

Conscious Sedation Guide

It Shouldn't Be a Bad Memory!

List of Terms

- Because of the wide range of settings in which this presentation will be viewed, a list of generic and proprietary drug names is presented. Please refer to this slide as necessary throughout the presentation.
- Alprazolam = Xanax
- Diazepam = Valium
- Flumazininil = Romazicon
- Lorazepam = Ativan
- Methohexital = Brevital
- Midazolam = Versed
- Naloxone = Narcan
- Propofol = Diprivan
- Sodium Thiopental = Sodium Pentothal

Conscious Sedation-What Is It?

- Conscious sedation refers to the practice of administering drugs for specific goals:
 - ◆ Provision of safe analgesia, anxiolysis, sedation, and amnesia during stressful procedures.
 - ◆ Safely decreasing adverse psychological responses associated with stressful procedures.
 - ◆ The return of patients to their pre-procedural level of functioning.
- Information to follow on when standards of conscious sedation apply to your patient.

Levels of Conscious Sedation

- Sedation Score 0 = Fully awake
- Sedation Score 1 = Light sedation, largely aware of self/surroundings. Mildly sleepy.
- Sedation Score 2 = Moderate sedation, slightly aware of self/surroundings; somnolent but easily aroused with stimulation.
- Sedation Score 3 = Deeply sedated; unaware of self/surroundings.
- Sedation Score 4 = General anesthesia; patient is unconscious.

Levels of Conscious Sedation

Table 1. Operational Definitions and Characterization of Levels of Sedation-Analgesia						
Sedation Score	Level of Sedation	Level of Consciousness	Response-Verbal	Response-Tactile	Airway Patency	Ventilation, Oxygenation
0	None	Fully aware of self & surroundings	P	P	P	P
1	"Light"	Mostly aware of self & surrounding, but sedate	P-L	P	P	P
2	"Moderate"	Slightly aware of self & surroundings, usually somnolent, arouses easily with stimuli	L-A	P-L	P-L §	P-L *
3	"Deep"	Not aware of self or surroundings, little arousal with stimuli	A	L (to pain)	L-A	L
4	General Anesthesia	Unconscious, no arousal with painful stimuli	A	A (to pain)	L-A	L-A

P: Present, adequate, or normal.

L: Limited, partial, mildly abnormal.

A: Absent, inadequate

*- May need supplemental oxygen to keep SaO₂ ≥ 90%.

§-Airway may need limited support.

Other Sedation Correlates

- Sedation Level 0 = Patient unimpaired.
- Sedation Level 1 = Slightly decreased level of consciousness and verbal response; no other impairments.
- Sedation Level 2 = Altered level of consciousness; patient maintains patent airway and hemodynamic performance.
- Sedation Level 3 = Poorly responsive patient with decreased airway patency and respiratory drive; at risk for compromised cardiovascular performance.
- Sedation Level 4 = Little or no response to painful stimuli; absolute airway compromise; possible impaired hemodynamics.

Patient Assessment Prior To Conscious Sedation

- The physician, dentist, or independent practitioner responsible for overall conduct of the conscious sedation is generally required to do the following within 30 days prior to procedural sedation:
 - ◆ perform a history and physical exam
 - ◆ assign an American Society of Anesthesiologist (ASA) health class
 - ◆ document a sedation plan
 - ◆ document NPO status and interval changes if H&P not done immediately prior to procedure.

Focused History and Exam

- History should focus on factors that may increase
 - ◆ patient sensitivity to sedatives/analgesics
 - ◆ patient risk of respiratory/cardiopulmonary complications
 - ◆ difficulty in managing complications

Focused History, con't

- Cardiopulmonary disease may accentuate hemodynamic/respiratory depression caused by sedatives and analgesics. May require decreased drug dosages; EKG monitoring warranted.
- Hepatic or renal abnormalities may impair drug metabolism, causing altered sensitivity and duration of action when sedatives/analgesics are administered.
- Medication interactions between a patient's routine medications & sedatives/analgesics may alter normal drug responses.

Focused History, con't

- Patient allergies must be known and documented.
- Alcohol/illicit substance abuse may increase tolerance to sedatives/analgesics while acute use prior to conscious sedation will be additive or synergistic with medication effects.
- Tobacco use increases airway irritability and risk of bronchospasm during sedation.
- Prior adverse reaction to anesthesia/sedation may increase risk during subsequent procedures.

