NORADRENALINE This drug must be guardrailed

Trade Name	Levophed ® 1:1000 Concentrate for IV Injection (Hospira) Noradrenalin- BNM ® 4mg /4 mL (=1:1000)
Class	Vasoconstrictor sympathomimetic
Mechanism of Action	Increases blood pressure by stimulating alpha receptors in vascular smooth muscle resulting in peripheral vasoconstriction. Also stimulates cardiac beta receptors providing some inotropic effects including increased heart rate and vasodilatation of coronary arteries.
Indications	Refractory hypotension in the setting of pulmonary hypertension or septic shock with no response to fluid resuscitation, or high dose dopamine
Contraindications	Uncorrected hypovolaemia (absolute contraindication). History of hypersensitivity to noradrenaline or sulphites. Hypertension. Mesenteric or peripheral vascular thrombosis. Hypoxia or hypercapnia (may cause noradrenaline-induced cardiac arrhythmias) No central line access
Supplied As	4mg/4mL
Dilution	**See Noradrenaline infusion sheet:** **Babies greater than 2.5 kg** Take 1x wt (kg) in mL of noradrenaline 1mg/mL and make up to 50mL with 5% dextrose without heparin **0.1 microgram/kg/min = 0.3 mL/hr** **Max concentration = 100 microgram/mL** **Babies less than or equal to 2.5kg** Take 2x wt (kg) in mL of noradrenaline 1mg/mL and make up to 50mL with 5% dextrose without heparin **0.2 microgram/kg/min = 0.3 mL/hr** **Max concentration = 100 microgram/mL** Must be infused through a central line
Dosage ***Must chart guardrail and use Alaris pump***	0.05 – 0.5 microgram/kg/minute Suggest starting at 0.1 microgram/kg/minute and titrate up or down every 30 minutes until control achieved Higher doses up to 1-2 microgram/kg/minute may be required to control blood pressure and are at the Consultant's discretion

Guardrail	Conc: Min – 4 microgram/mL Max – 100 microgram/mL Soft Min: 0.05 microgram/kg/min Hard Max: 2 microgram/kg/min Soft Max: 0.5 microgram/kg/min Default: 0.1 microgram/kg/min
Interval	Continuous iv infusion
Administration	Continuous IV infusion via a central venous line. **Not** to be given subcutaneously or intramuscularly due to risk of severe, rapid vasoconstriction, this may result in gangrene. Avoid extravasation as this will cause tissue necrosis. Antidote for noradrenaline extravasation is phentolamine. (Infiltrate affected area with 1- 5 mg diluted in 5 mL sodium chloride 0.9%)[6]
Compatible With	**Solutions:** Glucose 5% or glucose/ saline is preferred because glucose protects noradrenaline from oxidative degradation. Infusion in solutions other than glucose is not recommended by the manufacturer however independent reference sources eg Neofax, ANMF, Micromedex site compatibility with sodium chloride 0.9% and lactated Ringer's. **Terminal Y-site:** adrenaline, amikacin, amiodarone, atropine, benzylpenicillin, calcium chloride, calcium gluconate, caspofungin, cefazolin, cefotaxime, cefoxitin, caftazidime, cefuroxime, dexamethasone, dexmedetomidine, digoxin, dobutamine, dopamine, erythromycin,fentanyl, fluconazole, furosemide, gentamicin, glycopyrrolate, heparin, hydrocortisone, imipenem, insulin**, lidocaine, magnesium, meropenem, midazolam, milrinone, morphine, piperacillin, potassium chloride, ranitidine, ticarcillin, tobramycin, TPN, (no information re compatibility with lipid), vancomycin, vasopressin, voriconazole. * Variable reports on compatibility with insulin use separate line if possible
Incompatible With	Alkaline solutions, chlorpheniramine, chlorothiazide, diazepam, diazoxide, indomethacin, iron salts, nitrofurantoin, phenobarbital, phenytoin, sodium bicarbonate, streptomycin, sulfadiazine trimethoprim/sulfamethoxazole. No information to confirm that prostaglandin (alprostadil) is compatible, use a separate line.
Interactions	Concurrent treatment with betablockers, doxapram or monoamine oxidase inhibitors may cause hypertension. Concurrent treatment with halogenated anaesthetics or digoxin may precipitate arrhythmias
Monitoring	Blood pressure, heart rate, urine output, peripheral perfusion.
Stability	Readily oxidised do not use if solution is brown. Ampoules contain no preservative and are single use only. Discard any remaining contents immediately after use. Change iv infusion every 24 hours

Storage	Protect from light. Store below 25^{o}C
Adverse Reactions	Bradycardia, arrhythmias, breathing difficulties, headache, extravasation necrosis at injection site.
Metabolism	Rapidly and extensively metabolised. Plasma half life is approximately 2 minutes. Steady state concentrations are reached within 10 -15 minutes of commencing the infusion. Clearance is not influenced by renal function.
Comments	Not extensively studied in newborns but studies have shown improved systemic blood pressure, pulmonary blood flow and cardiac output in the setting of PPHN and septic shock
References	1. www.medsafe.govt.nz 2. www.adhb.govt.nz/newborn/DrugProtocols/NoradrenalinePharmacology.htm 3. Medicines for Children RCPCH 1999.BNF for Children 2011-2012 4. Paediatric and Neonatal Dosage Handbook Taketomo et al. 19th Edition 2012. 5. Trissell Handbook on Injectable Drugs in www.micromedexsolutions.com 6. Neofax in www.micromedexsolutions.com
Updated By	A Lynn, B Robertshawe, N Austin Feb 2013 A Lynn, B Robertshawe April 2017 (added TPN compatibility) A Lynn B Robertshawe October 2021 (update compatibility section and max concentration. A Lynn, B Robertshawe Sept 2023 (allow higher concentration option)