Sedation Medications: Gabbing about GABA

Benzodiazepines, Barbiturates, Imidazopyridines and Alcohols

(Plus notes on Opioids, Antihistamines, and Reversal Agents thrown in for good measure!)

Bart Johnson, DDS MS

---

**GABA**

- What is it?
- Main inhibitory neurotransmitter
- “Referees” your brain activity
- More GABA = Less action
  - Less thought
  - Less worry

---

**All ligands need a receptor**

- Baseballs need a glove…
- Basketballs need a hoop…
- Keys need a lock…
- Cars need a garage…
- GABA needs GABA receptors!

---

**GABA Receptors:**

- Found throughout the neuroaxis
- Especially evident in areas of the brain dealing with emotional responses
  - Limbic system

---

**GABA Receptors:**

- $\text{GABA}_a$: Associated with ligand-gated ion channels
- $\text{GABA}_b$: Associated with receptors that bind epinephrine
- $\text{GABA}_a$ and $\text{GABA}_b$ are not related to one another molecularly

- For this discussion, we will focus on $\text{GABA}_a$ only

---

**$\text{GABA}_a$ Receptor**

- A protein complex that builds a pore into neural membranes
- $\text{GABA}$ binds, pore shape alters
  - Allows $\text{Cl}^-$ to flow in
  - Too much $\text{Cl}^-$: Nerves cannot fire
  - Inhibition
  - “Sedation”
  - “Hypnosis”
  - “Muscle relaxation”
  - “Anti-anxiety”
  - “Amnesia”
  - “Anticonvulsant”
GABA<sub>a</sub> Receptor

- Heterooligomeric with 5 subunits.
  - Most common is α<sub>2</sub>β<sub>2</sub>γ<sub>1</sub>
  - The α and γ subunits are necessary for benzodiazepine binding
    - Primarily α, of which 6 different types exist

OK, so what does all that gobbledygook mean?

GABA<sub>a</sub> Receptor

- Different subunit combinations allow many possible kinds of GABA<sub>a</sub> receptors
  - = Many different potential inhibitory effects!!
  - = Different drugs have “personalities”

The Benzodiazepine Site

- Also called (perhaps erroneously):
  - BZD receptor
  - α-receptor

The safety of benzodiazepines is due to their indirect effect via GABA on the Cl<sup>-</sup> channels

- The BZD is not opening the channel
- It only encourages GABA to do so
The Barbiturate Site
- Barbiturates bind and open the Cl⁻ ionophore complex channels by themselves
- They also lengthen the time the pore is open

Barbiturate receptors
- Overdose can lead to full nerve paralysis and death of the patient
- Barbiturates and Benzodiazepines act differently on how they open the pore
  - Indirect, short bursts more often
  - Direct, longer duration of opening
- Synergism occurs

The Alcohol Site
- Not much understood about this yet
- Ethanol and other alcohols bind
effect a similar GABA-mediated opening of the pore

Drug Classifications: Benzodiazepines

Clinical Personalities:
- Anti-anxiety
  - The best we've got!
- Sedation
- Somnolence
- Hypnosis
- Muscle relaxation
- Amnesia (anterograde)
- Anticonvulsant
Clinical Characteristics:

- Flat dose-response curves
  - Safe!!

Cautions:

- Do not use with narrow angle glaucoma
- Metabolized in liver by P450 enzyme system.
  - Watch medications that interrupt the Cytochrome P450 system

Adverse effects (common):

- Atypical or paradoxical reactions
  - Usually dysphoria
  - “Unleash the Beast”

Adverse effects (rare):

- CNS depression beyond expected
- Respiratory depression (usually minimal)
- Chronic use dependence liability
- Teratogenesis potential
  - All are Pregnancy Category D or X

Clinical Characteristics:

- Unpredictable effects in elderly
  - 95% to 98% PPB
    - May be much less in a geriatric patient
    - Decrease doses
    - Expect more sedation than usual

Clinical Characteristics:

- Relatively low potency in young

- Mild central anticholinergic-like effect
- Minimal hepatic effects
  - May still need dose reductions with cirrhosis
Drug interactions:

- Other CNS depressants
  - Additive or supraadditive
  - Particularly Ethanol

- Possible diminution of opioid analgesia

- Levodopa: decreased levodopa effect

Diazepam (Valium®)