Focused Airway Assessment

- The patient undergoing conscious sedation should have a thorough airway assessment focusing on
 - ◆ airway class
 - ◆ mouth opening
 - ◆ thyromental distance (distance from chin to thyroid)
 - ◆ range of motion of the neck

Focused Airway Assessment

- This picture represents a Mallampati Class One airway. The entire uvula and tonsillar pillars are seen. This individual should be easy to mask ventilate or to intubate with a laryngoscope and endotracheal tube.



Focused Airway Assessment, con't

- This picture represents a Mallampati Class Three airway. None of the uvula or tonsillar pillars are seen. This individual may find it hard to mask ventilate, and quite difficult to intubate.



Focused Airway Assessment, con't

- This image is representative of an extremely short thyromental distance, indicating tremendous difficulty in tracheal intubation, and possible difficulty establishing a satisfactory mask seal.



Patient Classification Scheme

- Class I A normal, healthy patient with a localized pathological process.
- Class II A patient with well-controlled systemic disease which does not limit activity.
- Class III A patient with moderate-severe systemic disease that limits daily activity.
- Class IV A patient with severe disease that is a daily threat to life.
- Class V A patient at substantial risk of death within 24 hours.
- E Emergency status; added to patient class if individual is undergoing an emergency procedure.

When Do Standards For Conscious Sedation Apply?

- Generally, standards for conscious sedation apply when the practitioner responsible for overall conduct of procedural sedation is not a specialist in anesthesia and
 - ◆ It is expected that the drugs to be administered will result in a substantive impairment in the patient's level of consciousness, impaired airway reflexes/hemodynamic status, or a sedation level ≥ 2 , or if the patient has an ASA class ≥ 4 .

Key Points In Patient and Family Education

- Education, individually geared to the patient and family, helps alleviate concerns associated with conscious sedation.
- Key points
 - ◆ duration of sedation (children may fear never waking up)
 - ◆ interindividual variability of response to drugs
 - ◆ potential for sedation failure
 - ◆ alternatives to sedation
 - ◆ potential for adverse events
 - ◆ plan for monitoring by a nurse during the procedure and discharge criteria.

Informed Consent

- The prescriber should review the sedation plan with the patient/guardian as soon as possible. Discussion and documentation should include
 - ◆ potential risks and benefits
 - ◆ potential problems after the procedure
 - ◆ potential for sedation failure
 - ◆ consequences of not providing sedation/analgesia
 - ◆ alternatives to receiving sedation/analgesia

Preprocedural Fasting Guidelines To Minimize Aspiration Risk

Substance Ingested	Minimum Fasting Period
Clear Liquids	2
Breast Milk	4
Infant Formula	6
Non-human Milk	6
Light Meal	6

Pharmacology For Conscious Sedation

- A variety of agents can be used to provide sedation and analgesia.
- Opioids are primarily used when analgesia is required for painful procedures.
- Benzodiazepines and other sedatives are used to produce sedation, anxiolysis, and amnesia. Sedative drugs do not provide analgesia.

Pharmacology: Points To Ponder

- Drugs administered for conscious sedation should allow a patient to be calm, comfortable and cooperative.
- Clinical endpoints for conscious sedation may include a respiratory rate of 10-12 in an adult and a slurring of speech.
- A drug should be allowed to exert its full effect before administering additional doses or another drug.
- When combining opioids and sedatives, administer the opioid first to ensure the patient receives analgesia prior to painful stimulation.

More Points To Ponder

- Patients who receive sedatives may become disinhibited and, at times, uncooperative.



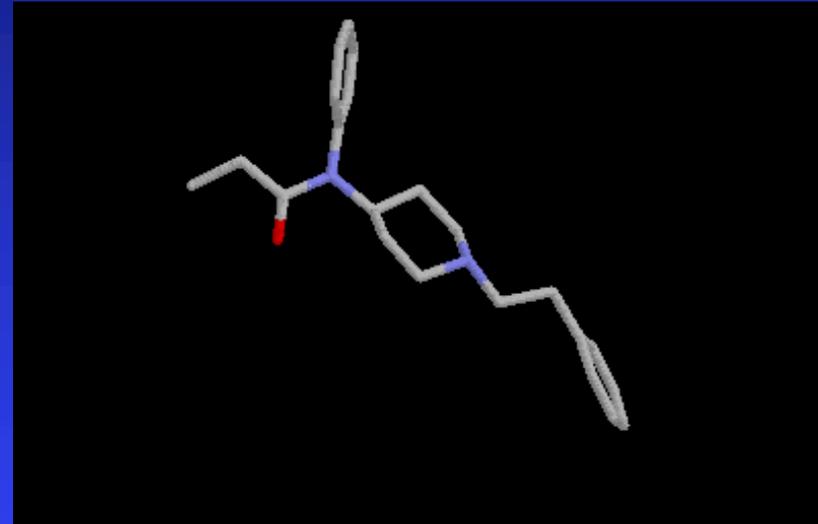
Another Point To Ponder

- All medications have the potential to cause unplanned deep sedation. When that happens providers may find themselves up to their bottom ends in alligators!



