Conscious Sedation – General Concepts
Nitrous Oxide – Clinical Use

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FARMACIE, ȘTIINȚE ȘI TEHNOLOGIE
„GEORGE EMIL PALADE”
DIN TÂRGU MUREȘ

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Steps for patient sedation

Doctor
Medical staff
Patient
Relatives

Physical and Psychological Evaluation

Goals:

- To determine the patient's ability to tolerate physically the stresses involved in the planned dental treatment
- To determine the patient's ability to tolerate psychologically the stresses involved in the planned dental treatment
- To determine whether treatment modification is indicated to enable the patient to better tolerate the stresses of dental treatment
- To determine whether the use of sedation is indicated
- To determine which technique of sedation is most appropriate for the patient
- To determine whether contraindications exist to (1) the planned dental treatment and (2) any of the drugs to be used

- Stress- why important?
  - acute exacerbation of underlying medical problem(s)during periods of increased stress
  - angina pectoris, seizure disorders, asthma, and sickle cell disease
  - most of these patients will be able to tolerate the planned dental care in relative safety
  - “healthy” patients : hyperventilation and vasodepressor syncope (vasovagal syncope, “fainting”)

Stress-reduction protocols

Don’t forget drug interactions!

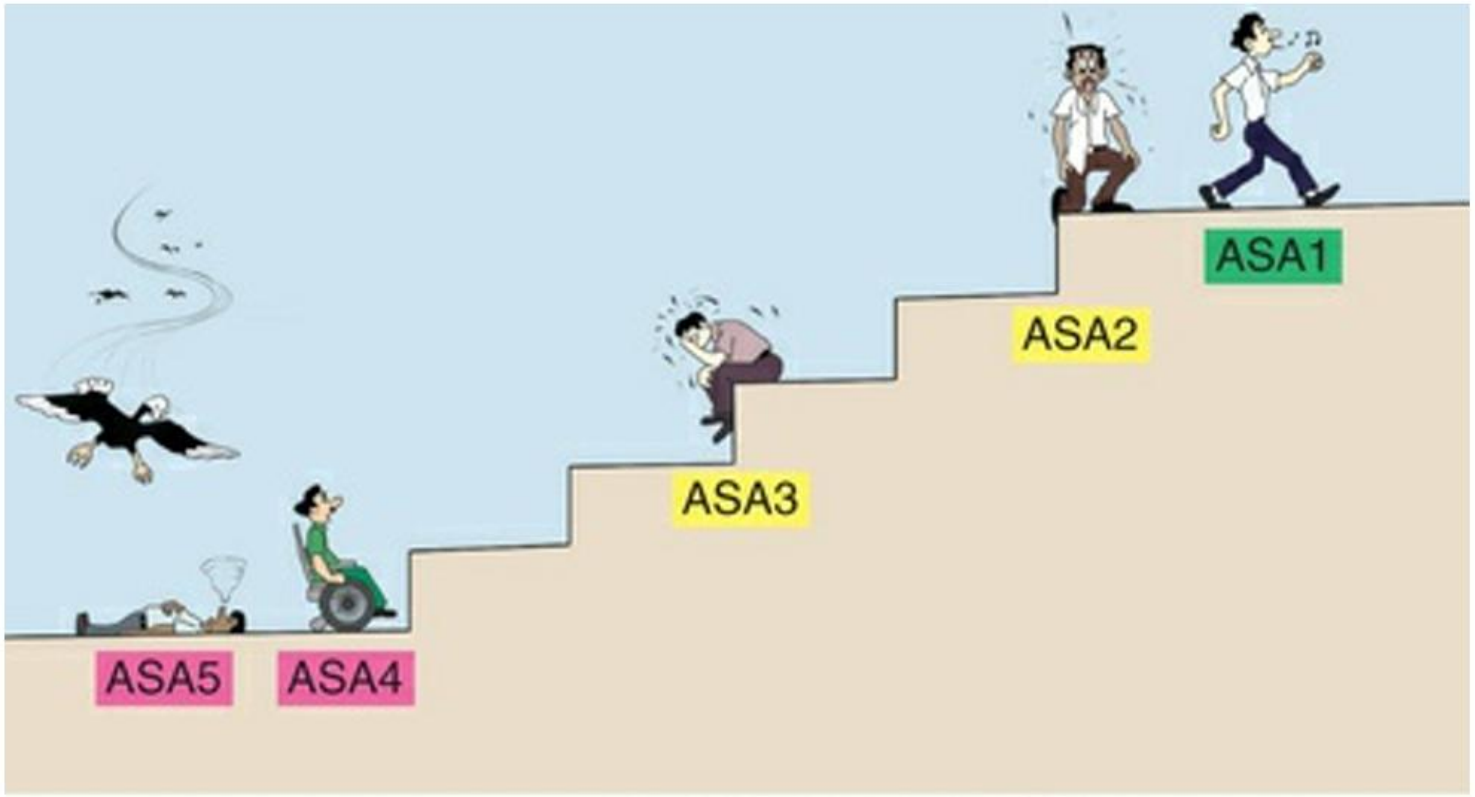


FIGURE 4.13 ASA classification. (Courtesy Dr. Lawrence Day.)

