Table 6a. Adult Sedation and Analgesia Drugs and Reversal Agents

MEDICATION	RECOMMENDED DOSAGE	ROUTE OF ADMINISTRATION	ONSET	DURATION	ADDITIONAL INSTRUCTIONS	PRECAUTIONS/ CONTRAINDICATIONS
ETOMIDATE						
	0.1-0.3 mg/kg	IV over period of 30-60 seconds	Ultra rapid 2-3 min	1 hour	Considered a general anesthetic. Also, sedation and amnesiac. Cardiac, respiratory, and BP monitoring required.	Not approved for children < 12 years of age. Avoid if seizure disorder, nausea, vomiting. May cause myoclonic jerks, pain at injection site.
FENTANYL CITRATE (SUBLIMAZE)						
	1-5 mcg/kg induction 50-100 mcg (1-2 mL)	IV	1.7 min	30-60 min	Potent narcotic analgesic. 100 mcg (2 mL) is equivalent to 10 mg MSO4 or 75 mg meperidine. Acts as a respiratory depressant (5-15 min following injection). Reduce dose in elderly and debilitated patients. CNS depressant drugs will have additive or potentiating effects with fentanyl.	Large doses may produce apnea. Chest wall rigidity may occur if pushed too quickly. The duration of the respiratory depressant effect may be longer than the analgesic effect. May produce bradycardia and bronchoconstriction. Use with caution in patients with COPD. Use with caution in patients with liver and kidney dysfunction. Adverse reactions: hypotension, hypertension, emesis, laryngospasm.
LORAZEPAM (ATIVAN)						
	0.02-0.05 mg/kg	IV	15 min	2 hours	Useful as anxiolytic, sedation for radiographic procedures, some minor surgical procedures (burns, foreign body removal, laceration repair).	Severe liver disease, severe respiratory disease (potential respiratory depressant). Benzodiazepines possibly teratogenic in first trimester of pregnancy.
MEPERIDINE						
	0.3 - 1.5 mg/kg	IV or IM	10-15 min	1 ½ - 2 hours half-life, effective duration 2-3 hours		Metabolite normeperidize may cause CNS toxicity, seizures in sickle cell patients or renal-impaired patients. Contraindicated if patient on MAOI.
METHOHEXITAL (BREVITAL)						
	1-3 mg/kg	IV	1 min	10 min	Discontinue immediately if extravasation occurs since tissue necrosis can occur. May cause hemodynamic instability and bronchospasm.	If given intraarterially, thrombosis and gangrene can occur. Contraindicated in severe hepatic function or porphyria. May cause respiratory depression, hypotension.
MIDAZOLAM (VERSED)						
	0.05-0.1mg/kg (1-2 mg) Total dose 0.1 mg/kg	IV	3-5 min	2 hours half-life 60 mins	Short-acting benzodiazepine CNS depressant. Do not give as a bolus dose; administer over at least 2 min and allow an additional 2 min to evaluate sedative effect. Reduce dosage in older (> 60 years) or debilitated patients. Causes impairment in memory and recall.	Associated with respiratory depression and respiratory arrest. May cause hypotension from venous pooling. Contraindicated in patients with acute narrow angle glaucoma. Patients with chronic renal failure and congestive heart failure eliminate midazolam slowly. Do not use in acute alcohol intoxication. Reduce dose by 30% in pts > 60 years or chronic illness. Benzodiazepines possibly teratogenic in 1st trimester of pregnancy.
MORPHINE SULFATE						
	0.03-0.15 mg/kg (2-10 mg)	IV	1-3 min Peak effect, 15 min	3-5 hrs half-life/ effective duration	Can be given with hydroxyzine 0.5 mg/kg. IM or PO in children.	Complications: Bronchospasm, respiratory depression, histamine release, hypotension, prolonged sedation, bradycardia, GI dysmotility, chest wall rigidity.

