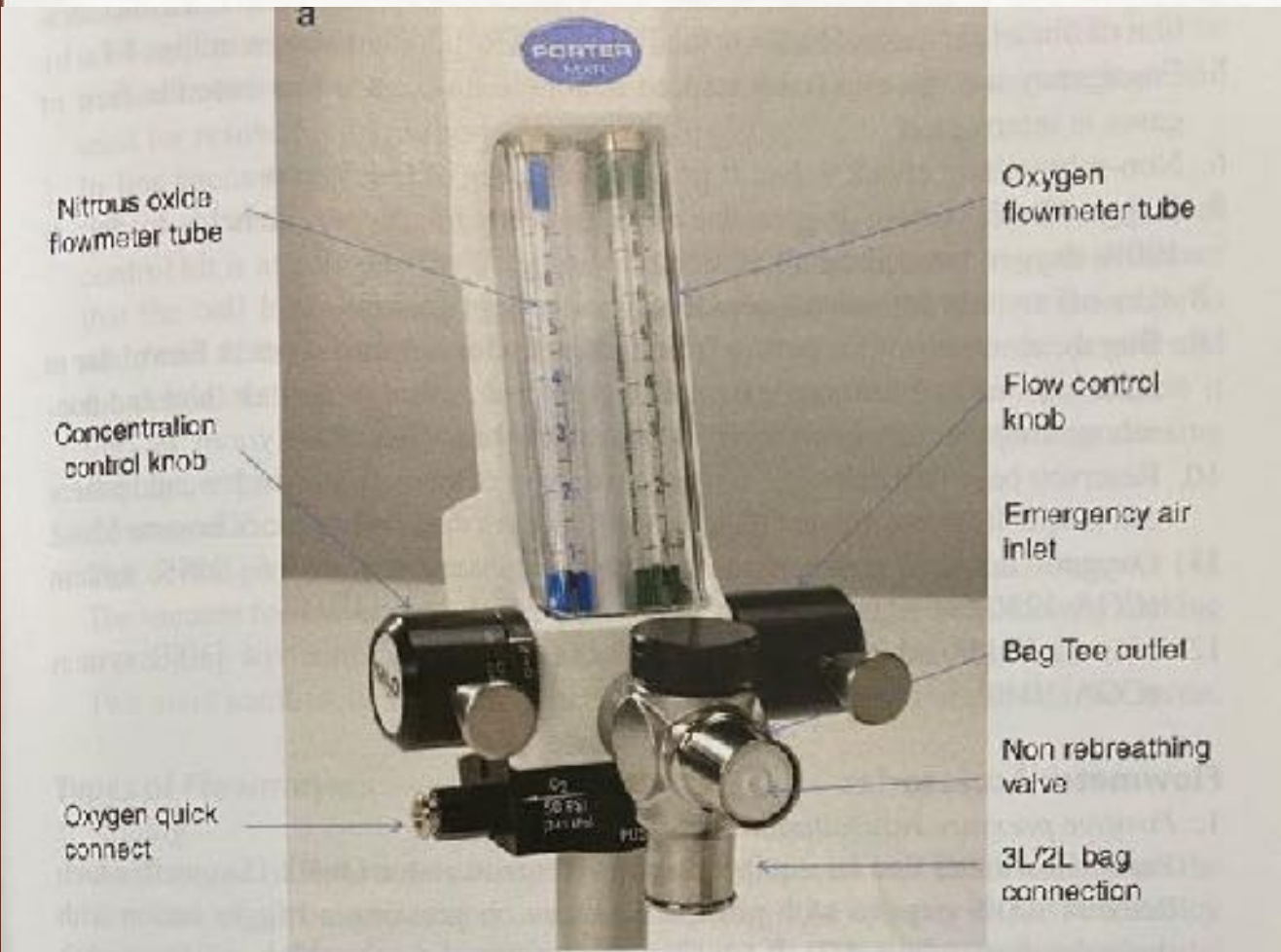
Gupta K, Emmanouil D, Sethi A. Nitrous oxide in paediatric dentistry: A clinical handbook



Gupta K, Emmanouil D, Sethi A. Nitrous oxide in paediatric dentistry: A clinical handbook

