Specialist Adult Intravenous Monographs

Generic Name	Brand Name	Speciality Area
Abatacept	Orencia	Not restricted
Acetazolamide	Acetazolamide	Critical Care
Addiphos	Addiphos	Critical Care
Adrenaline Critical Care	Adrenaline Critical Care	Critical Care
Adrenaline in CRYP	Adrenaline CRYP	CRYP
Ajmaline	Gilurytmal	CRY Unit
Alemtuzumab	Lemtrada	Neurology
Alteplase (Actilyse-Cathflo)	Actilyse Cathflo	CVAD patients
Amiodarone	Cordarone	Critical Care
Andexanet alfa	Ondexxya	ED/ Critical Care
Argatroban	Argatroban	ICU/ PACU
Argipressin (arginine vasopressin)	Embesin	Critical Care
Atracurium	Tracrium	ICU/ PACU
Calcium Gluconate	Calcium Gluconate	Critical Care
Clonidine	Catapress	Critical Care
Co-trimoxazole	Septrin	Critical Care
Dantrolene	Agilus	RDSC, Critical Care, ECT.
Dexmedetomidine	Dexmedetomidine	Critical Care
Dopamine	Dopamine	Critical Care
Eculizumab	Soliris	Renal patients
Enoximone	Perfan	Critical Care
Eptifibatide	Integrilin, Athenex	Cardiology/Critical Care
Eptinezumab	Vyepti	Rynd Unit
Esmolol	Brevibloc	Critical Care
Fentanyl procedural sedation	Fentanyl procedural sedation	Adult X-Ray/ Endoscopy/ Renal Dept
Fentanyl Critical Care	Fentanyl ICU/ PACU/ HDU	Critical Care
Filgrastim Critical Care	Neupogen	Critical Care
Heparin during Haemodialysis via AV fistula	Heparin during Haemodialysis via AV fistula	Dialysis Unit
Heparin during Haemodialysis via CVAD	Heparin during Haemodialysis via CVAD	Dialysis Unit
Heparin CVAD lock solution	Heparin CVAD lock solution	Dialysis Unit/ ICU
Hydralazine	Hydralazine	Not restricted
Ibuprofen	Ibuprofen	ED
Isoprenaline hydrochloride	Isuprel	CRY Unit
IVIg: Human Normal Immunoglobulin 5%	Flebogamma DIF 5%	Not restricted
IVIg: Human Normal Immunoglobulin 10%	Flebogamma DIF 10%	Not restricted
IVIg: Human Normal Immunoglobulin 5% & 10%	Intratect 5%, Intratect 10%	Not restricted
Ketamine	Ketalar	Critical Care

Not for general ward use, only to be used by suitably qualified personnel in the clinical area specified

This information has been summarised to act as a guide for those administering IV medication in TUH adult patients. Information on dose, adverse effects, cautions & contra-indications is not complete. Further information is available from SPC, BNF, TUH Adult Medicines Guide & clinical pharmacist.

Labetalol	Labetalol	Acute Stroke Unit/ ED/ Critical Care
Levosimendan	Simdax	Critical Care
Magnesium Sulphate	Magnesium Sulphate	Critical Care
Methylthioninium Chloride Proveblue (methylene blue)	Methylthionium Chloride Proveblue	Critical Care
Metoprolol	Betaloc (other brands also used)	Acute Stroke Unit/ ED/ Critical Care
Midazolam procedural sedation	Hypnovel procedural sedation	Adult X-Ray/ Endoscopy/Renal Dept
Midazolam in Critical Care	Midazolam in Critical Care	Critical Care
Milrinone	Primacor	Critical Care
Morphine Sulphate Critical Care	Morphine Sulphate ICU/PACU	Critical Care
Naloxone procedural sedation	Naloxone procedural sedation	Adult X-ray/ Renal Dept
Natalizumab	Tysabri	Neurology
Nicardipine	Loxen	Acute Stroke Unit, ED
Nimodipine	Nimotop	Critical Care/ Acute Stroke
Noradrenaline (norepinephrine)*	Noradrenaline	ED Resus/POSU/ Theatre/Paeds/CCU-HDU, blue boxes
Ocrelizumab	Ocrevus	Neurology
Paricalcitol	Zemplar	Dialysis Unit
Patisiran	Onpattro	Rynd Unit
Phenylephrine	Phenylephrine	Critical Care
Potassium chloride	Potassium chloride	Critical Care
Potassium Phosphate	Potassium Phosphate	Critical Care
Propofol 1%	Propofol-Lipuro 1%	ICU/ PACU
Remifentanil	Ultiva, Noridem	Critical Care
Risankizumab	Skyrizi	Gastroenterology
Rocuronium bromide	Esmeron	ICU/ PACU
Sodium Phosphate	BBraun Natrium Phosphate	Critical Care
Sodium thiosulfate Martindale/Ethypharma product	Sodium thiosulfate	Renal Dept (exceptions apply)
Sodium thiosulfate Hope pharmaceuticals product	Sodium thiosulfate	Renal Dept (exceptions apply)
Tenecteplase	Metalyse	Acute Stroke
Thiopental Sodium	Thiopental Sodium	ICU/PACU
Tinzaparin bolus during HD via arterial port	Innohep	Dialysis
Tinzaparin continuous infusion during HD via arterial anticoagulation line	Innohep	Dialysis
Tocilizumab	RoActemra	Not restricted
Trisodium Citrate	Duralock-C	Dialysis Unit/ ICU
Ustekinumab	Stelara	Not restricted
Vancomycin	Vancomycin	Critical Care

Not for general ward use, only to be used by suitably qualified personnel in the clinical area specified

This information has been summarised to act as a guide for those administering IV medication in TUH adult patients. Information on dose, adverse effects, cautions & contra-indications is not complete. Further information is available from SPC, BNF, TUH Adult Medicines Guide & clinical pharmacist.

Vasopressin	Pitressin	Critical Care
	Embesin-refer to Argipressin monograph	
Vedolizumab	Entyvio	Not restricted
Vernakalant	Brinavess	ED

* Please select the correct monograph for the brand in use in your area

ABATACEPT (Orencia®) (page 1 of 2)

IV cytokine modulators are on the exclusion list of drugs not generally to be administered by nursing staff as per the IV Drug Administration Policy

Form: 250mg dry powder vial

Reconstitution: Reconstitute each 250mg vial with 10mL of Water for Injection, using the silicone-free syringe provided and an 18-21 gauge needle (pink or green). Direct the stream of water for injections to the glass wall of the vial.

Do not use the vial if there is no vacuum present

To minimise foam formation, the vial should be rotated with gentle swirling until the contents are completely dissolved. **Do not shake.** Avoid prolonged or vigorous agitation.

Compatible Fluid: Sodium Chloride 0.9%

Administration: Peripheral or central IV route.

Intermittent IV infusion

After complete dissolution of the powder, the vial should be vented with a needle to dissipate any foam. *After reconstitution, the solution should be clear and colourless to pale yellow. Do not use if opaque particles or discolouration present.*

After reconstitution (described above):

1. From a 100mL bag, withdraw a volume of solution equal to the volume of reconstituted vials.
2. Add the required dose using the silicone-free syringe provided, to make up to a total volume of 100mL and give over 30 minutes (using a giving set with a 0.2 micron filter – see below).

The solution should be used immediately after preparation.

Allergy	Anaphylaxis has been reported rarely with abatacept.	
Contra-Indications	Severe or uncontrolled infection Previous hypersensitivity to abatacept	
Usual dose range	**Bodyweight**	**Dose**
	Less than 60kg	500mg (2 vials)
	60-100kg	750mg (3 vials)
	100kg or greater	1g (4 vials)
	Dose repeated 2 weeks and 4 weeks after initial infusion, then every 4 weeks.	

ABATACEPT (Orencia®) (page 2 of 2)	
Renal or Hepatic Impairment	Abnormal LFTs are a possible adverse effect. Abatacept has not been studied in renal or hepatic impairment, therefore no dose recommendations are made by the manufacturer.
Dose if underweight / obese	Adjust dose based on body weight – see above
Infusion-related adverse effects	Dizziness, headache, hypotension, hypertension, wheezing, pruritus, hypersensitivity reactions (including anaphylaxis)[1]
Extravasation	No information available
Other common adverse effects	GI side effects, rash, headache, cough, infection, fatigue, abnormal LFTs
ECG/ telemetry?	No special requirements.
Special giving set?	Administer using an Infusomat Space Line including 0.2 micron filter, NSV code: FSB03230 (8700098SP) for BBraun pumps. This is a sterile, non-pyrogenic, low-protein binding 0.2micron filter. Order from Materials Management in advance.
Other notes	Screen for latent TB and viral hepatitis prior to use. Abatacept contains maltose, which can interfere with the readings of blood glucose monitors that use test strips GDH-PQQ, and may result in falsely elevated blood glucose readings. *Accu check Inform II* test strips are currently used in TUH, and are not affected by this. Live vaccines should not be given concurrently with abatacept or within 3 months of its discontinuation. Send order to pharmacy in advance (48 hours ahead). Abatacept is stored in the fridge. Once removed, it is stable at room temperatures of less than 25^0C for up to 24 hours prior to reconstitution.

