

3mg - mid.
50mg - febr

- kids oral

0.5mg/kg

PRINTED monographs from the IH Medication Manual (for Parenteral Drugs) may not be the most recent version.
The OFFICIAL version is available on the InsideNet.



Interior Health

→ will increase possibly to 5 mg.
100mg Dose

Dix 10mg.

MIDAZOLAM
(MID aye zoe lam)

OTHER NAMES	CLASSIFICATION	*ALLERGY ALERT
Versed®, midazolam hydrochloride	Benzodiazepine	See Contraindications HIGH ALERT MEDICATION

INDICATIONS

HEALTH PROTECTION BRANCH APPROVED¹

- For conscious sedation prior to and during endoscopic or diagnostic procedures and direct current cardioversion.
- Induction of anaesthesia.
- Sedation in intensive care.

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE:

- Refractory status epilepticus², in palliative care.³

CONTRAINDICATIONS¹

- * Hypersensitivity to midazolam, other benzodiazepines or benzyl alcohol.
- Acute pulmonary insufficiency or severe COPD, acute narrow angle glaucoma.
- Outside of ICU setting: shock, coma, myasthenia gravis, acute alcoholic intoxication or severe depression of vital signs.

CAUTIONS¹

- Elderly, obese or debilitated patient; and those with COPD, CHF, renal failure or severe alcoholic cirrhosis: decreased dose required.
- Anterograde amnesia may persist for over 2 hours.

DRUG INTERACTIONS

- CNS depressants including narcotics, barbiturates and alcohol; may enhance the hypnotic effect and increase risk of apnoea.
- Midazolam is a substrate for cytochrome P450 3A4; cimetidine, diltiazem, erythromycin, ketoconazole and verapamil may increase serum concentration, which may lead to prolonged sedation.

PREGNANCY/BREAST FEEDING

- Contact pharmacy for most recent information.

ADMINISTRATION¹

MODE	DIRECT IV	INTERMITTENT INFUSION	CONTINUOUS INFUSION
	YES	YES	YES
WHO MAY GIVE	All registered nurses.		Registered nurses with Critical Care/ER or Palliative Care skills – see required monitoring.
ADULT	Give slowly over 2 - 3 minutes. Allow 3 minutes between doses.		ADULT STANDARD CONCENTRATION: = 1 mg/mL (Prepare in D5W or NS) Dose/rate chart available.
PEDIATRIC	As above	See Syringe Pump Dilution Table	PEDIATRIC STANDARD CONCENTRATION: = 100 mcg/mL (Prepare in D5W or NS) Dose/rate chart available.
NEONATE		See Syringe Pump Dilution Table	NEONATAL STANDARD CONCENTRATION: = 200 mcg/mL (Prepare in D5W) Dose/rate chart available.

50/1 = 3/4

3/4 = 0.75

3/8/2016



Interior Health

MIDAZOLAM (MID aye zoe lam)

REQUIREMENTS	IV infusion device for continuous infusion.
---------------------	---

MONITORING

REQUIRED for IV administration

- Direct IV: Baseline BP, HR and RR. Repeat q 5 minute x 3 and until stable, then q 15 minute x 3.
Palliative Care exemption: when used for end-of-life care, monitor as per palliative care physician
- Continuous IV infusion: Continuous BP or non- invasive BP monitoring q 5 minutes.
HR, RR and O₂ sats. q 15 minute until stable, then q 1 hour.
Palliative Care exemption: monitor as per below for Continuous SC infusion.
- Conscious sedation: Baseline BP, HR, RR, O₂ sats and sedation rating, then q 5 - 15 minute until procedure complete and q 15 minute until level 1 on the conscious sedation rating scale (occasionally drowsy, easy to arouse to verbal stimuli)

REQUIRED for SC/IM administration

- Direct SC/IM: Baseline BP, HR and RR. Repeat q 15 minutes x 3
Palliative Care exemption: when used for end-of-life care, monitor as per palliative care physician
- Continuous SC infusion: Baseline BP, HR and RR. Repeat q 15 minutes until stable, then q 1 hour or as directed

RECOMMENDED

- None.

DOSE PREPARATION

- Availability (within IH): 1 mg/mL (2 mL, 5 mL, 10 mL), 5 mg/mL (1 mL, 2 mL, 10 mL) vials.
- Store at room temperature. Protect from light.
- Do not use if discolored or contains particulate matter.
- Multidose vials contain benzyl alcohol 1% as a preservative. Discard 28 days after initial puncture.

