

# Midazolam

## Newborn use only

2020

<b>Alert</b>	High risk medication causing significant patient harm when used in error.																
<b>Indication</b>	Sedation during ventilation or procedure. Treatment of refractory seizure.																
<b>Action</b>	Intensify the physiological inhibitory mechanisms mediated by gamma-aminobutyric acid (GABA) by accumulation and occupation of benzodiazepine receptors. Anti-anxiety properties are related to increasing the glycine inhibitory neurotransmitter.																
<b>Drug type</b>	Short acting benzodiazepine.																
<b>Trade name</b>	Hypnovel, Midazolam Alphapharm,, Midazolam Pfizer,, Midazolam-Baxter, B.Braun Midazolam, Midazolam Accord, Midazolam Apotex.																
<b>Presentation</b>	5 mg/mL, 5mg/5mL, 150mg/10mL and 15mg/3mL ampoules used for IV and oral use																
<b>Dose</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Method</th> <th>Dose</th> </tr> </thead> <tbody> <tr> <td>IV infusion for sedation</td> <td>0.2–1 microgram/kg/minute</td> </tr> <tr> <td>IV infusion for seizures</td> <td>Loading dose: 150–200 microgram/kg over 3–5 minutes Maintenance dose: 1–7 microgram/kg/minute</td> </tr> <tr> <td>IV bolus</td> <td>50 microgram/kg/dose every 2 hours when required (Dose range: 50–150 microgram/kg/dose)</td> </tr> <tr> <td>IM injection</td> <td>50 microgram/kg/dose every 4 hours when required (Dose range: 50–150 microgram/kg/dose)</td> </tr> <tr> <td>Oral</td> <td>250 microgram/kg as a single dose</td> </tr> <tr> <td>Sublingual</td> <td>200 microgram/kg as a single dose</td> </tr> <tr> <td>Intranasal</td> <td>200 microgram/kg per dose as a single dose (Dose range: 200–300 microgram/kg/dose)</td> </tr> </tbody> </table>	Method	Dose	IV infusion for sedation	0.2–1 microgram/kg/minute	IV infusion for seizures	Loading dose: 150–200 microgram/kg over 3–5 minutes Maintenance dose: 1–7 microgram/kg/minute	IV bolus	50 microgram/kg/dose every 2 hours when required (Dose range: 50–150 microgram/kg/dose)	IM injection	50 microgram/kg/dose every 4 hours when required (Dose range: 50–150 microgram/kg/dose)	Oral	250 microgram/kg as a single dose	Sublingual	200 microgram/kg as a single dose	Intranasal	200 microgram/kg per dose as a single dose (Dose range: 200–300 microgram/kg/dose)
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<b>Dose adjustment</b>																	
<b>Maximum dose</b>																	
<b>Total cumulative dose</b>																	
<b>Route</b>	IV, IM, Oral, Sublingual, Intranasal.																
<b>Preparation</b>	<p><b>IV</b></p> <p><b>Sedation using 5 mg/1 mL strength</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"><u>Infusion strength</u></th> <th style="width: 50%;"><u>Prescribed amount</u></th> </tr> </thead> <tbody> <tr> <td><u>1 mL/hour = 1 microgram/kg/minute</u></td> <td><u>3 mg/kg midazolam and make up to 50 mL</u></td> </tr> </tbody> </table> <p>Draw up 0.6 mL/kg (3 mg/kg of midazolam) and add glucose 5%, glucose 10% or sodium chloride 0.9% to make final volume 50 mL. <b>Infuse at a rate of 1 mL/ hour = 1 microgram/kg/minute.</b></p> <p><b>Sedation using 5mg/5 mL strength</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"><u>Infusion strength</u></th> <th style="width: 50%;"><u>Prescribed amount</u></th> </tr> </thead> <tbody> <tr> <td><u>1 mL/hour = 1 microgram/kg/minute</u></td> <td><u>3 mg/kg midazolam and make up to 50 mL</u></td> </tr> </tbody> </table> <p>Draw up 3 mL/kg (3 mg/kg of midazolam) and add glucose 5%, glucose 10% or sodium chloride 0.9% to make final volume 50 mL. <b>Infuse at a rate of 1 mL/ hour = 1 microgram/kg/minute.</b></p> <p><b>Seizures using 5 mg/1 mL strength</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"><u>Infusion strength</u></th> <th style="width: 50%;"><u>Prescribed amount</u></th> </tr> </thead> <tbody> <tr> <td><u>1mL/hour = 5microgram/kg/minutes</u></td> <td><u>15mg/kg midazolam and make up to 50mL</u></td> </tr> </tbody> </table> <p>Draw up 3 mL/kg (15 mg/kg of midazolam) and add glucose 5%, glucose 10% or sodium chloride 0.9% to make final volume 50 mL. <b>Infuse at a rate of 1 mL/hour = 5 microgram/kg/minute.</b></p> <p><b>Seizures using 5 mg/5 mL strength (not to be used for babies over 3.3 Kg)</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"><u>Infusion strength</u></th> <th style="width: 50%;"><u>Prescribed amount</u></th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> </tbody> </table>	<u>Infusion strength</u>	<u>Prescribed amount</u>	<u>1 mL/hour = 1 microgram/kg/minute</u>	<u>3 mg/kg midazolam and make up to 50 mL</u>	<u>Infusion strength</u>	<u>Prescribed amount</u>	<u>1 mL/hour = 1 microgram/kg/minute</u>	<u>3 mg/kg midazolam and make up to 50 mL</u>	<u>Infusion strength</u>	<u>Prescribed amount</u>	<u>1mL/hour = 5microgram/kg/minutes</u>	<u>15mg/kg midazolam and make up to 50mL</u>	<u>Infusion strength</u>	<u>Prescribed amount</u>		
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# Midazolam

