

MEDICATIONS FOR PROCEDURAL SEDATION/ ANALGESIA

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** All opioids and sedatives when used in combination have synergistic effects with higher risks of respiratory depression **

This table compares commonly used enteral and parenteral medications for procedural sedation and is not intended to be all-inclusive. All procedural sedation providers and personnel should be familiar with the Procedural Sedation: Non Critical Care Standards and Guidelines. Refer to other resources for information about local anesthetics ("Local Anesthetic Cream Application"), nitrous oxide ("Analgesia Using 50% Nitrous Oxide in 50% Oxygen for Painful Procedures and Reducing Anxiety in the Emergency Department and Orthopedic Clinic"), and acetaminophen/NSAIDs, which may be used alone or in conjunction with these sedatives/analgesics.

DRUG	CLASS	ROUTE	USUAL PROCEDURAL DOSE	ONSET	DURATION	ADMINISTRATION	SPECIFIC ANTAGONIST	ADVANTAGES	DISADVANTAGES
MIDAZOLAM (Versed®)	benzo-diazepine	PO/IV/ intranasal	PO: 0.5-1 mg/kg/dose (max 20 mg) IV: 0.1mg/kg/dose (max 8 mg) Intranasal: 0.5 mg/kg/ dose (range 0.3-0.5 mg/ kg/dose; max 5 mg per nostril)	PO: 15-30 min IV: 2-5 min Intranasal: 10-15 min	PO: 30-45 min IV: 10-20 min Intranasal: 30-45 min	IV: Administer undiluted over 2-3 min	Flumazenil	-produces amnesia/anxiolysis -rapid onset of action -no pain on IV injection -short duration of action	-no analgesia -respiratory depression, especially when used with other sedatives or opioids -poor palatability of oral form (injectable form may be used orally) -nasal irritation (burning) with intranasal form -hypotension
LORAZEPAM (Ativan®)	benzo-diazepine	PO/SL/IV	PO/SL: 0.05 mg/kg/dose (max 4 mg) IV: 0.05 mg/kg/dose (max 2 mg for anxiolysis or 4 mg for procedural sedation)	PO: 20-30 min IV: 10-20 min	6-8 hrs	IV: Administer undiluted over 2-5 min (max 2 mg/min)	Flumazenil	-produces amnesia/anxiolysis -SL route can be used in children who can't swallow pills (onset of action is similar to oral)	-no analgesia -respiratory depression especially when used with other sedatives or opioids -slow onset -long duration
MORPHINE	opioid	PO/IV/SC	PO: 0.2-0.5 mg/kg/dose (max 15-20 mg) IV/SC: 0.05-0.1 mg/kg/ dose (max 5-10 mg)	PO: 30 min IV: 5 min	PO: 3-5 hrs IV: 1 hr	IV: Dilute in NS to a concentration of 1 to 5 mg/mL Administer over 5 min SC: undiluted	Naloxone	-good analgesia -longer duration of analgesia (compared to fentanyl) is good for procedures > 30 min. duration	-no amnesia -risk of respiratory depression increases when used with other sedatives -nausea, pruritus -causes histamine release
HYDRO-MORPHONE	opioid	PO/IV/SC	PO: 0.03-0.08 mg/kg/ dose (max 2-4 mg) IV/SC: 0.015 mg/kg/dose (max 1 mg)	PO: 15-30 min IV: 5 min	PO: 3-4 hrs IV: 3-4 hrs	IV: May administer undiluted or dilute in a convenient volume of NS. Administer over 2-3 min SC: undiluted	Naloxone	-good analgesia -longer duration of analgesia (compared to fentanyl) is good for procedures > 30 min. duration	-no amnesia -risk of respiratory depression increases when used with other sedatives -nausea, pruritus -causes histamine release