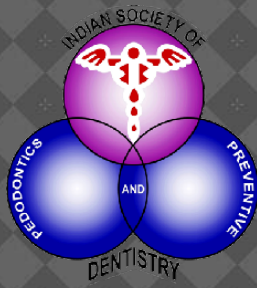






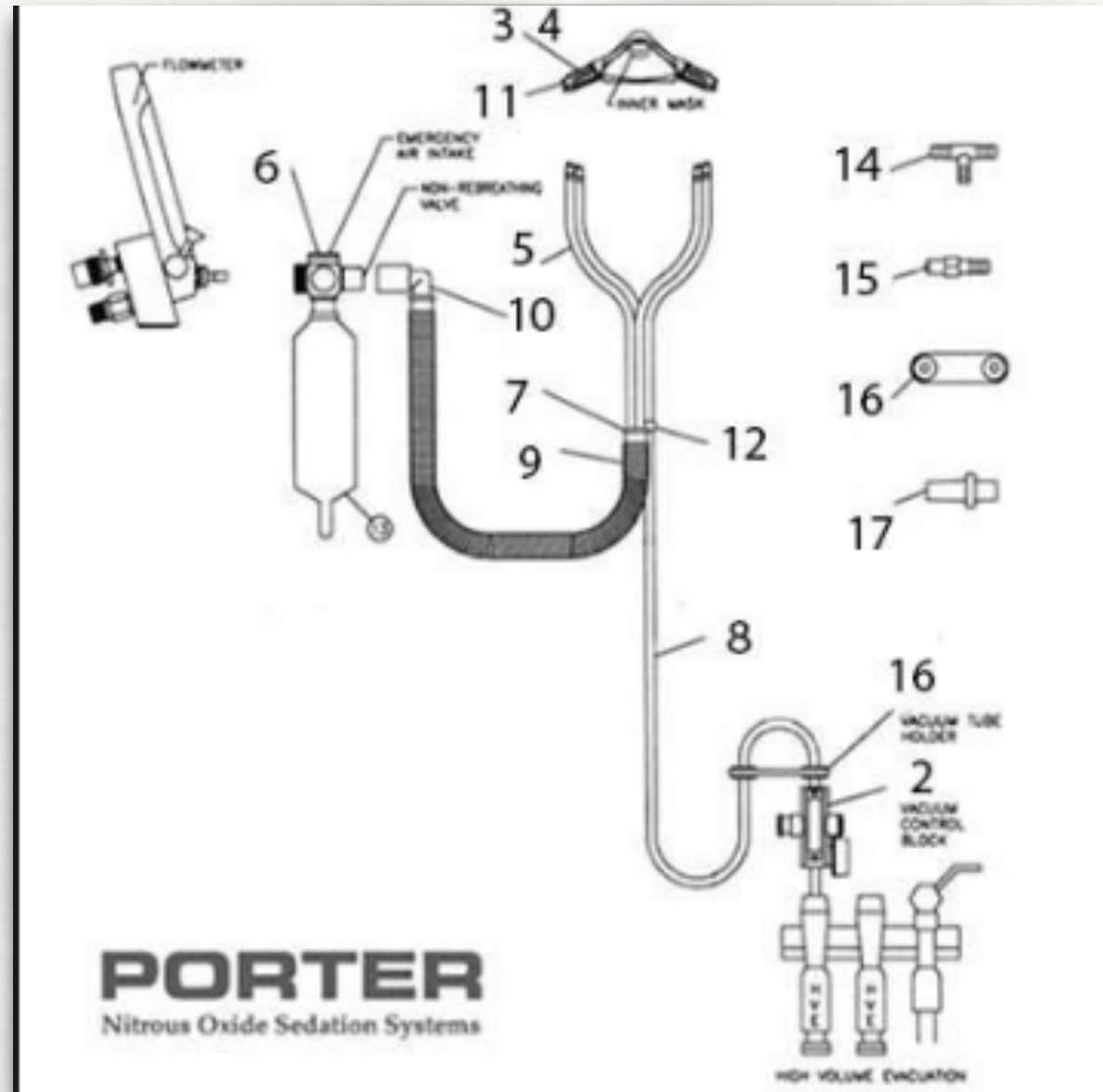
Gupta K, Emmanouil D, Sethi A. Nitrous oxide in paediatric dentistry: A clinical handbook

