APPENDIX: SELECTED AGENTS FOR PEDIATRIC SEDATION AND ANALGESIA

John Kanegaye, MD

DRUG	DOSE/KG	ONSET	DURATION	INDICATIONS	PRECAUTIONS	COMMENT
Opioids: Morphine	0.1 - 0.2 mg IV/SC/IM max 10 mg	peak resp. depression: 7-10 min; peak analgesia 20 min	2-4 hr	• moderate duration analgesia for ongoing pain (post-op, sickle crisis) or prolonged procedure with post-procedure pain (burn debridement)	• histamine release • decreased clearance in neonates • resp. depression uder 2 mo	**all narcotics:** • caution with ICP, resp disease • not primarily sedating • use addtnl agent if sedation, anxiolysis desired
Meperidine	1 mg IV (max 100) 1 - 2 mg IM, PO (max 125)	5-10 min 10-15 min (peak 30-45)	2-3 hr	• as above	• significant CNS toxicity due to normeperidine • venodilation, SVT	• caution with MAOI • see DPT below
Fentanyl	1 - 2 µg IV, IM Titrate to 5 µg/kg max (max single dose 100 µg) 10-20 µg transmucosal	1-2 min peak 10 min	30-50 min	• rapid titrable analgesia, for brief procedures (see midazolam-fentanyl below) • fracture reduction, abcess I & D) **An, (sed)**	• poor clearance in neonates • chest wall rigidity if rapid or > 7 µg/kg • facial pruritis • seizures • poss. resp. depression <u>before</u> sedation and <u>after</u> pain ends • vomiting with transmucosal	• IV 0.5 µg/kg/min or 4 min for 2 µg/kg dose • IV route preferred over IM • Good CV stability
Benzodiazepines: Diazepam	.1-.2 mg IV/IM/PO	1-5 min	15-60 min		• resp. depression (esp. rapid IV)	• IV irritant
Lorazepam	0.1 mg IV/IM	1-5 min IV 15-30 min IM	8-12 hr		• less effective as a sedative	
Midazolam	.05-.1 mg IV 0.5 (to 1?)mg IN, pr, SL 0.6+ mg po (max single IV dose 5 mg)	1-2 min (pk 3-5) 5 min 20-30 min	30+ min	• rapid titrable sedation, amnesia for brief procedures <u>if</u> analgesic agent added • laceration repair, LP • see midazolam-fentanyl below **Sed, anx, amn**	• non-analgesic • resp. depression, esp. in combination • paradoxical agitation	• for po, mix with cherry syrup or tylenol elixir • 5 mg/ml for IN, PO • IN stings (topical anesth?) • older children may need only 1 - 2 mg IV
Barbiturates: Pentobarbital	2-6 mg IV/IM/PO (max 100)	1 min IV 10-30 IM 30-60 PO	30 min 2-4 hr 2-4 hr	• useful for non-threatening, non-painful procedures, e. g. CT, MR **Sed**	• poor anxiolysis • 6 mg/kg is dose for pentobarb coma • may incr. pain sensitivity	• titrate if IV (2.5-1.25-1.25 mg/kg)
Other agents: Ketamine	1-2 mg IV 3-5 mg IM 6-10 mg PO 10-15 mg PR	30 sec IV 3-4 min IM	5-15 min IV 15-30 min IM	• for profound unawareness and amnesia, with preservation of resp drive and reflexes: • sex abuse exam, perineal laceration, suturing in precarious areas (eyelid, tongue) **Sed, an, amn**	• secretions • resp. depression in rapid dose • emergence phenomena • hypotension in catechol depletion • beware ICP, HTN (head trauma) • laryngospasm if pharyngeal stimulation • not in porphyria	• IV doses over 60 sec • adverse effect more likely < 3 mo • consider atropine, benzo (compat. in solution) • po, pr very preliminary
Nitrous Oxide	30-50 %	Rapid	Rapid recovery after removal	• <u>adjunct</u> for brief painful procedures: • fracture reduction in combination with hematoma block **Sed, an, amn, anx**	• need cooperation • diffusion hypoxia post-procedure • beware pneumo or bowel obstruction • caution with prior narcotic	• wash out with 100% O_2 x 5 min • MAC> 100% • expensive setup • scavenging system needed
Choral Hydrate	50-75 mg po, pr (max 1-2 gm)	30-40 min	1-2 hr	• safe, effective and gentle sedation • toddler eye exam and FB removal • neurodiagnostics (non-urgent) **Sed**	• ? mutagenic • not analgesic • GI irritant • paradoxical agitation esp. if pain • potentiated by EtOH	• may be more effective in combination, e.g. hydroxyzine • hepat. metab. to trichloroethanol; renal excretion • caution with lasix, warfarin
DRUG	**DOSE/KG**	**ONSET**	**DURATION**	**INDICATION**	**PRECAUTION**	**COMMENT**

Recommended administration rate for most agents: over 2 min by IV

rev. 091803

Abbreviations for drug actions: **sed**, sedation; **an**, analgesia; **amn**, amnesia; **anx**, anxiolysis.