Prepared by:	Muriel Pate	18/01/2012	Checked by:	C Gowing	18/01/2012
Updated by:	Mary Coyle	26/05/2014	Checked by:	J Mcgillycuddy	28/05/2014
Updated by:	C O Connor	26/06/2020	Checked by:	Mary Coyle	02/07/2020
Giving set product code and NSV code update				J Mcgillycuddy	11/05/2022

1. MI databank query #13700 Orencia abatacept fridge excursion; logged 22/11/2019.
2. MI databank query #14302 Information in relation to Blood glucose monitoring test strips and abatacept; logged 03/07/2020.
3. Medusa Injectable Medicines Guide. Abatacept Monograph. Date published 21/03/2018. Available at http://medusa.wales.nhs.uk/IVGuideDisplay.asp (subscription required). Accessed 09/07/2020.

ACETAZOLAMIDE [Critical Care] (page 1 of 1)

Form: 500 mg vial

Reconstitution: Reconstitute 500mg vial with 10mL WFI[1]

Administration: Peripheral or central IV route (central route preferred[1])

Slow IV Injection
Give as a slow IV push over 3-5 mins

Allergy	Acetazolamide is a sulphonamide derivative. Cross-sensitivity with other sulphonamides is possible. Has been associated with Stevens-Johnson Syndrome
Contra-indications	Hypersensitivity, hyponatraemia, hypokalaemia, marked kidney or liver dysfunction or cirrhosis, suprarenal gland failure, hyperchloraemic acidosis, long term use in chronic non-congestive angle-closure glaucoma.
Usual dose range	Congestive heart failure and drug induced oedema: 250 – 375 mg/day. Glaucoma: 250-1000mg per 24 hours, in divided doses. Epilepsy: 375-1000mg/day in divided dose, although varying dosing regimens exist.
Renal or Hepatic Impairment	If GFR <50ml/min a dose reduction may be required: contact Pharmacy for additional advice.
Dose if underweight / obese	No special advice from manufacturer.
Infusion-related adverse effects	Hypersensitivity, paraesthesia, flushing, photosensitivity, flaccid paralysis, convulsions, fever, rash. This injection is alkaline and may cause tissue damage in the event of extravasation[1].
Other common adverse effects	Crystalluria, renal calculus, bone marrow depression and other haematological effects, transient myopia.
ECG/ telemetry?	ECG monitoring recommended if treatment results in hypokalaemia.
Special giving set?	No special requirements.
Other notes	Increasing the dose does not increase the diuresis and may increase the incidence of drowsiness and/or paraesthesia. If the patient fails to respond to diuresis after initial response, allow for kidney recovery by skipping a day or dosing on alternate days. IM route not recommended.

Prepared by:	Mary Coyle	11/05/2016	Checked by:	J Mcgillycuddy	13/05/2016
Reviewed by:	T. Smeaton	21/05/2018	Checked by:	Mary Coyle	03/09/2018

Information provided relates to Acetazolamide for injection USP manufactured by X-GEN (US technical leaflet available on request from Pharmacy)

Reference: 1. NHS Injectable Medicines Guide. Acetazolamide Intravenous Adult Monograph. Version 5. Last updated: 14/12/15. Available online http://medusa.wales.nhs.uk (password-protected). Accessed 21/05/18.

ADDIPHOS® [Critical Care] (page 1 of 2)

Form: 20ml vial containing Phosphate 40mmol, Potassium 30mmol and Sodium 30mmol.

Reconstitution: Already in solution
Further dilute before administration, bolus injection may be fatal

Compatible Fluid: Glucose 5%

Administration: Peripheral or central IV route

Intermittent IV infusion (peripheral route)
Dilute each 20ml vial to at least 750ml with infusion fluid[1]. Administer over at least 6-12 hours [2,3].

Intermittent IV infusion (central route-critical care only)
Dilute each 20ml vial to at least 100ml of compatible infusion fluid and administer over at least 3 hours but ideally over 6-12 hours using a rate-controlled infusion pump with telemetry[2].

Essential Safety Precautions (IV preparations containing Potassium)

1. Bolus injection may be fatal.
2. Rate control is essential. Administer via an infusion pump. The maximum recommended rate of administration of potassium is 10mmol per hour. The absolute **maximum rate** of administration of potassium is **20mmol per hour**. This **must not be exceeded.**
3. Mixing. It is **essential** to ensure thorough mixing. The potassium chloride component is 'heavier' than the infusion fluids listed above, therefore, layering can arise with subsequent **serious toxic effects** if not mixed thoroughly.
4. Monitoring. Telemetry is required when the potassium concentration is greater than 80mmol/L.

Allergy	Not considered likely
Contra-Indications	Plasma potassium above 5mmol/L. Use in presence of dehydration without fluid replacement. Use of a solution which is cloudy, contains sediment or is in anyway unusual.
Usual dose range	Calculate for individual patient. Usual dose range is 10 to 20ml per day.
Renal or Hepatic Impairment	Caution in renal disease and hepatic dysfunction due to high potassium and phosphate content.
Dose if underweight / obese	No specific recommendations
Infusion-related adverse effects	**Vascular Tolerance**. Potassium is a potent vesicant: monitor patient and injection site for pain or phlebitis during administration.

ADDIPHOS® [Critical Care] (page 2 of 2)

Other common adverse effects	N/A
Special giving set?	No special requirements. Rate control essential. Administer via rate-controlled infusion pump.
ECG/ telemetry/ monitoring requirements	Baseline ECG if potassium level < 3mmol/L. Telemetry recommended if potassium level is 2.5mmol/L or less. Telemetry required if administering at potassium infusion concentration greater than 80mmol/L. Telemetry recommended if rate of potassium administration is > 10mmol/hour and required if rate of administration is 20mmol/ hour
Other notes	Store in the CD press or in the case of ICU, in the potassium cabinet Do not add to infusion fluids containing calcium or magnesium as precipitation may result. When the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with glucose 5% or sodium chloride 0.9%.

Prepared by:	J Mcgillycuddy	01/07/14	Checked by:	Mary Coyle J. Hayde	10/11/2014 06/02/2015
Reviewed by:	Dr G. Fitzpatrick Mary Coyle	14/07/15	Checked by:	Jennifer Hayde	20/07/2015
Reviewed by:	Terry Smeaton	22/05/18	Checked by:	Mary Coyle C. Mc Auliffe	03/09/2018 26/11/2018
Reviewed by:	Aidan Morris	24/11/21	Checked by:	J Mcgillycuddy	30/11/2021

Information provided relates to Addiphos concentrate for solution for infusion manufactured by Fresenius Kabi Limited.

References

1. Tallaght Hospital Adult Medicines Guide 2020/2021. Accessed 24/11/2021.
2. NHS Injectable Medicines Guide. Addiphos Adult Monograph. Version 6. Last updated: 22/06/20. Available online at www.injguide.nhs.uk. (password-protected). Accessed 24/11/2021.
3. Evaluation and treatment of hypophosphataemia. www.UpToDate.com. Accessed 03/08/2018.

ADRENALINE (EPINEPHRINE) [Critical Care] (page 1 of 2)

Form: 1mg/ ml (1:1000) ampoule
1mg/10ml (1:10,000) pre-filled syringe

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5% (preferred option)
Sodium chloride 0.9%

Administration: IV injection (for resuscitation or critically low blood pressure while waiting for infusion to be prepared): Give by rapid IV injection either centrally or into a large peripheral vein. IV injection via a peripheral vein should be followed by a 20ml flush of sodium chloride 0.9%.