Opioids

- The opioids provide analgesia and some sedation, as well as alterations of mood and perception of surroundings. They may also depress cough reflexes.
- Examples include
 - ◆ morphine
 - ◆ hydromorphone
 - ◆ meperidine
 - ◆ fentanyl depicted at right
- Some opioids like meperidine and fentanyl are synthetic substances, while others are natural.



Opioids, con't

- Opioids exert their agonist actions at opioid receptors concentrated in the CNS.
- Opioids are highly lipid-soluble and are therefore rapidly and extensively distributed to tissues.
- Opioids tend to accumulate in reservoirs of fat, potentially producing long-lasting effects.
- Opioids are metabolized in the liver, but some active metabolites are excreted via the kidneys.

Opioids, con't

- Opioids exhibit some adverse effects including
 - ◆ decreased respiratory drive/apnea
 - ◆ potential increased PCO₂/decreased PO₂
 - ◆ altered hemodynamics and bradycardia
 - ◆ GI upset & itching
- True allergic reactions are fairly rare.

Opioids: Special Considerations

- Elderly patients are often more sensitive to the effects of opioids because of decreased hepatic or renal function and increased depots of fat-soluble drugs. Consider reduced doses.
- Pediatric patients, particularly those under 6 months, exhibit increased sensitivity to opioids because of immature blood-brain barrier and renal function.
- Meperidine should not be administered to patients who have taken MAO inhibitors within the past two weeks. Meperidine+MAO inhibitors=Seizures

Opioids: Relative Potency

- A standard way of evaluating opioid potency is to compare equianalgesic doses of a drug with morphine.
 - ◆ Morphine is 10x more potent than meperidine.
 - ◆ Morphine is 10x less potent than hydromorphone.
 - ◆ Morphine is 100x less potent than fentanyl.

Two Specific Opioids

- **Fentanyl** may cause chest wall and glottic rigidity, particularly when administered rapidly. This may make manual ventilation very difficult.
- **Meperidine** should be used cautiously in patients with renal/hepatic disease, those at risk for seizure due to accumulation of its active metabolite, normeperidine, and in those with little cardiac reserve.

Benzodiazepines (BZD)

- This class of drugs provides sedation, amnesia, anxiolysis, and even anticonvulsant properties by occupying the GABA receptor in the brain. GABA is the major inhibitory neurotransmitter in the CNS.
- Benzodiazepines include the drugs midazolam, diazepam, lorazepam, and alprazolam.



Benzodiazepines, con't

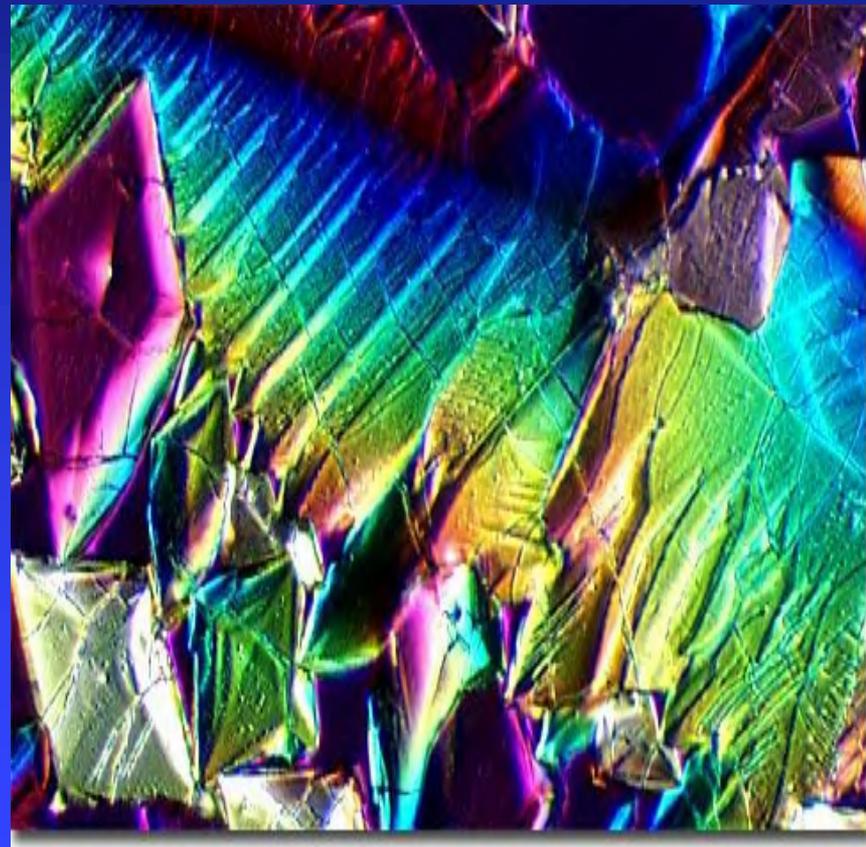
- Lipid solubility of BZDs determines onset & duration of a single bolus dose.
- Duration of action of BZDs is also related to blood level.
 - ◆ The short duration of a single, small dose of BZD is due to rapid redistribution out of the CNS, while repeated doses of these drugs prolongs their duration of action.