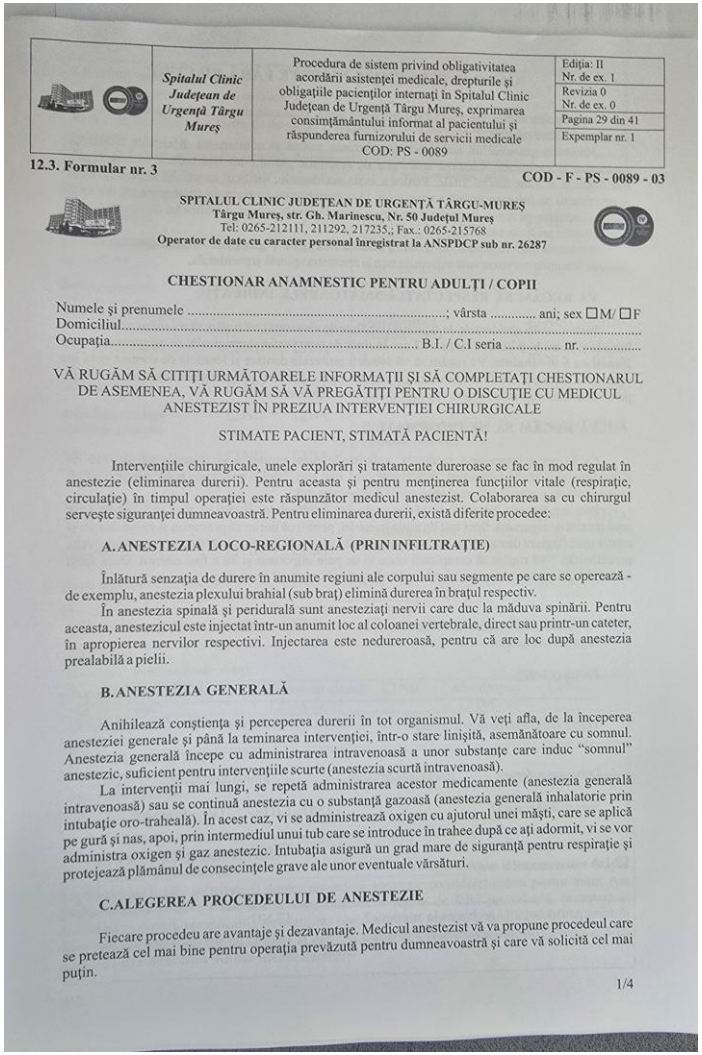
Stress-Reduction Protocol: Normal, Healthy, but Anxious Patient (ASA 1 or 2)

- Recognition of anxiety
- Premedication with CNS depressant (anxiolytic, hypnotic) the night before the scheduled appointment, as needed
- Premedication with CNS depressant (anxiolytic, hypnotic) immediately (e.g., 1 hour) before the scheduled appointment, as needed
- Appointment scheduled in the morning
- Minimization of office waiting time
- Psychosedation during treatment, as needed
- Adequate pain control during treatment
- Length of appointment variable
- Postoperative pain and anxiety control

Stress-Reduction Protocol: Medical Risk Patient (ASA 3 and 4)

- Recognition of medical risk
- Medical consultation before treatment, as needed
- Appointment scheduled in the morning
- Preoperative and postoperative vital signs monitored and recorded
- Psychosedation during treatment, as needed
- Adequate pain control during treatment
- Length of appointment variable, but not to exceed patient's limits of tolerance
- Postoperative pain and anxiety control

Preanesth form



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		Revizia 0 Nr. de ex. 0
		Pagina 29 din 41
		Exemplar nr. 1

12.3. Formular nr. 3 **COD - F - PS - 0089 - 03**

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Numele și prenumele .....; vârsta ..... ani; sex ☐M/ ☐F
Domiciliul.....
Ocupația..... B.I. / C.I seria ..... nr. .....

VĂ RUGĂM SĂ CITIȚI URMĂTOARELE INFORMAȚII ȘI SĂ COMPLETAȚI CHESTIONARUL DE ASEMENEA, VĂ RUGĂM SĂ VĂ PREGĂTIȚI PENTRU O DISCUȚIE CU MEDICUL ANESTEZIST ÎN PREZIUA INTERVENȚIEI CHIRURGICALE

STIMATE PACIENT, STIMATĂ PACIENTĂ!

Intervențiile chirurgicale, unele explorări și tratamente dureroase se fac în mod regulat în anestezie (eliminarea durerii). Pentru aceasta și pentru menținerea funcțiilor vitale (respirație, circulație) în timpul operației este răspunzător medicul anestezist. Colaborarea sa cu chirurgul servește siguranței dumneavoastră. Pentru eliminarea durerii, există diferite procedee:

A. ANESTEZIA LOCO-REGIONALĂ (PRIN INFILTRAȚIE)

Înlătură senzația de durere în anumite regiuni ale corpului sau segmente pe care se operează - de exemplu, anestezia plexului brahial (sub braț) elimină durerea în brațul respectiv.
În anestezia spinală și peridurală sunt anesteziați nervii care duc la măduva spinării. Pentru aceasta, anestezicul este injectat într-un anumit loc al coloanei vertebrale, direct sau printr-un cateter, în apropierea nervilor respectivi. Injectarea este nedureroasă, pentru că are loc după anestezia prealabilă a pielii.

B. ANESTEZIA GENERALĂ

Anihilează conștiența și perceperea durerii în tot organismul. Vă veți afla, de la începerea anesteziei generale și până la teminarea intervenției, într-o stare liniștită, asemănătoare cu somnul. Anestezia generală începe cu administrarea intravenoasă a unor substanțe care induc "somnul" anestezic, suficient pentru intervențiile scurte (anestezia scurtă intravenoasă).
La intervenții mai lungi, se repetă administrarea acestor medicamente (anestezia generală intravenoasă) sau se continuă anestezia cu o substanță gazoasă (anestezia generală inhalatorie prin intubație oro-traheală). În acest caz, vi se administrează oxigen cu ajutorul unei măști, care se aplică pe gură și nas, apoi, prin intermediul unui tub care se introduce în trahee după ce ați adormit, vi se vor administra oxigen și gaz anestezic. Intubația asigură un grad mare de siguranță pentru respirație și protejează plămânul de consecințele grave ale unor eventuale vărsături.

C. ALEGEREA PROCEDEULUI DE ANESTEZIE

Fiecare procedeu are avantaje și dezavantaje. Medicul anestezist vă va propune procedeul care se pretează cel mai bine pentru operația prevăzută pentru dumneavoastră și care vă solicită cel mai puțin.

