

Neonatal Intravenous Infusions Administration Guide

Key Points

- This is a locally compiled guide of Intravenous Medications Monographs used on the neonatal units within the trust
- It is not a comprehensive guide and for medications not listed please consult the BNFc

This is a controlled document. If you are using a printed copy, check it against the guidelines site to ensure you are using the latest edition. Print copies must be destroyed after use.

Abbreviations

BNFc	British National Formulary for children
ECG	electrocardiogram
DoH	Department of Health

Contents

Adrenaline dosing chart	5
Dinoprostone	6
Dobutamine	7
Dobutamine dosing chart	8
Dopamine	9
Dopamine dosing chart	10
Epoprostenol (prostacyclin)	11
Glucose – 12.5% w/v, 15% w/v, 17.5% w/v and 20% w/v solutions	12
Heparin sodium	13
Insulin (Actrapid®)	14
Intravenous Immunoglobulin (IVIG)	15
Midazolam	16
Morphine sulphate	17
Noradrenaline	19
Rocuronium	20
Sodium bicarbonate	21
Sodium chloride 2.7% or 3%	23
Vecuronium	24
Vecuronium dosing chart	25

References:.....26

Full version control record.....27

Adrenaline

INDICATIONS FOR USE	Life threatening bradycardia, resistant hypotension
ROUTE	Continuous intravenous infusion
DOSING	Initially 0.1 <i>microgram</i> /kg/min increasing until response obtained up to usual maximum 1.5 <i>micrograms</i> /kg/minute
PREPARATION(S)	Several strengths available but infusion should be prepared using adrenaline 1 in 1000 (1mg/mL) solution
DILUTION	Dilute 3mg/kg body weight to a final volume of 50 mL with glucose 5% <i>or</i> sodium chloride 0.9%
ADMINISTRATION	Infuse through a central venous catheter. An infusion rate of 0.1 mL/hour provides a dose of 0.1 <i>micrograms</i> /kg/minute
SIDE EFFECTS	Tremor, tachycardia, arrhythmias, cold extremities, hypertension (leading to cerebral haemorrhage), pulmonary oedema, metabolic acidosis. See BNFc for full list
CAUTIONS AND CONTRAINDICATIONS	None in life threatening situations. Caution in ischaemic heart disease, hypertension, hyperthyroidism, hypokalaemia or hypercalcaemia. See BNFc for full list Extravasation at injection site may cause necrosis
MONITORING	Continuous blood pressure and ECG monitoring
COMPATIBILITY INFORMATION	Compatible: Amikacin, caffeine, calcium gluconate, dobutamine, dopamine, fentanyl, flucloxacillin, furosemide, heparin sodium, hydrocortisone sodium succinate, midazolam, morphine sulfate, noradrenaline, pancuronium, potassium chloride, ranitidine, vecuronium. Incompatible: Nitrates, nitrites and salts of iron, copper and zinc. Sodium chloride 5%. Adrenaline should not be mixed with sodium bicarbonate or alkaline solutions. Compatible with the following infusion fluids: Glucose 10%, glucose 5%, glucose 2.5%, sodium chloride 0.18%, sodium chloride 0.9% and compound sodium lactate (Hartmann's)

Adrenaline dosing chart

Body weight (kg)	Volume (mL) of 1:1000 adrenaline to dilute up to 50mL for infusion	Body weight (kg)	Volume (mL) of 1:1000 adrenaline to dilute up to 50mL for infusion
0.45	1.35	2.25	6.75
0.50	1.50	2.30	6.90
0.55	1.65	2.35	7.05
0.60	1.80	2.40	7.20
0.65	1.95	2.45	7.35
0.70	2.10	2.50	7.50
0.75	2.25	2.55	7.65
0.80	2.40	2.60	7.80
0.85	2.55	2.65	7.95
0.90	2.70	2.70	8.10
0.95	2.85	2.75	8.25
1.00	3.00	2.80	8.40
1.05	3.15	2.85	8.55
1.10	3.30	2.90	8.70
1.15	3.45	2.95	8.85
1.20	3.60	3.00	9.00
1.25	3.75	3.1	9.30
1.30	3.90	3.2	9.60
1.35	4.05	3.3	9.90
1.40	4.20	3.4	10.2
1.45	4.35	3.5	10.5
1.50	4.50	3.6	10.8
1.55	4.65	3.7	11.1
1.60	4.80	3.8	11.4
1.65	4.95	3.9	11.7
1.70	5.10	4.0	12.0
1.75	5.25	4.1	12.3
1.80	5.40	4.2	12.6
1.85	5.55	4.3	12.9
1.90	5.70	4.4	13.2
1.95	5.85	4.5	13.5
2.00	6.00	4.6	13.8
2.05	6.15	4.7	14.1
2.10	6.30	4.8	14.4
2.15	6.45	4.9	14.7
2.20	6.60	5.0	15.0