Benzodiazepines: Adverse Effects & Special Considerations

- BZDs may cause dose-related respiratory depression, hypotension, and tachycardia, particularly in the elderly.
- Midazolam administered rapidly is particularly likely to produce apnea.
- BZDs are generally contraindicated in pregnancy.
- Diazepam and lorazepam may cause thrombophlebitis.

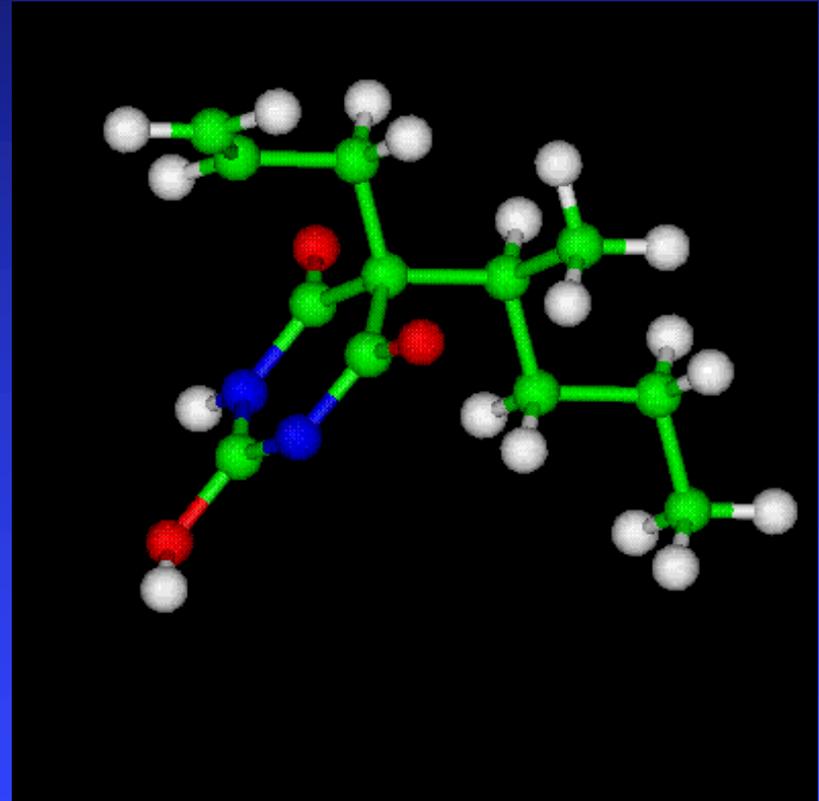
Benzodiazepines: Relative Potency

- Midazolam is 3-4x more potent than diazepam.
 - ◆ 10 mg diazepam=2.5-3mg midazolam.
- Lorazepam is 5x more potent than diazepam.
 - ◆ 10 mg diazepam=2mg lorazepam.
- At right is a crystalline pictograph of midazolam.



Barbiturates

- Barbiturates enhances GABA effects within the central nervous system, depress sensory cortex, and alter cerebellar function.



Barbiturates

- Barbiturates include sodium pentothal and methohexital.
- Barbiturates provide sedation but no analgesia.