- History:
  - "Granddaddy of them all"
  - Approved in 1960, released in 1963
  - Rolling Stones song “Mother’s Little Helper” (1966)

  Kids are different today, I hear ev’ry mother say
  Mother needs something today to calm her down
  And though she’s not really ill, there’s a little yellow pill
  She goes running for the shelter of a mother’s little helper
  And it helps her on her way, gets her through her busy day

- Pharmacologic characteristics
  - Lipophilic
    - Quick onset
    - Should be quick recovery
  - $T_{1/2} = 20 - 50h$ (long!)
    - Active metabolites (with their $T_{1/2}$ up to 96h)
  - PPB 98%

COMMONLY USED BENZODIAZEPINES IN DENTISTRY

Uh… I mean by the PATIENTS…!

Diazepam (Valium®)

- Personality
  - Anti-anxiety
  - Sedation/Somnolence/Hypnosis
  - Muscle relaxation
  - Amnesia (anterograde)
  - Anticonvulsant

- Excellent
  - Varies; usually little or none
  - Excellent
  - Usually none
  - Excellent
Diazepam (Valium®)

- Dose formulations
  - 2, 5, and 10 mg tablets
  - 5 mg/mL injection
    - Contains Propylene Glycol
    - Irritant
    - Precipitates in aqueous solutions

- Dose
  - Usual range: 5-10 mg
  - Minimum: 2 mg
  - Intelligent Maximum: 15 mg
  - Absolute Maximum: 20 mg
  - Kids: 0.2-0.3 mg/kg, <10 mg

- Timing:
  - 45 minutes to 1 hour before procedure

- Notes:
  - Rebound effect after meals
  - Partial agonist?
  - Pregnancy Risk Category D

- Recommendations
  - Use with history of previous success
  - Great for muscle relaxation
  - I do not use this as much now due to long half lives of the metabolites

Lorazepam (Ativan®)

- History:
  - Introduced in 1977
  - Known for high addiction potential
Lorazepam (Ativan®)

- Pharmacologic characteristics
  - Hydrophilic
    - Slow onset
    - Long recovery
  - $T_{1/2} = 15$ hrs (long!)
    - Duration of action is 6-8 hours
  - PPB 85%

Lorazepam (Ativan®)

- Personality
  - Anti-anxiety
  - Sedation/Somnolence/Hypnosis
  - Muscle relaxation
  - Amnesia (anterograde)
  - Anticonvulsant
    - Excellent
    - Varies; usually mild to moderate
    - Fair
    - Usually none
    - Excellent; first drug of choice for Status Epilepticus

Lorazepam (Ativan®)

- Dose formulations
  - 0.5, 1, and 2 mg tablets

Lorazepam (Ativan®)

- Dose
  - Usual range: 1-2 mg
  - Minimum: 0.5 mg
  - Intelligent Maximum: 3 mg
  - Absolute Maximum: 4 mg
  - Kids: (unlabeled) 0.05 mg/kg

- Timing:
  - 1.5 - 2 hours before procedure
  - HS

Lorazepam (Ativan®)

- Notes:
  - Pregnancy Risk Category D
  - Minimal or no active metabolite

Lorazepam (Ativan®)

- Recommendations
  - Excellent for HS dosing night prior
  - Excellent for long procedures

  - Use this when:
    - You want a long-acting anti-anxiety drug
    - You do not need sleepiness or amnesia

  - Be sure to give it plenty of time to get going!
    - Usual mistake is to start after 30-60 minutes
    - Nowhere near peak yet!
Alprazolam (Xanax®)

- **History:**
  - Introduced in 1981
  - Developed for panic disorder
  - First group of study patients found it so effective, they pooled funds and bought stock in Upjohn… and got quite wealthy!