1/4

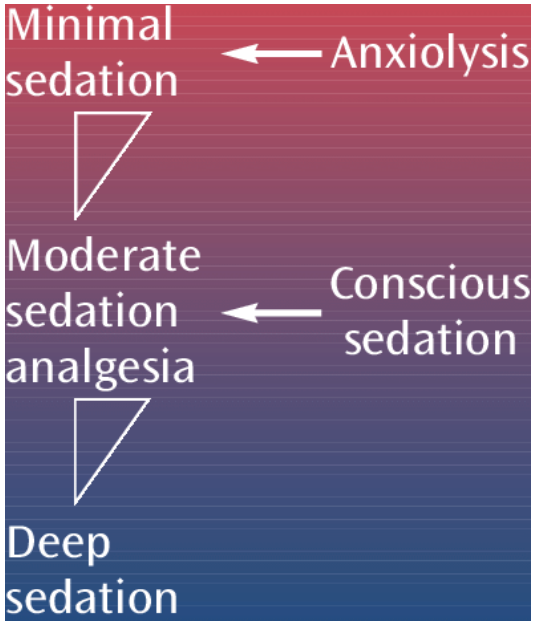
Definitions

Anxiolysis (minimal sedation)

- minimally depressed level of consciousness
- ability to independently and continuously maintain an airway
- respond appropriately to physical stimulation or verbal command
- is produced by a pharmacologic or nonpharmacologic method or a combination
- cognitive function and coordination may be modestly impaired
- ventilatory and cardiovascular functions are unaffected

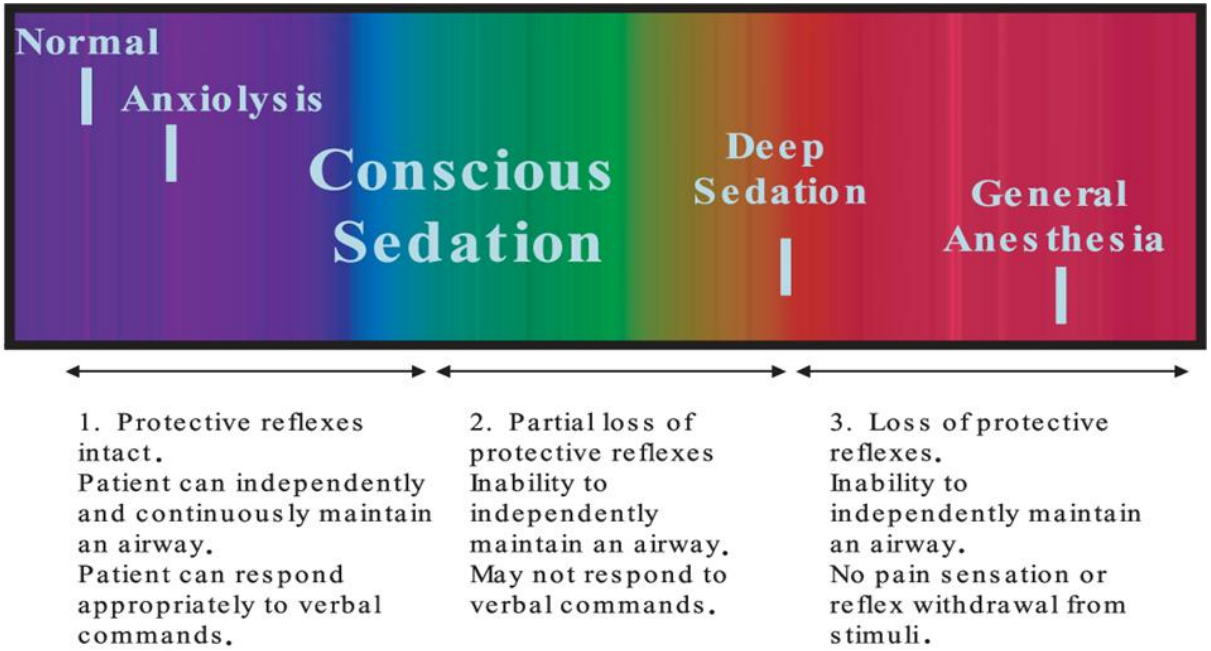
Conscious sedation (moderate sedation)

- drug induced minimally depressed level of consciousness
- respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation
- independently and continuously maintain an airway
- respond appropriately to physical stimulation and verbal command



Deep sedation

- a drug-induced depression of consciousness
- patients cannot be easily aroused, but respond purposefully following repeated or painful stimulation
- the ability to independently maintain ventilatory function may be impaired
- may require assistance in maintaining a patent airway, and spontaneous ventilation may be inadequate
- cardiovascular function is usually maintained



The Concept of “Rescue”

American Society of Anesthesiologists

Because sedation and general anesthesia are a continuum, it is not always possible to predict how an individual will respond. Hence, practitioners intending to produce a given level of sedation **should be able to diagnose and manage the physiologic consequences** (rescue) for patients whose level of sedation becomes deeper than initially intended.

For all levels of sedation, the practitioner must have the training, skills, drugs and equipment to identify and manage such an occurrence until either assistance arrives (emergency medical service) or the patient returns to the intended level of sedation without airway or cardiovascular complications.

Ordin pentru modificarea și completarea Regulamentului de organizare şi funcţionare a secţiilor şi compartimentelor de anestezie şi terapie intensivă din unităţile sanitare, aprobat prin Ordinul ministrului sănătăţii nr. 1.500/2009

2. Articolul 5 se modifică și va avea următorul cuprins:

„(1) În unităţile sanitare publice sau private, aprobate/avizate după caz, care furnizează servicii în regim de spitalizare de zi şi investighează/tratează pacienţi care necesită administrarea oricărei forme de anestezie, altele decât anestezia locală prin infiltraţie, sedarea minima orală (anxioliza) și inhalosedarea prin amestec inhalator de protoxid de azot si oxigen-echimolecular, se vor organiza

1

minimum un post de lucru de anestezie, precum şi un salon de supraveghere postanestezică, denumit în continuare SPA.