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PARTS OF BREATHING SYSTEM

- Breathing mask
- Breathing circuit
- Scavenging pump





TO PATIENT
STAGE 1
INHALATION

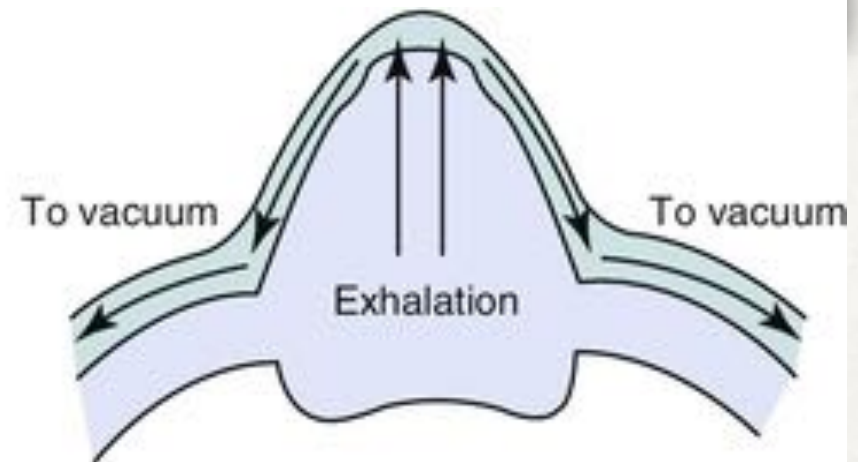
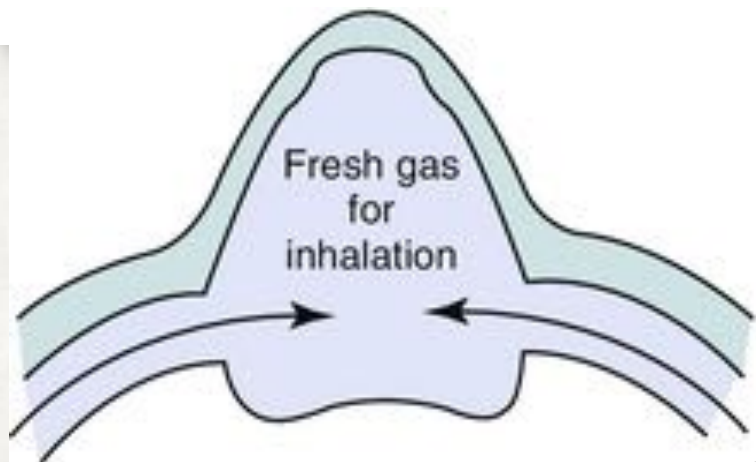
FROM PATIENT
STAGE 2
INITIAL EXHALATION

FROM PATIENT
STAGE 2
COMPLETE EXHALATION

● Nitrous Oxide ● Oxygen ● Carbon Dioxide



Porter patented Double Mask Scavenger Design





TO PATIENT
STAGE 1
INHALATION



FROM PATIENT
STAGE 2
INITIAL EXHALATION

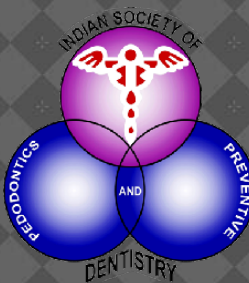


FROM PATIENT
STAGE 2
COMPLETE EXHALATION

Primary
leak Area

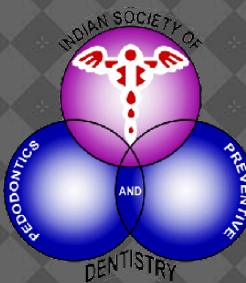
● Nitrous Oxide ● Oxygen ● Carbon Dioxide

Single Mask Design



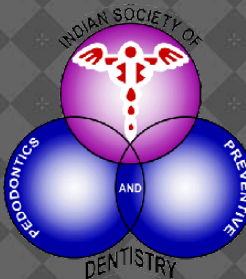
Silhouette mask

- Unobstructed access to the oral cavity
- A more predictable nitrous experience
- Adhesive strip to secure the mask in place
- Enhanced scavenging efficiency for reduced N₂O exposure
- Disposable mask and circuit for improved infection control
- Four size options for a perfect fit on all