Continuous IV infusion (central IV route only)
Adrenaline can be administered as either a single, double or quadruple strength infusion. Further dilute as per the following table with compatible infusion fluid to 50ml and administer using a syringe pump:

Strength	Amount of adrenaline	Diluted to (final volume)	Strength (microgram/ml)
Single	3mg	50ml	60 microgram/ml
Double	6mg		120 microgram/ml
Quadruple	12mg		240 microgram/ml

IMPORTANT NOTE on calculating rate:
Dosage is often prescribed in terms of microgram/minute. If you are using the drug library on the BBraun smartpump (as recommended), select the **adrenaline strength in use (Single/ Double/ Quadruple) and the **desired adrenaline dose in microgram/minute**. The pump will calculate rate in ml/hour.**

ADRENALINE (EPINEPHRINE) [Critical Care] (page 2 of 2)

Allergy	Sodium metabisulphite, an excipient, can rarely cause severe hypersensitivity reactions and bronchospasm. This possibility should not deter the use of the product for the treatment of serious allergic reactions and other emergency situations.
Contra-indications	Use during labour, use with local anaesthesia of peripheral structures, use in ventricular fibrillation
Usual dose range	Infusion rate adjusted according to patient's BP
Renal or Hepatic Impairment	Use with great caution in severe renal impairment.
Dose if underweight / obese	No special advice from manufacturer.
Infusion-related adverse effects	Arrhythmias including VT and VF. Extreme hypertension leading to cerebral haemorrhage and pulmonary oedema. Anxiety, dyspnoea, restlessness, palpitations, tachycardia, angina pain, tremor, weakness, dizziness, headache, cold extremities, peripheral ischaemia, hyperglycaemia.
Other common adverse effects	As above.
ECG/ telemetry?	Continuous ECG and BP monitoring required.
Special giving set?	No special requirements.
Other notes	A replacement infusion must always be prepared before the infusion being administered is completed. Unit policy in ICU recommends double pumping with a three way tap connection with all inotropes. Start double pumping with at least 5ml left to administer or as per rate of infusion. Use single strength infusion for rates up to 10microgram/min, double strength for 10-20microgram/min and quadruple strength for rates greater than 20microgram/min. When the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with sodium chloride 0.9%

Prepared by:	J Mcgillycuddy	01/07/2014	Checked by:	Mary Coyle	03/11/2014
Amended by:	J Hayde	10/02/2015	Checked by:	Mary Coyle	21/04/215
Amended by:	M Coyle	21/04/2015	Checked by:	J. Hayde	08/05/2015
			Approved by:	Dr Fitzpatrick	14/07/2015
Amended by:	T Smeaton	22/05/18	Checked by:	Mary Coyle	03/09/2018

The information above relates to the Adrenaline 1mg/10ml (1:10,000) solution for injection in pre-filled syringe manufactured by Laboratoire Aguettant and Adrenaline (Epinephrine) Injection BP 1 in 1000 manufactured by Hameln Pharmaceuticals.

References

1. NHS Injectable Medicines Guide. Adrenaline/ epinephrine Adult Monograph. Version 5. Last update: 07/04/2011. Available online at www.injguide.nhs.uk (password protected). Accessed 22/05/18.

Not for general ward use, only to be used by suitably qualified personnel in the clinical area specified

ADRENALINE (EPINEPHRINE) [CRYP unit] (page 1 of 2)

Indication: QT and CPVT Stress Test[1]

Form: 1mg in 1mL (1 in 1000) ampoule

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5% (preferred option)
Sodium chloride 0.9%

Administration: Continuous IV infusion
Adrenaline can be administered as either a single, double or quadruple strength infusion. For this stress test, the single strength infusion should be used; dilute 3mg to a final volume of 50ml with compatible infusion fluid to give a concentration of 60 microgram/mL

$$\textbf{Infusion rate (mL/hr)} = \frac{\text{Dose (microgram/kg/min) x patient weight (kg) x 60 (mins)}}{\text{Concentration (microgram/mL)}}$$

Administer via a rate controlled syringe pump under ECG, cardiac and BP monitoring at the rates specified in the stress test protocol[1] until target dose and duration is reached or test stopped.

IMPORTANT NOTE on calculating rate:
Dosage is often prescribed in terms of microgram/minute. If you are using the drug library on the BBraun smartpump (as recommended), select the adrenaline strength in use (Single**) and the desired adrenaline dose in microgram/minute. The pump will calculate rate in ml/hour. **

Allergy	Sodium metabisulphite, an excipient, can rarely cause severe hypersensitivity reactions and bronchospasm. This possibility should not defer the use of the product for the treatment of serious allergic reactions and other emergency situations.
Contra-indications	Use during labour, use with local anaesthesia of peripheral structures, use in ventricular fibrillation
Usual dose range	QT & CPVT Stress Test: commencing at 0.025microgram/kg/min, titrating up at specific time interval and doses to a max. of 0.2microgram/kg/min
Renal or Hepatic Impairment	Use with great caution in severe renal impairment

ADRENALINE (EPINEPHRINE) [CRYP unit] (page 2 of 2)

Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	Tissue infiltration may lead to local ischaemia. Tissue necrosis may occur due to low pH. Arrhythmias including VT and VF. Extreme hypertension leading to cerebral haemorrhage and pulmonary oedema. Anxiety, dyspnoea, restlessness, palpitations, tachycardia, angina pain, tremor, weakness, dizziness, headache, cold extremities, peripheral ischaemia, hyperglycaemia.
Other common adverse effects	Nausea
ECG/ telemetry?	Continuous ECG, cardiac and BP monitoring required as outlined in QT Stress Test Protocol
Special giving set?	No special requirements
Other notes	This is a high-risk intervention. Emergency resuscitation should be immediately available. Stop infusion if: 1. Systolic BP > 200 mmHg 2. Non-sustained VT 3. Polymorphic VT 4. >10 premature ventricular complexes per min 5. T-wave alternans 6. Patient intolerance 7. Target dose and duration achieved Flushing: if administering peripherally, flush the cannula at the same speed as the rate of infusion to avoid adverse haemodynamic effects If administering centrally, after the infusion is discontinued, disconnect the administration set, aspirate the cannula contents and then flush. See Stress Test Protocol for full details eg dose titrations, ECG monitoring etc. [1]

Prepared by:	J Mcgillycuddy & H Connaughton (on behalf of Dr D Ward)	Oct 2016	Checked by:	Mary Coyle	28/11/2016

The information above relates to the Mercury brand of adrenaline 1:1000 solution for injection.

References

1. Tallaght Hospital. Adrenaline QT & CPVT Stress Test Protocol. Drugs & Therapeutics Committee-approved October 2016. Available on Qpulse.
2. NHS Medusa. Injectable Medicines Guide. Available online at www.injguide.nhs.uk (password-restricted). Accessed 05/04/2016.

AJMALINE (Gilurytmal) [CRY unit] (page 1 of 2)

Form: 50mg in 10ml ampoule

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5%
NaCl 0.9% [1]

Administration: Continuous IV infusion
Dilute the required dose to a final volume of 100ml with compatible infusion fluid.
Example:
If patient =75kg (75mg =15ml ajmaline 5mg/ ml), remove 15ml fluid from 100ml infusion bag and add 15ml ajmaline 5mg/ml

Administer via a rate controlled infusion pump at a rate not exceeding 10mg per minute under ECG and BP monitoring until target dose (1mg/kg to a max. dose of 100mg) is reached or test stopped. In the case of patients with previous cardiac damage, the period of infusion must be extended to 15-20 minutes per 50mg ajmaline.
Preferably administer via a central venous access device or if this is not possible, use a large peripheral vein.

Allergy	No specific mention in SPC.
Contra-indications	Known hypersensitivity to ajmaline or any excipients, severe conduction disorders between the atria and ventricles, pre-existing conduction disorders within the ventricles, Adams-Stokes attacks, cardiac decompensation, substantial increases in conduction dissemination in the ventricles or prolongation of the entire electrical heart action, cardiac glycoside toxicity, myasthenia gravis, hypertrophic cardiomyopathy, bradycardia, tachycardia secondary to cardiac decompensation, within 3 months of a myocardial infarction or in patients with a left ejection fraction <35%.
Usual dose range	Test for Brugada syndrome: 1mg/kg at a maximum rate of 10mg/min to max. 100mg.
Renal or Hepatic Impairment	Use with caution in renal or hepatic impairment.
Dose if underweight/ obese	No special advice from manufacturer (weight-based dose which is capped at 100kg).
Infusion-related adverse effects (continued overleaf)	Ventricular arrhythmia, a feeling of tingling, flushing, or desire to pass urine may occur. The very short half-life means effects are usually short-lived.