Routes of Drug Administration

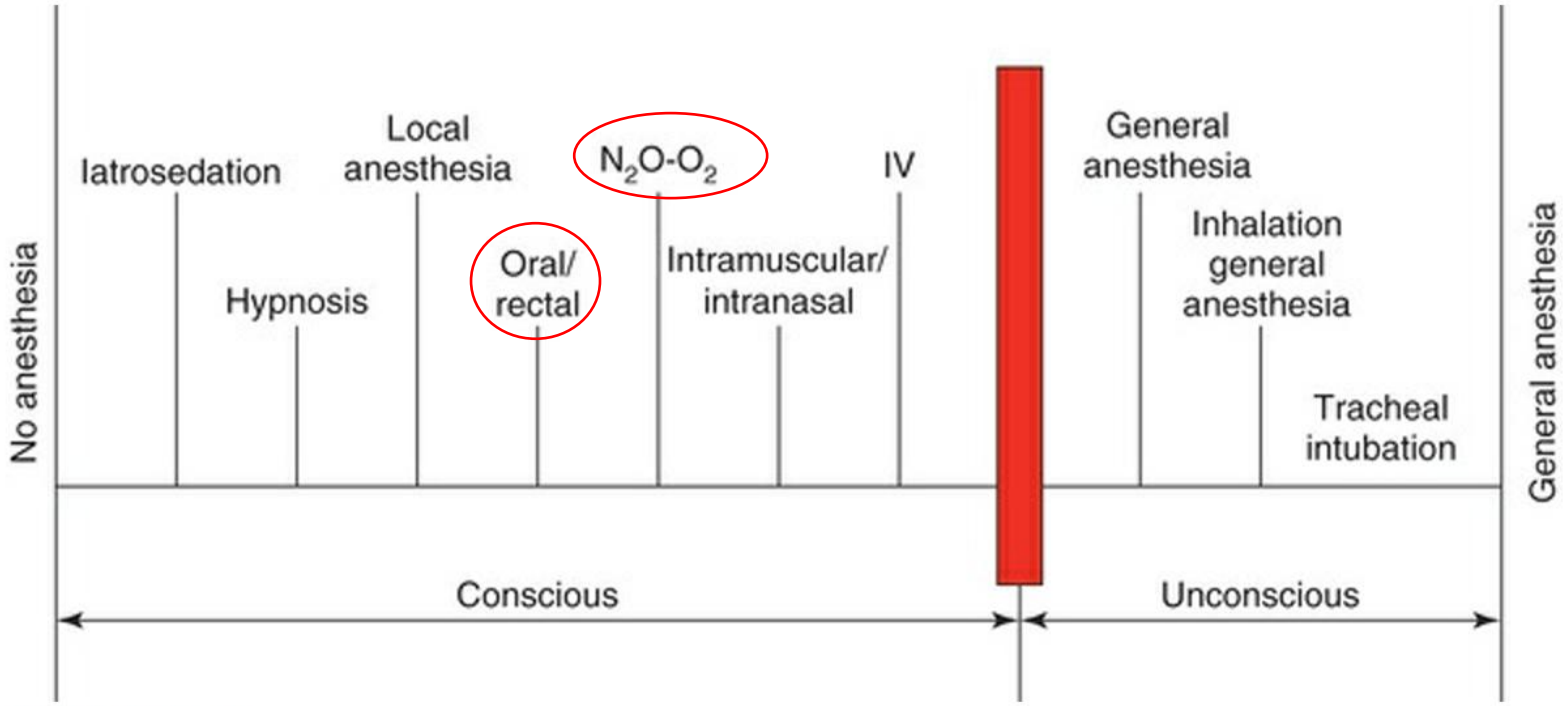


FIGURE 3.1 Spectrum of pain and anxiety control. Illustration of the range of techniques available in medicine and dentistry for patient management. Vertical bar represents the loss of consciousness.

Richmond Agitation-Sedation Scale

Target RASS Value		RASS Description
+4	Combative	Combative, Violent, Immediate Danger to Staff
+3	Very Agitated	Pulls or Removes Tube(s) or Catheter(s); Aggressive
+2	Agitated	Frequent non-Purposeful Movement, Fights Ventilator
+1	Restless	Anxious, Apprehensive but Movements are not Aggressive or Vigorous
0	Alert and Calm	
-1	Drowsy	Not Fully Alert, but has Sustained Awakening to Voice (Eye Opening & Contact >10sec)
-2	Light Sedation	Briefly Awakens to Voice (Eye Opening & Contact <10sec)
-3	Moderate Sedation	Movements or Eye Opening to Voice (BUT NO Eye Contact)
-4	Deep Sedation	No Response to Voice, BUT has Movement or Eye Opening to Physical Stimulation
-5	Unarousable	No Response to Voice or Physical Stimulation

Oral

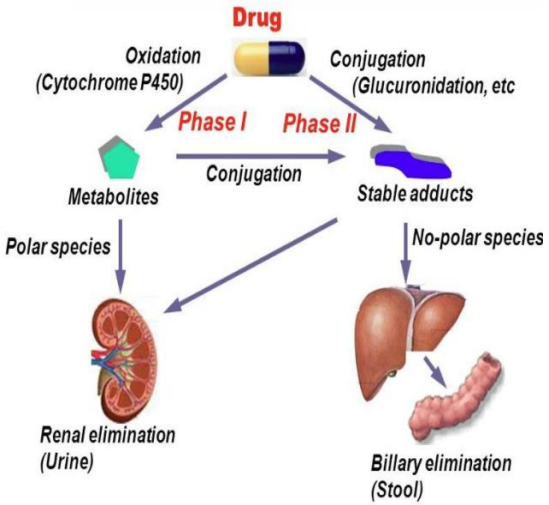
- Advantages
  - almost universal acceptance by patients
  - easy administration
  - relative safety
  - decreased incidence of adverse reactions
  - decreased severity of adverse reactions
  - when they do occur, they are normally less intense than those reactions that develop following parenteral administration
- Disadvantages
  - long latent period (≈ 30 min)
  - unreliable drug absorption (maximal effect ≈ 60 min)
  - inability to easily achieve a desired drug effect (titration is not possible)
  - prolonged duration of action ($\approx$ 3-4 hours)
  - Patients receiving CNS depressant drugs via the oral route must be advised against operating potentially dangerous machinery or driving a car