Adrenaline 1 in 1000 is 1mg in 1mL

Dinoprostone

INDICATIONS FOR USE	Maintaining patency of the ductus arteriosus
ROUTE	Continuous intravenous infusion
DOSING	Initially 5 <i>nanograms</i> /kg/minute. If necessary, increase in steps of 5 <i>nanograms</i> /kg/minute as required to 20 <i>nanograms</i> /kg/minute
PREPARATION(S)	750 <i>micrograms</i> in 0.75mL ampoule (1mg/mL)
DILUTION	Dilute to 1 <i>microgram</i> /mL with glucose 5% <i>or</i> glucose 10% <i>or</i> sodium chloride 0.9% as described below: Take 0.5mL (500 <i>micrograms</i>) from the ampoule using a filter needle. Change the needle and add to a 500mL bag of diluent and mix well . This gives 1 microgram/mL. Withdraw 50mL into a syringe for infusion
ADMINISTRATION	Infuse initially at 5 <i>nanograms</i> /kg/minute (0.005mL/kg/minute <i>or</i> 0.3mL/kg/hour using the dilution above) using an infusion pump. Titrate as above. <i>A maximum of 100 nanograms/kg/minute has been used but is associated with increase adverse reactions – rarely recommended, consult tertiary centre</i>
SIDE EFFECTS	Bradycardia, hypotension, cardiac arrest, respiratory depression and apnoea, bronchospasm, DIC
CAUTIONS AND CONTRAINDICATIONS	Avoid in hyaline membrane disease. Caution in haemorrhage. Extravasation at the injection site is likely to cause tissue damage, product contains dehydrated alcohol
MONITORING	Continuous ECG monitoring. Monitor urine output, respiratory rate, arterial oxygenation and body temperature
COMPATIBILITY INFORMATION	No known compatibility information. Use a separate line for other infusion fluids and medicines. Do not infuse with any other medicine.

Dobutamine

INDICATIONS FOR USE	Inotropic support in the treatment of low cardiac output states Improve cardiac contractility
ROUTE	Continuous intravenous infusion
DOSING	Initially 5 - 10 <i>micrograms</i> /kg/minute. If necessary, increase in steps of 5 <i>micrograms</i> /kg/min every 30 minutes up to the maximum dose of 20 <i>micrograms</i> /kg/minute NB: Tolerance may develop with continuous infusions longer than 72 hours. An increase in dose may be required but should not exceed the maximum stated dose
PREPARATION(S)	250mg/20mL ampoule (12.5mg/mL)
DILUTION	Dilute 30mg/kg body weight to 50mL with sodium chloride 0.9% or glucose 5% Dobutamine solutions may develop a pink discolouration which is harmless and does not affect potency.
ADMINISTRATION	Infuse via an infusion pump at 0.5mL/hour to provide a dose of 5 <i>micrograms</i> /kg/minute. Administered via a central line if possible, however concentrations under 5mg/mL may be administered peripherally if necessary Concentrations of 5mg/mL and over must be infused via a central line only
SIDE EFFECTS	Tachycardia, arrhythmias, hypertension, hypotension, phlebitis, bronchospasm. See BNFC for full list
CAUTIONS AND CONTRAINDICATIONS	Phaeochromocytoma Correct hypercapnia, hypovolaemia, hypoxia, metabolic acidosis before starting and during treatment Extravasation at injection site may cause tissue necrosis
MONITORING	Continuous ECG monitoring
COMPATIBILITY INFORMATION	Compatible: Adrenaline, amiodarone, dobutamine, dopamine, fentanyl, fluconazole, lidocaine, morphine, noradrenaline, potassium chloride, ranitidine. Incompatible: Aciclovir, furosemide, heparin, phenytoin, piperacillin/tazobactam, alkaline solutions Compatible with the following infusion fluids: Sodium chloride 0.45%, sodium chloride 0.9%, glucose 5%, glucose 10% and Hartmann's solution

Dobutamine dosing chart

Body weight (kg)	dose (mg) of dobutamine to make up to 50mL (accurate to 5%)	Body weight (kg)	dose (mg) of dobutamine to make up to 50mL (accurate to 5%)
0.45	14	2.25	68
0.50	15	2.30	69
0.55	17	2.35	71
0.60	18	2.40	72
0.65	20	2.45	74
0.70	21	2.50	75
0.75	23	2.55	77
0.80	24	2.60	78
0.85	26	2.65	80
0.90	27	2.70	81
0.95	29	2.75	83
1.00	30	2.80	84
1.05	32	2.85	86
1.10	33	2.90	87
1.15	35	2.95	89
1.20	36	3.00	90
1.25	38	3.1	93
1.30	39	3.2	96
1.35	41	3.3	99
1.40	42	3.4	102
1.45	44	3.5	105
1.50	45	3.6	108
1.55	47	3.7	111
1.60	48	3.8	114
1.65	50	3.9	117
1.70	51	4.0	120
1.75	53	4.1	123
1.80	54	4.2	126
1.85	56	4.3	129
1.90	57	4.4	132
1.95	59	4.5	135
2.00	60	4.6	138
2.05	62	4.7	141
2.10	63	4.8	144
2.15	65	4.9	147
2.20	66	5.0	150