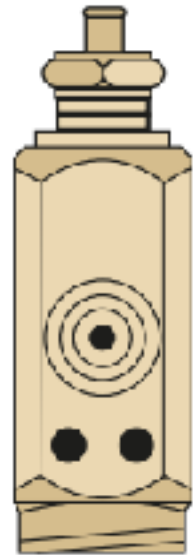


Safety features

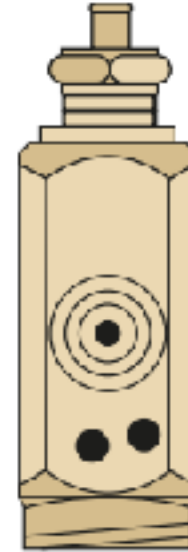
- Pin index safety system
- Diameter index safety system
- Minimum percentage oxygen
- Oxygen fail safe mechanism
- Emergency air inlet
- Color coding
- Oxygen flush button
- Reservoir bag



Pin index system



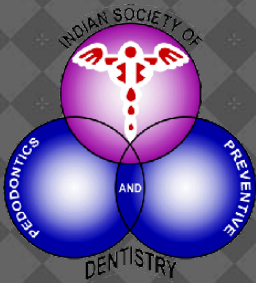
Oxygen



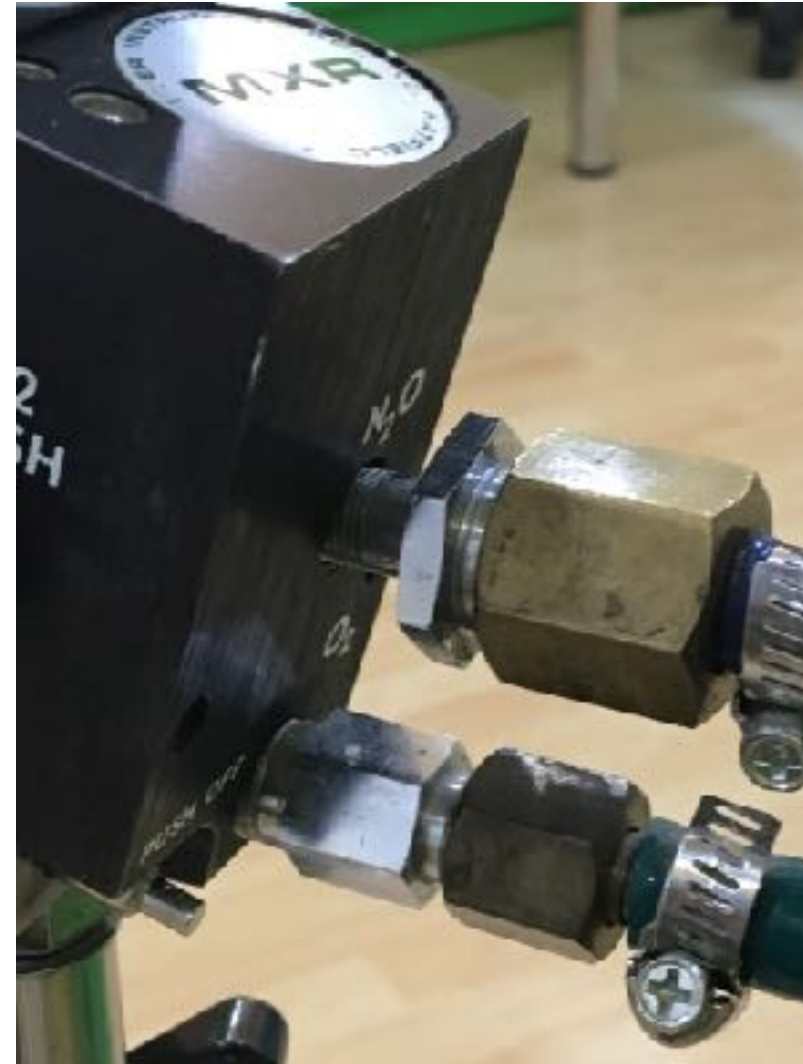
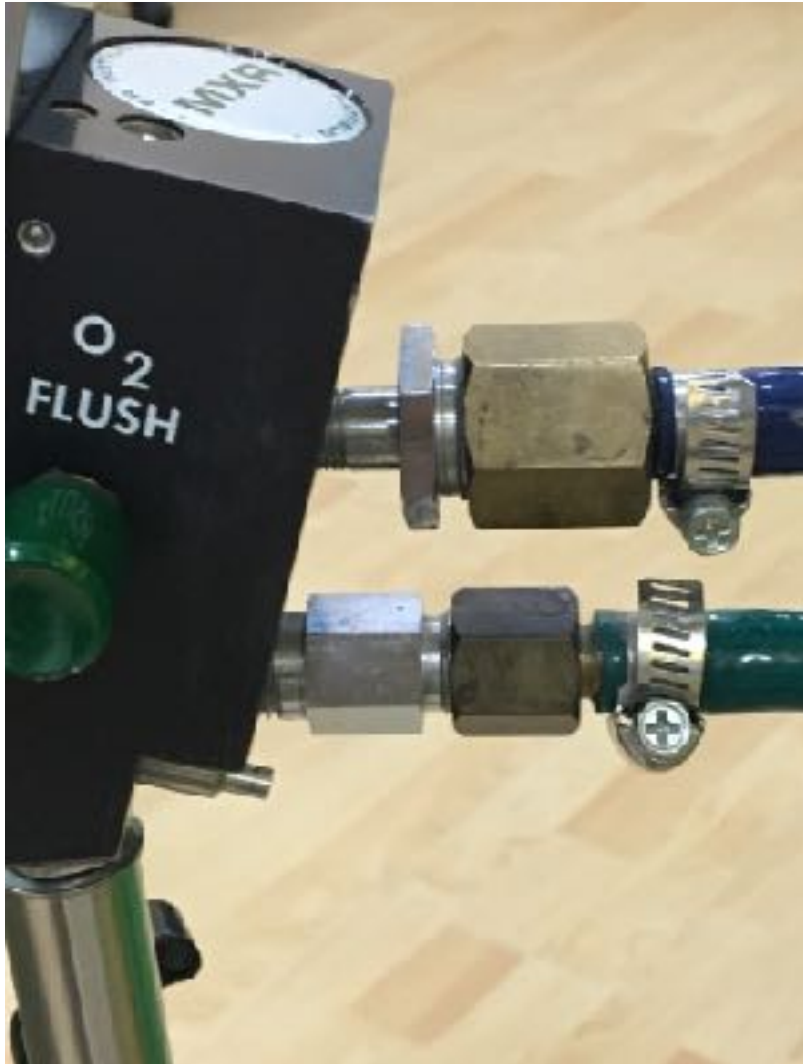
Nitrous oxide



