

# Procedural Sedation

## Emergency Principles

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## Objectives

- Review the policies pertaining to sedation in the ED
- Discuss the myths of procedural sedation
- Understand the medications appropriate for sedation

# Policy

- Years ago, the method of choice was brutaine
- Turf battles, agents used in ED
- Still present in some departments today
- ACEP clinical policy: 2005  
Clinical Policy: Procedural Sedation and Analgesia in the Emergency Department  
[www.ACEP.org](http://www.ACEP.org)
- Several studies show decreased cost
- Most studies show E.P.s are quite capable of sedation
- Important to document, protocols

PAIN MANAGEMENT/CLINICAL POLICY

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**Clinical Policy: Procedural Sedation and Analgesia in the  
Emergency Department**

From the American College of Emergency Physicians Clinical Policies Subcommittee (Writing Committee) on  
Procedural Sedation and Analgesia:

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**PREFACE**  
Emergency medicine training provides physicians with expertise in critical care, airway and pain management.

Accordingly, expertise in procedural sedation and analgesia is a core competency in emergency medicine practice.<sup>1,2</sup> Emergency physicians routinely provide sedation, analgesia, respiratory, and hemodynamic management of critically ill patients.

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## The Joint Commission Mandate DEFINITIONS

- [www.jcaho.org](http://www.jcaho.org) (directs you to ASA website)
- PSA – Procedural Sedation and Analgesia
- *Minimal sedation:*
  - “light sedation”
  - Patient responds normally to verbal stimuli
  - Ventilatory/cardiovascular fxn preserved

## DEFINITIONS

- *Moderate Sedation/Analgesia (Formally Conscious sedation)*
  - Pt responds purposefully to verbal command
  - Airway maintained
  - Spontaneous ventilation adequate
  - Cardiovascular function maintained
  - e.g.- fentanyl/midazolam

## DEFINITIONS

- ***Deep Sedation/Analgesia***
  - Pt cannot be easily aroused “unconscious sedation”
  - Pt responds purposefully after repeated or painful stimuli
  - Ventilatory function may be impaired
    - May require assistance
    - Spontaneous ventilation may be inadequate
  - Cardiovascular function may be impaired

## DEFINITIONS

- ***Anesthesia***
  - Pt not arousable, even to painful stimuli
  - Independent ventilatory function impaired
  - Airway assistance often impaired
  - Cardiovascular function may be impaired
  - Many of the PSA’s we do are **between *deep sedation and anesthesia***

## Joint Commission Standard

- Patients must receive pre-sedation assessment and give informed consent (risk, benefits, options)
- Must be re-evaluated immediately *before* sedation
- Status reviewed after sedation and prior to discharge

## Joint Commission Standard

- Personnel must be credentialed
  - To administer agents, monitor, have sufficient number
  - Competency-based education and training
  - Have appropriate equipment
    - Pulse ox, BP cuff, monitor, EKG machine
  - Everything must be documented
  - Licensed medical practitioner must discharge

- **STATEMENT ON GRANTING PRIVILEGES TO NONANESTHESIOLOGIST PRACTITIONERS FOR PERSONALLY ADMINISTERING DEEP SEDATION OR SUPERVISING DEEP SEDATION BY INDIVIDUALS WHO ARE NOT ANESTHESIA PROFESSIONALS**
- **(Approved by the ASA House of Delegates on October 18, 2006)**
- Because of the significant risk that patients who receive deep sedation may enter a state of general anesthesia, privileges to administer deep sedation should be granted only to practitioners who are qualified to administer general anesthesia or to appropriately supervised anesthesia professionals.

## When to sedate?

- IV insertion
- LP
- Burn evaluation/debride
- FB removal
- Suturing
- Fracture care and reduction
- Chest tubes
- Nasal packing
- RSI/intubation
- CT/MRI
- SANE exams
- Diagnostic procedures
- Calming the agitated
- I&D
- Cardioversion
- Many, many more

# Prepare, Prepare, Prepare

- Co-morbidity, allergies
- assess airway
  - Joint Commission “the standards for anesthesia care apply when patients, in any setting, receive sedation (with or without analgesia) which, in the manner used, *may be reasonably expected to result in the loss of protective reflexes*”
  - Therefore, we are expected to act like anesthesiologists during these procedures

# Prepare, Prepare, Prepare

- Airway:
  - patients may react unexpectedly - always prepare for the worst
  - have bag **READY** - know how to use it!
  - **SUCTION**
  - in my experience, the more prepared, the less complications
  - Capnography, Bispectral Index
    - Might be the only clue to hypoventilation and ventilatory failure
    - Minimal data on **OUTCOMES**

