

Pediatric sedation and analgesia

Twenty, twenty, twenty-four hours ago
 I wanna be sedated
 Nothing to do nowhere to go
 I wanna be sedated
 the Ramones

Indications

- **control pain** - from trauma, post-operative pain, or for painful procedures
- **decrease anxiety** - hospital environment may provoke anxiety
- **decrease motion** - for diagnostic procedures (e.g., CT, MRI)

Conscious sedation

- **protective reflexes maintained**
- **patient able to maintain own airway**
- **appropriate response to stimulation or voice command** - e.g., "open your eyes"

Deep sedation

- **cannot respond purposefully to physical or verbal stimulation**
- **may have partial or complete loss of protective reflexes**
- **may not be able to maintain a patent airway independently**

General anesthesia

- **unconscious**
- **cannot respond purposefully to physical or verbal stimulation**
- **loss of protective reflexes including inability to maintain airway independently**

Sedation as a continuum

- **responsible physician must be prepared to handle next deeper level of sedation**

Each state of sedation carries the risk of the patient slipping into the next deeper level of sedation; therefore, if conscious sedation is used, must be prepared to manage a patient in deep sedation

General guidelines - equipment

Must be appropriate for age and size of the patient

- **blood pressure and oxygen saturation equipment**
- **access to positive-pressure oxygen delivery system**
- **access to emergency cart or kit**

General guidelines - documentation

- **informed consent and instructions** - risks and benefits of sedation must be explained to parents and consent obtained and documented. Information must be given to the person responsible for the patient, including objectives of the sedation, anticipated changes in behavior during and after sedation, limitations of activities and any dietary precautions and a 24-hour telephone number for the practitioner or his/her associates (see AAP guidelines).
- **patient's recent food and fluid intake** - NPO guidelines appropriate for age should be followed (see AAP guidelines)
- **history and physical**
- **vital signs, oxygen saturation, and level of responsiveness during sedation**
- **level of consciousness at time of discharge**

General guidelines - personnel

- **person doing procedure**
- **separate person responsible for monitoring**

Medications available**Local anesthetics**

- **lidocaine** - overdose may cause seizures, cardiovascular depression; calculate dose, particularly in small children; maximum recommended dose = 7mg/kg
- **TAC (tetracaine, adrenaline, cocaine)** - can be applied topically; may see toxicity if applied to large mucosal surface which allows rapid drug absorption; avoid use in areas with limited circulation (e.g., tip of finger) because of vasoconstrictive properties
- **EMLA (eutectic mixture of local anesthetics)** - lidocaine plus prilocaine; absorbed through intact skin; may induce methemoglobinemia if excessive drug is applied for longer than necessary

Analgesics - non-narcotic

- **acetaminophen**
- **aspirin** - avoid with chicken pox or influenza
- **nonsteroidal anti-inflammatory agents**
 - **ibuprofen**
 - **ketorolac** - may be given IV or IM

Analgesics - narcotic

May cause respiratory depression, particularly when combined with a benzodiazepine; can be reversed with **naloxone (Narcan) 0.01-0.1 mg/kg** - however, half-life of naloxone may be shorter than that of the narcotic, making repeated doses necessary

- **morphine** - dose 0.1-0.2 mg/kg IV or IM; good sedation and analgesia; onset 10 minutes if given IV, 20-60 minutes if given IM; duration of action 3-4 hours; may decrease systemic vascular resistance; may cause histamine release
- **meperidine** - dose 1-2 mg/kg IV or IM; onset 15-30 minutes with peak effect 45-60 minutes IV, 90 minutes IM; half-life 3-4 hours; may accumulate toxic metabolites (normeperidine) if given chronically
- **fentanyl** - dose 1-2 mcg/kg IV; rapid onset of action; opioid effects last 30-45 minutes, but respiratory depression may last longer; can cause chest wall and glottic rigidity when given rapidly; less histamine release than morphine; may be given transdermally
- **codeine** - dose 0.5-0.75 mg/kg; useful for mild to moderate pain; well absorbed orally

Sedatives - benzodiazepines

Relieve anxiety, provide sedation and amnesia; no analgesic properties; can be given orally, rectally or IV; respiratory and/or cardiovascular depression may occur, particularly with rapid administration; may be reversed with **flumazenil 0.002-0.02 mg/kg**; may cause agitation and hyperexcitability

- **diazepam** - dose 0.1-0.3 mg/kg; onset of action IV 1-3 minutes; duration of action 15-30 minutes
- **midazolam** - dose 0.05-0.1 mg/kg; fast onset (1-5 minutes) and shortest duration of action
- **lorazepam** - 0.02-0.05 mg/kg; onset of action IV 15-30 minutes; duration of action 8-12 hours

Sedatives - barbiturates

CNS depression, from mild sedation to deep coma; no analgesic properties; may cause respiratory depression with loss of protective airway reflexes at higher doses; may cause cardiovascular depression

- **pentobarbital** - dose 2-5 mg/kg; onset of action within 1 minute given IV, 15-60 minutes given orally or rectally; duration of hypnotic effect 15 minutes given IV, 1-4 hours given orally or rectally
- **thiopental** - rapid onset and short duration of action; causes significant respiratory depression; useful for rapid sequence intubation

Sedatives - other

- **chloral hydrate** - sedative-hypnotic; no analgesic properties; dose 20-100 mg/kg po or pr; onset of sleep 30-60 minutes; irregular absorption may lead to prolonged effect; minimal effects on respiration
- **propofol** - extremely short-acting sedative-hypnotic; continuous infusion required to maintain sedation; rapidly produces a state of general anesthesia, therefore should not be used by individuals unskilled in airway management; may cause hypotension particularly with rapid bolus injection; causes pain at injection site

Other agents

- **diphenhydramine** - antihistamine, with side effect of sedation, from mild drowsiness to deep sleep; dose 1-1.5 mg/kg orally or IV; may cause paradoxical excitement
- **hydroxyzine** - antihistamine, with side effect of sedation, from mild drowsiness to deep sleep; may cause paradoxical excitement
- **ketamine** - phencyclidine derivative; provides sedation, amnesia and analgesia; less respiratory or cardiovascular depression than narcotic/benzodiazepine combination; may cause hypersalivation, laryngospasm, hypertension, increased intracranial pressure or increased intraocular pressure; may cause emergence dysphoria; use with anticholinergic agent such as atropine (decreases secretion production) and a benzodiazepine (reduces emergence dysphoria)
- **DPT** - Demerol/Phenergen/Thorazine; slow onset with prolonged effect; impossible to titrate to effect; may lead to respiratory depression; can lead to dystonic reactions

Choose agents based on expectations of procedure

- **e.g., sedatives only if procedure is not painful, analgesics if pain is expected**
- **try to match duration of action to expected duration of procedure**

Use only drugs you have experience with and feel comfortable using