COMPATIBILITY/STABILITY

- Stable in D5W and NS for 24 hours at room temperature.¹
- Compatible with dextrose, saline and lactated Ringer's solution.¹
- **Pharmacy mixing:** (ie CIVA program using LAFH or BSC)"
Prepared bags: 1 mg/mL in NS, 49 days in fridge, 10 days at room temperature¹⁰¹
- *Compatible via Y-site:* amiodarone, calcium gluconate, ceFAZolin, ciprofloxacin, clindamycin, diltiazem, DOPamine, erythromycin, fentaNYL, fluconazole, gentamicin, haloperidol, heparin, HYDROmorphone, insulin (regular), labetalol, methylPREDNISolone, metroNIDAZOLE, milrinone, morphine, nitroglycerin, norepinephrine, potassium chloride, propofol (if midazolam in D5W), tobramycin, vancomycin
- *Incompatible via Y-site:* dimenhyDRINATE, furosemide, prochlorperazine, ranitidine, sodium bicarbonate
- For additional drug-drug compatibility contact Pharmacy.

ADVERSE EFFECTS¹

CARDIOVASCULAR

- Decreased/increased mean arterial pressure; increased/decreased pulse rate.

RESPIRATORY

- Decreased respiratory rate, respiratory arrest.

CENTRAL NERVOUS SYSTEM

- Headache, drowsiness, excessive sedation, dizziness.
- Seizure - like myoclonus in neonates; especially if infused rapidly.⁴

GASTROINTESTINAL

- Nausea, vomiting.

ANTIDOTE

- Effects can be reversed by flumazenil.



Interior Health

MIDAZOLAM (MID aye zoe lam)

DOSE

- IV direct route preferred. Dose must be individualised. Use smaller doses in elderly patients or those premedicated with narcotics or other CNS depressants.
- For continuous infusions gradually taper dose before discontinuing.

ADULT

Conscious sedation:¹ Use 1 mg/mL solution. See table below.

Patient Type	Unpremedicated Patient		Premedicated Patient (Narcotics or CNS Depressants)
	Initial Dose	Total Dose	
Patients below age 55	No more than 2 to 2.5 mg	Some patients may respond to as little as a total dose of 1 mg. Do not exceed 0.1 mg/kg	Reduce dosage by about 30%
Patients age 55 or older; Debilitated patients; Chronically ill patients; Patients with limited pulmonary reserve	No more than 1 to 1.5 mg	More than a total dose of 3.5 mg is not usually necessary. Do not exceed 0.07 mg/kg	Reduce dosage by about 30% (i.e. 60% less than for healthy young unpremedicated patients).

Sedation in critical care:

- Loading dose: 0.03 - 0.3 mg/kg.⁵ Administer as small incremental doses of 0.5 to 1 mg at 3 minute intervals and titrate to effect.⁶
- Maintenance dose: 0.015 - 0.15 mg/kg/hour, or approximately 1 - 10 mg/hour.⁶ In patients with prior/concomitant narcotics, 1 - 2 mg/hour is often adequate, while 10 mg/hour and more has been used with safety in agitated patients.⁵

Refractory status epilepticus:²

- Loading dose: 0.1 - 0.3 mg/kg. Repeat x 1 if required.
- Infusion: 0.05 - 0.4 mg/kg/hour.

PEDIATRIC¹⁰⁰

Procedural sedation:

- 0.1 mg/kg over 2-3 minutes. May repeat dose at 5 min intervals. Max: 8 mg/dose.

Sedation in Mechanical Ventilation:

- Loading dose (if required): 0.05-0.2 mg/kg over at least 3 minutes
- Maintenance infusion: 30-360 mcg/kg/hr. Lower dose by 25 % when used with opioids.

Refractory Status epilepticus:

- Loading dose: 0.1 mg/kg (max 8 mg) over 2-3 minutes
- Maintenance infusion: 120 mcg/kg/hr. Titrate upward by 60 mcg/kg/hr every 5 min until seizures are controlled. Mean infusion rate: 120-180 mcg/kg/hr, Range: 60-1440 mcg/kg/hr.