## “The full stomach”

- risk of pneumonitis is inversely related to the pH of undiluted gastric fluid
- fasting increases aspiration risk (increased gastric fluid, decreased pH)
- Clinical Policy: Critical Issues in the Sedation of Pediatric Patients in the Emergency Department
- Approved by the ACEP Board of Directors  
October 5, 2007



## “The full stomach”

- ASA recommends (without evidence), that pts should not undergo sedation if they had solids within 6 hrs, liquids within 2 hrs (minimize aspiration risk)
- Probably no relationship b/w fasting status and adverse events
- Agrawal, et.al. *Ann Emerg Med* 2003;42(5):636-645
  - >1000 pediatric procedural sedations
  - 6.7% incidence of adverse events
  - NONE related to pre-sedation fasting status
  - **NO ASPIRATION EVENTS REPORTED**

## Oxygen

- Monitor, pulse ox
- *oximetry does not identify hypoventilation, only hypoxia*
- Theoretically ?O<sub>2</sub> reserves, avert hypoxia
- no data to support supplemental oxygen - can delay recognition of ventilatory failure
- Solution: capnography

## Talk to your patient (and/or their family)

- Explanation is important
- Prepares the family for the procedure
- Explain effects (ketamine especially)
- Invite parents/family to stay, as long as they sit down

*“Sympathy with joy intensifies the sum of sympathy in the world, sympathy with pain does not really diminish the amount of pain”*

-Oscar Wilde

## Routes of administration

Route	Advantage	Disadvantage
IV	Rapid, reliable, titratable	Need to place IV, can get dislodged
IM	Simple	Painful, scary (all ages), Erratic absorption (delay)
PO	Painless, pt acceptance	Large doses, erratic absorption (delay)
PR	Some meds well absorbed	Not well tolerated, erratic absorption

## Medication Pearls

- If you are using a benzo or opiate, have reversal agents handy (know doses)
  - flumazenil - careful in chronics
    - 0.2mg over 15 secs, then 0.2mg qmin up to a mg
  - narcan - careful of withdrawal
    - 0.2mg and titrate up
- Probably better to titrate than bolus

## It's really anxiety....

- We're effective at pain management
- Anxiety is the *real* challenge
  - Hard to control
  - Systemic sedation is sometimes not practical
  - Topic anesthetics are usually not effective
  - Forceful immobilization is potentially traumatic
- Thus, we provide PSA to combat
  - Anxiety, pain, memory

***“Restriction of sedatives or analgesics is not in the best interests of the patient - provided the doctors who use these medications demonstrate a reasonable knowledge about their use”***

## Choosing a “cocktail”

- Many agents and combinations
- Think
  - Age of patient
  - Needs
  - Length of procedure
  - Ability to handle complications (and side-effects)
  - Reversibility of agents

## Chloral Hydrate

- Children undergoing diagnostic procedures
- Sedative/hypnotic – *no analgesia*
- PO or PR
- 25-50mg/kg (up to 2g)
- superior to oral midazolam (big whoop)
  - 40% FAILURE RATE!
- Respiratory failure, hypotension, paradoxical agitation, unreliable, bad taste
- slow (up to 1hr), weak, **not recommended in ED**

## Benzodiazepines

- Anxiolytic/sedation/hypnotic
- Valium (diazepam) vs Versed (midazolam)
- conflicting data
- more experience with midazolam

## Valium vs Versed

- Diazepam slightly faster onset by a minute or so, greater amnesia, decreased length of stay (on in 2-4min)
- wait 2-3 minutes after IV injection for maximal affect (redose after 10min)
- both last about 40 minutes
- Versed better intramuscular absorption
- **This is sedation not analgesia!**

## Versed

- Start with 1-2mg in adults (children 0.05mg/kg) IV; 0.08mg/kg IM (hurts)
- Orally - not very effective - commercially prepared or use IV form
  - 0.5mg/kg up to 10mg
  - watch disinhibition - you ever see a kid get agitated from it? 1.5% - 3% paradoxical reaction (consider opiate prior or flumazenil)

# Fentanyl

- Most popular opiate – sedative/analgesic
  - Enhanced effect/complications with benzos
- No histamine release (minimal hypotension)
- off in 45 minutes
- 1 mcg/kg every 5 minutes (I recommend titration)
- give SLOWLY - chest rigidity (narcan)
- Facial pruritis/nose rubbing
- may have to tell patients to breath!!!!