Barbiturates, con't

■ Adverse effects

- ◆ Respiratory depression/apnea
- ◆ Laryngospasm, bronchospasm
- ◆ Tachycardia and hypotension
- ◆ CNS depression OR excitation
- ◆ Twitching & myoclonus, often mistaken for seizures

Barbiturates

■ Cautions

- ◆ Frequently produces deep sedation; should be used only by those with hospital privileges in deep sedation.
- ◆ Use cautiously in those with hepatic/renal disease, congestive heart failure, or hypovolemia
- ◆ Contraindicated in patients with porphyria.
- ◆ Very alkaline; causes tissues damage if extravastion occurs.
- ◆ Methohexital may induce seizures; not used in those with seizure disorder.

Chloral Hydrate

- Drug's mechanism of action is unknown.
- Primary effects are due to the active metabolite, trichlorethanol.
- Metabolized by the liver
- Degree of CNS depression is related to dose and frequency of administration.
- No analgesic properties.
- Onset of action may be delayed 30-60 min. with a duration of action of 60-90 min. May last up to eight hours in some instances.

Chloral Hydrate: Special Considerations

- Respiratory depression may be delayed four hours or more following administration.
- Increased risk of airway obstruction in children with enlarged tonsils & adenoids.
- May cause dysrhythmias in patients with structural or other heart disease.
- May cause paradoxical agitation, particularly in patients with neurological disorders; less effective in children >5 yrs .
- Liquid form may cause mucosal irritation throughout the body.

Diphenhydramine

- Antihistamine that works at H-1 receptors in the GI tract, blood vessels, and respiratory tract.
- Used for mild sedation & its antihistamine properties.
- May cause paradoxical excitement.
- May produce hypotension, tachycardia, and urinary retention.
- Metabolized in the liver.
- Causes anticholinergic effects in conjunction with MAO inhibitors.
- Use with caution in infants and young children.



Ketamine

- This drug carries an increased risk of deep sedation and should be used only by those with hospital privileges in deep sedation.
- Derivative of the street drug phencyclidine.
- Induces a functional dissociation between the cortical & limbic systems to create a sensory isolation and “trance-like” state.
- A potent pain reliever as the drug prevents cortical interpretation of noxious stimuli.

Ketamine

- Produces CNS stimulation & inhibits catecholamine uptake, so direct myocardial depressant effects are overcome.
- May cause nystagmus, vocalizations, and myoclonus.



Ketamine

- While producing sedation, amnesia, & analgesia, ketamine may also produce dreams & delirium. This is minimized by co-administering small doses of midazolam.

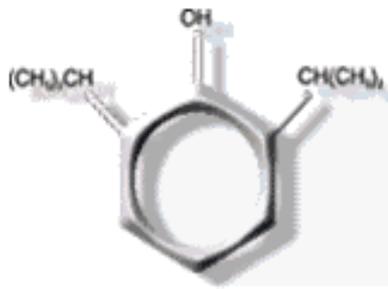


Ketamine: Other Considerations

- Ketamine produces heavy secretions; consider co-administration of glycopyllotrate as a drying agent.
- May be given IM or IV so useful when IV access is difficult.
- Causes increased intracranial pressure, exacerbation of congestive heart failure, and may decrease B/P in catecholamine-depleted patients.
- Onset of action is ~1 min. IV & 10-20 min. IM. Baseline level of consciousness returns ~15 min after single IV dose.

Propofol

- This drug carries an increased risk of progression to deep sedation and should be used only by those with hospital privileges in deep sedation.
- Propofol is thought to mediate activity at the GABA receptor in the CNS.
- Propofol has no analgesic properties but does produce sedation and amnesia.



DIPRIVAN[®]
INJECTABLE
EMULSION *propofol*



Anesthesia / Sedation

- Propofol is widely distributed in the body and is eliminated via hepatic & pulmonary systems.
- No dosage adjustments necessary in patients with hepatic/renal disease.
- To prevent hypotension consider reduced doses in the elderly, hypovolemic, or patients receiving other narcotics/sedatives.
- Supports rapid bacterial growth; discard 6 hrs after opening.

The Lytic Cocktail

- A fixed combination of meperidine, promethazine, and chlorpromazine.
- Long history of use in pediatric sedation.
- Commonly called DPT, an acronym for demerol, phenergan, and thorazine.
- Its use is strongly discouraged; equivalent or superior sedation may be achieved with single agents or individualized combinations of sedatives & narcotics.

Reversal Agents: Naloxone

- Naloxone is an opioid antagonist which binds to CNS opioid receptors to displace opioid agonists.
- Reverses respiratory depression and sedation associated with opioids.
- May be displaced from CNS receptors by additional doses of opioid.