Rationale for Use

- primary use of the oral route is in the management of anxiety before the dental procedure
- only minimal-to-moderate sedation be sought via the oral route
- antianxiety or hypnotic drug taken 1 hour before bedtime the night before → ensure a restful night's sleep and a more stress-tolerant patient during treatment

- Drugs
  - inhibit salivary secretions (antisialagogues)
  - drugs to prevent or to manage nausea (antiemetics)
  - antibiotics
  - histamine blockers
  - opioids
  - antianxiety or sedative-hypnotic drugs

- Many antianxiety and sedative-hypnotic drugs for oral administration are produced in three dosage forms
  - “average” dose
  - larger dosage form
  - smaller dosage form



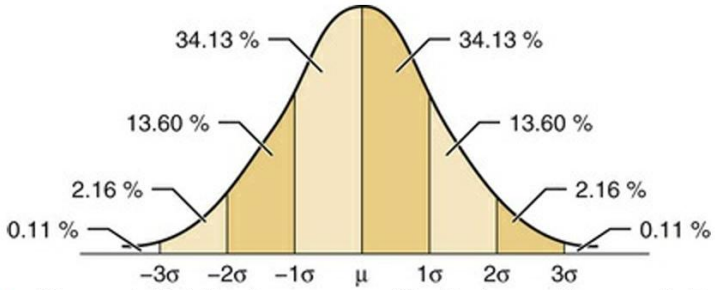


FIGURE 7.1 Normal distribution curve (“bell-shaped” curve). Persons will respond to drug dosages in dissimilar ways. Approximately 2.5% of persons will be extremely resistant to a “usual dose,” and 2.5% will be quite sensitive to the same dose. (Data from Bennett CR: Jorgensen Memorial Lecture: drug interactions. *Anesth Prog* 30(4):106–112, 1983.)

Titrate by appointment

- increase or decrease the dosage of drug(s) administered at subsequent appointments

Anti-anxiety drugs	Sedative-hypnotics	Histamine blockers	Opioid analgesics
Benzodiazepines • Diazepam • Oxazepam • Clorazepate • Prazepam • Halazepam • Alprazolam • Midazolam	Benzodiazepine • Flurazepam • Temazepam • Triazolam • Lorazepam • Midazolam Nonbenzodiazepine • Zolpidem • Zaleplon • Eszopiclone	• Promethazine • Hydroxyzine	reserved for the management of pain when milder analgesics have proved ineffectual

Anti-anxiety drugs (oral)

- Manage mild-to-moderate daytime anxiety and tension
- CNS-depressant action: at therapeutic dosages they produce the level defined as minimal sedation
  - usually without impairing the patient's mental alertness or psychomotor performance
- Benzodiazepine antianxiety drugs are preferred
  - Precautions: dosage decreased in elderly or debilitated patients
- Antianxiety drugs $\approx$ sedative-antianxiety drugs

Drug	Peak Plasma Level (hr)
Flurazepam	1–1.5
Midazolam	0.5–1
Triazolam	0.5–2
Medazepam	1–1.5
Alprazolam	1–2
Oxazepam	3–4
Nitrazepam	0.5–3
Diazepam	1–1.5
Lorazepam	2–4
Halazepam	1–3
Temazepam	0.5–3
Chlordiazepoxide	1.5–4
Prazepam	2–6

	Peak Plasma Level (hr)	Half-Life (hr)	Active Metabolites
Alprazolam	1–2	10–20	No
Chlordiazepoxide	4	5–30	Yes
Clorazepate	Variable	35–152	Yes
Clonazepam	1–4	19.5–50	Yes
Diazepam	1–1.5	34–70	Yes
Flunitrazepam	0.5–3	18–26	Yes
Flurazepam	1–1.5	2.3	Yes
Halazepam	1–3	30–100	Yes
Lorazepam	2–4	3.3–14.8	No
Medazepam	1–1.5	36–200	–
Midazolam	0.5–1	1.5–2.5	No
Nitrazepam	0.5–3	17–48	No
Oxazepam	3–4	4–11	No
Prazepam	2–6	36–200	Yes
Temazepam	0.5–3	4–10.5	No
Triazolam	0.5–2	2	No

- Oral Benzodiazepines in dentistry
  - pretreatment anxiolysis via oral administration in the dental and surgical setting are oxazepam and diazepam
  - to sleep restfully the evening before their treatment, flurazepam and triazolam are preferred

- Contraindications
  - allergy
  - psychoses
  - acute narrow-angle glaucoma

- Warnings
  - Other CNS depressants, such as alcohol, opioids, and barbiturates should be avoided while benzodiazepines are used
  - Be advised against driving a motor vehicle

ORAL BNZ	Dosage
Diazepam	Adult dosage: • 2 to 10 mg two to four times daily Elderly patients • 2 to 2.5 mg once or twice daily to start Premedication is 5 to 10 mg 1 hour before bedtime or treatment.
Alprazolam (Xanax)	Adult dosage • 0.25 to 0.5 mg three times a day Elderly patients • 0.25 mg two or three times daily
Oxazepam	Adult dosage • 10 to 15 mg three to four times daily Elderly • 10 mg three times daily

Sedative-Hypnotics (oral)

- Either sedation or hypnosis
  - Depending on the dosage of the drug administered and the patient's response to it
- Lower dose: calming effect (sedation)+ degree of drowsiness and motor incoordination (ataxia)
- Higher dosages: hypnosis (a state resembling physiologic sleep)

