

Table 1. Procedural Sedation Pharmacopeia*§

Analgesia	Dose	Onset	Duration	Notes	Side effects/contraindications
Fentanyl	0.5 mcg/kg IV (<6mo) 1 mcg/kg IV (>6mo)	3-5 min	30-60 min	Preferred opiate for procedural sedation because of short duration of action and reduced side effects	Respiratory depression (synergistic with sedative-hypnotics), vomiting, bradycardia, chest wall rigidity (rare)
Morphine	0.1 mg/kg IV	5-10 min	2-4h	Longer duration of action with more frequent side effects	Hypotension, vomiting, pruritis
	0.1-0.2 mg/kg IM	20-30 min	2-4h		
Sedation					
Ketamine	1-1.5 mg/kg IV over 1-2min May repeat 0.5-1 mg/kg q10min	1 min	15 min	Preferred agent for a wide variety of procedures; recommend adjunctive glycopyrrolate or atropine to reduce hypersalivation; adjunctive benzodiazepine not necessary, provides both sedation and analgesia	Hypersalivation, vomiting, upper airway obstruction, laryngospasm, emergence reactions Numerous contraindications including active URI or asthma*
	4-5 mg/kg IM May repeat 2-4 mg/kg q10min	3-5 min	15-30 min		
Midazolam	0.05-0.1 mg/kg IV (1-5y) 0.025-0.05 mg/kg IV (6-12y)	2-3 min	45-60 min	Reduce dose when used with opiates; wide variety of formulations	Respiratory depression, paradoxical excitement (may be treated with additional midazolam)
	0.1-0.15 mg/kg IM	10-20 min	60-120 min		
	0.5-0.75 mg/kg PO	15-30 min	60-90 min		
Methohexital	0.2-0.5 mg/kg IN	10-15 min	60 min	Useful for orthopedic reductions (IV) and diagnostic imaging (PR); do not combine PR form with other agents due to additive risk of respiratory depression	Respiratory depression (potent when given IV), paradoxical excitement, hiccups, cough; Contraindicated in temporal lobe epilepsy, porphyria
	0.5-1 mg/kg IV	1 min	5-10 min		
	15-25 mg/kg PR	3-5 min 10-15 min	60 min		
Thiopental	25 mg/kg PR (>3mo)	10-15 min	60-120 min	Useful for medium duration diagnostic imaging studies	Respiratory depression, paradoxical excitement, difficult to titrate, hiccups, cough; Contraindicated in temporal lobe epilepsy, porphyria
Pentobarbital	1-2 mg/kg IV q3min to max 5 mg/kg	3-5 min	15-45 min	Useful for longer duration diagnostic imaging	Respiratory depression, paradoxical excitement, difficult to titrate, hiccups, cough; Contraindicated in temporal lobe epilepsy, porphyria
	2-6 mg/kg IM, 100 mg max	10-15 min	60-120 min		

(Table continued on next page.)

Table 1 (Continued). Procedural Sedation Pharmacopeia*§

Analgesia	Dose	Onset	Duration	Notes	Side effects/contraindications
Propofol	1 mg/kg IV over 2 min Repeat 0.5 mg/kg q30sec as needed	1 min	5-15 min	Useful when deep sedation is required; use adjunctive analgesia; has antiemetic properties	Potent respiratory depression, hypotension, pain on injection; Contraindicated in porphyria, soybean or egg allergy
Etomidate	0.15-0.2 mg/kg over 30-60sec May repeat 0.1-0.2 mg q10min	1 min	5-15 min	Useful when deep sedation required; use adjunctive analgesia; minimal hemodynamic side effects	Respiratory depression, myoclonus, nausea and vomiting
Nitrous Oxide	Preset mixture with \geq 30% O ₂	<5 min	<5 min	Using demand valve useful for minimally painful procedures; continuous flow provides deeper sedation but closer monitoring, may need adjunctive analgesia	Euphoria, laughter, crying, voice changes, emesis; Contraindicated if suspect air trapped within hollow viscous (e.g., bowel obstruction)
Chloral Hydrate	25-100 mg/kg PO may repeat 25-50 mg/kg at 30m	15-30 min	60-120 min	Not recommended secondary to risk of prolonged sedation, and lower efficacy compared to alternatives; unreliable in age > 3y	Respiratory depression, paradoxical excitement, prolonged sedation; Contraindicated in cardiac, renal, or hepatic disease
Reversal Agents					
Naloxone (opiate reversal)	0.1 mg/kg IV/IM q2min, max 2 mg	1-2 min IV 10-15 min IM	20-40 min IV 60-90 min IM	Use only after conservative and supportive treatment have failed; will make post-procedure analgesia difficult	Agitation, vomiting, pain
Flumazenil (benzodiazepine reversal)	0.01 mg/kg IV May repeat q2min	1-2 min	30-60 min	Use only after conservative and supportive treatment have failed; use naloxone first if appropriate; will make post-procedure analgesia difficult	Seizures, benzodiazepine withdrawal, resedation. Contraindicated in patients on benzodiazepines, TCA overdose, seizure disorder, suspected elevated ICP, or taking drugs lowering seizure threshold (INH, lithium, TCAs, theophylline, propoxyphene, long-term benzodiazepines)

*Absolute contraindications: age < 3 months, known or suspected psychosis; Relative: elevated ICP, hydrocephalus, known or suspected CNS mass lesion, elevated intraocular pressure or globe injury, age < 1 year or >15 years, procedures involving stimulation of posterior oropharynx, active URI, pulmonary infections or wheezing, cardiovascular disease, psychiatric disease, severe hypertension, thyroid disease, porphyria

§ Table adapted from: Krauss B, SM Green. Procedural sedation and analgesia in children. *Lancet* 2006;367(9512):766-80.

Key: IV = intravenous; PR = by way of rectum; IM = intramuscular; IN = intranasal; PO = by mouth; isonicotinic acid hydrazide (isoniazid); TCA = tricyclic antidepressant; ICP = intracranial pressure