Reversal Agents: Naloxone

- Naloxone's half-life is ~30 min; opioids' half-life is 4-6 hours.
 - ◆ Patients receiving naloxone will therefore require a longer period of monitoring to watch for recurrent respiratory depression.
 - ◆ May need additional doses of naloxone.
 - ◆ Monitor for one hour after last dose of naloxone.

Reversal Agents: Naloxone

- Naloxone may cause severe pain if entire analgesic effect of narcotics is reversed.
- Overadministration of naloxone results in tachycardia, hypertension, severe pain, nausea & vomiting, and even pulmonary edema related to sympathetic outflow.



Reversal Agents: Flumazenil

- Flumazenil binds to GABA receptors in the CNS to reverse effects of benzodiazepines.
- Flumazenil may be displaced from receptors by administration of additional BZDs.
- Flumazenil reverses sedation, respiratory depression & paradoxical agitation, and causes cessation of amnesia following its administration.

Reversal Agents: Flumazenil

- The half-life of BZDs may be >12 hrs; flumazenil's half-life is only ~45 min.
- Patients will require monitoring for 1 hr. after last dose of flumazenil.
- May precipitate sz in patients with underlying disorder.



Reversal Agents

Reversal Agents for Opioids and Benzodiazepines

Drug	IV Dosing		Onset	Peak	Duration
	Pediatrics	Adults			
Naloxone (opioid reversal)	0.01 mg/kg for children < 20 kg	0.04-0.1 mg prn	< 2 min	5-15 min	20-60 min
Flumazenil (benzodiazepine reversal)	0.01 mg/kg for children < 20 kg	0.1 mg increments prn	1-3 min	6-10 min	<60 min

Notes of Caution:

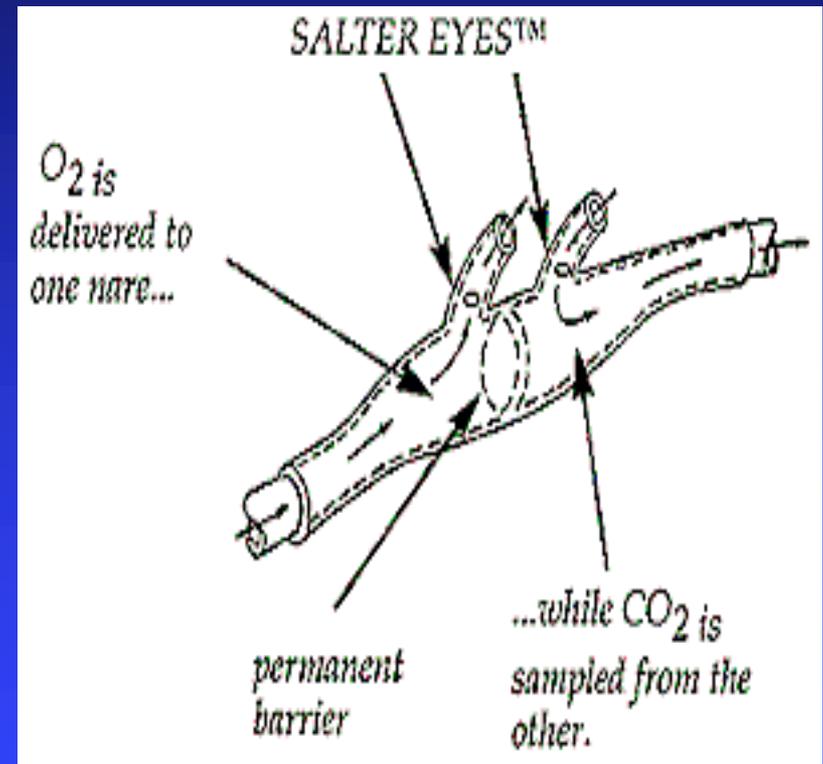
1. For inadequate ventilation, start with naloxone at the low end of the dosing scale. For apnea, start with 0.1 mg increments.
2. The higher doses of naloxone may also reverse the analgesia, leading to an acute increase in pain, hypertension, and/or nausea.
3. Naloxone is stocked as either 0.4 mg/ml or 1 mg/ml. It may be easier to dilute 1 ml to a total of 10 ml with normal saline.
 - o For 0.4 mg in 10 ml (conc = 0.04 mg/ml), dose is 1-2 ml prn.
 - o For 1 mg in 10 ml (conc = 0.1 mg/ml), dose is 0.5-1ml prn.
4. Since the duration of action of both of these agents is shorter than that of the drug they are reversing, repeat doses may be needed and patients should continue to be monitored.

