

Alert	1:10,000 (1 mg/10 mL) ampoule is the preferred preparation for adrenaline infusion.												
Indication	Treatment of hypotensive shock with or without myocardial dysfunction.												
Action	<p>Catecholamine with alpha and beta adrenergic actions. Haemodynamic effects are dose dependent:</p> <ul style="list-style-type: none"> At low doses of 0.01–0.1 microgram/kg/minute primarily stimulates cardiac and vascular beta 1- and beta 2-adrenoreceptors leading to increased inotropy, chronotropy, conduction velocity and peripheral vasodilation. At doses greater than 0.1 microgram/kg/minute adrenaline also stimulates vascular and cardiac alpha 1-receptors causing vasoconstriction and increased inotropy. The net effects are increases in blood pressure and systemic blood flow caused by the drug-induced increases in systemic vascular resistance (SVR) and cardiac output.¹ 												
Drug Type	Inotropic vasopressor.												
Trade Name	Aspen Adrenaline 1: 10,000 Adrenaline Acid Tartrate injection; Adrenaline 1:1,000 Adrenalin Acid Tartrate injection.												
Presentation	1 mg/10 mL or 1:10,000 ampoule [100 microgram/mL] 1 mg/mL or 1:1,000 ampoule [1000 microgram/mL]												
Dosage / Interval	Low dose: 0.05–0.1 microgram/kg/minute High dose: 0.1–1 microgram/kg/minute												
Route	Continuous IV infusion.												
Preparation/Dilution	<p>Preparation using 1:10,000 (1 mg/10 mL) ampoule</p> <p>LOW CONCENTRATION IV infusion</p> <table border="1"> <thead> <tr> <th>Infusion dose</th> <th>Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 0.05 microgram/kg/minute</td> <td>150 microgram/kg adrenaline and make up to 50 mL</td> </tr> </tbody> </table> <p>Draw up 150 microgram/kg [1.5 mL/kg] of 1:10,000 adrenaline and add glucose 5%, glucose 10% or sodium chloride 0.9% to make a final volume of 50 mL with a concentration of 3 microgram/kg/mL. Infusing at a rate of 1 mL/hour = 0.05 microgram/kg/minute.</p> <p>HIGH CONCENTRATION IV infusion</p> <table border="1"> <thead> <tr> <th>Infusion dose</th> <th>Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 0.2 microgram/kg/minute</td> <td>600 microgram/kg adrenaline and make up to 50 mL</td> </tr> </tbody> </table> <p>Draw up 600 microgram/kg [6 mL/kg] of 1:10,000 adrenaline and add glucose 5%, glucose 10% or sodium chloride 0.9% to make a final volume of 50 mL with a concentration of 12 microgram/kg/mL. Infusing at a rate of 1 mL/hour = 0.2 microgram/kg/minute.</p> <p>For infants requiring fluid restriction consider:</p> <p>VERY HIGH CONCENTRATION IV infusion*</p> <table border="1"> <thead> <tr> <th>Infusion dose</th> <th>Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 0.4 microgram/kg/minute</td> <td>1200 microgram/kg adrenaline and make up to 50 mL</td> </tr> </tbody> </table> <p>Draw up 1200 microgram/kg [12 mL/kg] of 1:10,000 adrenaline and add glucose 5% ONLY to make a final volume of 50 mL with a concentration of 24 microgram/kg/mL. Infusing at a rate of 1 mL/hour = 0.4 microgram/kg/minute.</p> <p>*Stability data only available for 5% glucose for very high concentration.</p>	Infusion dose	Prescribed amount	1 mL/hour = 0.05 microgram/kg/minute	150 microgram/kg adrenaline and make up to 50 mL	Infusion dose	Prescribed amount	1 mL/hour = 0.2 microgram/kg/minute	600 microgram/kg adrenaline and make up to 50 mL	Infusion dose	Prescribed amount	1 mL/hour = 0.4 microgram/kg/minute	1200 microgram/kg adrenaline and make up to 50 mL