- Benzodiazepine sedative-hypnotics
- Nonbenzodiazepine sedative-hypnotics

Availability of Benzodiazepines (Oral)

GENERIC	PROPRIETARY (USA)	CLASS	AVAILABILITY (MG)	DOSE* (MG)
Alprazolam	Xanax, Niravam,	AA	0.25, 0.5, 1, 2	0.25–0.5
Chlorazepate with dipotassium	Generic only	AA	3.75, 7.5, 15	15–30
Chlordiazepoxide	Generic only	AA	5, 10, 25	5–10
Clonazepam	Klonopin	AC	0.5, 1, 2	0.25–0.5
Diazepam	Valium	AA	2, 5, 10	2–10
Flunitrazepam	Rohypnol	SH	2	0.25–2
Flurazepam	Generic only	SH	15, 30	15–30
Lorazepam	Ativan	SH, AA	0.5, 1, 2	2–4
Midazolam	Generic only	SH	2 mg/mL syrup	2 mg/mL
Oxazepam	Generic only	AA	10, 15, 30	10–30
Temazepam	Restoril	SH	7.5, 15, 22.5, 30	7.5–30
Triazolam	Halcion	SH	0.125, 0.25	0.25–0.5

*For nighttime sedation or preoperative anxiety control.

AA, Antianxiety; *AC*, anticonvulsant; *SH*, sedative-hypnotic.

Nonbenzodiazepine Anxiolytics-Hypnotics (oral)

Zolpidem	**Adult: 5 to 10 mg PO hs (by mouth at bedtime) Elderly: mg orally**
Zaleplon (Sonata)	Adult: 5 to 10 mg orally 1 hour before sleep
Eszopiclone (Lunesta)	Adult: 1 to 3 mg orally immediately before sleep

Histamine (H1) Blockers (Antihistamines)

- sedation and hypnosis is a known side effect of some drugs used primarily for other purposes

Phenothiazines

GENERIC	PROPRIETARY	SEDATIVE ACTION
Chlorpromazine	Thorazine	High
Promethazine	Phenergan	High
Thioridazine	Mellaril	High
Prochlorperazine	Compazine	Moderate
Promazine	Sparine	Moderate
Trifluoperazine	Stelazine	Moderate
Perphenazine	Trilafon	Low to moderate

Precautions

- caution in patients with a history of convulsive disorders because they may lower the seizure threshold
- patients receiving other CNS depressants should be aware of the additive effects of the phenothiazines
- postural (orthostatic) hypotension and a reflex tachycardia
- are capable of producing extrapyramidal reactions

Dosage:

- adult dose for sedation is 25 to 50 mg 1 hour before treatment
- for preoperative sedation, the dose is 50 mg 1 hour before bedtime

Hydroxyzine:

- sedative, antiemetic, antispasmodic, and anticholinergic properties
- adult dosage ranges from 25 mg three times a day to 100 mg four times a day
- the dose for preoperative drug in adults is 50 to 100 mg 1 hour preoperatively

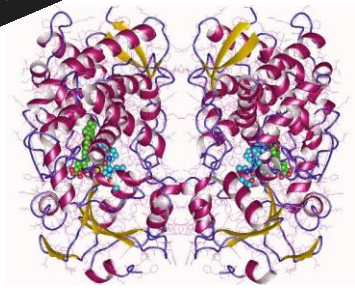
The Oral Sedation Appointment—Adult Patient

- At a previous visit, the patient has been evaluated for suitableness for oral sedation
- Their medical history has been reviewed and baseline vital signs recorded
- Preoperative instructions are reviewed and a copy given to the patient
- On the day of the appointment
  - the patient is scheduled to appear at the dental office **1 hour before** the scheduled start of dental treatment
  - the oral sedative drug is administered to the patient with 30 ml of water in the dental office by the dentist or staff member
  - the patient is kept in an area that is monitored constantly
  - at **45 minutes**, the dentist should evaluate the efficacy
  - the patient must be assisted when walking to the treatment room and never left to walk alone
  - if the patient is not yet adequately sedated, permit them an additional 15 or 20 min

- Monitors: pulse oximetry, blood pressure cuff
- Oxygen may be administered via nasal mask or nasal cannula if desired
- Local anesthesia is administered to the patient exactly as it would be administered had the patient not received sedation
- Discharged in the company of a responsible adult, the escort is brought into the treatment room where the postoperative instructions are read to, and then a copy is given to, both the patient and the escort
- The dentist should make the postoperative telephone call to the patient (retrograde amnesia)

If you don’t know what to do …

- Xanax (alprazolam) 0.25 mg oral 1 hour before intervention (adult)
- For the patient !!!
- No:
  - allergy,
  - glaucoma,
  - ketoconazole,
  - pregnancy
- Precaution (CYP3A4 inhibitors):
  - grapefruit,
  - clarithromycine/erithromycine,
  - verapamil
  - carbamazepine

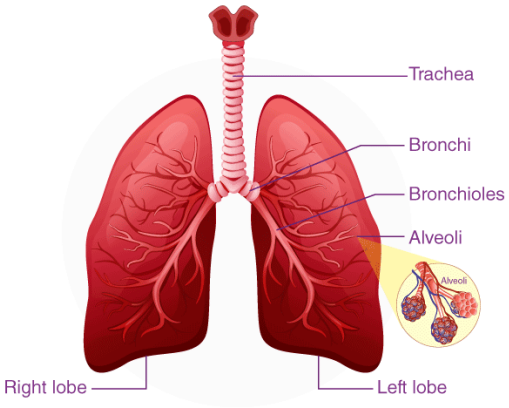


Cytochrome P450 3A4

What is your opinion about oral anxiolysis?

How you describe yourself about oral anxiolysis?