- **Pharmacologic characteristics**
  - Lipophilic
    - = Moderate to fast onset
    - = Moderate recovery
  - \( T_{1/2} = 6-11 \) hrs
    - Duration of action is 5-6 hours
  - PPB 80%

- **Personality**
  - Anti-anxiety
  - Sedation/Somnolence/Hypnosis
  - Muscle relaxation
  - Amnesia (anterograde)
  - Anticonvulsant
    - Excellent
    - Very little
    - Very little
    - Usually none
    - Fair

- **Dose formulations**
  - 0.25, 0.5, 1, and 2 mg tablets
Alprazolam (Xanax®)

- **Dose**
  - Usual range: 0.5 - 1 mg
  - Minimum: 0.25 mg
  - Intelligent Maximum: 1 mg
  - Absolute Maximum: 2 mg
  - Kids: (unlabeled) 0.005 mg/kg

- **Timing:**
  - 1 hour before procedure

- **Notes:**
  - Pregnancy Risk Category D
  - Minimal or no active metabolite

Alprazolam (Xanax®)

- **Recommendations**
  - Best for anti-anxiety only
  - Use this when:
    - You want a moderate anti-anxiety drug
    - You do not need sleepiness or amnesia
  - (I do not use this one often anymore…)

Triazolam (Halcion®)

- **Definitions:**
  - Calm, peaceful, tranquil: Halcyon weather
  - Rich, wealthy, prosperous: Halcyon times of peace
  - Happy, joyful, carefree: Halcyon days of youth

- **Mythology:**
  - A mythical bird, usually identified with the kingfisher; said to breed about the time of the winter solstice in a nest floating on the sea, and to have the power of charming the winds and waves into calmness

Triazolam (Halcion®)

- **History:**
  - Introduced in 1979 in the Netherlands
  - Originally dosed at 1 mg
  - Many side effects; pulled from market in 1992-93
  - Reintroduced at lower doses a year or two later
  - Has been doing much better since
Triazolam (Halcion®)

- Pharmacologic characteristics
  - Lipophilic
    - Very fast onset
    - Moderate recovery
  - $T_{1/2} = 1.5\text{–}5.5$ hrs
    - Duration of action is 6–7 hours
  - PPB 89%

- Personality
  - Anti-anxiety
    - Excellent
  - Sedation/Somnolence/Hypnosis
    - Excellent
  - Muscle relaxation
    - Very little
  - Amnesia (anterograde)
    - Powerful
  - Anticonvulsant
    - Fair

- Dose formulations
  - 125, 250 mcg tablets

- Dose
  - Usual range: 250 mcg
  - Minimum: 125 mcg
  - Intelligent Maximum: 375 mcg
  - Absolute Maximum: 500 mcg
  - Kids: (unlabeled) 250 mcg or 15 mcg/kg

- Timing:
  - 20 mins SL before procedure is most effective
  - 30 mins PO also works
  - HS

- Notes:
  - Pregnancy Risk Category X
  - Do not mix Ethanol with this drug!
  - Higher incidence of psychiatric disturbances
    - Has been used as a defense for violent behavior
  - As a sleeping pill, is best to induce sleep
    - It cannot maintain sleep due to the short half life
  - Very strong anterograde amnesia, may persist for several hours after the procedure
    - Must have someone watch the patient
      - Medications
      - Cooking
    - See next slides for DOCS protocols and data
**DOCS protocols**
- Disclaimer: I have not taken their courses
- Their concept:
  - Re-dose / titrate Triazolam for long procedures
    - Good idea?
    - Bad idea?
- Another concept:
  - Flumazenil reversal!

**Doug Jackson’s Study**
- The study administered:
  - 250 mcg at time zero
  - 500 mcg at time 60 minutes and
  - 250 mcg at time 90 minutes
  - Reversed with Flumazenil at 180 minutes
- These are big doses!
  - … but they are not outside of what providers might do

**The Data**

![Figure 1](image1.png)

**The Data**

![Figure 2](image2.png)

**The Data**

![Figure 3](image3.png)

**What conclusions can we draw?**
- Highly variable responses!
- After 180 minutes, the level of sedation was still rising
  - It should have been falling
  - Most dental appts are not 3+ hours long
What conclusions can we draw?

- Some patients were sedated well past “moderate” sedation
  - Clearly in realm of deep sedation/GA
  - Unresponsive
- Unsafe
- Unwise
- … and illegal!

What conclusions can we draw?