# Propofol

- Used since 1989 – mainly OR and vent pts
- 2,6-diisopropylphenol - very rapid onset (30sec), dissipates within 6-8 min
- 0.5-1.0mg/kg IV – may repeat every 2-3 minutes (0.5mg/kg)
  - may require 2 or 3 doses
  - Give over 30 seconds (less respiratory depression)
- Recovery is dramatic
- NO confusion, vomiting, agitation

# Propofol

- No analgesic properties
  - can be combined with fentanyl
- Painful administration
  - May add lidocaine (0.5mg/kg)
- watch that airway (2-5%), hypotension
  - *Acad EM* 1999;6:989-997
- Watch those with allergies to soybean oil, egg yolk, and disodium edetate

## The Safe and Effective Use of Propofol Sedation in Children Undergoing Diagnostic and Therapeutic Procedures: Experience in a Pediatric ICU and a Review of the Literature

- Wheeler, DS, et al, *Ped Emerg Care* 19(6):385, December 2003
- 110 same day procedures in San Diego Naval Medical center
- ICU administration
- Induction dose ranged from 1-5.8 mg/kg (avg 2.4 mg/kg)
- 81% required an additional dose in the form of an infusion
- 32% received a dose of fentanyl for analgesia
- 3 patients developed hypotension requiring a fluid bolus
- 3 patients had O<sub>2</sub> desaturation requiring airway repositioning

## Propofol in Emergency Medicine: Pushing the Sedation Frontier

- Green, SM, et al, *Ann Emerg Med* 42(6):792, December 2003
- According to Joint Commission individual hospitals can set their own policies on procedural sedation
- Pre-oxygenated patients can tolerate respiratory depression and frank apnea for 1-3 minutes
- No evidence that Propofol creates an undue risk of aspiration
- Addition of capnography to monitor interventions might be judicious to mirror the practice of anesthesiologists (?BIS monitoring)

## Use of Propofol Sedation in a Pediatric Emergency Medicine Department: A Prospective Study

- Skokan, EG, et al, *Clin Ped* 40(12):663 December 2001
- Prospective study involving 40 children in a Utah Peds ED, aged 2mos-16yrs
- All rec'd opiates as pretreatment
- Bolus dosing used 1mg/0.5mg per Kg
- Total dose ranged from 1.5-8.5 mg/kg (avg dose 3.3 mg/kg)
- None of the patients who received supplemental O2 had evidence of desaturation
- Most children exhibited a drop in BP, but this almost always resolved spontaneously

## Pros and Cons of Propofol

- Quick onset
- Rapid Recovery
- Marked Potency
- Antiemetic
- Euphoric
- Hypotension
- Apnea
- Pain on Injection
- Bradycardia
- Bacterial contamination of lipid emulsion

*“There are only three sins - causing pain, causing fear, and causing anguish. The rest is window dressing.”*

*-Roger Caras*

# Nitrous Oxide

“the tank should be kept in a locked room, as the gas tends to mysteriously disappear in uncontrolled conditions”

- Was at Christiana, until.....you know
- 50/50 mixture with oxygen recommended
- self-administered mask - will drop when they are out (on 3min, off 1-3min)
- need good ventilation and scavenger system
- can diffuse into air-filled space (bowel-SBO,PTX)



# Methohexital

- Pediatric considerations
  - Barbiturate: sedative/hypnotic
  - IV 1.0mg/kg; duration 5-10 min
  - Rectal dose 25mg/kg up to 500mg
  - Onset 9 min
  - Duration 45 min
  - No serious side effects
    - Avoid use in seizure disorder or porphyria
  - 87% effective
  - Better than chloral hydrate

## Pentobarbital

- The best medicine for CT scan in children:  
on in minutes, off in 20 min
- IV: Time 0 - 1.5mg/kg  
2 min - 1.25mg/kg  
4 min - 1.25mg/kg\*  
\*hold this dose until in scanner  
not usually necessary

## Ketamine

- “the safest anesthetic in the world”
- “the lights are on and nobody’s home”
- dissociates cortical activity from the brainstem rather than depressing CNS function: sedative/analgesic
- VS maintained, airway reflexes intact
- increase BP, pulse
- weak bronchodilator

## Ketamine (con't)

- IM: 4-5mg/kg
  - onset 5 minutes, lasts 30-45 min (can take over 1 hour for recovery)
- IV: 1-2mg/kg
  - onset 1 minute, lasts 20-30 minutes
  - can titrate with an additional dose
- Most studies show same effects on discharge, satisfaction. AVOID IV?