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	<u>1mL/hour = 5microgram/kg/minutes</u>	<u>15mg/kg midazolam and make up to 50mL</u>
	<p>Draw up 15 mL/kg (15 mg/kg of midazolam) and add glucose 5%, glucose 10% or sodium chloride 0.9% to make final volume 50 mL. <b>Infuse at a rate of 1 mL/hour = 5 microgram/kg/minute.</b></p> <p><b>IV bolus, IM, oral, sublingual and intranasal</b></p> <p><u>Using 5 mg/mL ampoule</u>, draw up 0.4 mL (2000 microgram of midazolam) and add 9.6 mL of sodium chloride 0.9% to make final volume of 10 mL with a concentration of 200 microgram/mL.</p> <p><u>Using 5 mg/5mL ampoule</u>, draw up 1 mL (1000 microgram of midazolam) and add 4 mL of sodium chloride 0.9% to make final volume of 5 mL with a concentration of 200 microgram/mL.</p>	
<b>Administration</b>	<p>IV infusion: continuous infusion via a syringe pump. Change solution every 24 hours.</p> <p>IV bolus: slow push over 10 minutes.<sup>9</sup></p> <p>Oral: Plastic IV ampoules may be used for oral administration.</p> <p>Intranasal: IV ampoules may be used for intranasal administration. Drop dose into alternating nostrils over 15 seconds. Absorption is rapid; maximum effect in 10 minutes and duration up to 2 hours. May be irritating to nasal mucosa.</p> <p>IM: Inject deep into a large muscle.</p>	
<b>Monitoring</b>	<p>Apnoea, respiratory depression</p> <p>Blood pressure</p> <p>Level of sedation.</p>	
<b>Contraindications</b>	<p>Known hypersensitivity to midazolam.</p>	
<b>Precautions</b>	<p>In preterm infants, especially in extreme preterm, midazolam half-life is increased from 4–6 hours in term neonates up to 22 hours in premature infants. It is longer with impaired liver function.</p> <p>Caution when concurrently used with opioids – midazolam interacts with other central nervous system depressants and may increase the risk of drowsiness, respiratory depression and hypotension. Withdraw slowly after chronic administration as abrupt discontinuation may precipitate withdrawal seizures.</p> <p>Caution in neonates with renal and hepatic impairment – increased sensitivity to central nervous system (CNS) effects; use doses at lower end of the range.</p> <p>Rapid IV infusion may result in hypotension, respiratory depression or seizure.</p>	
<b>Drug interactions</b>	<p>Concurrent administration with erythromycin promotes accumulation.</p> <p>Xanthines may decrease the anaesthetic/sedative effect of benzodiazepines. Care needs to be taken with adding or withdrawing caffeine or aminophylline.</p>	
<b>Adverse reactions</b>	<p>Hypotension and reduced cardiac output, particularly when used in combination with fentanyl.</p> <p>Respiratory depression and apnoea.</p> <p>Hypersalivation.</p> <p>Nasal discomfort (with intranasal route).</p> <p>Seizure-like myoclonus (more common in premature neonates receiving via intravenous route).</p>	