AJMALINE (Gilurytmal) [CRY unit] (page 2 of 2)

Infusion-related adverse effects (continued from previous page)	Seizures, paraesthesia, AV block, widening of QRS complex, dysrhythmia, and a substantial fall in BP after rapid IV infusion. Respiratory arrest has been reported after excessively rapid IV infusion.
Extravasation	Likely to cause tissue damage as pH <5 and contains propylene glycol as an excipient.
Other common adverse effects	Adverse neurological effects reported including eye twitching, convulsions, and respiratory depression. Hepatotoxicity and agranulocytosis may occasionally occur.
ECG/ telemetry?	Continuous ECG monitoring recommended during and for at least 60 minutes after the infusion/until ECG normalises or any adverse effects resolve. The patient should remain in the hospital for a further 30 minutes. [2]
Special giving set?	No special requirements
Other notes	This is a high-risk intervention. IV administration should be made with defibrillation, intubation and resuscitation facilities immediately available. Stop injection if: • Type 1 changes are seen (i.e. coved ST elevation) • QT interval increases > 30% above baseline • Frequent premature ventricular contractions (PVCs) develop • Target dose achieved Flushing: if administering peripherally, choose a large vein and flush the cannula at the same speed as the rate of infusion to avoid adverse haemodynamic effects. If administering centrally, after the infusion is discontinued, disconnect the administration set, aspirate the cannula contents and then flush. See Ajmaline Guideline for full details e.g. ECG monitoring requirements etc. [3] Isoprenaline should be on hand when using ajmaline in case of the occurrence of arrhythmia. [4]

Prepared by:	J Mcgillycuddy	19/06/2014	Checked by: Reviewed by:	Mary Coyle Dr D Ward H Connaughton	15/07/2014 02/10/2014 02/10/2014
Updated by:	A Morley	01/10/2020	Update checked by:	Roisin Logan	22/02/2021
Updated by:	J Mcgillycuddy	27/11/2023	Checked by:	Carol O'Brady	29/11/2023

Information provided relates to Gilurytmal brand of ajmaline (unlicensed) by Carinopharm, Germany (Feb 2010: Idis-translated SPC on file in DI room of pharmacy dept).

References

1. Midatabank query re use of 0.9% NaCl with ajmaline. #17243.
2. NHS Medusa. Injectable Medicines Guide. Available online at www.injguide.nhs.uk (password-restricted). Accessed 29/02/2021.
3. Dr Ward opinion. Email communication on file from Helen Connaughton re same.
4. Guidelines for administration of ajmaline for the testing of Brugada syndrome in the CardiovascularRisk in Younger Persons Unit. August 2010. Copy logged on Midatabank #2761.
5. Wilde, A.A.M. et al.,Proposed Diagnosis Criteria for the Brugada Syndrome. Consensus Report. Eur Heart J 2002; 23: 1678-1654.

Alemtuzumab (Lemtrada®) [Neurology] (page 1 of 2)

IV monoclonal antibodies are on the exclusion list of drugs not generally to be administered by nursing staff as per Intravenous Drug Administration Policy
Prepared by the Aseptics Unit in the Pharmacy during weekdays

Form: 12 mg/ 1.2mL vial (10mg/mL)

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central IV route

Intermittent IV infusion
Further dilute 1.2 mL with compatible infusion fluid to 100 mL (if not prepared by pharmacy).
Protect from light during administration[1, 2].
Administer over 4 hours. Patients should be monitored for signs of infusion-related reactions for 2 hours after completion of the infusion. Invert gently to mix the solution; do not shake.

Allergy	Acute infusion reactions including anaphylactic reactions can occur.
Contra-indications	Hypersensitivity to the active substance or any excipient Human Immunodeficiency Virus (HIV) infection Patients with severe active infection
Usual dose range	**First treatment course**: 12mg/day on 5 consecutive days. **Second (and subsequent, if required) treatment course**: 12mg/day on 3 consecutive days administered 12 months after the previous course.
Renal or Hepatic Impairment	No information available in those with renal or hepatic impairment.
Dose if underweight / obese	No special advice from manufacturer.
Infusion-related adverse effects	Headache, rash, pyrexia, nausea, urticaria, pruritus, insomnia, chills, flushing, fatigue, dyspnoea, altered taste, rash, chest discomfort, hypotension, tachycardia, bradycardia, dyspepsia, dizziness and pain. If an Infusion Associated Reaction occurs, treat symptoms and consider reducing the infusion rate, if appropriate.

Alemtuzumab (Lemtrada®) [Neurology] (page 2 of 2)

Other common adverse effects	Infections, thyroid disorders, nephropathies, Immune Thrombocytopenic Purpura, cytopenias and other blood disorders. Anxiety, depression, vertigo, tremor, hypoaesthesia, paraesthesia, abdominal pain, vomiting and diarrhoea, deranged LFTs, myalgia, muscle weakness – see SPC for full list.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements.
Other notes	Before starting treatment patients should agree to follow-up monitoring for 4 years post last infusion. Patients should be provided with a patient alert card and patient guide available on www.hpra.ie. Patients should be pre-treated with steroids ± antihistamine ± antipyretics immediately prior to alemtuzumab on each of the first 3 days of any treatment course. Ensure prophylaxis of herpes infection in those receiving alemtuzumab. Consider prophylaxis of listeriosis ± diet modification. Patients should be screened for TB prior to therapy ± hepatitis B virus ± hepatitis C virus (in groups at high risk). It is recommended to update vaccinations in accordance with local immunisation guidelines at least 6 weeks prior to treatment.

Prepared by:	Mary Coyle	25/09/2018	Checked by:	Colette Morris	12/12/2018

Information provided relates to Lemtrada manufactured by Sanofi.

References

1. Communication from Sanofi Genzyme logged on Midatabank query # 12606.
2. Medusa Injectable Medicines Guide. Available online at http://www.injguide.nhs.uk (password restricted). Accessed 25/09/2018.

ALTEPLASE (Actilyse Cathflo®) CVAD patients (page 1 of 3)

* Please use separate alteplase monograph for thrombolysis in **massive pulmonary embolism, myocardial infarction and acute ischaemic stroke** located in the general ward IV monographs*

** There is a separate policy on **intra-arterial alteplase administration** for **lower limb arterial occlusion**, located on Qpulse**

Indication: Treatment of occluded central venous assess devices including those used in haemodialysis.
May be used on an individual basis by consultant as a locking solution in dialysis patients only.

Form: 2mg powder for solution (total amount in the vial is 2.2mg)

Reconstitution: Reconstitute each vial with 2.2mL WFI (final concentration 1mg/mL). Swirl gently until complete dissolution to avoid foaming. This should result in a clear and colourless to pale yellow solution.

Compatible Fluid: Sodium chloride 0.9%

Administration: **NOT for direct IV injection or infusion**.
Use as a catheter lock administered via CVAD.
Remove any locking solution (if present) from the lumens if possible.
Flush arterial and venous lumens of the catheter with 10 ml of sodium chloride 0.9% if possible.

<u>Correcting Poor CVAD Patency</u>

1. Solution preparation.

- Catheters of with a **lumen volume less than to 2 mL**, instil (slowly and gently, exerting gentle pressure on the syringe) a sufficient volume of the reconstituted solution to overfill the volume of dysfunctional CVAD lumen by 0.1mL e.g. for a catheter with an internal lumen volume of 1.6mL, instil 1.7mL of reconstituted solution.

- Catheters of with a **lumen volume of 2mL or greater,** further dilute the reconstituted solution with Sodium Chloride 0.9% to the internal volume of the catheter plus 0.1mL (minimum concentration 0.2 mg / ml) e.g. for a catheter with internal volume of 2.5mL, drawn up 2mL of reconstituted solution in a syringe and make it up with sodium chloride 0.9% to 2.6mL. Instil (slowly and gently, exerting gentle pressure on the syringe) into the dysfunctional lumen.

ALTEPLASE (Actilyse Cathflo®) CVAD patients (page 2 of 3)

Treatment of occluded devices

2. After 30mins of dwell time, assess catheter function by attempting to aspirate blood and catheter contents. If unsuccessful continue to Step 3.
3. After a further 90mins (total time 120mins) of dwell time, assess catheter function by attempting to aspirate blood and catheter contents. If unsuccessful continue to Step 4.
4. If unsuccessful after a total of 120mins, a second dose may be instilled. Repeat the above steps.

After catheter function has been restored, aspirate 4-5mL of blood to remove alteplase and residual clot, flush with sodium chloride 0.9% solution.

Locking solution (unlicensed indication)
Aspirate catheter to remove alteplase, before next dialysis under consultant guidance.

Allergy	Allergic reactions, including rash, urticaria, bronchospasm, angio-oedema, hypotension and shock.
Contra-indications	Hypersensitivity to alteplase, **gentamicin** or any of the excipients.
Usual dose range	2 mg administered to each affected lumen up to two times for any one occlusion. The second dose may be administered 120mins after the first dose.
Renal or Hepatic Impairment	Not applicable
Dose if underweight / obese	Not applicable
Infusion-related adverse effects	Pyrexia
Other common adverse effects	Catheter related complication, sepsis
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements

ALTEPLASE (Actilyse Cathflo®) CVAD patients (page 3 of 3)

Other notes	Caution should be exercised in patients at risk of bleeding. Dosing adjustment required for patients weighing less than 30 kg, please refer to the Summary of Product Characteristics. Avoid excessive pressure when instilling Alteplase into the catheter due to the potential to rupture the catheter or expel the clot into the circulation. Co-administration with heparin is not recommended as it has not been shown to have improved efficacy. Note: product is stored in the fridge.