## Ketamine: adverse effects

- Increased oral/bronchial secretions
- emergence effect = nightmares, greatest under the age of 5 – 22% vs 12%
- N, V (5-10%-most at home), ?ICP
- laryngospasm: rare, may need a minute of bagging (<1%)
- Bronchorrhea: atropine recommended for under 5yo
- Abnormal gait up to 1/3
- Roving eyes, *The Exorcist*

## Ketamine for adults

- Some literature support
- people fear emergence reactions
- adjunctive sedation controls/prevents
  - versed
- Most studies show for children, versed adds NOTHING, except added sedation

## Contraindications to Ketamine

- <3 months
- pulmonary/tracheal disease
- significant CAD
- Glaucoma/globe injury (?IOP)
- psychiatric illness
- recently ate?

## Ketofol

- Combination of half propofol and half ketamine IV (same syringe, titrated)
- Willman. *Ann Emerg Med*, 2007;49:23-30
- High efficacy, few adverse effects, short recovery time
- Less hypotension than propofol alone
- Lower doses required (propofol-0.75mg/kg and ketamine-0.75mg/kg)

## The DART

- Mixture of IM meds producing nice predictable sedation:
  - ketamine 3-5mg/kg
  - atropine 0.01 - 0.02 mg/kg (no less than 0.1mg)
  - +/- versed 0.1mg/kg - watch sedation with this, not validated in the literature
    - Sherwin, Green, *Ann EM* 2000;36
    - We no longer use benzos in combo at CCHS

# ETOMIDATE

- Used extensively as induction agent (1972 in Europe, 1983 US)
- recently increased usage for sedation
- deep sedation
- carboxylated imidazole - unrelated to all other agents

## Etomidate PK/PD

- Hypnosis in one arm-brain circulation (about 15sec)
- 0.15 mg/kg IV over 3 seconds
- Return of consciousness in 3-7 minutes
- Rapid IV infusion – as fast as you can push
- use less in the elderly
- decreased intracranial pressure/cerebral protective properties (increases oxygen supply/demand ratio)

## Etomidate

- Minimal cardiovascular effects
- Effects on ventilation are minimal
  - may be brief period of hyperventilation followed by apnea (20sec)
- N,V - *reported up to 30%* in anesthesia studies **with anesthesia doses**
- Temporary blockade of adrenal response to ACTH - lowering cortisol - not considered clinically significant or is it?
  - 2 abstracts at 2007 SCCM meeting (? LOS, ICU, mortality)

## Etomidate

- Pain on injection up to 60%
- **Myoclonus** up to 15-20% (70% in one study) –
  - transient, ?fentanyl decreases
- PI states to be careful under 10yo due to lack of data - but it is used commonly for RSI
- May lower seizure threshold in those with FOCAL seizure, otherwise protective
- **Finding some failures in large drinkers of ETOH (? Same for propofol)**

## Etomidate (CCHS study)

- Side effects:
  - Myoclonic jerks: 16/78 (21%):
    - Described as any noted involuntary muscular movements.
  - Hypoxia 15/78 (19%):
    - 13% required supplemental oxygen.
    - 6% required a brief period of bagging.
  - Nausea 4/78 (5%).
- 8 required re-sedation (10%).
- Levine, BJ, Jasani, NB, Vickers, SM, Rosenbaum, RA, Largen, KN. The Use of Etomidate for procedural sedation in the emergency department. *Academic Emergency Medicine*, 2001;8 (5):423.

## Propofol vs Etomidate

- |             | <u>Propofol(109)</u> | <u>Etomidate(105)</u> |
|-------------|----------------------|-----------------------|
| • Efficacy  | 97%                  | 89%                   |
| • Myoclonus | 1.8%                 | 20%                   |
| • Time      | 6.8min               | 8.8min                |
| • ?BP (sys) | 7.9mmHg              | 3.8mmHg               |
- Equal – desaturation, BP (and changes), ETCO<sub>2</sub> (and change)
  - Miner, JR, et al. *Ann Emerg Med*. 2007;49:15-22

## After the procedure

- You are not done, don't walk away and never come back
- Complications occur after the procedure
- Reduce the joint and they may stop breathing
- If reversal agent used, watch the patient for about 2 hours!
- Need to be able to walk, talk and oxygenate efficiently

## Procedural sedation

- **Conclusions:**
  - Prepare, prepare, prepare
  - Have suction, reversal agents, BVM available
  - *KNOW EVERYTHING ABOUT ANY MEDICINE YOU GIVE TO A PATIENT*- there is no ONE cocktail for everyone!
  - Assess comorbidities
  - Have fun!!!!!!You can really make a difference in a pt's ED visit for a lifetime!
  - Fill out all forms
  - Review Green, SM. *Ann Emerg Med* 2007;49:31-36