- Flumazenil reversed the deeper sedation
  - But did not bring them back to fully awake
  - Did not sustain the recovery it stimulated
- On the positive side: Nobody was unsafe
  - No airway issues
  - Nothing other than sleepy folks

My read on this concept

- I do IV sedation titration and re-dosing all the time.
  - The concept is valid!
- Back to Pharmacologic Phish!
  - The first dose fills reservoirs
  - The second dose should be much smaller

My read on this concept

- I do not agree with repeated 250 mcg dosing
  - Pharmacologically excessive
  - If you want to re-dose, I suggest half of a 125 mcg (i.e., 62.5 mcg!)
  - Your sedation will be much safer

My read on this concept

- As we will talk about later, only dose your patient through the difficult times
  - Anesthetic
  - Drilling
- If you have N₂O, use that instead of re-dosing
  - Can titrate easily
  - Goes away rapidly when you turn it off

My read on this concept

- Do not rely on Flumazenil for routine reversal
  - Emergencies only
  - Let the drug wear off naturally
- Only send the patient home when you are convinced they are well-recovered
  - Awake and stays that way
  - Responds appropriately to questions
  - VSS
  - Able to keep head up
  - Not drifting off
A Final Opinion:

- Remember:
  - You are not an anesthesiologist!
  - This is CONSCIOUS sedation

- If you want your patient groggy and asleep, you are out of your legal zone!
  - Unsafe!
  - Unwise!
  - Hire an anesthesiologist!

Triazolam (Halcion®)

- Recommendations
  - Oral workhorse of dentistry today
  - For 90% of your oral sedations

  - Use this when:
    - You want an excellent anti-anxiety drug
    - You want sleepiness
    - You want amnesia
    - (Gee, isn’t that all the time in dentistry?)

- I strongly recommend one dose only
  - Back up with N₂O
  - Keep them conscious and responsive

  - If you re-dose, use small subsequent doses and do it only once or twice

  - Recover your patient naturally without Flumazenil

Triazolam (Halcion®)

- Use your lovely personality, your quick wit and hilarious jokes, light conversation about great movies and other relaxing techniques to calm the patient!

  - If that does not work, refer or hire an anesthesiologist!

Midazolam (Versed®)

- History:
  - Introduced in 1975
  - Currently the most commonly used BZD in anesthesia

Midazolam (Versed®)
Midazolam (Versed®)

- Pharmacologic characteristics
  - Hydrophilic as packaged (pH 3.5)
  - Lipophilic when buffered in blood (pH 7.4)
  - = Fast onset
  - = Fast recovery
  - = Good in veins
  - $T_{1/2} = 1-4$ hrs
  - Duration of action is ~2 hours
  - PPB 95%

- Personality
  - Anti-anxiety
  - Sedation/Somnolence/Hypnosis
  - Muscle relaxation
  - Amnesia (anterograde)
  - Anticonvulsant
    - Excellent
    - Excellent
    - Very little
    - Powerful
    - Fair

Midazolam (Versed®)

- Dose formulations
  - 1 mg/mL Injectable (2, 5, 10 mL)
  - 5 mg/mL Injectable (1, 2, 5, 10 mL)
  - 2 mg/mL Syrup

  "Dr. Doug's Famous Midazolam Mix!"
  - 5 mg/mL Injectable plus Kool-Aid
  - Mix to a sweet paste

- Dose
  - Usual range: 0.25 – 0.5 mg/kg up to 20 mg
  - Intranasal 0.2 mg/kg up to 15 mg
  - Best for young kids
  - Adult mg/kg doses become prohibitive

- Timing:
  - 30-45 minutes before procedure

Midazolam (Versed®)

- Notes:
  - Pregnancy Risk Category D
  - This drug is best for IV sedation
  - Tastes HORRIBLE!!
    - Must hide the taste somehow

- Recommendations
  - Small children only

  Use this when:
  - You have a short quick case
  - You can mask the taste with something very sweet
Drug Classifications:

**IMIDAZOPYRIDINE**

### Zolpidem (Ambien®)

- **History:**
  - Introduced in 1975
  - Marketed as a “non-benzodiazepine” sedative agent
  - Used almost exclusively as a sleeping aid

- **Pharmacologic characteristics**
  - Not a benzodiazepine by structure
  - Occupies and triggers the BZD site
  - “Non-benzodiazepine Benzodiazepine”
  - Fast onset
  - Fast recovery
  - $T_{1/2} = 2$-3 hrs
  - Duration of action is ~2 hours
  - PPB 93%

### Zolpidem (Ambien®)

- **Personality**
  - Anti-anxiety: Weak
  - Sedation/Somnolence/Hypnosis: Excellent
  - Muscle relaxation: Weak
  - Amnesia (anterograde): Powerful
  - Anticonvulsant: Weak