Prepared by:	Mary Coyle	18/10/2018	Checked by:	Carol O'Brady	18/10/2018
Clarification by:	Mary Coyle	26/10/2018	Checked by:	Dawn Davin	26/10/2018
Update by:	Mary Coyle	29/07/2019	Checked by:	JMcgillycuddy	04/09/2019
Information provided relates to Actilyse Cathflo manufactured by Boehringer Ingelheim.					

AMIODARONE (Cordarone®) [Critical Care] (page 1 of 3)

Form: 150mg in 3ml vial
300mg/10mL pre-filled syringe

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5%

Administration:

Central Use
Amiodarone should ideally be given via a **central** line when repeated or continuous infusion is anticipated.

Peripheral Use
If a central line is impossible to insert, or if the patient's clinical condition is such that delay in administration for central line insertion is impractical, a large peripheral vein with good blood flow should be used. Repeated or continuous peripheral administration can lead to discomfort, inflammation and sometimes severe phlebitis.
The maximum concentration for continuous infusion via peripheral veins is 1.8mg/ml[1].

Intermittent infusion-central line
For intermittent infusion, the initial amiodarone dose is diluted to 50ml with compatible infusion fluid[1] and given over 20 mins to 2 hours via a syringe pump with ECG monitoring.

Continuous infusion-central line
For continuous infusion, amiodarone 600-900mg doses are diluted to 50ml with compatible infusion fluid[1] and given over 24 hours (or 23 hours on day 1 after loading dose) via a syringe pump.

Slow Injection
In extreme clinical emergency the drug may, at the discretion of the clinician, and as per ACLS guidelines, be given as a slow injection of 150-300mg as a pre-filled syringe without dilution (if a pre-filled syringe is unavailable, 150mg in 3mL preparation may be administered in 10-20mL glucose 5%) over a minimum of 3 minutes[1,2]. An additional 150mg dose may be considered after at least 15 minutes if ventricular fibrillation persists. Follow by an infusion as indicated. These patients must be closely monitored.

AMIODARONE (Cordarone®) [Critical Care] (page 2 of 3)

Allergy	Anaphylaxis has been reported. Rapid IV administration has been associated with anaphylactic shock, hypotension, hot flushes, sweating, nausea and circulatory collapse
Contra-Indications (Except in cardiac arrest due to shock resistant V Fib)	Hypersensitivity to amiodarone,iodine or to any of the excipients. Sinus bradycardia, sino-atrial heart block and sick sinus syndrome. In patients with severe artrioventricular conduction distubances or sinus node disease amiodarone should only be used in conjuction with a pacemaker Severe respiratory failure, circulatory collapse, or severe arterial hypotension. Avoid bolus injection in congestive heart failure or cardiomyopathy. Evidence or history of thyroid dysfunction. Combination with drugs which may induce torsades de pointes is contra-indicated
Usual dose range	See above and Adult Medicines Guide.
Renal or Hepatic Impairment	Caution in hepatic impairment
Dose if underweight / obese	No specific advice from manufacturer.
Infusion-related adverse effects	Rapid IV administration has been associated with anaphylactic shock, hypotension, hot flushes, sweating, nausea and circulatory collapse Infusion site reactions may occur e.g. pain, erythema, oedema, necrosis, inflammation, thrombophlebitis, phlebitis. Monitor site closely.
Extravasation	Extravasation is likely to cause tissue damage due to low pH and because it contains Polysorbate 80. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	Angioedema, onset or worsening of arrhythmia, QTc prolongation, bradycardia, bronchospasm and/or apnoea (notably in patients with asthma). See SPC and BNF for side-effects associated with long term use.
ECG/ telemetry?	Cardiac monitoring and ECG are recommended to monitor the patients' heart rate and rhythm. The patient should ideally be nursed in ICU/CCU.

AMIODARONE (Cordarone®) [Critical Care] (page 3 of 3)

Special giving set?	A non DEHP containing set is required; the standard Braun 8700036SP giving sets available at ward level are suitable to use. (standard Vygon sets– e.g. Lectro Cath Ref: 1155.15 and Lectro Spiral Ref: 1155:80)
Other notes	Where possible, baseline TFTs and LTFs should be done before commencing amiodarone. When the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with glucose 5% Use with caution in elderly patients, particularly those receiving digoxin treatment as they may be more susceptible to bradycardia and conduction defects if too high a dose is used.

Prepared by:	J Mcgillycuddy	02/07/2014	Checked by: Approved by:	Mary Coyle J Hayde Dr G.Fitzpatrick	03/11/2014 10/02/2015 14/07/2015
Updated by:	Mary Coyle	23/11/2020	Checked by:	Grace Power	07/12/2020
Update by:	D Stewart	04/02/2025	Checked by:	K Burke	24/06/2025

References

1. Medusa Injectable Medicines Guide. Available online at http www.medusaimg.nhs.uk (password restricted). Accessed 04/02/2025.
2. MI databank query no.7813 July 2015
3. BNF online. Available online at www.medicinescomplete.com. Accessed 04/02/2025.
4. Injectable Drugs Guide. Available online at www.medicinescomplete.com (subscription required). Accessed 04/02/2025.

ANDEXANET ALFA (Ondexxya®) [ED, Critical Care]
1 of 3

Consultant Recommendation Only- Haematology/Emergency Medicine/Critical Care

Form: 200mg dry powder vial

Reconstitution: See box below for details on how to prepare

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route
An initial IV bolus should be administered followed by a maintenance dose using a syringe pump, in-line 0.2micron low-protein binding filter (B Braun Sterifix filter 4099303-stored with medication) and Vygon lectrospiral administration set (image below).[1]

Loading IV Bolus
Low or high-dose regimen: give the reconstituted solution at a rate of 30mg per minute (160mL/hour over approximately 15 minutes) using the pump and infusion set specified above.

Continuous IV infusion
Low-dose regimen: give the reconstituted solution at a target rate of 4mg/ minute (24mL/ hour) for 120 minutes using the pump and infusion set specified above.
High-dose regimen: give the reconstituted solution at a target rate of 8mg/ minute (48mL/ hour) for 120 minutes using the pump and infusion set specified above.

ANDEXANET alfa (Ondexxya®) [ED, Critical Care] page 2 of 3

Preparation using aseptic technique to give 10mg/mL:

- Reconstitute 5 x 200mg vials for the low dose regimen and 9 x 200mg for the high dose regimen. Use **21 gauge** needles during preparation.[2]
- Inject 20mL water for injections into each vial, directing the stream down the wall of the vial.
- Gently swirl the vial (do not shake as this can lead to foaming) until the powder is completely dissolved (this takes approx. 3-5 minutes for each vial).
- This gives a final concentration of 200mg in 20mL (10mg in 1mL)
- Prepare all vials needed before the next step.

For administration using a syringe pump:

- Withdraw the reconstituted solution from each vial, using a 50mL syringe with a **21 gauge** needle.
- For high dose therapy, you may need two syringes for the loading dose and two for the maintenance dose.
- Use separate syringes for the loading and maintenance dose.

<table>
<tr><td>Allergy</td><td>Possible</td></tr>
<tr><td>Contra-indications</td><td>Hypersensitivity to active substance, known allergic reaction to hamster proteins or intracranial haemorrhage with Glasgow Coma Scale <7.</td></tr>
<tr><td>Usual dose range</td><td>Low-dose or high-dose regimen, depending on whether rivaroxaban or apixaban taken, dose and timing of last dose. See HSE Prescribing Guidelines for Andexanet Alfa for guidance. [1]
<table>
<tr><th></th><th>Initial IV bolus</th><th>Continuous IV infusion</th><th>No. 200mg vials needed</th></tr>
<tr><td>Low dose</td><td>400mg at a target rate of 30 mg/min</td><td>4 mg/min for 120 minutes (480 mg)</td><td>5</td></tr>
<tr><td>High dose</td><td>800 mg at a target rate of 30 mg/min</td><td>8 mg/min for 120 minutes (960 mg)</td><td>9</td></tr>
</table></td></tr>
<tr><td>Renal or Hepatic Impairment</td><td>No dose adjustment recommended</td></tr>
<tr><td>Dose if underweight / obese</td><td>No special advice from manufacturer</td></tr>
<tr><td>Infusion-related adverse effects</td><td>Mild-moderate reactions within minutes to hours after the start of the infusion, including flushing, feeling hot, cough, metallic taste (dysgeusia) and dyspnoea.
Mild infusion reactions: usually managed with clinical monitoring. Moderate infusion reactions: manage by slowing or stopping the infusion temporarily: use of an antihistamine can be considered. Severe infusion reactions should be managed by stopping the infusion and managing the patient specific symptoms.[1]</td></tr>
</table>

ANDEXANET alfa (Ondexxya®) [ED, Critical Care] page 3 of 3

Extravasation	Likely to cause tissue damage due to polysorbate 80.[3]
Other common adverse effects	Ischaemic stroke, MI, DVT, PE and pyrexia
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	A volume of the medicine (which may be clinically significant) remains in the infusion set at the end of the infusion. To minimise medicine losses, the infusion set may be flushed with NaCl 0.9% at the same rate the medicine was administered. Store in a refrigerator (2-8C). Andexanet alfa does not need to be brought to room temperature before reconstitution or administration to the patient. This medicine is subject to additional monitoring; any suspected reactions should be reported to the HPRA at www.hpra.ie and cc'd to Medication Safety.