<b>Compatibility</b>	<p>Fluids: Glucose 5%, glucose 10%, sodium chloride 0.9%.</p> <p>Y-site: Amino acid solutions. Abciximab, amikacin, amiodarone, anidulafungin, atracurium, bivalirudin, calcium gluconate, caspofungin, cefotaxime cefazolin, ciprofloxacin, cisatracurium, clindamycin, digoxin, dopamine, doripenem, eptifibatide, erythromycin, esmolol, fentanyl, fluconazole, gentamicin, glyceryl trinitrate, haloperidol lactate, hydromorphone, labetalol, linezolid, methadone, methylprednisolone, metronidazole, milrinone, morphine sulfate, noradrenaline (norepinephrine), palonosetron, pancuronium, potassium chloride, ranitidine, remifentanyl, sodium nitroprusside, tirofiban, tobramycin, vancomycin, vecuronium.</p>	
<b>Incompatibility</b>	<p>Fluids: No information.</p> <p>Y-site: Fat emulsion. Aciclovir, albumin, aminophylline, amoxicillin, ampicillin, azathioprine, azithromycin, cefepime, ceftazidime, chloramphenicol, clonidine, dexamethasone, ertapenem, esomeprazole, flucloxacillin, foscarnet, furosemide (frusemide), ganciclovir, hydrocortisone sodium succinate, imipenem-cilastatin, indomethacin, omeprazole, phenobarbital (phenobarbitone), piperacillin-tazobactam (EDTA-free), potassium acetate, sodium bicarbonate, thiopental (thiopentone), tramadol, trimethoprim-sulfamethoxazole.</p>	
<b>Stability</b>	<p>Diluted solution: Store at 2–8°C and use within 24 hours.</p>	

<b>Storage</b>	Midazolam Apotex, Midazolam-Baxter: Store below 30°C. Protect from light. B. Braun Midazolam, Hypnovel, Midazolam Alphapharm: Store below 25°C. Protect from light. Midazolam Pfizer: Store below 25°C. Protect from light. Unopened ampoules will be suitable for use for up to 8 months after the foil sachet has been opened, if protected from light. Schedule 4D (S4D) medication. Store in dangerous drug safe and record use in S4D register.
<b>Excipients</b>	Sodium chloride, hydrochloric acid, sodium hydroxide, water for injections.
<b>Special comments</b>	Flumazenil is a specific benzodiazepine antagonist and may be used (very limited experience in the neonate) to rapidly reverse respiratory depression – 10 microgram/kg/dose IV push. May repeat every minute for up to 4 more doses.
<b>Evidence</b>	Refer to full version.
<b>Practice points</b>	Refer to full version.
<b>References</b>	Refer to full version.

<b>VERSION/NUMBER</b>	<b>DATE</b>
Original 1.2	23/03/2016
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REVIEW (5 years)	16/11/2025

**Authors Contribution**

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