Dopamine

INDICATIONS FOR USE	Correction of haemodynamic imbalance associated with acute hypotension, shock or cardiac failure
ROUTE	Continuous intravenous infusion
DOSING	Initially <i>5micrograms/kg/minute</i> . If necessary, increase in steps of <i>5 micrograms/kg/min</i> every 30 minutes up to the maximum dose of <i>20micrograms/kg/minute</i> (For renal perfusion dose at <i>1-5microgram/kg/min</i>)
PREPARATION(S)	200mg in 5mL ampoule (40mg/mL)
DILUTION	Dilute 30mg/kg body weight to 50mL with sodium chloride 0.9% or glucose 5%
ADMINISTRATION	A rate of 0.5mL/hour provides a dose of <i>5 micrograms/kg/minute</i> Administer via a central line using an infusion pump. If no alternative e.g. while a central line is being sited, it may be administered peripherally at a maximum concentration of 3.2mg/mL. Where fluid restriction is necessary, a double strength solution may be used. Dilute 60mg/kg body weight to 50mL and infuse centrally at 0.25mL/hour to give <i>5micrograms/kg/minute</i>. More concentrated solutions (including undiluted solution) may be used if necessary. These MUST be via central line, and consideration should be given to the accuracy of the infusion pump available.
SIDE EFFECTS	Tachycardia, vasoconstriction, gangrene, hypotension, bradycardia, hypertension, arrhythmia, dyspnoea, tremor
CAUTIONS AND CONTRAINDICATIONS	Tachyarrhythmia Phaeochromocytoma Correct hypovolaemia before initiating Can cause local vasoconstriction leading to severe tissue hypoxia and ischaemia Monitor carefully for peripheral ischaemia if not given centrally
MONITORING	Continuous ECG monitoring
COMPATIBILITY INFORMATION	Compatible: ciprofloxacin, dobutamine, fentanyl, heparin, metronidazole, noradrenaline, potassium chloride, vecuronium Compatible with the following infusion fluids: Sodium chloride 0.45%, sodium chloride 0.9%, glucose 5%, glucose 10% Incompatible: Aciclovir, furosemide, gentamicin, insulin Dopamine is inactivated in alkaline solution and should NOT be infused with sodium bicarbonate or other alkaline substances.

Dopamine dosing chart

Body weight (kg)	dose (mg) of dopamine to make up to 50mL (accurate to 5%)	Body weight (kg)	dose (mg) of dopamine to make up to 50mL (accurate to 5%)
0.45	14	2.25	68
0.50	15	2.30	69
0.55	17	2.35	71
0.60	18	2.40	72
0.65	20	2.45	74
0.70	21	2.50	75
0.75	23	2.55	77
0.80	24	2.60	78
0.85	26	2.65	80
0.90	27	2.70	81
0.95	29	2.75	83
1.00	30	2.80	84
1.05	32	2.85	86
1.10	33	2.90	87
1.15	35	2.95	89
1.20	36	3.00	90
1.25	38	3.1	93
1.30	39	3.2	96
1.35	41	3.3	99
1.40	42	3.4	102
1.45	44	3.5	105
1.50	45	3.6	108
1.55	47	3.7	111
1.60	48	3.8	114
1.65	50	3.9	117
1.70	51	4.0	120
1.75	53	4.1	123
1.80	54	4.2	126
1.85	56	4.3	129
1.90	57	4.4	132
1.95	59	4.5	135
2.00	60	4.6	138
2.05	62	4.7	141
2.10	63	4.8	144
2.15	65	4.9	147
2.20	66	5.0	150

Epoprostenol (prostacyclin)

INDICATIONS FOR USE	Persistent pulmonary hypertension
ROUTE	Continuous intravenous infusion
DOSING	Initially 5 <i>nanograms/kg/minute</i> (use 1-2<i>nanograms/kg/minute</i> if blood pressure very unstable). If necessary, increase in steps of 5 <i>nanograms/kg/minute</i> as required to 20 <i>nanograms/kg/minute</i>. Doses of up to 40 <i>nanograms/kg/minute</i> may be necessary under certain circumstances.
PREPARATION(S)	500 <i>microgram</i> vial with glycine buffer diluent
RECONSTITUTION AND DILUTION	Step 1 Reconstitute 500 <i>microgram</i> vial. Using the <u>glycine buffer diluent provided</u> add approximately 10mL to the vial. Shake gently until the powder has dissolved. Draw up the reconstituted solution and re-inject it into the remaining volume of glycine buffer diluent. Mix well. This will give a 'concentrated solution' of 10<i>micrograms/mL</i> Step 2 To prepare 50mL of a 2,000<i>nanograms/mL</i> (2<i>micrograms/mL</i>) solution: draw up 10mL (100 <i>micrograms</i>) of the above 'concentrated solution' directly into a 20mL syringe. Attach the filter provided. Withdraw 40mL of sodium chloride 0.9% into a 50mL syringe. Filter the 10mL of 'concentrated solution' into the 50mL syringe containing sodium chloride 0.9% over approximately 15 seconds. Mix well.
ADMINISTRATION	Administer via a central line if possible. Infuse initially at 5 <i>nanograms/kg/minute</i> (0.0025mL/kg/minute or 0.15mL/kg/hour using the dilution above) using an infusion pump. Titrate as above.
SIDE EFFECTS	Arrhythmia, haemorrhage, rash, sepsis, hyperthyroidism, pulmonary oedema, hypotension, bradycardia, tachycardia, hyperglycaemia
CAUTIONS AND CONTRAINDICATIONS	Pulmonary veno-occlusive disease. Severe left ventricular dysfunction Avoid abrupt withdrawal – risk of rebound pulmonary hypertension and hypertensive crisis Extravasation at the injection site may cause tissue damage
MONITORING	Continuous ECG monitoring
COMPATIBILITY INFORMATION	No known compatibility information. Use a separate line for other infusion fluids and medicines. Do not infuse with any other medicine. Do not reconstitute with any other diluent than the glycine buffer provided. Dilute only with sodium chloride 0.9%