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	<p>Preparation using 1:1,000 (1 mg/mL) ampoule – Occasionally used for infants >4 kg. : 1:1000 (1 mg/mL) ampoule is generally not kept in the NICUs</p> <p>LOW CONCENTRATION IV infusion</p> <table border="1"> <thead> <tr> <th>Infusion dose</th> <th>Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 0.05 microgram/kg/minute</td> <td>150 microgram/kg adrenaline and make up to 50 mL</td> </tr> </tbody> </table> <p>Draw up 150 microgram/kg [0.15 mL/kg] of 1:1000 adrenaline and add glucose 5%, glucose 10% or sodium chloride 0.9% to make a final volume of 50 mL with a concentration of 3 microgram/kg/mL. Infusing at a rate of 1 mL/hour = 0.05 microgram/kg/minute.</p> <p>HIGH CONCENTRATION IV infusion</p> <table border="1"> <thead> <tr> <th>Infusion dose</th> <th>Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 0.2 microgram/kg/minute</td> <td>600 microgram/kg adrenaline and make up to 50 mL</td> </tr> </tbody> </table> <p>Draw up 600 microgram/kg [0.6 mL/kg] of 1:1000 adrenaline and add glucose 5%, glucose 10% or sodium chloride 0.9% to make a final volume of 50 mL with a concentration of 12 microgram/kg/mL. Infusing at a rate of 1 mL/hour = 0.2 microgram/kg/minute.</p> <p>For infants requiring fluid restriction consider: VERY HIGH CONCENTRATION IV infusion*</p> <table border="1"> <thead> <tr> <th>Infusion dose</th> <th>Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 0.4 microgram/kg/minute</td> <td>1200 microgram/kg adrenaline and make up to 50 mL</td> </tr> </tbody> </table> <p>Draw up 1200 microgram/kg [1.2 mL/kg] of 1:1000 adrenaline and add glucose 5% ONLY to make a final volume of 50 mL with a concentration of 24 microgram/kg/mL. Infusing at a rate of 1 mL/hour = 0.4 microgram/kg/minute. *Stability data only available for 5% glucose for very high concentration.</p>	Infusion dose	Prescribed amount	1 mL/hour = 0.05 microgram/kg/minute	150 microgram/kg adrenaline and make up to 50 mL	Infusion dose	Prescribed amount	1 mL/hour = 0.2 microgram/kg/minute	600 microgram/kg adrenaline and make up to 50 mL	Infusion dose	Prescribed amount	1 mL/hour = 0.4 microgram/kg/minute	1200 microgram/kg adrenaline and make up to 50 mL
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Administration	Continuous intravenous infusion via a central line. Use with caution via a peripheral line.												
Monitoring	Continuous heart rate, ECG and blood pressure monitoring preferable. Assess urine output and peripheral perfusion frequently. Observe IV site closely for blanching and extravasation.												
Contraindications	Arrhythmia and tachyarrhythmia. Cardiovascular disease resulting in arterial narrowing including cerebrovascular disease, coronary artery disease and digital ischaemia. Pheochromocytoma. Thyrotoxicosis. Glaucoma. Known hypersensitivity to sympathomimetic amines.												
Precautions	Ensure adequate circulating blood volume prior to commencement. Adrenaline is a potent chronotrope and vasopressor – may cause excessive tachycardia, severe hypertension and ventricular arrhythmias. Adrenaline may cause lactic acidosis and hyperglycaemia.												
Drug Interactions	Hypotension may be observed with concurrent use of vasodilators such as glyceryl trinitrate, nitroprusside and calcium channel blockers. Concurrent use of digitalis glycosides may increase the risk of cardiac arrhythmias. Concurrent use of IV phenytoin with adrenaline may result in dose dependent, sudden hypotension and bradycardia.												
Adverse Reactions	Tachycardia and arrhythmia. Systemic hypertension especially at higher doses. May cause hypokalaemia. Tissue necrosis at infusion site with extravasation. Digital ischaemia.												
Compatibility	Fluids: Glucose 5%, glucose 10%, Hartmann's, sodium chloride 0.9%. Stability data only available for 5% glucose for very high concentration.												