Inhalation Sedation



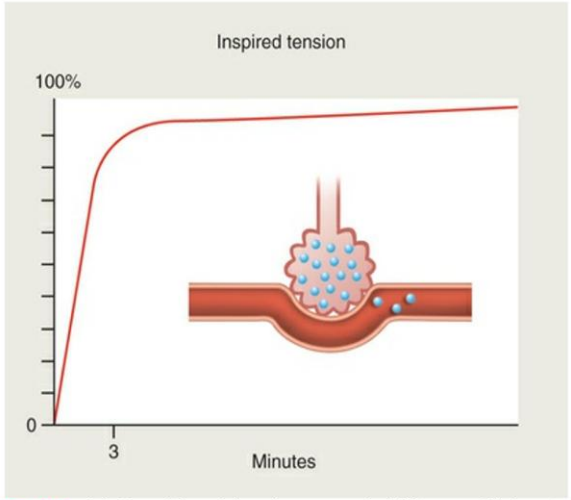
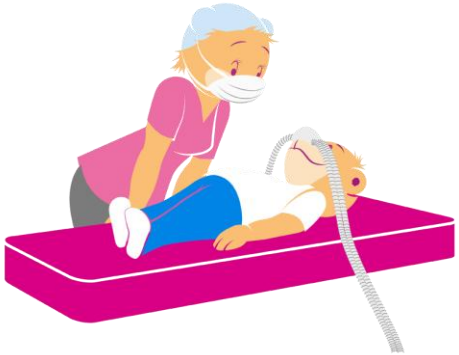
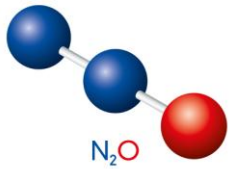


FIGURE 13.3 N_2O, with a blood–gas solubility coefficient of 0.47 (relatively insoluble), demonstrates both rapid onset and rapid recovery. Primary saturation of blood occurs within 3 to 5 minutes.





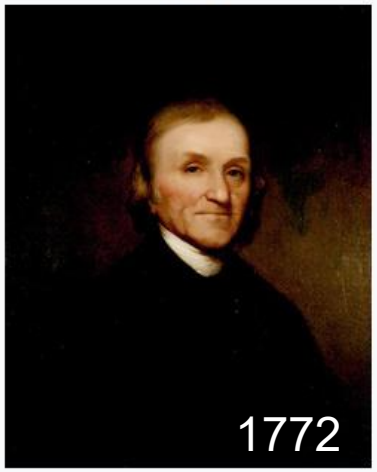
Nitrous oxide

N2O

- Physical Properties
  - nonirritating, sweet-smelling, colorless gas
- Chemical Properties
  - stable under pressure at usual temperatures
  - relatively insoluble in the blood
  - the oxygen in the N2O molecule is not available for use by the tissues because N2O does not break down in the body
- Is the least potent of the anesthetic gases
- In subanesthetic doses produces analgesia, a change in the patient's perception of pain
  - 50%:50% mixture of N2O-O2 produces the analgesic effectiveness of 10 to 15 mg of morphine

Joseph Priestley

FRS

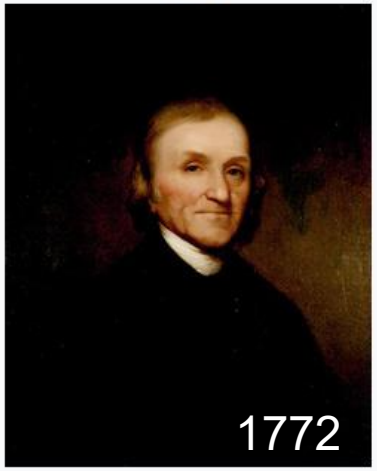


Sir

Humphry Davy

Bt FRS MRIA FGS

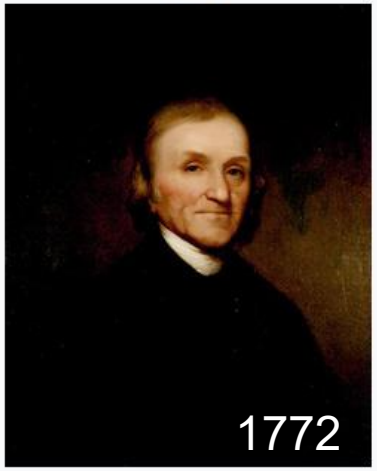
Joseph Priestley
FRS



Laughing Gas Parties Were A Big Hit With 19th Century Society

Sir
Humphry Davy
Bt FRS MRIA FGS

Joseph Priestley
FRS



Sir
Humphry Davy
Bt FRS MRIA FGS

Anesthesia application

Effects:

CNS:

- almost all forms of sensation are depressed (sight, hearing, touch, and pain)
- memory is affected to a minimal degree

CV:

- 50% no clinically significant effect
- cutaneous vasodilation is observed,which produces a degree of flushing and perspiration

Respiratory:

- not irritating to the pulmonary epithelium; it may therefore be administered to patients with asthma with no increased risk of bronchospasm

GI:

- no clinically significant actions

Entonox

⏱️ **Onset of action**

- **30 seconds to 1 minute** for noticeable analgesic effects
- **2–3 minutes** to reach maximum effect

⏱️ **Duration & offset**

- Effects wear off **within 3–5 minutes** after stopping inhalation
- The patient usually returns to baseline quickly, with no lasting sedation

Entonox is considered very safe when used correctly because:

- It **cannot cause hypoxia** (contains 50% oxygen).
- Its effects **wear off within minutes** after stopping.
- Patients remain **conscious and maintain protective reflexes**.

Entonox - contraindications

Absolute contraindications

- Pneumothorax
- Bowel obstruction
- Recent diving accident / decompression sickness
- Middle ear surgery or infection
- Air embolism
- Severe facial trauma preventing mask seal
- Head injury with impaired consciousness
- Vitamin B12 deficiency or pernicious anemia (risk of neurological toxicity)

Relative contraindications

- COPD with risk of CO_2 retention
- Pregnancy (especially first trimester)
- Severe anxiety or inability to cooperate
- Chest injury with suspicion of lung compromise

Entonox use

🛡️ Safety Measures During Use

- Patient must be **self-administering** (if they become oversedated, they naturally stop inhaling).
- Use in a **well-ventilated area** to avoid staff exposure.
- Monitor **vital signs** during prolonged use.
- Ensure **scavenging systems** for occupational safety.
- Check the **Entonox cylinder temperature** (must be above **–5°C** to avoid gas separation).