Glucose – 12.5% w/v, 15% w/v, 17.5% w/v and 20% w/v solutions

INDICATIONS FOR USE	Persistently low blood glucose Hyperinsulinaemia For neonatal hyperkalaemia refer to separate policy on the intranet
ROUTE	Intravenous infusion
DOSING	See hypoglycaemia guidelines
RECONSTITUTION AND ADMINISTRATION	Using 500mL glucose 10% w/v bags and glucose 50% w/v vials <u>To make a 12.5% w/v solution:</u> •Withdraw and discard 50mL from glucose 10% 500mL bag •Add 30mL glucose 50% w/v to bag •Resulting solution = 480mL glucose 12.5% w/v <u>To make a 15% w/v solution:</u> •Withdraw and discard 80mL from glucose 10% 500mL bag •Add 60mL glucose 50% w/v to bag •Resulting solution = 480mL glucose 15% w/v <u>To make a 17.5% w/v solution:</u> •Withdraw and discard 110mL from glucose 10% 500mL bag •Add 90mL glucose 50% w/v to bag •Resulting solution = 480mL glucose 17.5% w/v <u>To make a 20% w/v solution:</u> •Withdraw and discard 140mL from glucose 10% 500mL bag •Add 120mL glucose 50% w/v to bag •Resulting solution = 480mL glucose 20% w/v
MONITORING	Blood glucose Monitor infusion site regularly Solutions of greater than 12.5% irritate peripheral veins and MUST be administered via central line

Heparin sodium

INDICATIONS FOR USE	Maintenance of neonatal umbilical arterial catheter
ROUTE	Via arterial line
DOSING	0.5 to 1 unit/hour
PREPARATION(S)	Use one ampoule of 50 units in 5mL (other strengths available)
RECONSTITUTION AND ADMINISTRATION	Make up 50 units (5mL) of heparin to 50mL with 0.45% or 0.9% sodium chloride*. This gives 1 unit in 1mL
SIDE EFFECTS	Haemorrhage, thrombocytopenia.
CONTRAINDICATIONS	Haemophilia and other haemorrhagic disorders, thrombocytopenia, recent cerebral haemorrhage.
COMPATIBILITY INFORMATION	Compatible: Adrenaline, alfentanil, aminophylline, clonidine, dobutamine, dopamine, fentanyl, fluconazole, furosemide, ganciclovir, insulin, linezolid, meropenem, midazolam, morphine, noradrenaline, remifentanyl, rocuronium, sodium nitroprusside, vecuronium Incompatible: Alteplase, amiodarone, amphotericin, ciprofloxacin, clarithromycin, erythromycin, gentamicin, hydrocortisone sodium succinate, isosorbide dinitrate, labetalol, nicardipine, tobramycin

*Always check product leaflet for diluent information

Insulin (Actrapid®)

INDICATIONS FOR USE	Neonatal diabetes and neonatal hyperglycaemia For neonatal hyperkalaemia refer to separate policy on the intranet
ROUTE	Intravenous infusion
DOSING	Starting dose of 0.05 units/kg/hour and titrate to response according to separate guidelines
PREPARATION(S)	Insulin soluble (Actrapid®) 100 units/mL - 10mL vial
DILUTION AND ADMINISTRATION	Dilute 25 units (using an insulin syringe) of Actrapid® to 50mL with sodium chloride 0.9%. The resultant solution is 0.5 units/mL A rate of 0.1mL/kg/hour provides a dose of 0.05units/kg/hour Note: this dilution may differ from practice in other centres. This is to allow for the minimum infusion rate possible with current equipment (0.1mL/hour). To give doses smaller than 0.05 units/kg/hour, 10 units of Actrapid® may be made up to 40mL (0.25 units/mL) Insulin may be adsorbed to plastics: prime giving set with at least 5mL of the prepared insulin solution prior to connection.
SIDE EFFECTS	Hypoglycaemia, transient oedema, local reactions and fat hypertrophy at injection site, rarely hypersensitivity reactions including urticaria, rash
CAUTIONS AND CONTRAINDICATIONS	Hypersensitivity to insulin
MONITORING	Blood glucose, potassium
COMPATIBILITY INFORMATION	Compatible: Dobutamine (in glucose 5%), gentamicin (in sodium chloride 0.9%), meropenem (in sodium chloride 0.9%), morphine, potassium chloride, vancomycin (in glucose 5%) Compatible with the following infusion fluids: Sodium chloride 0.9%, glucose 5%, glucose 10% Incompatible: dopamine, ranitidine

Intravenous Immunoglobulin (IVIG)