- **Dose formulations**
  - 5 mg and 10 mg tablets
Zolpidem (Ambien®)

- **Dose**
  - Usual range: 5-10 mg
  - Minimum: 5 mg
  - Intelligent Maximum: 10 mg
  - Absolute Maximum: 10 mg
  - Kids: Not suggested

- **Timing**
  - 30 minutes before procedure

---

Zolpidem (Ambien®)

- Complex activities have occurred, with no memory (parasomnia events)
  - Sleep walking
  - Sleep driving
  - Cooking/eating meals
  - Phone calls
  - Sexual interactions

---

Zolpidem (Ambien®)

- There have been published instances of this drug bringing comatose (i.e., in a “minimally conscious state”) patients back to being fully awake for a few hours

- May be related to the parasomnia effects of stimulating parts of the brain but not others

- Has researchers fascinated…

---

Zolpidem (Ambien®)

- **Notes**
  - Pregnancy Risk Category C
  - (Formerly Category B)

---

Zolpidem (Ambien®)

- **Recommendations**
  - Only when they have experience with this medication

  - Technically one of our lowest-risk agents for pregnant women, but still ill-advised

---

**Drug Classifications:**

- **BARBITURATES**
A few brief words…

- Low dose: Bind barbiturate site in GABA, potentiate GABA

- High dose: GABA mimetic, directly open chloride channels
  - Respiratory depression and death

A few brief words…

- No good use of these oral drugs any more in dentistry
  - Secobarbital (Seconal®)
  - Phenobarbital (Luminal®)

  - Phenobarbital is still used as an anticonvulsant

Drug Classifications:

**CHLORAL HYDRATE**

**Chloral Hydrate**

- Pharmacologic characteristics
  - An alcohol
  - Believed to occupy and trigger the EtOH site

  - $T_{1/2} = 8-11$ hrs
    - Duration of action is 4-8 hours
    - Active metabolite

  - PPB N/A

**Chloral Hydrate**

- Personality
  - Anti-anxiety
  - Sedation/Somnolence/Hypnosis
  - Muscle relaxation
  - Amnesia (anterograde)
  - Anticonvulsant

  - Weak
  - Moderate
  - Weak
  - Weak

**Chloral Hydrate**

- History:
  - First synthesized in 1832
  - Classically used as a pediatric sedative
  - Some people still swear by it
  - Most pediatric dentists have given it up
Chloral Hydrate

- **Dose formulations**
  - Syrup 100 mg/mL
  - Capsules 500 mg

- **Dose**
  - Usual range: 25-50 mg/kg
  - Minimum: 25 mg/kg
  - Intelligent Maximum: 120 mg/kg <1.5-2.0 gm
  - Absolute Maximum: 120 mg/kg <1.5-2.0 gm

- **Timing**
  - 30-45 minutes before procedure

Chloral Hydrate

- **Notes:**
  - Pregnancy Risk Category C
  - Heavy GI irritation

  The safe dose is often much lower than the necessary dose for effect
  - i.e., bad drug

Chloral Hydrate

- **Unfortunate Death**
  - April, 2010
  - Dylan Stewart, age 5
  - Pediatric dental appointment in Florida
  - Was given chloral hydrate
  - Circumstances unknown

  Extremely sad for all 😞

Chloral Hydrate

- **Recommendations**
  - Not a good choice any more
  - Use benzodiazepines instead

Drug Classifications:

- ETHANOL
Ethanol

- **General:**
  - Ambiance may be most useful factor

- **Representative drugs:**
  - Various forms
  - Dose: Equivalent of 1 oz ethanol 15 minutes before procedure

Hydroxyzine (Vistaril®)

- **History:**
  - Introduced in 1956
  - Believed to be antiserotonergic

- **Pharmacologic characteristics**
  - $H_1$ blocker
  - Side effect is sedation
  - Exact mechanism unknown
  - $T_{1/2} = 3-7$ hrs
  - Duration of action is 4-6 hours
  - PPB N/A

- **Personality**
  - Anti-anxiety
  - Sedation/Somnolence/Hypnosis
  - Muscle relaxation
  - Amnesia (anterograde)
  - Anticonvulsant
  - Excellent
  - Good
  - Mild
  - Usually none
  - Weak