Table 6a. (Continued) Adult Sedation and Analgesia Drugs and Reversal Agents

MEDICATION	RECOMMENDED DOSAGE	ROUTE OF ADMINISTRATION	ONSET	DURATION	ADDITIONAL INSTRUCTIONS	PRECAUTIONS/ CONTRAINDICATIONS
PROPOFOL (DIPRIVAN)						
	50-200 mcg/kg/min sedation (2-3 mg/kg induction) 1-2 mg/kg for orthopedic procedures, joint reduction, burns requiring sedation 10 mg/mL concentration	IV IV	1-2 min	5-10 min	Titrate to effect. Use with caution in volume-depleted patients (may need fluid bolus prior to giving propofol). Causes pain on injection so use larger antecubital vein and/or add lidocaine 0.5-1.0 mg/kg. Lidocaine may be given with propofol drip or as bolus alone.	Side effects: Hypotension, bradycardia, apnea. Nausea, vomiting, limited analgesic properties. May need to add fentanyl 0.1 mg/kg, as propofol has no analgesic properties. Anaphylaxis with soy and egg allergy. Transient apnea in up to 40%. May be used as infusion. 100-200 mcg/kg/min. (10-20 mg/min in a typical adult, titrated for effect.)
REVERSAL AGENTS						
NALOXONE (NARCAN)						
	5-10 mcg/kg Titrate to desired effect. (0.4 mg-2 mg) Standard historical dose for OD	IV/ET/IM	1-2 min	Dependent upon the dose and route of administration. 30-60 min typical.	A narcotic antagonist, preventing or reversing the effects of opioids, including respiratory depression, sedation, and hypotension. Titration is preferred to rapid bolus. Maximum dose of 10 mg. Only applies to suspected unknown overdose.	The patient who has responded satisfactorily to naloxone should be kept under continued surveillance; repeated doses may be required as necessary since the duration of action of some narcotics may exceed that of naloxone. May use IV titration. Excessive use beyond the recommended dosage may actually potentiate respiratory depression in an already depressed patient.
FLUMAZENIL (MAZICON)						
	0.01 mg/kg May repeat 60 sec. x 3 (0.2 mg) Max dose 1 mg	IV	1-2 min	20 minutes	Used for the reversal of benzodiazepine-induced sedation. Administer slowly to avoid the adverse consequences of abrupt awakening such as dysphoria and agitation. Repeat doses of flumazenil may be given at 20-min intervals as needed to reverse resedation. Maximum dose of 1 mg at any one time; no more than 3 mg in 1 hour. A 1 mg dose sustains antagonism for 48 min.	Seizures may occur as reversal of sedative effects performed. Duration of action of flumazenil is shorter than midazolam and other benzodiazepines. Resedation may occur following initial reversal; monitoring must be performed for an appropriate period after initial reversal. Contraindicated in status epilepticus, increased intracranial pressure, tricyclic antidepressant overdose, and chronic benzodiazepine use (more than 2 weeks).
DISSOCIATIVE AGENTS						
KETAMINE (KETALAR)						
	1 mg/kg sedation (2 mg/kg induction) 2-5 mg/kg 6 mg/kg 6-10 mg/kg 10-15 mg/kg	IV IM Intra-nasal PO PR	1-3 min 5-20 min 15-30 min 15-30 min 15-30 min	10-20 min 30-60 min 30-60 min 30-60 min 30-60 min Anesthesia duration: 15-20 min Analgesic duration: 45 min	Pre-treatment with glycopyrrolate at 0.01 mg/kg (or atropine at 0.01 mg/kg) to decrease secretions should be given. Combine glycopyrrolate with IV, IM, or PO dose to give all at once; i.e., may combine with IM in syringe for one injection.	Increases intracranial pressure. Positive side effect is bronchodilation (can be used in asthmatics). Hallucinatory emergence reactions are common in adults but uncommon in children. Can treat with midazolam 0.2 mg/kg concurrently. Potential for laryngospasm so avoid if active pulmonary or upper respiratory infection or excessive salivation or bleeding. Avoid if coronary artery disease or if patient has elevated intraocular pressure. Possible hypertension.

Table 6a. (Continued) Adult Sedation and Analgesia Drugs and Reversal Agents

MEDICATION	RECOMMENDED DOSAGE	ROUTE OF ADMINISTRATION	ONSET	DURATION	ADDITIONAL INSTRUCTIONS	PRECAUTIONS/ CONTRAINDICATIONS
ADULT DRUGS FOR AGITATION						
DROPIDEROL (INAPSINE)						
	1-10 mg	IV or IM	10 min	2 hours	Agitated patients. CT scan or procedure on an uncooperative patient. Contraindicated if cardiac conduction abnormality.	Cardiac conduction abnormality. Rare hypotension. Rare neuroleptic malignant syndrome, QT prolongation with torsade de pointes.
HALOPERIDOL (HALDOL)						
	1-10 mg	IV or IM	IV: 10 min IM: 20 min	2 hours	Agitated, combative patients. Patients requiring rapid sedation. Contraindicated if cardiac conduction abnormality.	Cardiac conduction abnormality. History of dystonic reactions is contraindication to use.