INDICATIONS FOR USE	Haemolytic Disease of the Newborn This is a red indication in the DoH Guidelines; automatic approval for use will be granted, but an immunoglobulin request form is still required. The ward pharmacist (or out of hours the on-call pharmacist) must be contacted prior to use. Other possible indications need to be discussed with the pharmacist before administration
ROUTE	Intravenous infusion
DOSING	0.5g/kg over minimum 4 hours as per NICE CG98 Neonatal Jaundice NOTE: to maximise benefit and minimise wastage, where a dose is less than a whole vial the dose may be rounded up to that whole vial if requested by consultant, and at the discretion of the pharmacist. - Doses must <u>never</u> exceed 1g/kg. - Doses may not be increased beyond the smallest vial size that would provide the original (0.5g/kg) dose
PREPARATION(S)	100mg/mL in various pack sizes Record brand administered
DILUTION	Give undiluted. Give via a separate infusion line, do not infuse with any other medicines
ADMINISTRATION	Infuse at: 0.3mL (30mg)/kg/hour for 30 minutes. If tolerated increase to 0.6mL (60mg)/kg/hour for 30 minutes, then 1.2mL (120mg)/kg/hour for 30 minutes, then 1.5mL (150mg)/kg/hour for the remainder of the infusion Delivers a dose of 0.5g/kg in approximately 4hrs 10mins
SIDE EFFECTS	Nausea, vomiting, headache, chills, fever, headache, hypotension, muscle spasms. See BNFc for complete list.
CAUTIONS AND CONTRAINDICATIONS	Contraindicated in hyperprolinaemia (Privigen® brand) Previous hypersensitivity reactions to immunoglobulin products Ensure adequate hydration Extravasation at injection site may cause tissue damage Avoid live vaccines <u>except rotavirus</u> for 3 months following immunoglobulin infusion. If rotavirus not given on schedule the chance to vaccinate may be lost.
MONITORING	Observations as per blood products (blood pressure, heart rate, oxygen saturations, respiratory rate and temperature) every 20 minutes. If there are any problems with the observations the infusion should be reduced to the last tolerated rate. The remainder of the infusion should then be run at this rate. Patients should be monitored for 1 hour after the infusion finishes

**NB: Not stocked wards. During opening hours contact the ward pharmacist for supply.
Out of hours – contact on call pharmacist via Site Manager.**

Midazolam		
INDICATIONS FOR USE	Sedation	Status epilepticus
ROUTE	Intravenous Injection / Continuous intravenous infusion	
DOSING	<u>Neonates < 32 weeks CGA:</u> 60micrograms/kg/hour. Reduce after 24 hours to 30 micrograms/kg/hour Adjust according to response <u>Neonates >32 weeks CGA:</u> 60micrograms/kg/hour adjusted according to response Maximum treatment of 4 days	<u>Loading dose via IV injection:</u> Initially 150–200 micrograms/kg <u>Maintenance dose by continuous IV infusion:</u> 60micrograms/kg/hour, increased in steps of 60 micrograms/kg/hour every 15 minutes until seizure controlled (maximum 300 micrograms/kg/hour)
PREPARATION(S)	10mg in 2mL and several sizes of 1mg/mL	
DILUTION	<u>For IV injection</u> Dilute dose if necessary, to aid administration, to maximum concentration of 1mg/mL with glucose 5% or sodium chloride 0.9%. <u>For IV infusion</u> Dilute 5mg/kg body weight to a final volume of 50mL with either sodium chloride 0.9% or glucose 5%. Where fluid restriction is necessary midazolam may be diluted in a smaller volume to a maximum concentration of 1mg/mL	
ADMINISTRATION	Infuse centrally or via a large peripheral vein at 0.6mL/hour to provide a dose of 60micrograms/kg/hour	<u>Loading dose (IV Injection)</u> Give dose over at least 3 - 5 minutes <u>Maintenance dose (IV infusion)</u> Infuse centrally or via a large peripheral vein at 0.6mL/hour to provide 60micrograms/kg/hour 120 micrograms/kg/hour: 1.2mL/hour 180 micrograms/kg/hour: 1.8mL/hour 240 micrograms/kg/hour: 2.4mL/hour 300 micrograms/kg/hour: 3mL/hour
SIDE EFFECTS	Anaphylaxis, bronchospasm, respiratory depression, jaundice, hypotension, cardiac arrest, convulsions, paradoxical excitement, blood disorders, and others: see BNFc Following prolonged courses, reduce dose gradually over several days Flumazenil is the specific antidote for midazolam induced respiratory depression.	
CONTRAINDICATIONS	Severe respiratory depression, acute pulmonary insufficiency, sleep apnoea syndrome	
COMPATIBILITY INFORMATION	Compatible with the following infusion fluids: Glucose 5%, sodium chloride 0.9%, glucose 10% See Medusa IV guide for full list of compatibilities	

