

GUIDELINES FOR THE ADMINISTRATION OF MIDAZOLAM INFUSION

INDICATIONS FOR USE IN NEUROSCIENCES:

Intravenous midazolam infusions at the doses indicated below are permitted to be used on the Neuroscience unit according to the following guidelines, provided:

- the intravenous midazolam infusion is initiated in a critical care area (PICU or ER or NICU);
- the dose has been titrated to effect;
- the patient has been assessed to be stable on this effective dose for at least one hour.

Midazolam infusion is used for patients in status epilepticus who are resistant to conventional therapy. Intravenous midazolam must be weaned off slowly over a period of days in order to prevent rebound seizures.

Inclusion criteria for stability:

- No cardiorespiratory problems
- No decrease in level of consciousness

Patients may be transferred directly to the Neuroscience unit from ER **only** if they meet ALL of the following criteria:

- Intravenous midazolam dose has been titrated to effect
- Patient has been stable on this effective dose for at least one hour
- Patient is no longer in status epilepticus
- There is a neurologist directly available in the hospital for admission to the Neuroscience unit and for at least one hour after admission

MECHANISM OF ACTION:

Midazolam appears to enhance the effect of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA). It is widely distributed into body tissues and across the blood-brain barrier. It is metabolised by the liver and excreted in the urine. Onset of action is within 1-5 minutes and the duration of action is usually 2 hours or less and is dose related.

DOSAGE:

- usual range: 60 to 180 micrograms/kg/hour
(higher doses may be used based on the physician's clinical assessment of the patient)
- increases in the infusion rate on the ward are permitted **ONLY** if a physician is directly available in-hospital for one hour after the increase

NOTE: dose increase increments are recommended to be 30 micrograms/kg/hour or less at intervals of greater than 60 minutes

- the dose on the unit **may not exceed** the dose that the patient originally arrived on the unit with
- midazolam boluses are to be administered by a physician (independent of the infusion) and a physician must be directly available in-hospital for one hour after the bolus.

NOTE: When decreasing midazolam on the ward a slower rate of reduction should be considered to decrease the risk of status epilepticus recurrence and, thereby, decrease the need for boluses. A physician should be available in hospital when decreasing doses in the event that a bolus dose is required to control rebound seizures.

- A standard concentration of 1 mg/mL will be used
 - standard syringes of 1 mg/mL (30 mL syringe) will be provided from pharmacy upon receipt of physician's order
 - 3 mL syringes are available for rates less than 0.1 mL/hour
- **NOTE:** 60 mcg/kg/hour = 1 mcg/kg/minute

SIDE EFFECTS:

- Respiratory depression
- excessive sedation
- hypotension
- bradycardia
- drowsiness
- headache
- behaviour changes
- nausea/vomiting
- rash
- anaphylaxis
- blurred vision
- tenderness at the site of injection.

Seizure disorder is a contraindication to Flumazenil administration. Do NOT give Flumazenil. (If a reduction in effect is desired, a physician's order is required to decrease or stop the infusion. The effect should wear down rapidly as the T1/2 is less than 2 hours in most children.)

NURSING CONSIDERATIONS:

- Nursing supervision in the room for the first 12 hours on the ward (and for one hour after every dose increase), then observational monitoring every hour.

PROCEDURE:

1. **CHECK** chart for Midazolam preprinted order. The order must be completed and signed by a neurologist.
2. **OBTAIN** prefilled syringe of midazolam 1 mg/mL from pharmacy.
NOTE: When Pharmacy is closed, standard syringes are available via usual Night Cupboard procedures.
3. **CHECK** medication against M.A.R. and physician's order for:
 - a. correct patient
 - b. correct medication
 - c. correct route (IV)
 - d. correct standard concentration in syringe
4. **REVIEW** medication for:
 - a. Patient allergies
 - b. Action, indication, side effects, adverse reactions, safe dose per patient's weight
 - c. Administration method: route, diluent solution and volume
 - d. Proper storage of medication (refrigerated)
 - e. Expiry date
5. **CALCULATE** infusion rate using the following formula and have **2nd RN perform independent double check of calculation:**
$$\text{Infusion rate (mL/hr)} = \frac{\text{Dose (mcg/kg/hour)} \times \text{weight (kg)}}{\text{Concentration (in mcg/mL)}}$$

NOTE: 1 mg = 1000 mcg
6. **ASSEMBLE** equipment for syringe pump infusion and prime tubing with midazolam to end.
NOTE: Midazolam infusion may be y-connected to a compatible solution to maintain a rate to keep the vein open. Do not add any additional extension tubing below the y-connector and ensure y-connector primed with midazolam as well.
7. **ENSURE** all clamps are closed.
8. **LOAD** syringe in syringe infusion module.
9. **PROGRAM** infusion pump, from guardrail drug library, entering **dose in micrograms/kg/hour** as per orders. Pump will auto-calculate and auto-populate rate. **COMPARE** auto-calculated rate with manually calculated rate to ensure accuracy.
10. **2nd RN to DOUBLE CHECK** pump programming and perform site to source check of infusion system.
11. **COMMENCE** infusion and open clamps.

12. **ENSURE** correct dose scrolls across syringe module as per ordered dose.

13. **DOCUMENT** on appropriate record(s):

- a. date and time
- b. drug, dose, route
- c. RN commencing infusion
- d. RN performing double check
- e. patient's response to infusion
- f. unexpected outcomes and related treatment
- g. patient/family education

MONITORING GUIDELINES:

- while awake:
 - Respiratory Rate (RR), Heart Rate (HR) and Arousal Score every hour
 - Continuous Pulse oximetry (SpO₂)
- while sleeping:
 - Respiratory Rate (RR) and Heart Rate (HR) every hour
 - Continuous Pulse oximetry (SpO₂)
 - Arousal score if:
 - RR less than 12 breaths per minute (BPM) for children greater than age 10
 - RR less than 14 BPM for children age 2-10 years
 - RR less than 20 BPM for children less than age 2

EMERGENCY PROCEDURES:

*If the respiratory rate is less than appropriate for the child's age **AND/OR** arousal score is greater than 2: **rouse the patient, encourage breathing, and call the ordering physician.***

*If the respiratory rate is less than appropriate for the child's age **AND** unable to rouse the patient **AND** the SpO₂ is less than 90% on 6-10 litres O₂ by face mask: **stop infusion, apply oxygen 6-10 L by face mask, call a code blue and begin resuscitation procedures, call ordering physician.***

Arousal Score

1	2	3	4	5
Awake & Alert, Orientated	Normal Sleep Easy to Arouse to Verbal Stimulation	Difficult to Arouse to Verbal Stimulation	Responds Only to Physical Stimulation	Does Not Respond to Verbal or Physical Stimulation