NEONATE¹⁰⁰

Sedation:

- **Not used with an opioid:**
 - Loading dose: 200 mcg/kg over 30-60 minutes. (doses of 25-100 mcg/kg can be infused over 15 minutes)
 - Maintenance infusion: 30-70 mcg/kg/hr (reduce dose in premature infants)
- **Combined with and opioid:**
 - Loading dose: none
 - Maintenance infusion: 50 mcg/kg/hr

Anticonvulsant:

- Loading dose: 200 mcg/kg over 30-60 minutes
- Maintenance infusion: start at 60 mcg/kg/hr (1 mcg/kg/min). If seizures persist, increase by 60 mcg/kg/hr (1 mcg/kg/min) every 15 minutes. Administer additional loading dose of 200 mcg/kg as necessary. Once seizures have stopped or burst suppression achieved, maintain effective infusion for 48 hours. If not seizures are observed, wean infusion by 60 mcg/kg/r (1 mcg/kg/min) every 15 minutes. If seizures recur, resume previously effective midazolam infusion rate.



Interior Health

MIDAZOLAM **(MID aye zoe lam)**

RENAL IMPAIRMENT ADJUSTMENTS¹²

- Decrease dose by 50% in patients with creatinine clearance less than 0.2 mL/sec (10 mL/minute).

HEPATIC IMPAIRMENT ADJUSTMENTS¹³

- Reduce dose by 50% in cirrhosis.

HEMO/PERITONEAL DIALYSIS¹²

- Not applicable.

MISCELLANEOUS

- May be given intramuscular (IM).
- Maybe given subcutaneous (SC).
- Antidote: flumazenil (Anexate®)
- Midazolam is 2 to 4 times more potent than diazepam.
- Recovery from sedation after stopping midazolam infusion is dependent on the duration of the infusion and may be more prolonged (greater than 10 hrs) if the infusion exceeds 24 hours.



Interior Health

MIDAZOLAM
(MID aye zoe lam)

MIDAZOLAM - REFERENCES

1. Welbanks L, ed. Compendium of Pharmaceuticals and Specialties. 35th ed. Ottawa, ON: Canadian Pharmaceutical Association; 2000.
2. Kumar A, Bleck TP. Intravenous midazolam for the treatment of refractory status epilepticus. Crit Care Med 1992; 20:483-8.
3. McNamara P. Use of midazolam in palliative care. Pall Med 1991; 5:244-9.
4. Young TE, Mangum OB, eds. Neofax®: A manual of drugs used in neonatal care. 12th ed. Raleigh, NC: Acorn publishing; 1999:130-1.
5. Amrein R, Hetzel W. Pharmacology of drugs frequently used in ICUs: Midazolam and flumazenil. Int Care Med 1991; 17:S1-S10.
6. Salden RN. Sedation in the intensive care unit: Clinical considerations. In Reves JG, Greenblatt DJ, Sladen RN. Drug infusion for sedation in the intensive care unit. Boston, MA: Tufts University School of Medicine; 1994.
7. Guidelines for sedation and analgesia for pediatric patients at VGH, RJH. Passed MAC Oct 7, 1999.
8. Krauss B, Green SM. Sedation and analgesia for procedures in children. N Engl J Med 2000; 342:938-45.
9. Booker PD, Beechey A, Lloyd-Thomas AR. Sedation of children requiring artificial ventilation using an infusion of midazolam. Br J Anaesth 1986; 58:1104-8.
10. Rosen DA, Rosen KR. Midazolam for sedation in the pediatric intensive care unit. Intensive Care Med 1991; 17:S15-S19.
11. Rivera R, Segnini M, Baltodano A et al. Midazolam in the treatment of status epilepticus in children. Crit Care Med 1993; 21: 991-4.
12. Aronoff GR, Berns JS, Brier ME, et al, eds. Drug prescribing in renal failure: Dosing guidelines for adults. 4th ed. Philadelphia, PA: American College of Physicians; 1999:94.
13. Mammen GJ. ed. Clinical pharmacokinetics drug data handbook 1989. Auckland; NZ: AIDS Press Ltd. 1989:103.
100. Esau R. Pediatric Drug Dosage Guidelines. 6th ed. Children's & Women's Health Centre of B.C.; 2012
101. Trissel LA, ed. Handbook of injectable drugs. 16th ed. Bethesda, MD: American Society of Hospital Pharmacists; 2011: 1075-86.