Morphine sulphate

INDICATIONS FOR USE	Sedation or relief of pain (following loading dose). For loading dose see the Neonatal Medicines Guide.
ROUTE	Continuous intravenous infusion
DOSING	5 - 20 <i>micrograms</i> /kg/hour
PREPARATION(S)	10mg in 10mL ampoules
DILUTION	Dilute 0.5mg/kg body weight to a total volume of 50mL with sodium chloride 0.9%, glucose 5% or glucose 10%
ADMINISTRATION	5<i>micrograms</i>/kg/hour Infuse at 0.5mL/hour 10<i>micrograms</i>/kg/hour Infuse at 1mL/hour 15<i>micrograms</i>/kg/hour Infuse at 1.5mL/hour 20<i>micrograms</i>/kg/hour Infuse at 2mL/hour Doses above 20<i>micrograms</i>/kg/hour may be given by increasing the flow rate accordingly; suggested maximum in non-ventilated patients is 60<i>micrograms</i>/kg/hour. Usual maximum concentration 100<i>microgram</i>/mL Where fluid restriction is necessary more concentrated solutions can be used, but consideration should be given to the accuracy of the infusion pump available.
SIDE EFFECTS	Vomiting, constipation and drowsiness. Larger doses produce respiratory depression and hypotension.
CAUTIONS AND CONTRAINDICATIONS	Paralytic ileus, raised intracranial pressure, acute respiratory depression and liver failure (may precipitate coma) Caution in phaeochromocytoma Monitor for respiratory depression

COMPATIBILITY INFORMATION	Compatible: Adrenaline, amikacin, atropine, cefotaxime, cefuroxime, dobutamine, dopamine, fentanyl, fluconazole, gentamicin, hydrocortisone, insulin, magnesium sulfate, meropenem, metronidazole, midazolam, noradrenaline, paracetamol, potassium chloride, vancomycin, vecuronium. Compatible with the following infusion fluids: Compound sodium lactate, glucose 5%, glucose 10%, and sodium chloride 0.9% Incompatible: Likely to be incompatible with alkaline agents. Also aciclovir, amphotericin, furosemide, heparin, phenobarbitone, phenytoin, sodium bicarbonate.
----------------------------------	---

Noradrenaline

INDICATIONS FOR USE	Acute hypotension (septic shock) or acute hypotension secondary to excessive vasodilation
ROUTE	Continuous intravenous infusion
DOSING	20-100 <i>nanograms</i> /kg/minute, adjusted according to response to a maximum of 1 <i>microgram</i> /kg/minute
PREPARATION(S)	Noradrenaline base 1mg/mL (= noradrenaline tartrate 2mg/mL)
DILUTION	Dilute 300<i>micrograms</i>/kg bodyweight of noradrenaline base to a total volume of 50mL with glucose 5%. Sodium chloride 0.9% may be used as an alternative. All doses and concentrations are expressed as base 1mg noradrenaline base = 2mg noradrenaline tartrate
ADMINISTRATION	Infuse via a central line at 0.2mL/hour to provide a dose of 20<i>nanogram</i>/kg/minute The infusion must not be used if it is discoloured (e.g. pink, dark yellow, brown) or contains precipitate. Down-titrate infusion before stopping to avoid rebound hypotension. Do not flush line as this will cause a bolus of inotrope in the dead space to be given. Instead attach syringe of 0.9% sodium chloride and run at previous rate until dead space of lumen is cleared.
SIDE EFFECTS	Vomiting, hypoxia, arrhythmias, peripheral ischaemia, hypertension, bradycardia, tachycardia, dyspnoea, tremor, urinary retention, angle-closure glaucoma
CAUTIONS AND CONTRAINDICATIONS	Hypertension (monitor blood pressure and flow frequently) Extravasation at injection site will cause tissue necrosis
COMPATIBILITY INFORMATION	Compatible: Adrenaline, dobutamine in glucose 5%, dopamine in glucose 5%, fentanyl, heparin sodium, hydrocortisone, midazolam in glucose 5%, morphine in glucose 5%, potassium chloride, vecuronium Compatible with the following infusion fluids: Sodium chloride 0.9% (not usually recommended due to lack of protection from oxidation), glucose 5% and sodium chloride 0.9%, Hartmann's solution Incompatible: Alkaline solutions or bicarbonate, insulin

Rocuronium

INDICATIONS FOR USE	Neuromuscular blockade for assisted ventilation (intermediate duration) *
ROUTE	Intravenous injection over 3 to 5 minutes Intravenous infusion
DOSING	Initial dose (optional) 600 <i>micrograms</i> /kg by IV injection then 300-600 <i>micrograms</i> /kg/hour for first hour then adjusted according to response
PREPARATION(S)	10mg/mL as a 5mL vial.
RECONSTITUTION AND ADMINISTRATION	The 10mg/mL solution may be used undiluted for injection or infusion. If required, it may be diluted using sodium chloride 0.9% or glucose 5% to any appropriate concentration. Dilute 40mg/kg body weight to a final volume of 20mL with sodium chloride 0.9% or glucose 5%. A rate of 0.15mL/hour provides a dose of 300 <i>micrograms</i>/kg/hour.
SIDE EFFECTS	Tachycardia, hypotension, prolonged neuromuscular block, anaphylactic reactions, injection site histaminergic reactions (rare)
CONTRAINDICATIONS	Hypersensitivity to rocuronium, the bromide ion, or to any of the excipients
COMPATIBILITY INFORMATION	Compatible: Sodium chloride 0.9%, glucose 5%, glucose 5% in sodium chloride 0.9%, water for injections. Incompatible: many documented incompatibilities. Do not mix with any other medicines.