Table 6b. Pediatric Sedation and Analgesia Drugs and Reversal Agents

MEDICATION	RECOMMENDED DOSAGE	ROUTE OF ADMINISTRATION	ONSET	DURATION	ADDITIONAL INSTRUCTIONS	PRECAUTIONS/ CONTRAINDICATIONS
METHOHEXITAL (BREVITAL)						
	1 mg/kg 25 mg/kg	IV PR	1 min 2-5 min	10 min 45 min	Discontinue immediately if extravasation occurs, since tissue necrosis can occur. May cause hemodynamic instability and bronchospasm.	If given intraarterially, thrombosis and gangrene can occur. Contraindicated in severe hepatic dysfunction or porphyria.
MIDAZOLAM (VERSED)						
	0.05-0.1 mg/kg 0.1 mg/kg 0.2-0.5 mg/kg 0.5-1.0 mg/kg Suggested pediatrics combination: 0.02 mg/kg IV when used with 1 mg/kg fentanyl	IV IM Intra-nasal PO/PR	1-3 min 15-30 min 2-5 min 10-30 min	1 hour 1-2 hrs 1-2 hrs 1-2 hrs	IV: May repeat 0.1 mg/kg by giving increments of 0.05 mg/kg until adequately sedated to a **maximum total of 2 mg.** Must be given slowly over 2 minutes. Alternative sedation drug for patients on barbiturate therapy for seizures. IM: Use 5 mg/cc concentration to reduce volume. **Maximum total of 2 mg.** PO: **Maximum total of 15-20 mg.** Mix with small amount of juice or may be mixed with acetaminophen elixir, in a standard dose of 15 mg/kg, for pain. PO or intranasal: Use 5 mg/cc concentration. No change in ICP. Excellent amnestic, anxiolytic.	Can cause respiratory depression if given rapidly or in addition to barbiturate therapy. Will obtain faster onset with higher doses. Intranasal: Coughing/ sneezing may reduce absorption. Midazolam syrup (cherry flavored) available: 0.25-1 mg/kg, most effective dose 0.5 mg/kg (up to 20 mg); onset 10-20 min, duration 60 min. Contraindication: hypersensitivity to cherries.
FENTANYL (SUBLIMAZE)						
	1-3 mcg/kg 1-2 mcg/kg 5-10 mcg/kg 1-2 mcg/kg	IV IM Oralet Nasal	1-2 min 7-15 min 15 min 10 min	Peak 10 min duration 30-45 min Variable 1 ½-2 hours 1 hour	Dose can be titrated. Should not exceed a maximum dose of 5 mcg/kg. PO: For weight ≤ 40 kg, dose is 5-10 mcg/kg **up to a maximum of 400 mcg**. For weight > 40 kg, give adult dose of 400 mcg. Oralet available in 100, 200, 300, or 400 mcg.	**Push slowly and monitor closely for respiratory depression.** Oralets may cause nausea and vomiting. Child must suck on oralet, not chew it. Bradycardia, hypotension, chest wall rigidity.

Table 6b. (Continued) Pediatric Sedation and Analgesia Drugs and Reversal Agents

MEDICATION	RECOMMENDED DOSAGE	ROUTE OF ADMINISTRATION	ONSET	DURATION	ADDITIONAL INSTRUCTIONS	PRECAUTIONS/ CONTRAINDICATIONS
PENTOBARBITAL (NEMBUTAL)						
	0.5-2 mg/kg sedation (2-5 mg/kg induction) 2-6 mg/kg PO, PR, IM	IV sedation IV anethesia IV rate should be < 50 mg/min	30-60 sec IM: 10-15 min PR: 15-60 min	15+ min	**For induction only in head-injured patients.** Titrate dosage based on the child's response; not to exceed a maximum dose of 8 mg/kg *or* 150 mg total dose. For barbiturate coma, IV loading dose of 10-15 mg/kg slowly over 1-2 hrs, then start 1 mg/kg/hr up to 3 mg/kg/hr for maintenance. Adjunct in treatment of ICP.	Contraindicated in patients suffering from acute intermittent porphyria. High doses may result in cardiovascular depression and hypotension. Cautioned use in patients with respiratory distress, particularly those in status asthmaticus. Should not be administered to hyperactive children. Use with caution if hypotension is present. Contraindicated in liver failure.

REVERSAL AGENTS

MEDICATION	RECOMMENDED DOSAGE	ROUTE OF ADMINISTRATION	ONSET	DURATION	ADDITIONAL INSTRUCTIONS	PRECAUTIONS/ CONTRAINDICATIONS
FLUMAZENIL (MAZICON)						
	0.2 mg/kg 0.2 mg 0.01 mg/kg (peds)	IV IV IV	1-2 min	20 min	Duration of action is shorter than midazolam, other benzodiazepines. A 1.0 mg dose will sustain antagonism for 48 min. (May repeat every 60 sec x 3. Max dosage 1.0 mg per 20 min.)	Do not give if myoclonic jerking before flumazenil. Abrupt awakening with dysphoria, agitation. Seizures may occur if chronic benzodiazepine use (more than 2 weeks). Contraindicated in status epilepticus or if elevated ICP. Contraindicated in TCA overdose.
NALOXONE (NARCAN)						
	5-10 mcg/kg **titrated to desired effect**	IV/ET/IM	1-2 min	30-60 min	To be used as an antidote for narcotic depression. **Titration preferred to rapid bolus.** The patient who has satisfactorily responded to naloxone should be kept under surveillance, since the duration of action of some narcotics may exceed that of naloxone.	Excessive use beyond the recommended dosage may actually potentiate respiratory depression in an already depressed patient.

NOTE: IV line preferred for giving sedation and analgesia. If IV access is impossible, may give IM, intranasal, PO, or PR, depending upon the drug. Respiratory therapist should be in attendance with patient on monitor and pulse oximetry.