BRIEF ADMINISTRATION GUIDE

(For more detailed guideline information please see the following pages)

Indications: Refractory hypotension in the setting of septic shock or persistent pulmonary hypertension[1-3]

Route: Intravenous (central line preferred)[1-4]

Dose: Continuous IV Infusion[1-5]

- Initially 0.05 - 0.1 microgram/kg/min
- Titrate dose in small increments every 30 minutes until the desired response is achieved
- Maximum dose 2 microgram/kg/min
- Avoid abrupt withdrawal, reduce the infusion rate gradually

Supplied as: Noradrenaline 4 mg/4 ml (1:1000) ampoule[1]

Preparation and administration:

Continuous Intravenous Infusion

- Dilute as per 'NICU Drugs' computer software available on all desktops in the NICU. If this resource is not available, dilute as per the default dilution below:
- Draw up noradrenaline 300 microgram/kg (0.3 ml/kg) and dilute to 10 ml with compatible fluid (dextrose 5%). Infusing at a rate of 0.1 ml/hr = 0.05 microgram/kg/min
- Filter prior to administration through a PALL 0.2 micron filter
- Administer by continuous IV infusion preferably via a central line using a syringe driver with Guardrails settings. In exceptional circumstances, peripheral administration in a large vein (antecubital or femoral) may be permitted[2,5-7]
- Change infusion solution and tubing every 12 hours. Do not use the solution if solution forms a precipitate or if brown discoloration is observed[5,7]

Monitoring:

- Continuous cardio-respiratory monitoring required[2,3,5-8]
- Monitor peripheral perfusion frequently (colour and temperature of limbs)[2,3,6,8]
- Observe IV site regularly for signs of extravasation[2,3,7,8]
- Monitor urine output hourly[3]
- Document vital signs hourly and when required[7]

1. Purpose and scope

To facilitate the safe and effective use of noradrenaline in the Neonatal Intensive Care Unit (NICU).

2. Drug

Drug	Noradrenaline, norepinephrine
Drug action	Noradrenaline is a potent sympathomimetic amine that stimulates beta$_{1}$-adrenergic receptors and alpha-adrenergic receptors. This causes increased contractility and heart rate as well as vasoconstriction, which increases systemic blood pressure and coronary blood flow. It is very rapid acting, with a vasopressor action of only 1 to 2 minutes[2,3,9].
Indications	Refractory hypotension in the setting of septic shock or persistent pulmonary hypertension[1-3]
Presentation	Noradrenaline 4 mg/4 ml (1:1000) ampoule[1] Clear colourless solution[8,9] Note: Each preparation contains noradrenaline as the acid tartrate, but doses always refer to the noradrenaline component alone[1]
Route	Intravenous (central line preferred)[1-4]
Dose	**Continuous IV Infusion**[1-5] • Initially 0.05 - 0.1 microgram/kg/min • Titrate dose in small increments every 30 minutes until the desired response is achieved • Maximum dose 2 microgram/kg/min • Avoid abrupt withdrawal, reduce the infusion rate gradually
Contraindications	• Hypersensitivity to noradrenaline or any component of the preparation[2,3] • Uncorrected hypovolaemia[1,3,5] • Hypertension[1] • Concurrent use of halogenated anaesthetics[1-3]
Precautions	• Coronary, mesenteric or peripheral vascular thrombosis, unless it is a lifesaving procedure[1-3,5] • Hypoxia or hypercapnia[1-3,5] • Hyperthyroidism[1]
Incompatibilities	• Compatible with glucose 5%, or glucose 5% with sodium chloride 0.9%[5,6,8,9] • Manufacturers recommend avoiding dilution in sodium chloride 0.9% alone as the glucose content protects against significant loss of potency, however it does appear to be physically compatible[5,8,9] • Compatible at a Y-site with dopamine and dobutamine[10] • Incompatible with alkalis, oxidising agents, aminophylline, diazepam, indomethacin, phenobarbital, phenytoin, sodium bicarbonate, co-trimoxazole[2,9] • Do not mix with other drugs, blood or blood products without consulting a pharmacist
Adverse effects	• Extravasation at injection site can cause profound vasoconstriction and tissue necrosis, refer to rescue medication for management[1,3,6,9] • Systemic hypertension, bradycardia, arrhythmias[1,9] • Peripheral ischaemia, including gangrene of the extremities[1,3] • Hypoxia, dyspnoea[1,3,9] • Urinary retention[1]