Monitoring & Oxygen Administration

- Oxygen saturation should be recorded prior to administration of supplemental oxygen & prior to initiating sedation. Pulse oximeter tone should be in the “on” position.
- Oxygen should be administered to all patients undergoing conscious sedation
 - ◆ Begin at 2L/min via nasal cannula
 - ◆ Changes in rate/mode of oxygen delivery may be made at the discretion of the team.

Monitoring & Oxygen Administration

- Salter cannulas may be used to simultaneously administer O_2 and monitor CO_2 in a patient who is breathing spontaneously. This increases safety by producing an observable capnograph that will disappear in the face of apnea or disconnection/obstruction of the capnograph.



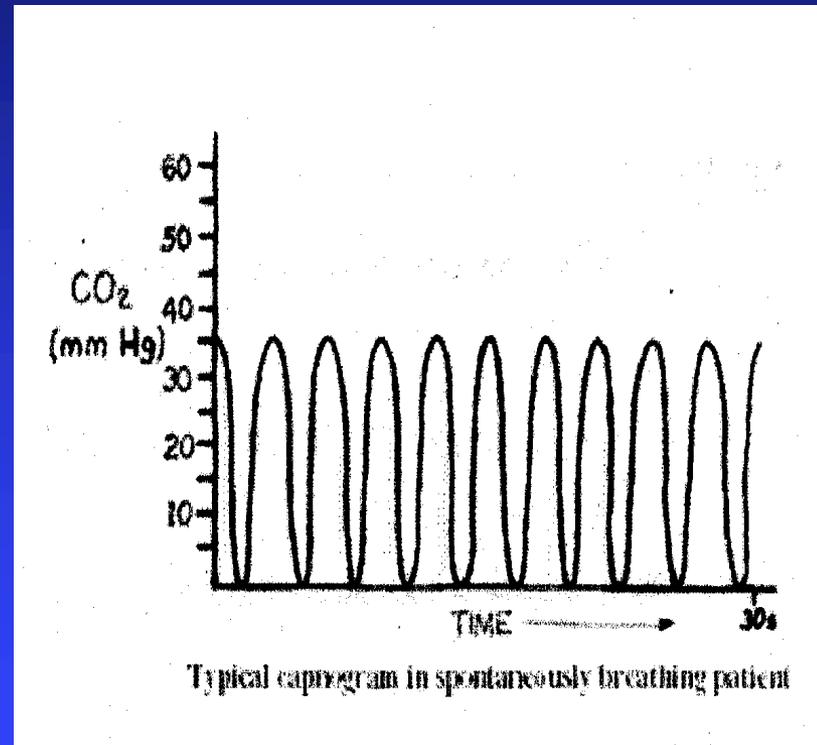
Monitoring Respiration

■ Respiration

- ◆ Baseline assessment made & recorded prior to administration of drugs and at least every 15 minutes thereafter.
- ◆ Note and record respiratory rate
- ◆ Continually observe for adequacy of spontaneous ventilation/airway patency.
- ◆ Auscultate; Watch the chest rise & fall!
- ◆ May utilize capnometry

Monitoring Respiration: Capnography

- Capnograms display a digital readout of inspired and end-tidal carbon dioxide and may be obtained via a Salter cannula that monitors CO_2 .
- Loss of capnogram tracing may indicate patient apnea or disconnection/obstruction of the capnogram.



Monitoring B/P & Heart Rate

- Baseline measurements and recordings are required.
- Assess & document 2-3 minutes after administration of any drug, when the patient's condition changes, and at least every 15 minutes.
- Consider EKG monitoring for patients with cardiac disease or at risk for dysrhythmias.

Monitoring Level of Consciousness

- Pt. Response to commands/light tactile stimuli should be frequently assessed using the patient sedation scale.
- Document the patient's level of consciousness at least every 15 minutes.

Monitoring & Intervention

- Pts responding only to painful stimulation are deeply sedated and at risk for airway compromise.
- Immediately evaluate
 - ◆ Instruct pt to take a deep breath, physically stimulate patient and instruct again to take a deep breath.
- A provider with privileges in deep sedation or anesthesia personnel should be immediately available to provide airway and/or hemodynamic support as necessary.

