

South Australian Neonatal Medication Guidelines

Sodium Nitroprusside

50mg/2mL ampoule

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Note:

This guideline provides advice of a general nature. This statewide guideline has been prepared to promote and facilitate standardisation and consistency of practice, using a multidisciplinary approach. The guideline is based on a review of published evidence and expert opinion.

Information in this statewide guideline is current at the time of publication.

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Health practitioners in the South Australian public health sector are expected to review specific details of each patient and professionally assess the applicability of the relevant guideline to that clinical situation.

If for good clinical reasons, a decision is made to depart from the guideline, the responsible clinician must document in the patient's medical record, the decision made, by whom, and detailed reasons for the departure from the guideline.

This statewide guideline does not address all the elements of clinical practice and assumes that the individual clinicians are responsible for discussing care with consumers in an environment that is culturally appropriate and which enables respectful confidential discussion. This includes:

- The use of interpreter services where necessary,
- Advising consumers of their choice and ensuring informed consent is obtained,
- Providing care within scope of practice, meeting all legislative requirements and maintaining standards of professional conduct, and
- Documenting all care in accordance with mandatory and local requirements

This is a High Risk Medication ⚠

An overdose can be rapidly fatal.

Consult Paediatric Intensive Care prior to use

Dose and Indications

Acute Treatment of Hypertensive Emergencies

Acute Afterload Reduction in Refractory Congestive Heart Failure

Intravenous Infusion

Initially 0.25 to 0.5microgram/kg/minute, increase cautiously in steps of 0.2microgram/kg/min as required according to clinical response. Usual maintenance dose 2microgram/kg/minute

Maximum dose: 6microgram/kg/minute. Caution with prolonged use at high doses.



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Preparation and Administration

Intravenous Infusion

Dilution may depend on the dose and fluid requirement.

- > Sodium nitroprusside is diluted with compatible fluid to a concentration of between 50microgram/mL to 200microgram/mL. Sodium Nitroprusside Concentration Selection Tables can be found on the following pages of this guideline to assist prescribers to gauge which strength is best for the patient.
- > In fluid restricted patients, concentrations of up to 1000microgram/mL (1mg/mL) in glucose 5% have been used.
- > Sodium nitroprusside decomposes when exposed to light - **Protect infusion solution from light by covering syringe with aluminium foil or black plastic**
- > Once diluted, sodium nitroprusside solution is a faint brown colour. Discard the solution if it is blue, green or dark/bright red in colour or if particles are present.

There are **TWO STEPS** to this process.

STEP ONE: Dilute 2mL (50mg/2mL) of sodium nitroprusside with 3mL of water for injection (to a total of 5mL). This makes a 10mg/mL solution

STEP TWO: Dilute the appropriate volume of the 10mg/mL sodium nitroprusside solution using compatible fluid; and administer by continuous infusion. Diluted preparation is stable for 24 hours at room temperature (**must be protected from light**).

The two standard strengths used are:

- > Sodium nitroprusside 100microgram/mL
- > Sodium nitroprusside 200microgram/mL

Formulae

To calculate infusion rate (mL/hr):

$$\text{Rate (mL/hr)} = \frac{60 \times \text{dose (microgram/kg/min)} \times \text{weight(kg)}}{\text{Strength (microgram/mL)}}$$

To calculate the dose (microgram/kg/min):

$$\text{Dose (microgram/kg/min)} = \frac{\text{Rate (mL/hr)} \times \text{Strength (microgram/mL)}}{60 \times \text{Weight (kg)}}$$



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TO MAKE 50mL SYRINGE:

Sodium Nitroprusside 100microgram/mL

There are **TWO STEPS** to this process.

STEP ONE: Dilute 2mL (50mg/2mL) of sodium nitroprusside with 3mL of water for injection (to a total of 5mL). This makes a 10mg/mL solution

STEP TWO: Dilute 0.5mL sodium nitroprusside (10mg/mL) with 49.5mL of glucose 5% injection. This makes a 100microgram/mL solution.

Rate (mL/hr)	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	Rate (mL/hr)
Weight (kg)	Approximate microgram/kg/minute									Weight (kg)
1	0.33	0.5	0.67	0.83	1	1.17	1.33	1.5	1.67	1
1.5	0.22	0.33	0.44	0.56	0.67	0.78	0.89	1	1.11	1.5
2	0.17	0.25	0.33	0.42	0.5	0.58	0.67	0.75	0.83	2
2.5	0.13	0.2	0.27	0.33	0.4	0.47	0.53	0.6	0.67	2.5

Sodium Nitroprusside 200microgram/mL

There are **TWO STEPS** to this process.