3. Administration

Competency for administration	This procedure is carried out by, or under, the direct supervision of a registered nurse/registered midwife who holds current Waikato DHB Generic Medicine Management and IV certification as well as Neonatal specific competency NCV/NAC and NIC2.
Preparation & Administration	**Continuous Intravenous Infusion** • Dilute as per 'NICU Drugs' computer software available on all desktops in the NICU. If this resource is not available, dilute as per the default dilution below: • Draw up noradrenaline 300 microgram/kg (0.3 ml/kg) and dilute to 10 ml with compatible fluid (dextrose 5%). Infusing at a rate of 0.1 ml/hr = 0.05 microgram/kg/min • Filter prior to administration through a PALL 0.2 micron filter • Administer by continuous IV infusion preferably via a central line using a syringe driver with Guardrails settings. In exceptional circumstances, peripheral administration in a large vein (antecubital or femoral) may be permitted[2,5-7] • Change infusion solution and tubing every 12 hours. Do not use the solution if solution forms a precipitate or if brown discoloration is observed[5,7]
Observations and management	• Continuous cardio-respiratory monitoring required[2,3,5-8] • Monitor peripheral perfusion frequently (colour and temperature of limbs)[2,3,6,8] • Observe IV site regularly for signs of extravasation[2,3,7,8] • Monitor urine output hourly[3] • Document vital signs hourly and when required[7]
Special considerations (audit, funding, storage)	• The pH of noradrenaline is 3 to 4.6[8] • Store ampoules at room temperature (below 25°C) and protect from light[8]
Rescue medication	In case of accidental overdosage with excessive blood pressure elevation, discontinue noradrenaline until the condition of the patient stabilises, then restart at a lower dose[9]. If extravasation occurs, phentolamine should be administered as soon as possible[2,3]. Refer to the Extravasation Injury in NICU Procedure 1559.

4. Guardrails

Noradrenaline is Guardrail profiled on the CC pump for NICU. Following are the guardrail limits[11]:

Guardrails Drug Name	**Noradrenaline**			
Pump	**CC**			
	0.4 – 1 kg	**1 – 2 kg**	**2 – 3 kg**	**3 – 5 kg**
Concentration (mcg/ml)				
Minimum	12	30	60	90
Maximum	120	240	360	600
Dose rate (mcg/kg/min)				
Default	0.05	0.05	0.05	0.05
Soft minimum	0.05	0.05	0.05	0.05
Soft maximum	0.5	0.5	0.5	0.5
Hard max	2	2	2	2

5. Associated documents

Waikato DHB. Extravasation injury in NICU Procedure 1559.

6. References

1. New Zealand Formulary for Children (NZFC). 2019. Noradrenaline. Accessed 30th January 2019. Available from: https://www.nzfchildren.org.nz/nzf_1417
2. Truven Health Analytics Inc. Pediatrics and Neofax®. 2019. Norepinephrine monograph. Accessed 30th January 2019. Available from: http://www.micromedexsolutions.com.
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4. Phelps SJ, Hagemann TM, Lee KR, Thompson AJ. The Teddy Bear Book: Pediatric Injectable Drugs. 10th edition. American Society of Health-System Pharmacists; 2013.
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7. New Zealand Hospital Pharmacists Assoc. Inc. Notes on Injectable Drugs 7th ed, 2015.
8. Ainsworth SB. Neonatal Formulary: Drug Use in Pregnancy and the First Year of Life 7th ed. John Wiley & Sons Incorporated; 2014.
9. BNM Group. Noradrenaline Data Sheet. 24 July 2017. Available from: https://www.medsafe.govt.nz/profs/datasheet/n/noradrenalineBNMinj.pdf
10. Truven Health Analytics Inc. Micromedex®. 2019. Norepinephrine Bitartrate monograph. Accessed 30th January 2019. Available from: http://www.micromedexsolutions.com.
11. Waikato DHB. Guardrails Database. 2018.