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Diameter index safety system



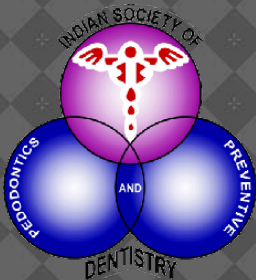
HISTORY OF NITROUS OXIDE

- Era of Discovery
 - Joseph Priestley isolated the gas in 1772
 - Sir Humphrey Davy started experimenting with the gas at Pneumatic Institute in Bristol, England
 - He took interest in inhalation of this gas
 - Experimented on himself and found that “pain always diminished after four- five inspirations”
 - Concluded that gas has analgesic properties

- Laughing gas exhibitions and parties
 - Euphoric properties of this gas made it a popular recreational agent
 - Laughing gas demonstrations and parties were held
 - Enjoyment in physical setting
 - But for years analgesic properties were not put to use

LAUGHING GAS IN DENTISTRY

- Colton “pioneer of nitrous oxide anaesthesia “
- learnt the effects of nitrous oxide during his studies in New York
- Organized lectures where participants were invited to experience the effects of gas
- In one such demonstration Horace Wells, a dentist observed that a participant was intoxicated after inhaling gas and did not realise after injuring his legs
- Horace Wells had his tooth extracted with Colton administering the gas
- Horace Wells was the first one to use this gas in dentistry

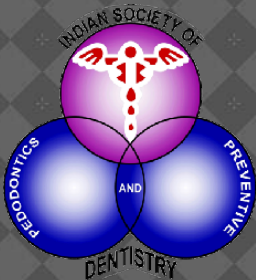


THE DEMONSTRATION AND A TRAGEDY

- In December 1844, Wells demonstrated usefulness of this gas to faculty and students of Harvard Medical School
- Medical student had his tooth extracted but cried while the tooth was being pulled out
- Demonstration was labelled as “failure”
- Wells in 1847 said that although the student cried but could not recollect any painful moment. The reason was that the bag was removed too soon
- Wells committed suicide, being shaken up with the failed experiment.