- **Dose formulations**
  - 25, 50 and 100 mg capsules
  - Suspension 5 mg/mL
  - Elixir/Syrup 2 mg/mL
Hydroxyzine (Vistaril®)

- **Dose**
  - Usual range: 50-100 mg
  - Minimum: 50 mg
  - Intelligent Maximum: 100 mg
  - Absolute Maximum: 100 mg
  - Kids: 0.6 to 2 mg/kg (max 75 mg)

- **Timing:**
  - 1 hour before procedure
  - Consider 50 mg HS, 50 mg qam, 50 mg 1h prior

Hydroxyzine (Vistaril®)

- **Notes:**
  - Pregnancy Risk Category C
  - Not recommended for the elderly

Hydroxyzine (Vistaril®)

- **Recommendations**
  - Good for children
  - Often combined with scopolamine and meperidine
  - Pediatric dentists use this recipe

DVS Recipe

- Used for ages 3-6 years old
- **Recipe:**
  - Demerol 2.2 mg/kg (=1 mg/#)
  - Vistaril 25 mg (fixed dose)
  - Scopolamine 0.1 mg (fixed dose)
  - Give in office 1 hr prior to procedure
  - Add 40-50% Nitrous Oxide
  - Provides 45-60 mins working time

DVS Recipe

- Multi-agent oral sedation
  - Requires Moderate Sedation permit
- Must have airway and monitoring skills
  - Kids may become pretty sedate
- If not trained to use this, straight Hydroxyzine plus Nitrous is “hard to get in trouble with” and effective

Other Antihistamines:

- Promethazine (Phenergan®)
  - Phenothiazine antipsychotic

  - **Formulations:**
    - Syrup 6.25 mg/5 mL
    - Rectal suppositories 12.5, 25 and 50 mg

  - PPB: 93%
Other Antihistamines:
- Promethazine (Phenergan®)
  - Dose:
    - 12.5 - 50 mg
    - Kids 0.5 – 1 mg/kg
  - Timing:
    - 1 hr before procedure
    - Long duration: 4-6 hours

Other Antihistamines:
- Diphenhydramine (Benadryl®)
  - Formulations:
    - Tablets 25 and 50 mg
    - Syrup 12.5 mg/5 mL
  - Dose:
    - 25 - 50 mg
  - Timing
    - 1 hr before procedure

A few words about Oral Narcotics and Sedatives

Oral Narcotics
- Some dentists are using a benzodiazepine (i.e., Triazolam) and adding tablet Oxycodone or Hydrocodone/Acet

- While theoretically a reasonable idea, in reality, a very BAD and potentially DANGEROUS idea
- These drugs synergize and airway loss/crisis is much more likely

Oral Narcotics
- If you need a narcotic-inclusive sedation, you need IV lines and monitors
- Pediatric DVS is the exception
  - But leave that to the pediatric dentists!
- Benzos and Nitrous are much safer combinations for dental purposes

In the Eyes of the Law:
- Mixing narcotic pain medications pre-op and sedatives becomes multi-drug sedation
  - Must have a Moderate Sedation permit
  - General dentist lost her license over this
  - Pediatric dentist was sanctioned
- Must give sufficient recovery from the oral sedation prior to starting post-op pain medications
  - Use long-acting locals, short acting sedatives
Reversal Agents

Flumazenil
Naloxone

Flumazenil (Romazicon®)

- **History:**
  - Introduced in 1987
  - Is the only BZD reversal agent currently available

- **Pharmacologic characteristics**
  - Displaces BZD off BZD site; does not potentiate GABA
  - \( T_{1/2} = 45-90 \text{ minutes} \)
  - Duration of action is 1 hour; re-sedation can occur after that
  - PPB 40%

- **Personality**
  - Excellent BZD reversal agent
  - Must titrate to effect
  - Designed for IV use
    - Can be used IM if no other choice

Flumazenil (Romazicon®)

- **Dose formulations**
  - 0.1 mg / mL injectible
**Flumazenil (Romazicon®)**
- Adult Dose (IV)
  - Initial Dose: 0.2 mg
  - Titrate 0.1-0.2 mg/min to effect
  - Usual dose is 0.6 mg to 1.0 mg
  - Maximum 3.0 mg
- Peds Dose (IV)
  - Initial Dose: 0.01 mg/kg up to 0.2 mg
  - Titrate 0.005-0.01 mg/kg/min up to 0.2 mg/min
  - Maximum 0.05 mg/kg up to 1.0 mg

**Notes:**
- Pregnancy Risk Category C
- Once you give it, ideally monitor for 2 hours

**Flumazenil (Romazicon®)**
- Recommendations
  - Use this when you have airway or over-sedation issues
  - Do not routinely use it for waking up your patients
    - Learn to dose them lower and smarter so they wake up naturally when you are done
    - I have used it once in the last 2 years!