STEP ONE: Dilute 2mL (50mg/2mL) of sodium nitroprusside with 3mL of water for injection (to a total of 5mL). This makes a 10mg/mL solution

STEP TWO: Dilute 1mL sodium nitroprusside (10mg/mL) with 49mL of glucose 5% injection. This makes a 200microgram/mL solution.

Rate (mL/hr)	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	Rate (mL/hr)
Weight (kg)	Approximate microgram/kg/minute									Weight (kg)
1	0.67	1	1.33	1.67	2	2.33	2.67	3	3.33	1
1.5	0.44	0.67	0.89	1.11	1.33	1.56	1.78	2	2.22	1.5
2	0.33	0.5	0.67	0.83	1	1.17	1.33	1.5	1.67	2
2.5	0.27	0.4	0.53	0.67	0.8	0.93	1.07	1.2	1.33	2.5
3	0.22	0.33	0.44	0.56	0.67	0.78	0.89	1	1.11	3
3.5	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.95	3.5

Compatible Fluids

Glucose 5%, sodium chloride 0.9%



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Adverse Effects

Common

Vomiting, sweating, muscle twitching

Infrequent

Severe hypotension, hypothyroidism, rash, flushing, increased intracranial pressure

Rare

Thrombocytopenia, methaemoglobinaemia, phlebitis

Toxicity may occur, particularly with prolonged infusion or higher than recommended dose, due to accumulation of cyanide or thiocyanate

Signs of cyanide toxicity include tachycardia, arrhythmia, metabolic acidosis, dilate pupils, pink skin, absent reflexes and decreased oxygen saturations

Thiocyanate toxicity is associated with dyspnoea and ataxia

Monitoring

- > Continuous intra-arterial blood pressure during infusion
- > Monitor for signs of toxicity (as above)
- > There should be a high level of suspicion of cyanide toxicity. If there is suspicion of cyanide toxicity, action should be taken immediately (see practice points).
- > Monitor thiocyanate levels if prolonged therapy, doses of greater than 2microgram/kg/min, or with renal dysfunction
 - > NOTE: There is a long processing time for these levels as they are sent interstate and so utility is limited

Practice Points

- > The efficacy and safety of sodium nitroprusside in neonates has not been well established. Clinical experience is limited.
- > Contraindicated in treatment of compensatory hypertension due to AV shunting or coarctation of the aorta.
- > Caution in use with patients with increased intracranial pressure.
- > Avoid sudden withdrawal – terminate infusion over 15 to 30minutes to prevent rebound hypertension.
- > Do not mix sodium nitroprusside with any other medications.
- > Extravasation may cause irritation, rash, flushing, reddening of the skin at the injection site and venous streaking.
- > Sodium nitroprusside is rapidly metabolised to cyanide. Cyanide is further metabolised to thiocyanate in the liver and requires the presence of thiosulfate. Thiocyanate is then renally excreted.
- > Renal impairment may reduce excretion of thiocyanate and increase risk of toxicity.



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- > Patients with hepatic dysfunction are at increased risk of cyanide poisoning. Avoid use in severe hepatic impairment.
- > Infants are particularly susceptible to cyanide toxicity
- > **If signs of cyanide toxicity appear:**
 - > Discontinue sodium nitroprusside infusion
 - > Consult Poisons Information Centre
 - > Initially, administer hydroxocobalamin 50mg/kg, intravenously over 30minutes
 - > Cyanokit® (SAS) availability may depend on hospital site.
Reconstitute Cyanokit® (hydroxocobalamin 5g) vial with 200mL compatible fluid (sodium chloride 0.9% or glucose 5%)
 - > Followed by administration of sodium thiosulfate 400mg/kg, intravenously over 10minutes
 - > Availability may depend on hospital site
- > The paediatric dose of hydroxocobalamin as an antidote in cyanide poisoning has not been determined, but an initial dose has been suggest by Toxicology Handbook
- > Renal haemodialysis may be used to eliminate thiocyanate if severe toxicity occurs

Reference

- > William E. Benitz, Natalie Malachowski, Ronald S. Cohen et al, Use of sodium nitroprusside in neonates: Efficacy and safety, The Journal of Pediatrics, 1985, vol 106, issue 1, pp 102-110
- > Murray L, Daly F, Little M, Cadogan M. Toxicology handbook. Sydney: Elsevier Australia, Churchill Livingstone; 2011.

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