Sodium bicarbonate

INDICATIONS FOR USE	Correction of acidosis
ROUTE	Intravenous infusion
DOSING	The formula for calculating a full correction is: $\text{bicarbonate (mmol)} = F \times \text{base deficit (mmol/L)} \times \text{weight (kg)}$ for a half correction use half the amount calculated above F (extracellular fluid to weight ratio) = 0.5-0.6 in premature neonates, 0.4 in neonates and 0.3 in infants and children
PREPARATION(S)	8.4% (1mmol/mL) 10mL ampoules 4.2% (0.5mmol/mL) 500mL Polyfusor or ampoules 1.26% (0.15mmol/mL) 500mL Polyfusor or ampoules <i>(isotonic)</i>
DILUTION	If giving centrally: use 4.2% solution and withdraw the required dose <i>or</i> If diluting 8.4%, draw up the required dose and add the same volume of diluent to make 4.2% sodium bicarbonate. If giving peripherally: ideally use 1.26% sodium bicarbonate and draw up the required dose <i>or</i> If diluting 8.4%, draw up the required dose and add 5 times the volume of diluent to make 1.4% <i>or</i> If diluting 4.2%, draw up the required dose and add 2 times the volume of diluent to make 1.4% Preferred diluents: glucose 5%, glucose 10% Other diluents: water for injection, sodium chloride 0.9%
ADMINISTRATION	Only half the base deficit should be corrected initially by slow IV infusion over 30 minutes and blood glucose, pH and electrolytes analysed before full correction is needed
SIDE EFFECTS	Alkalosis, hypokalaemia, hyper-irritability or tetany (administer calcium gluconate if tetany is present)

CONTRAINDICATIONS	Caution in hypernatraemia, carbon dioxide retention or renal impairment
COMPATIBILITY INFORMATION	Additions should never be made to sodium bicarbonate and it should not be infused via the same line as any other infusion, particularly calcium and magnesium salts

Sodium chloride 2.7% or 3%

INDICATIONS FOR USE	Treatment of cerebral oedema and raised intracranial pressure Symptomatic hyponatraemic seizures
ROUTE	Intravenous infusion over 10-20 minutes
DOSING	3mL/kg of 2.7% or 3% sodium chloride Dose may be repeated as clinically indicated (3mL/kg will increase plasma sodium by around 2-3mmol/L) <i>**dose is the SAME for 2.7% or 3%**</i>
PREPARATION(S)	First choice: 2.7% Polyfusor If pre-made 2.7% not available: use 30% ampoules (10mL) to prepare as below
PREPARATION OF 3% SODIUM CHLORIDE FROM 30% AMPOULES	***only if ready-made Polyfusor NOT available*** 1. remove and discard 36mL from a 500mL bag of 0.9% sodium chloride (464mL) 2. draw up 36mL of 30% sodium chloride and add to the 500mL bag (500mL) 3. mix thoroughly
ADMINISTRATION	Withdraw the prescribed volume of sodium chloride 2.7% OR 3% into a syringe to administer to the baby. Administer via central line if possible
SIDE EFFECTS	Acute hypotension (less likely if administered as an infusion), hypernatraemia, hypokalaemia Extravasation can cause severe tissue injury
CONTRAINDICATIONS	None when used for indications above
NURSING CARE CONSIDERATIONS	Do not connect the 500mL bag or Polyfusor directly to the baby: risk of serious sodium overdose if full bag accidentally infused

References

Southampton Oxford Retrieval Team (2024) *Guideline to make up hypertonic saline (3%NaCl)*. Available at:
<https://www.sort.nhs.uk/Media/Guidelines/Hypertonicsaline3sodiumchlorideguideline.pdf>
 (accessed: 25 November 2025).

Vecuronium

INDICATIONS FOR USE	Neuromuscular blockade for assisted ventilation (following loading dose) For loading dose see the Neonatal Medicines Guide. Onset of action: 19 – 120 seconds Duration of action: 30 – 40 minutes
ROUTE	Intravenous infusion
DOSING	50-80<i>micrograms</i>/kg/hour by IV infusion (see table) Titrated to a maximum of 200<i>micrograms</i>/kg/hour
PREPARATION(S)	10mg powder for reconstitution
RECONSTITUTION AND ADMINISTRATION	Reconstitute the 10mg vial with up to 10 mL water for injections Dilute 5mg/kg body weight to a total volume of 50mL with glucose 5%, glucose 10%, or sodium chloride 0.9% to give a concentration of 100 <i>micrograms</i>/kg/mL 0.5mL/hour gives 50 <i>micrograms</i>/kg/hour 0.8mL/hour gives 80 <i>micrograms</i>/kg/hour
SIDE EFFECTS	Flushing, hypotension. Prolonged neuromuscular block, anaphylactic reactions, injection site histaminergic reactions (rare)
CONTRAINDICATIONS	Hypersensitivity to vecuronium, the bromide ion, or excipients
COMPATIBILITY INFORMATION	Compatible: Adrenaline, amiodarone, calcium gluconate, cefuroxime, ciprofloxacin, clarithromycin, dobutamine, dopamine, esmolol, fentanyl, fluconazole, gentamicin, glyceryl trinitrate, heparin, hydrocortisone sodium succinate, isoprenaline, labetalol, lorazepam, magnesium sulfate, midazolam, morphine, noradrenaline, propofol, ranitidine, sodium nitroprusside, vancomycin. Incompatible: diazepam, etomidate, furosemide, pantoprazole, thiopental and other alkaline medicines/solutions.
NURSING CARE CONSIDERATIONS	**To avoid adverse effects from unintentional “bolus” dose, flush at same rate as the infusion was administered**