**Naloxone (Narcan®)**
- History:
  - Unable to determine when it was first synthesized
  - It has been distributed in many cities as part of an “emergency kit” to heroin addicts

**Pharmacologic characteristics**
- Excellent reversal agent for narcotic agonists
- Can be given IV or IM
  - $T_{1/2} = 1.5$ hrs
  - Duration of action is 1-2 hours, but may need re-dosing every 20-60 minutes
- PPB N/A
Naloxone (Narcan®)

- **Personality**
  - Rapidly and reliably reverses narcotic overdose
  - May induce withdrawal symptoms in narcotic dependent patients

Naloxone (Narcan®)

- **Dose formulations**
  - 0.4 mg/mL injectible

Naloxone (Narcan®)

- **Dose**
  - Usual range: 0.4 mg
  - Minimum: 0.1-0.2 mg (narcotic dependent pts)
  - Intelligent Maximum: 2 mg
  - Absolute Maximum: 10 mg
  - Kids: 0.01 mg/kg; repeat q2-3 mins prn

Naloxone (Narcan®)

- **Notes:**
  - Pregnancy Risk Category B/C
  - Minimal or no active metabolite

Naloxone (Narcan®)

- **Recommendations**
  - Use this when you have airway, respiratory depression, or over-sedation issues
  - Do not routinely use it for waking up your patients
  - Monitor for 2 hours afterwards to be sure re-sedation does not occur

---

**LET'S PUT THIS TOGETHER CLINICALLY:**

What do you need to do?
Nitrous Sedation

- Use it!
- Record the use, and ideally the doses
- Be sure the patient meets discharge criteria
- Good stuff

Oral Sedation - Minimal

- Dental records must contain time administered, drug, and dosage
- Pre-sedation vital signs must be recorded
  - At least B/P and pulse (ideally add R and SpO₂)
  - Can circumvent this only if:
    - “…the cooperation of the patient or circumstances of the case will not allow it. If pre-sedation vitals cannot be obtained, the reason(s) why must be recorded.”

Our Template

- **Triazolam / N₂O Sedation**
  - VS: 100/70 88 15 100% on RA
  - Patient took 250 mcg Triazolam SL in our waiting room at [XXX time]. It was allowed to take effect for 20-30 minutes prior to the procedure.
    - Nitrous added; mask fitted, O₂ started/flow adjusted
    - N₂O/O₂: 50%/50% → 30%/70% → 0%/100%

Oral Sedation - Minimal

- The patient must be continuously observed while in the office under the influence of the drug
- What about out-of-office sedation?
  - The law is nebulous
  - Best to avoid except HS dosing
    - *Patient must have appropriate supervision!*
  - Risk can extend to you if badness occurs
  - Must deal with “pre-op VS and dosage/time” issues = documentation

Oral Sedation - Minimal

- If the patient enters moderate sedation:
  - Must return to minimal sedation asap
  - Must monitor through procedure to dismissal:
    - Normal SOC is q5 mins
    - Pulse
    - Respiration
    - Blood pressure
    - SpO₂ is not required, but a really good idea

Oral Sedation - Moderate

- Everything the same but now SpO₂ is required
- Make sure you have a permit, or do not get into this realm!
Discharge Criteria (WAC 246-817-776)
- Applies to ALL levels of sedation
- VS (BP, P, R, SpO₂) all stable

The following must occur, as appropriate to age and pre-op status:
- A&O to person, place, time
- Talk and respond coherently to verbal questioning
- Sit up unassisted
- Walk with minimal assistance
- No uncontrollable N&V and minimal dizziness

A discharge entry must be made in the chart recording the above
Must include the name of the responsible party to whom the patient is released, if applicable

Whew! We did it. Questions?
Thank you!

How to reach me:
Bart Johnson
Seattle Special Care Dentistry
206-524-1600
bartj@sscdentistry.com
www.seattlespecialcaredentistry.com