Prepared by:	J Mcgillycuddy	15/06/2023	Checked by:	G. Power	26/06/2023

Information provided relates to Ondexxya brand.

Reference

1. HSE Prescribing Guidelines for Andexanet Alfa (Ondexxya) for adult patients treated with a direct factor Xa (FXa) inhibitor (apixaban or rivaroxaban) when reversal of anticoagulation is needed due to life-threatening or uncontrolled bleeding. Available online at https://www.hse.ie/eng/about/who/acute-hospitals-division/drugs-management-programme/protocols/ for prescribing information. Accessed 26/06/2023.
2. Astra Zeneca. Medical Information Response to query about needle gauge. Logged on Midatabank #16942. 26th June 2023.
3. NHS Injectable Medicines Guide. Andexanet Alfa monograph. Accessed 15/06/2023.

ARGATROBAN [ICU] (page 1 of 4)

Indication: Anticoagulation in adult patients with heparin induced thrombocytopaenia (HIT Type II) who require parenteral anti-thrombotic therapy

Form: 250mg/2.5ml concentrate for infusion

Reconstitution: Already in solution
Dilute further prior to administration

Compatible Fluid: Sodium chloride 0.9%,
Glucose 5%

Administration: Peripheral or central IV route

Continuous IV infusion
Add 250mg (2.5mL) to 250mL bag of compatible infusion fluid (final concentration 1mg/mL). Repeatedly invert the prepared solution bag for one minute to ensure thorough mixing. The diluted solution should be clear and virtually free of visible particles. Protect the diluted infusion from direct sunlight. Discard any remaining solution every 24 hours.

For low running rate infusions (i.e. <2ml/hr), a syringe may be used. Dilute 0.5mLs (50mg) up to 50mL with a compatible infusion fluid in a 50mL syringe (final concentration 1mg/mL) Change the syringe every 24 hours (or sooner if required).

Dose:

Critically ill patients (including ICU patients with multiple organ system failure) should be commenced on a **maximum dose of 0.5microgram/kg/min** with close aPTTR monitoring. NOTE: a reduced maintenance dose and smaller dose adjustments (0.1microgram/kg/min) are also required in the ICU setting –see tables further on.

Starting Dose Recommendations

Clinical Scenario	Argatroban starting dose
Critically ill / Multiple organ dysfunction syndrome	**0.5 micrograms/kg/min**
Hepatic impairment – Child Pugh C	Contra-indicated
Elderly patients	No dose reduction required
CVVHDF / Haemodialysis	Dose as in normal renal function and as per aPTTR
Maximum rate of infusion	10 microgram/kg/min

ARGATROBAN [ICU] (page 2 of 4)

Monitoring - Efficacy:

Anticoagulation with argatroban aims to maintain the aPTTR in the range 1.5-3.0. aPTT should not be allowed to exceed 100 seconds.

The aPTTR should be measured:

- 2 hours after commencement of the argatroban infusion.
- As per table below when out of range.
- 12 hourly when within the therapeutic range.

Dose Adjustments:

The infusion rate should be adjusted according to the aPTTR as follows (aiming for aPTTR 1.5-3.0):

Multi-organ system failure, Critically ill and/or moderate hepatic impairment			
Starting Infusion Rate = 0.5 microgram/kg/min			
aPTT (secs)	**aPTTR**	**Infusion rate change**	**Recheck aPTTR**
Greater than 105.7	**> 4.0**	Stop the infusion and only resume once aPTTR is in the range 1.5-3.0. Restart the infusion at half the previous rate	Repeat every 2 hours until aPTTR is in range
79.7-105.7	**3.1 – 4.0**	Stop the infusion for two hours and then resume at half the previous rate of infusion	4 hours after rate change
37.9-79.6	**1.5-3.0**	No change	4 hours after last aPTTR; after 2 consecutive aPTTRs in range, check 12 hourly
Less than 37.8	**< 1.4**	Increase infusion by 0.1 microgram/kg/min	4 hours after rate change

ARGATROBAN [ICU] (page 3 of 4)

IMPORTANT NOTE on calculating dose

If you are using the drug library on the BBraun smartpump (as recommended), enter the patient's **weight in kg & the **desired argatroban dose in microgram/minute.** The pump will calculate rate in mL/hour of a 1mg/mL solution. Otherwise, use this table to calculate the infusion rate. **

MODERATE HEPATIC IMPAIRMENT / CRITICALLY ILL DOSING

Pt weight (kg) [actual body weight]	**Dose in microgram/kg/min**																	
	0.1	0.2	0.3	0.4	0.5 – **(start dose)**	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
	Infusion rate in mL/hour (of 1mg/mL argatroban infusion)																		
50	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7
60	0.4	0.7	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	4	4.3	4.7	5	5.4	5.8	6.1	6.5	6.8
70	0.4	0.8	1.3	1.7	2.1	2.5	2.9	3.4	3.8	4.2	4.6	5	5.5	5.9	6.3	6.7	7.1	7.6	8
80	0.5	1	1.4	1.9	2.4	2.9	3.4	3.8	4.3	4.8	5.3	5.8	6.2	6.7	7.2	7.7	8.2	8.6	9.1
90	0.5	1.1	1.6	2.2	2.7	3.2	3.8	4.3	4.9	5.4	5.9	6.5	7	7.6	8.1	8.6	9.2	9.7	10.3
100	0.6	1.2	1.8	2.4	3	3.6	4.2	4.8	5.4	6	6.6	7.2	7.8	8.4	9	9.6	10.2	10.8	11.4
110	0.7	1.3	2	2.6	3.3	4	4.6	5.3	5.9	6.6	7.3	7.9	8.6	9.2	9.9	10.6	11.2	11.9	12.5
120	0.7	1.4	2.2	2.9	3.6	4.3	5	5.8	6.5	7.2	7.9	8.6	9.4	10.1	10.8	11.5	12.2	13	13.7
130	0.8	1.6	2.3	3.1	3.9	4.7	5.5	6.2	7	7.8	8.6	9.4	10.1	10.9	11.7	12.5	13.3	14	14.8
140	0.8	1.7	2.5	3.4	4.2	5	5.9	6.7	7.6	8.4	9.2	10	10.9	11.8	12.6	13.4	14.3	15.1	16

ARGATROBAN [ICU] (page 4 of 4)

Allergy	Hypersensitivity reactions have been reported
Contra-Indications	Uncontrollable haemorrhage Severe liver impairment (Child Pugh score = C) Hypersensitivity to argatroban or one of its constituents
Usual dose range	See initial dosing table above. The maximum recommended dose is 10 microgram/kg/min.
Infusion-related adverse effects	Injection site reactions can occur
Other common adverse effects	May cause haemorrhage; monitor haematocrit and BP. May also cause hyponatraemia, hypoglycaemia, hepatic dysfunction, arrhythmias and renal insufficiency, deep vein thrombosis, nausea, purpura.
Renal or Hepatic Impairment	Contra-indicated in severe hepatic impairment-Child Pugh C No special requirements in renal impairment (incl. dialysis).
Dose if underweight / obese	Use actual body weight, rounded to nearest 10kg and refer to infusion table above.
ECG/ telemetry?	Recommended as arrhythmias may occur.
Special giving set?	No special requirements.
Other notes	Anticoagulation with oral anticoagulants (e.g. warfarin) should not be considered until platelets >150. Crossover to oral anticoagulation requires specialist supervision as argatroban causes extension of Prothrombin time in addition to its effect on aPTTR. Argatroban may also cause extension of PT/INR in the absence of warfarin. Argatroban contains ethanol (1g/vial), therefore a disulfiram type reaction with metronidazole is theoretically possible. There is no antidote to argatroban – anticoagulation parameters should return to normal within 2-4 hours of ceasing the infusion. Patients with a reduced cardiac output and/or fluid overload may require a reduced dose. Reduced clearance may be attributed to hepatic congestion. Half-life is 40-50 minutes with excretion predominantly via biliary secretion into the faeces.