	<p>Y-site: Amino acid solutions. Amiodarone, anidulafungin, atracurium, bivalirudin, caspofungin, cisatracurium, dexmedetomidine, dobutamine, dopamine, ethanol, fentanyl, glyceryl trinitrate, heparin sodium, milrinone, morphine sulfate, pancuronium, potassium chloride, ranitidine, remifentanyl, sodium nitroprusside, tigecycline, tirofiban, vecuronium.</p>
Incompatibility	<p>Fluids: Sodium bicarbonate.</p> <p>Y-site: Aciclovir, aminophylline, ampicillin, atropine, azathioprine, calcium chloride, calcium gluconate, cefalotin, chloramphenicol, digoxin, ergometrine, ganciclovir, hyaluronidase, hydrocortisone sodium succinate, indomethacin, phenobarbitone sodium, sodium bicarbonate, thiopentone, vancomycin.</p> <p>No information: Adrenaline HCL is compatible with noradrenaline bitartrate but no stability data is available for Adrenaline acid tartrate and noradrenaline bitartrate</p>
Stability	<p>Ampoule: Store below 30°C. Protect from light.</p> <p>Diluted solution: Stable for 24 hours below 25°C.</p>
Storage	<p>Ampoule: Store below 25°C. Protect from light. Discard remainder after use.</p>
Special Comments	<p>Ensure adrenaline has a "dedicated" line to avoid accidental bolus. Do not use as a side line with maintenance fluids.</p> <p>Discard if exhibiting colour change.</p>
Evidence summary	<p>Efficacy:</p> <p>Treatment of hypotension in preterm infants: A single study of adrenaline 0.125–0.5 microgram/kg/minute versus dopamine 2.5–10 microgram/kg/minute reported they are equally effective at treating hypotension and increasing cerebral blood flow in very preterm infants. Adrenaline is associated with worse acid base status and increased hyperglycaemia. No difference in clinical outcomes was reported. [1–3] A single study of adrenaline 0.125, 0.250, 0.375, 0.5 microgram/kg/minute versus dopamine 5, 10, 15, 20 microgram/kg/minute reported dopamine reduced left ventricular output (LVO) 10% compared to a 14% increase in LVO with adrenaline. Dopamine and adrenaline caused significant increases in mean BP and pulmonary artery pressure. (LOE II, GOR C)</p> <p>Infants and children with septic shock: Early administration of adrenaline 0.1–0.3 microgram/kg/minute was associated with increased survival compared to dopamine. [4] (LOE II, GOR B)</p> <p>Vasopressors for hypotensive shock (newborns excluded): In treatment of hypotensive shock beyond the newborn period, there was no difference in mortality comparing adrenaline and other vasopressors (noradrenaline, noradrenaline and dobutamine, or noradrenaline and dopexamine). [5] (LOE I, GOR B)</p> <p>Summary: Adrenaline may be used in hypotensive neonates with vasodilatory shock with or without myocardial dysfunction, particularly those with septic shock or unresponsive to other inotropes. (LOE II, GOR B)</p> <p>Safety: Adrenaline may be associated with worse acid base status and increased hyperglycaemia.[3] Adrenaline is a potent vasoconstrictor. [6]</p> <p>Pharmacokinetics: The onset of action is rapid and after intravenous infusion the half-life is approximately 5–10 minutes. [7] However, the half-life of intravenous adrenaline has not been reported in sick newborn infants. The plasma half-life of intratracheal adrenaline for newborn resuscitation is likely to average approximately 50 minutes.[8]</p>
References	<p>1. Pellicer A, Bravo MDC, Madero R, Salas S, Quero J, Cabañas F. Early systemic hypotension and vasopressor support in low birth weight infants: Impact on neurodevelopment. Pediatrics. 2009;123:1369-76.</p>

2. Pellicer A, Valverde E, Elorza MD, Madero R, Gayá F, Quero J, Cabañas F. Cardiovascular support for low birth weight infants and cerebral hemodynamics: A randomized, blinded, clinical trial. *Pediatrics*. 2005;115:1501-12.
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Original version Date: 31/03/2016	Author: NMF Consensus Group
Current Version number: 1.2	Current Version Date: 30/11/2017
Risk Rating: Medium	Due for Review: 30/11/2020
Approval by: As per Local policy	Approval Date:

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