🧑‍⚕️ Recovery

- Recovery occurs within **3–5 minutes**.
- Patients can usually **walk and communicate immediately**.
- No escort or prolonged monitoring needed unless combined with other sedatives.

⚠️ Side Effects

- Generally mild and short-lived:
- Dizziness
- Euphoria
- Nausea/vomiting
- Tingling sensations
- Headache after prolonged use

Hematopoiesis

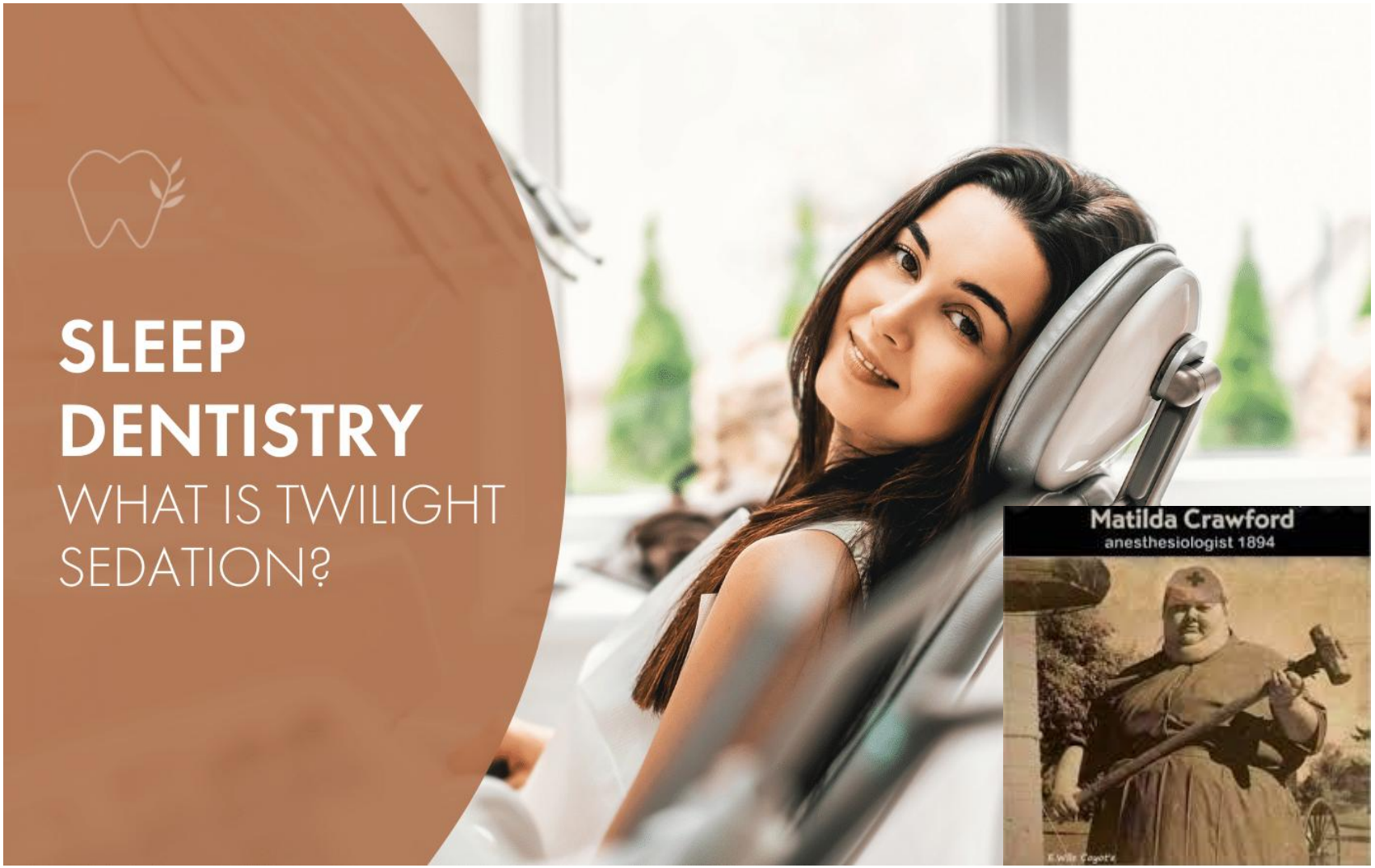
- inactivates methionine synthase (70% N_2O)

Repeated short-term exposure to N_2O

- neuropathy resembling vitamin B12 deficiency


SLEEP
DENTISTRY
WHAT IS TWILIGHT
SEDATION?

+ anesthetist

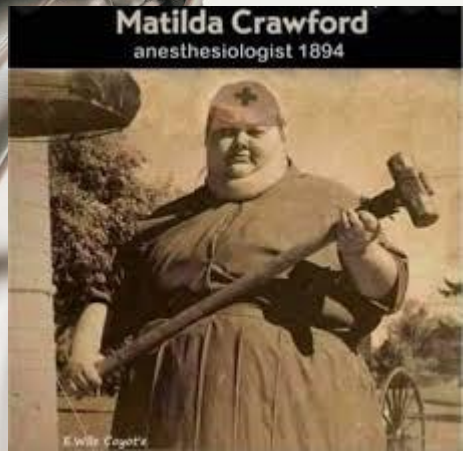


+ anesthetist + anesthesia post

+ anesthetist + anesthesia post + PACU

SLEEP DENTISTRY

WHAT IS TWILIGHT SEDATION?



What is your opinion about Entonox?

Should we try it?

Practical session