The above dosages and indications are summarized from the literature and represent general guidelines only. They are not intended to substitute for sound clinical judgement and appropriate experience with these agents.

APPENDIX: SELECTED AGENTS FOR PEDIATRIC SEDATION AND ANALGESIA

Combinations: Meperidine-promethazine-chlorpromazine (DPT, lytic, cardiac cocktail; Dermerol compound)	2:1:1 mg IM Soln: 25mg D+ 6.25 mg P+ 6.25mg T/ml	20-30 min	2-20 hr	• Not recommended	• erratic absorption • overly effective sedation • resp. depression • P and T : lower seizure threshold, CNS depression • P: possibly anti-analgesic, restlessness • T : hypotension • dystonic reaction	• avoid use if possible • be prepared for prolonged observation
Midazolam with narcotic (e. g., fentanyl)	• Midaz: start .05-0.1 mg/kg; titrate (max 5 mg/dose) • Narcotic (e. g., fentanyl): titrate as above	1.5 min	1.5-2 hr	• anxiolytic, amnestic, anlagesic • rapid acting, titrable • muscle relaxation • fracture reduction, intubation, other brief pain and anxiety producing procedure **Sed, an, amn, anx**	• combines 2 potent repiratory depressants • frequent desat requiring O_2, even before onset of sedation	• reversal agents for both • give one agent at a time, depending on primary need • monitor closely • meperidine, fentanyl compat. w/ midazolam IM • fracture reduction needs fentanyl ≥ 2 µg/kg
Meperidine-hydroxyzine	2:1 mg IM	20-30 min	2-3 hr	• procedures with prolonged pain, anxiety or prolonged pain (burn debridement) **Sed, an, amn, anx**	• resp depression, hypotension • CNS toxicity; V potentiates CNS depression	• no IV vistaril (phlebitis, gangrene, hemolysis) • vary components depending on need
NSAID: Ketorolac	0.5-1 mg IM 0.5 mg IV (0.8 mg loading dose) Adult 30-60 mg		6+ hr	• long acting pain relief with no CV, CNS, resp. effect • postop, sickle crisis, other pain syndromes (esp renal colic) • non-addictive, **an**	• potential NSAID toxicity (platelet, renal, GI, pregnancy) • theoretical concern over post-procedure bleeding	• “opioid sparing” • caution with ASA, other NSAID hypersensitivity
Oral analgesics: Acetaminophen	15 mg PO (adult 625-1000)		approx 4 hr	• mild pain, outpatient	• hepatotoxicity (acute, chronic OD)	• Recent data suggests PR dosing may require up to 40 mg/kg (at least initially, long term data lacking)
Ibuprofen	10 mg PO		approx 6 hr	• mild-mod pain, outpatient	• see ketorolac	• see ketorolac
Codeine	0.5 - 1 mg PO	20 min peak 1 - 2 hr	3 - 4 hr	• moderate pain, outpatient	• resp depression, somnolence (no driving, etc.) • nausea, vomiting (more than drugs below) • dose, frequency limited by APAP component	• C-III • Metabolized to morphine • Examples: 12 mg + 120 APAP/5 ml (elixir) 7.5 mg + 325 APAP (T # 1) 15 mg + 325 APAP (T # 2) 30 mg + 325 APAP (T # 3) 60 mg + 325 APAP (T # 4)
Hydrocodone	0.1- 0.15 mg PO (up to 0.2 mg?) Adult 5 - 15 mg		3 - 4 hr	• moderate pain, outpatient	• resp depression, somnolence (no driving, etc.) • dose, frequency limited by APAP, NSAID component	• C-III • Examples: 2.5 mg + 167 APAP/5 ml (Lortab elixir) 5 mg + 500 APAP (Vicodin) 7.5 mg + 200 ibuprofen
Oxycodone	0.1- 0.15 mg PO (up to 0.2 mg?) Adult 5 - 15 mg		3 - 4 hr	• moderate pain, outpatient	• resp depression, somnolence (no driving, etc.) • allergic, anaphylatic rxn to Na metabisulfite preservative • dose, frequency limited by APAP component	• C-II (DEA triplicate form) • Reputed superiority over hydrocodone unexplained (Differs by a single -OH group). • Examples: 5 mg + 325 APAP/5 ml (Roxicet elixir) 5 mg + 325 APAP (Percocet) 5 mg + 500 APAP (Tylox)

Recommended administration rate for most agents: over 2 min by IV

Abbreviations for drug actions: **sed**, sedation; **an**, analgesia; **amn**, amnesia; **anx**, anxiolysis.

The above dosages and indications are summarized from the literature and represent general guidelines only. They are not intended to substitute for sound clinical judgement and appropriate experience with these agents.