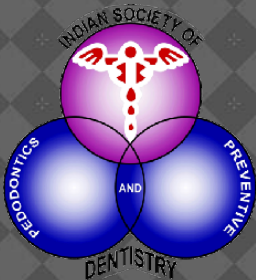
REVIVAL OF NITROUS OXIDE

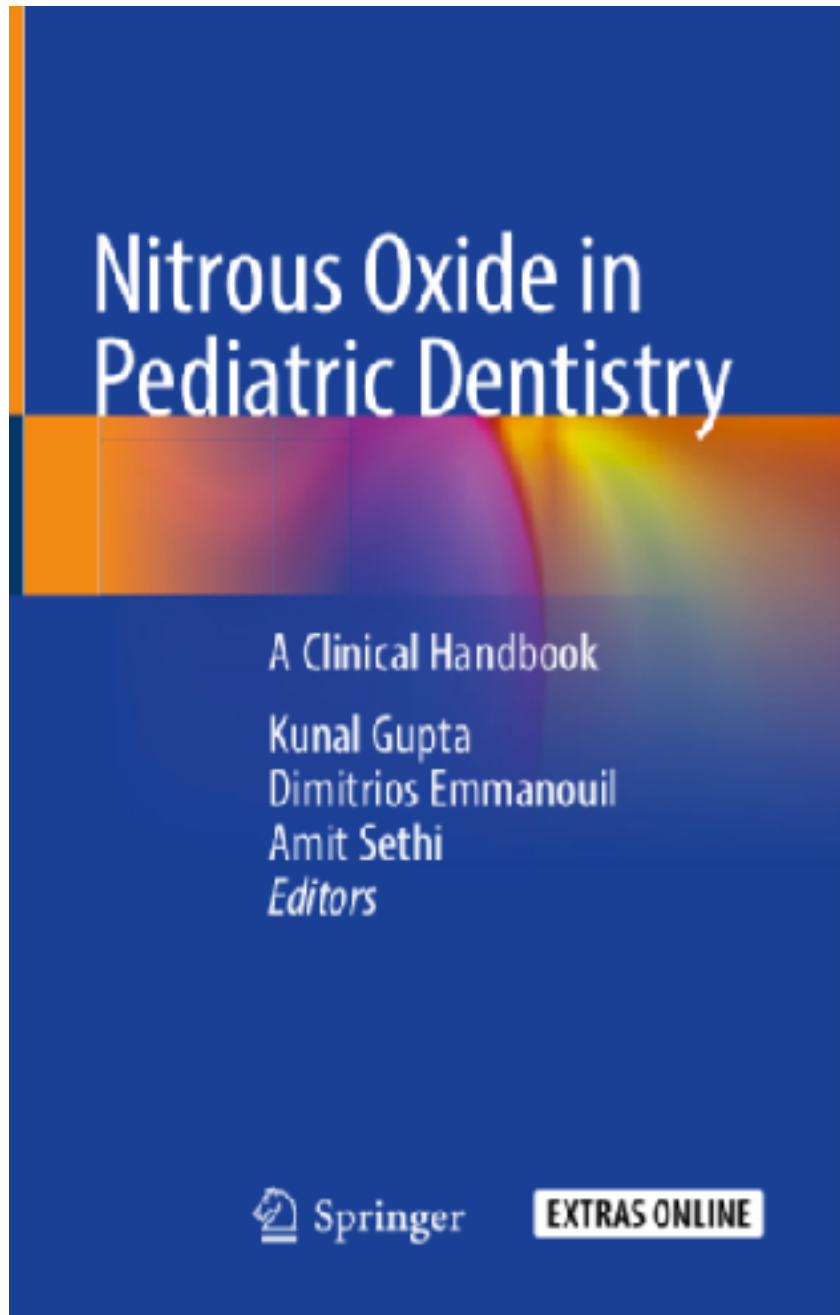
- Revived by Colton who began using it extensively for dental extractions
- Used 100% nitrous oxide for extractions
- 1868 , Andrews proposed adding 20% oxygen to nitrous oxide
- 1872, liquid nitrous oxide became available to the dentists for the first time
- 1887 Fredrick Hewitt made a machine to deliver nitrous oxide combined with oxygen



WHAT A GOOD ANSWER LOOKS LIKE

- ◉ Outline of the answer
- ◉ Headings and subheadings
- ◉ References, Author/ year
- ◉ Diagrams
- ◉ Conclusion





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Thank you