Prepared by:	C Gowing	Feb 2012	Checked by:	J Mcgillycuddy	Feb 2012
Updates by:	Mary Coyle	12/09/2016	Checked by:	J Mcgillycuddy	14/09/2016
Updated by:	Terry Smeaton	23/05/18	Checked by:	Mary Coyle C McAuliffe	04/09/2018 11/12/18

Information provided relates to Exembol 100mg/ml concentrate for solution for infusion manufactured by Mitsubishi Tanabe Pharma Europe Limited. **Key References:**

1. Exembol SPC. Available online at www.emc.medicines.org.uk. Last updated 02/03/2016. Accessed 04/09/2018.
2. The Renal Drug Database. Argatroban. Last updated 20/02/2018. Available online at www.renaldrugdatabase.com (password-protected). Date accessed 23/05/18.
3. Ansara, A.J. et al. Weight-based argatroban dosing nomogram for treatment if heparin –induced thrombocytopaenia. Ann Pharmacother 2009;43(1):9-18.
4. Lexicomp. Argatroban. Last updated 05/02/18. Available online at www.lexi.online.com (password-protected). Date accessed 23/05/18.
5. Warkentin TE et al. Treatment and prevention of heparin induced thrombocytopenia. American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition) Chest. 2008;133(6)(Suppl) Accessed 08/02/2012.
6. Linkins LA et al. Treatment and prevention of heparin induced thrombocytopenia. American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (9th Edition) Chest. 2012;14(2)(Suppl) Accessed 09/02/2015.
7. Cuker, A et al. How I treat heparin-induced thrombocytopaenia. Blood. 2012; 119(10):2209-18.

ARGIPRESSIN (arginine vasopressin; Embesin®) [Critical Care] (page 1 of 2)

(Argipressin=Arginine vasopressin=Synthetic vasopressin=Embesin®)

Please refer to Vasopressin monograph if using Pitressin® brand

Form: 40 units in 2mL vial

Reconstitution: Already in solution. Further dilution required.

Compatible Fluid: Glucose 5% (preferred diluent; unlicensed [2, 3])
Sodium chloride 0.9%

Administration: Central IV route

Continuous IV infusion
Dilute 20units of argipressin (1mL) with compatible infusion fluid to 50mL. This gives a **0.4units/mL** solution. Administer as a continuous infusion via a syringe driver at the rate appropriate to the indication specified in the table below:

Refractory Septic Shock: Argipressin 0.4unit/mL Administration Rate	
Minimum infusion rate i.e. 0.01 units/min	Recommended maximum infusion rate i.e. 0.03 units/min
1.5mL/hr	4.5mL/hr
Potential Organ Harvesting: Argipressin 0.4 units/mL Administration Rate[4]	
0.5 – 2.4 units/hr (0.008 – 0.04 units/min) to maintain MAP at target range	
1.25 – 6 mL/hr of 0.4 units/mL solution	

Allergy	Local or systemic allergic reactions including anaphylaxis may occur. Rarely associated with bronchospasm with urticaria and pruritus.
Contra-indications & Cautions	Use with special caution in patients with heart or vascular diseases.
Usual dose range	As per table above
Renal or Hepatic Impairment	No information available
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects [5]	Fluid retention, headache, tremor, sweating, vertigo, pallor, urticaria, bronchospasm, desire to defecate/diarrhoea, chest pain, cardiac arrest, hypertension, peripheral ischaemia.
Extravasation [5]	Extravasation is likely to cause tissue damage due to high pH.

ARGIPRESSIN (arginine vasopressin; Embesin®) [Critical Care]

(Argipressin=Arginine vasopressin=Synthetic vasopressin=Embesin®)

Other common adverse effects	Abdominal cramps, flatulence, nausea, vomiting. Fluid retention, pounding headache, abdominal cramps, nausea, vomiting, urticaria, bronchial constriction, symptoms of angina.
ECG/ telemetry?	Continuous ECG and BP monitoring required
Special giving set?	No special requirements
Other notes	Embesin® brand of argipressin must be **stored in the fridge**. Please refer to the Vasopressin monograph if using Pitressin® brand of vasopressin (stored at room temperature). **"Vasopressin"** should be selected on **ICCA** and on the **BBraun Smart Pumps** when prescribing/ administering argipressin. Disconnect the administration set when infusion stopped, aspirate the cannula contents and then flush with sodium chloride 0.9%.[5]

Prepared by:	J Mcgillycuddy	06/10/2021	Checked by:	Mary Coyle	07/10/2021

Information provided relates to Embesin brand of Argipressin manufactured by AOP Orphan Pharmaceuticals.

References

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2. Off-label information on Embesin supplied by manufacturer. Logged on Midatabank #13988.
3. Beaumont Hospital Pharmacy Dept Embesin (Argipressin) IV monograph. Approved Sept 2020. Logged on Midatabank #15409.
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ATRACURIUM [ICU/PACU] (page 1 of 2)

Atracurium is a neuromuscular blocking agent – respiratory assistance is mandatory.

Form: 50mg/5ml ampoule (10mg per mL)

Reconstitution: Already in solution

Compatible Fluid: Not applicable

Administration: Central IV route

IV Injection (only for supplemental doses in intubated patients):
Administer by rapid IV injection. For elderly patients or those with significant cardiac disease, hypovolaemia or increased sensitivity to the effects of histamine release, give more slowly over 1-2 minutes.

Continuous infusion
Use **without further dilution** via syringe pump as per dosing table guide below (Note: dosing is highly variable and may go outside the parameters of the table).

IMPORTANT NOTE on calculating rate:
** If you are using the drug library on the BBraun smart pump (as recommended), enter the patient's ideal body weight in kg and the desired atracurium dose in microgram/kg/hour. The pump will calculate rate in mL/hour. Otherwise, use the table below to calculate the infusion rate. **

Ideal Body Weight (Kg)	**Dose (micrograms/kg/hour)**								
	550	600	650	700	750	800	850	900	950
			Usual dose range 650-780microg/kg/hr						
	Infusion rate (mLs/hour of 10mg/mL solution)								
45	2.5	2.7	**2.9**	**3.2**	**3.4**	3.6	3.8	4.1	4.3
50	2.8	3.0	**3.3**	**3.5**	**3.8**	4	4.3	4.5	4.8
55	3.0	3.3	**3.6**	**3.9**	**4.1**	4.4	4.7	5.0	5.2
60	3.3	3.6	**3.9**	**4.2**	**4.5**	4.8	5.1	5.4	5.7
65	3.6	3.9	**4.2**	**4.6**	**4.9**	5.2	5.5	5.9	6.2
70	3.9	4.2	**4.5**	**4.9**	**5.3**	5.6	6.0	6.3	6.7
75	4.1	4.5	**4.9**	**5.3**	**5.6**	6.0	6.4	6.8	7.1
80	4.4	4.8	**5.2**	**5.6**	**6.0**	6.4	6.8	7.2	7.6
85	4.5	5.1	**5.5**	**6.0**	**6.4**	6.8	7.2	7.7	8.1
90	5.0	5.4	**5.9**	**6.3**	**6.8**	7.2	7.7	8.1	8.6

ATRACURIUM (Tracrium®) [ICU/PACU] (page 2 of 2)

Allergy	The potential for histamine release exists in susceptible patients during atracurium administration. Caution should be exercised in patients with a history suggestive of an increased sensitivity to the effects of histamine. In particular, bronchospasm may occur in patients with a history of allergy and asthma.
Contra-indications	Due to the high rate of cross-sensitivity between neuromuscular blocking agents (>50%), caution should be exercised when administering to patients who have shown hypersensitivity to other neuromuscular blocking agents.
Usual dose range	After optional initial bolus dose of 300-600 microgram/kg, usual dose for continuous infusion in ICU is 650-780microgram/ kg/ hr (range 270-1770microgram/ kg/ hr). Doses and infusion rates of neuromuscular blockers are highly variable and should be adjusted as per response to train of four testing in consultation with the anaesthetist.
Renal or Hepatic Impairment	No dose adjustment is required at all levels of renal or hepatic function, including end stage failure.
Dose if obese/ underweight	In obese patients dose as per ideal body weight-
Infusion-related adverse effects	Flushing, transient hypotension, hypertension, tachycardia, bronchospasm, seizures, anaphylactoid or anaphylactic reactions
Extravasation	Likely to cause tissue damage due to low pH & osmolarity
Other common adverse effects	See above
ECG/ telemetry?	Heart rate and blood pressure should be monitored.
Special giving set?	No special requirements
Other notes	May be infused at half normal rate during induced hypothermia as drug inactivation is reduced in this state. Increased atracurium sensitivity may be expected in patients with myasthenia gravis, other forms of neuromuscular diseases or severe electrolyte imbalances. Do not flush the vascular access device. After the infusion is discontinued, disconnect the giving set, aspirate the cannula contents and flush with NaCl 0.9% or glucose 5%.