FENTANYL (Sublimaze®)	opioid	IV/ intranasal	IV: titrate with 1-2 mcg/kg/dose (max 50 mcg) Intranasal: 1.5 mcg/kg/dose (max 50 mcg per nostril)	IV: immediate Intranasal: 10 min	30-45 min	IV: Administer undiluted over 1-3 min. (Alternatively dilute in a convenient volume)	Naloxone	-good analgesia -short acting -rapid onset of action	-no amnesia -apnea -respiratory depression, especially in infants < 3 months old) -chest wall rigidity
DEXMEDETOMIDINE (Precedex®)	alpha 2 receptor agonist	IV/ intranasal	IV: 0.2-0.6 mcg/kg/dose Intranasal: 3 mcg/kg/dose (range 1-3 mcg/kg/dose; max 100 mcg/nostril). May repeat dose of 1 mcg/kg/dose	IV: 5-10 min Intranasal: 20-45 min	1-2 hrs	IV: Dilute to a concentration of 4 mcg/mL. Administer over 10-20 min	None	-analgesia, -anxiolysis -minimal respiratory depression	-produces mild sedation and may not be ideal for invasive procedures -rapid infusion rates associated with hypotension, bradycardia
CLONIDINE	alpha 2 receptor agonist	PO	2-4 mcg/kg/dose	30 min-2 hrs	4 hrs		None	-analgesia, -anxiolysis -minimal respiratory depression -alternative to dexmedetomidine when no IV access	-produces mild sedation and may not be ideal for invasive procedures
CHLORAL HYDRATE	alcohol	PO/PR	PO/PR: 50-75 mg/kg/dose (procedural sedation) 20-50 mg/kg/dose for EEG and other non-invasive procedures) Max: 1500 mg/dose	60 min or more	4-8 hrs		None	-long safety record when used as a single dose -oral liquid can be used rectal route	-long acting -no analgesia, little amnesia -erratic absorption may result in peak effect occurring after procedure has finished -potential for prolonged sedation -frequently causes GI irritation/nausea -deaths reported (respiratory depression) due to delayed effect and administration of second dose or with concomitant opioid -poor palatability due to bitter taste
KETAMINE	general anaesthetic	PO/IV/IM	PO: 5-10 mg/kg/dose IV: 0.5-1 mg/kg/dose (may repeat up to 2 mg/kg) IM: 2-4mg/kg	PO: 30-45 min IV: 1 min IM: 3-4 min	PO: 2-4 hours IV: 10-15 min IM: 12-25 min	IV: Administer undiluted over more than 1 min IM: Use 50 mg/mL formulation	None	-produces analgesia and amnesia -does not cause respiratory depression	- do not combine oral and intravenous dosing -poor palatability of oral form (injectable form may be used orally) -increases oral and respiratory secretion
PROPOFOL	general anaesthetic	IV	0.5-2 mg/kg/dose	Within 1 minute	5-15 min	IV: Administer undiluted over 10-30 seconds	None	-very rapid onset of action -short duration of action -ease of titration -antiemetic properties -provides laryngeal relaxation	-no analgesia (need to premedicate with opioid for painful procedure) -respiratory depression -hypotension -pain on injection

SPECIFIC ANTAGONISTS (IE. REVERSAL AGENTS):

DRUG	DOSE	ONSET	ADMINISTRATION	DURATION	COMMENTS
FLUMAZENIL (Anexate®)	IV: 0.01 mg/kg/dose (max 0.2 mg); may repeat x 2 PRN	Less than 1 min	IV: Administer undiluted by rapid push (less than 30 sec)	30-60 min	-indicated for the treatment of benzodiazepine overdose -may not reverse respiratory depression -short duration of action; repeat doses are often necessary -monitor patients carefully until all central benzodiazepine effects have subsided -seizures may be induced in patients maintained on benzodiazepine therapy (eg. for epilepsy)
NALOXONE (Narcan®)	IV/IM/SC: 0.01-0.1 mg/kg/dose Repeat q 3-5 min PRN children >20 kg: 2 mg/dose	IV: less than 2 min IM/SC: 2-5 min.	IV: Administer undiluted by rapid push (15-30 sec)	20-60 min	-indicated for the treatment of opioid-induced respiratory or CNS depression -short duration of action (20-60 min.); may require multiple doses -monitor until opioid effects have decreased

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