Vecuronium dosing chart

Body weight (kg)	dose (mg) to make up to 50mL	Body weight (kg)	dose (mg) to make up to 50mL
0.45	2.25	2.25	11.25
0.50	2.50	2.30	11.50
0.55	2.75	2.35	11.75
0.60	3.00	2.40	12.00
0.65	3.25	2.45	12.25
0.70	3.50	2.50	12.50
0.75	3.75	2.55	12.75
0.80	4.00	2.60	13.00
0.85	4.25	2.65	13.25
0.90	4.50	2.70	13.50
0.95	4.75	2.75	13.75
1.00	5.00	2.80	14.00
1.05	5.25	2.85	14.25
1.10	5.50	2.90	14.50
1.15	5.75	2.95	14.75
1.20	6.00	3.00	15.00
1.25	6.25	3.1	15.50
1.30	6.50	3.2	16.00
1.35	6.75	3.3	16.50
1.40	7.00	3.4	17.00
1.45	7.25	3.5	17.50
1.50	7.50	3.6	18.00
1.55	7.75	3.7	18.50
1.60	8.00	3.8	19.00
1.65	8.25	3.9	19.50
1.70	8.50	4.0	20.00
1.75	8.75	4.1	20.50
1.80	9.00	4.2	21.00
1.85	9.25	4.3	21.50
1.90	9.50	4.4	22.00
1.95	9.75	4.5	22.50
2.00	10.00	4.6	23.00
2.05	10.25	4.7	23.50
2.10	10.50	4.8	24.00
2.15	10.75	4.9	24.50
2.20	11.00	5.0	25.00

References:

1. Royal Pharmaceutical Society (2025) *Martindale Complete Drug Reference* [online]. London: Royal Pharmaceutical Society. Available at: <https://www.medicinescomplete.com/#/browse/martindale> (Accessed: 25 November 2025).
2. NHS (no date) *Injectable Medicines Guide (Medusa)*. London: NHS England. Available at: <https://www.medusaimg.nhs.uk/> (Accessed: 25 November 2025)
3. Guy's and St Thomas' NHS Foundation Trust and Evelina London Children's Healthcare (2025) *How we approve medicines – the paediatric formulary*. Available at: <https://www.evelinalondon.nhs.uk/our-services/hospital/pharmacy/formulary.aspx> (Accessed: 25 November 2025).

Full version control record

Version:	2.0
Guidelines Lead(s):	Dr Angela Yannoulis, Consultant Paediatrician
Contributor(s):	Dr Sanjay Jaiswal, Consultant Paediatrician Ruth Botting, Ruhena Ahmad, Barbara Joules & Diedre Kriel, Women and Children's Pharmacists Shakeela Banno, Neonatal Ward Manager June Swanton, Neonatal Ward Manager
Lead Director / Chief of Service:	Rekha Sanghavi, Consultant Paediatrician
Library check completed:	25/11/25
Ratified at:	Cross-site Paediatric Clinical Governance Jan 2026 Drugs and Therapeutics Committee Feb 2026
Date Issued:	15/04/2026
Review Date:	01/04/2028
Pharmaceutical dosing advice and formulary compliance checked by:	Rashmi Selli Principal Pharmacist Women's and Children
Key words:	Neonatal Intravenous Formulary, Intravenous infusion(s) for neonates, Neonatal medicine, neonatal infusions

This guideline has been registered with the Trust. However, clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt, contact a senior colleague or expert. Caution is advised when using guidelines after the review date.

This guideline is for use in Frimley Health NHS Foundation Trust hospitals only. Any use outside this location will not be supported by the Trust and will be at the risk of the individual using it.

Version History

Version	Date	Guideline Lead(s)	Status	Comment
1.0	July 2021	Dr. Angela Yannoulis, Consultant Paediatrician Dr. Sanjay Jaiswal, Consultant Paediatrician Ruth Botting, Ruhena Ahmad, Barbara Joules & Dierdre Kriel, Women and Children's Pharmacists Shakeela Banno, Neonatal Ward Manager June Swanton, Neonatal Ward Manager	Final	Cross-site Paediatric Clinical Governance (21/07/2021)
2.0	April 2026	Dr. Angela Yannoulis, Consultant Paediatrician	Final	Cross-site Paediatric Clinical Governance (21/1/26) &

		Dr. Sanjay Jaiswal, Consultant Paediatrician Ruth Botting, Ruhena Ahmad, Barbara Joules & Dierdre Kriel, Women and Children's Pharmacists Shakeela Banno, Neonatal Ward Manager June Swanton, Neonatal Ward Manager		Drugs and Therapeutics Committee Feb 2026

Related Documents

Document Type	Document Name