Monitoring & Intervention

- Initial interventions to establish a patent airway and improve oxygenation
 - ◆ Open the airway with a jaw thrust
 - ◆ Insertion of nasal airway

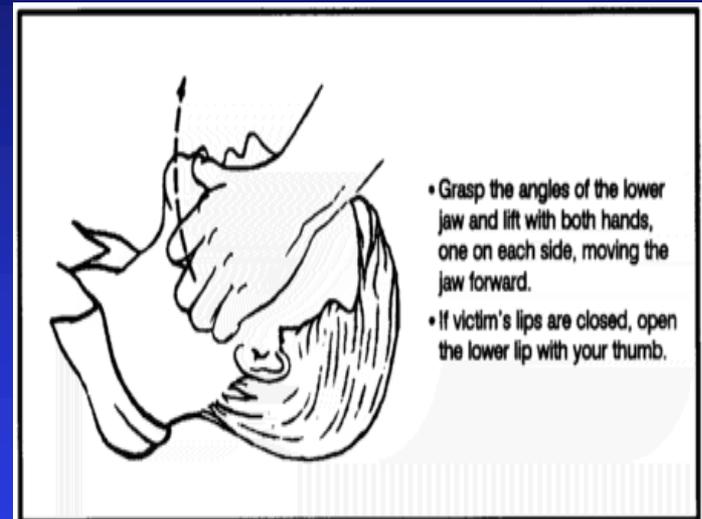
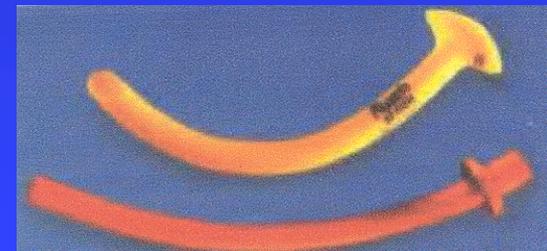


Figure 4-1. Jaw thrust method.



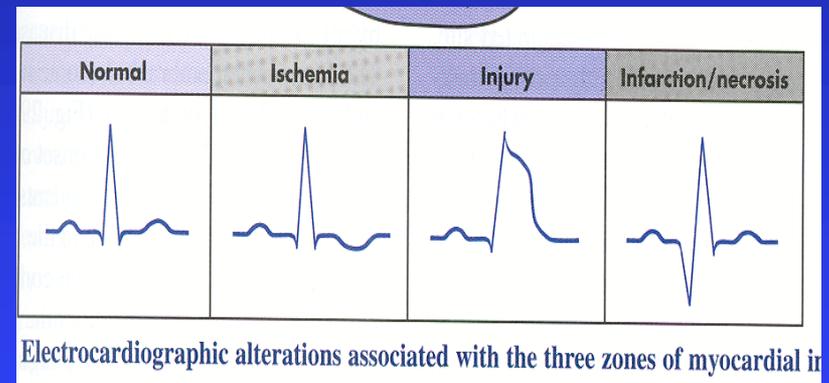
Monitoring & Intervention

- Other interventions to establish a patent airway and improve oxygenation include increasing oxygen concentration and manually ventilating the patient with a bag-valve mask device.



Monitoring & Intervention

- Patients may require intervention if they experience serious changes in vital signs or EKG tracing as they undergo conscious sedation.
- From left to right: Normal EKG, ischemic EKG, EKG demonstrating injury, and EKG demonstrating necrosis.



Monitoring & Equipment

- It is the responsibility of the person monitoring the patient to ensure that the following items are present & operational prior to initiating conscious sedation:
 - ◆ Source of oxygen & suction
 - ◆ Suction catheters
 - ◆ Nasal cannula, simple face masks, & blow-by sets for oxygen delivery
 - ◆ Pulse oximeter & probes
 - ◆ B/P machine /manometer and cuffs
 - ◆ EKG machine and/or stethoscope.

Emergency Equipment

- A number of items must be immediately available & operational before undertaking procedural sedation.
 - ◆ Supplemental monitors
 - ◆ Basic & advanced airway management equipment
 - ◆ IV supplies
 - ◆ Emergency drugs
 - ◆ Defibrillator

Recovery & Discharge

- The recovery period lasts from the conclusion of the test/operative procedure until the patient has returned to baseline.
- Saturation should be monitored continuously, and vital signs/level of consciousness recorded at regular intervals.
- Discharge instructions should be clearly written and reviewed with patient/responsible adult.

Conclusion

- Conscious sedation that is carefully planned and carried out by a thoughtful, well-trained health care team will allow both caregivers and patients to have a positive experience rather than a bad memory.