Prepared by:	Mary Coyle	11/11/2014	Checked by:	J. Hayde	19/02/2015
Amended by:	J. Hayde	08/05/2015	Checked by:	M. Coyle	18/05/2015
			Approved by:	Dr Fitzpatrick	14/07/2015
Reviewed by:	Mary Coyle	14/09/2016	Checked by:	JMcgillycuddy	07/11/2016
Reviewed by:	Terry Smeaton	25/06/18	Checked by:	Mary Coyle	04/09/2018
Reviewed by:	Aisling McGowan	13/03/2023	Checked by:	Aidan Morris	23/05/2023

Information provided relates to atracurium besilate 10mg/ml solution for injection or infusion manufactured by Kalceks
- Medusa Injectable Medicines Guide. Atracurium besilate monograph. Date published 28/09/2022. Available at https://medusa.wales.nhs.uk/IVGuideDisplay.asp (subscription required). Accessed 13/03/2023.

Not for general ward use, only to be used by suitably qualified personnel in the clinical area specified

CALCIUM GLUCONATE [Critical Care] (page 1 of 2)

Form: 2.25mmol calcium in 10mL vial (10% injection) provides approx. 2.25mmol calcium*

Reconstitution: Already in solution.
May dilute further before administration.

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central IV (preferred) route

Slow IV injection

ECG, heart rate, blood pressure and plasma-calcium monitoring should be carried out during administration of bolus doses of calcium. Preferably given via central line or large vein.

Acute symptomatic hypocalcaemia

Give 10-20mL of calcium gluconate 10% undiluted.[1] Give each 10mLs as a slow IV injection over a minimum of 5 minutes. If necessary the dose may be repeated depending on the patient's clinical condition.

Acute severe hyperkalaemia

Give 30 mL of calcium gluconate 10% undiluted over 10 minutes (approx. 6.8 mmol of calcium). If necessary the dose may be repeated depending on the patient's clinical condition.

Intermittent Infusion (Critical Care only)

Acute symptomatic hypocalcaemia

Dilute 2.2mmol (10mL) in 100ml compatible fluid and administer over 15-30mins[1]. Decrease infusion rate if patient experiences hypotension, decreased heart rate, cardiac depression and consider administering as a continuous infusion[1].

Continuous IV infusion

Acute symptomatic hypocalcaemia and post-operative hypocalcaemia

Add 60mL of calcium gluconate 10% (i.e. 6 x 10mL ampoules) to 500mL of compatible infusion fluid. This approximates to 1mg of elemental calcium per mL. Give at an initial rate of 50mL/hour, rate subsequently adjusted according to serum calcium levels which should be monitored 4-6 hourly.[1,2,3,4] Patients typically require 0.5 – 1.5mg/kg of elemental calcium per hour[4]. Consult Endocrinology or ICU for dose adjustment advice. See Hypocalcaemia section of the Adult Medicines Guide for advice on weaning infusion.

CALCIUM GLUCONATE [Critical Care] (page 2 of 2)

Allergy	Possible
Contra-Indications	Previous hypersensitivity, hypercalcaemia, hypercalciuria, intoxication with cardiac glycosides, Do not mix with bicarbonates, phosphates or sulphates.
Usual dose range	See above and the Adult Medicines Guide.
Renal or Hepatic Impairment	Calcium-phosphate balance should be monitored if renal impairment.
Dose if underweight / obese	No specific advice from manufacturer.
Infusion-related adverse effects	Hypotension, bradycardia, cardiac arrhythmia, nausea, vomiting, hot flushes, sweating may occur if given too rapidly. Irritation at injection site.
Extravasation	Calcium salts are highly irritant and care should be taken to avoid extravasation. They should be administered via a central line whenever possible. Calcium gluconate undiluted has a high osmolarity and may cause venous irritation and tissue damage in cases of extravasation. Calcium gluconate is less irritant than calcium chloride and may be given via a large peripheral vein if necessary. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	See infusion-related adverse effects.
ECG/ telemetry?	ECG monitoring (risk of arrhythmias) especially when giving by slow IV injection or intermittent infusion
Special giving set?	No special requirements.
Other notes	Regulatory authorities allow a small variation in the amount of calcium contained in calcium gluconate 10%. Calcium gluconate 10% is a supersaturated solution and is susceptible to precipitation. Prepare a fresh infusion bag at least every 24 hours

Modified from General IV monographs by:	M Coyle	24/06/2019	Checked by:	JMcgillycuddy	16/09/2019
Updated by	D Stewart	05/02/2025	Checked by:	K Burke	04/06/2025

Information provided relates to UK-licensed and German-licensed Braun brands as well as UK-licensed Hameln brand of Calcium gluconate 10%.

References

1. Medusa Injectable Medicines Guide. Available online at www.medusaimg.nhs.uk (password restricted). Accessed 10/02/2025.
2. BNF. Available online at www.medicinescomplete.com (subscription required). Accessed 10/02/2025.
3. Injectable Drugs Guide. Available online at www.medicinescomplete.com (subscription required). Accessed 10/02/2025.
4. UpToDate. Treatment of hypocalcaemia. Accessed online 10/02/2025.
5. Medicines information query no. 18921. Available on MI databank at TUH.

CLONIDINE CONTINUOUS INFUSION (Catapres®) [Critical Care] (page 1 of 4)

Indication: Sedation of adult critical care patients requiring a RASS score between 0 and -3
Ancillary sedative agent for critical care patients as it has analgesic and analgesic-sparing properties

Form: 150 micrograms in 1 mL ampoule

Reconstitution: Already in solution
Dilute further prior to administration

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central (preferable) IV route

Loading Dose
Give required dose by slow IV injection over 10-15 minutes to avoid a possible transient hypertensive effect; may dilute to a final volume of 10mL to facilitate slow administration
OR
Dilute required dose to a final volume of 100mL compatible infusion fluid and administer over 10-15 minutes

Continuous IV infusion
Draw up 750 micrograms (5 mL of 150 microgram/mL concentrate) in a 50 mL syringe. Further dilute with compatible infusion fluid, up to a final volume of 50 mL, to give a 15 microgram/mL solution.

CLONIDINE CONTINUOUS INFUSION (Catapres®) [Critical Care] (page 2 of 4)

Ideal Body Weight (kg)	Dose (microgram/kg/hour)																			
	0.2	0.4	0.5 Usual start dose	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0 Usual max dose	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0 Max dose
	Infusion rate (mL/hour of 15 microgram/mL solution)																				
40	0.53	1.07	1.33	1.60	2.13	2.67	3.20	3.73	4.27	4.80	5.33	5.87	6.40	6.93	7.47	8.00	8.53	9.07	9.60	10.13	10.67
45	0.60	1.20	1.50	1.80	2.40	3.00	3.60	4.20	4.80	5.40	6.00	6.60	7.20	7.80	8.40	9.00	9.60	10.20	10.80	11.40	12.00
50	0.67	1.33	1.67	2.00	2.67	3.33	4.00	4.67	5.33	6.00	6.67	7.33	8.00	8.67	9.33	10.00	10.67	11.33	12.00	12.67	13.33
55	0.73	1.47	1.83	2.20	2.93	3.67	4.40	5.13	5.87	6.60	7.33	8.07	8.80	9.53	10.27	11.00	11.73	12.47	13.20	13.93	14.67
60	0.80	1.60	2.00	2.40	3.20	4.00	4.80	5.60	6.40	7.20	8.00	8.80	9.60	10.40	11.20	12.00	12.80	13.60	14.40	15.20	16.00
65	0.87	1.73	2.17	2.60	3.47	4.33	5.20	6.07	6.93	7.80	8.67	9.53	10.40	11.27	12.13	13.00	13.87	14.73	15.60	16.47	17.33
70	0.93	1.87	2.33	2.80	3.73	4.67	5.60	6.53	7.47	8.40	9.33	10.27	11.20	12.13	13.07	14.00	14.93	15.87	16.80	17.73	18.67
75	1.00	2.00	2.50	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00
80	1.07	2.13	2.67	3.20	4.27	5.33	6.40	7.47	8.53	9.60	10.67	11.73	12.80	13.87	14.93	16.00	17.07	18.13	19.20	20.27	21.33
85	1.13	2.27	2.83	3.40	4.53	5.67	6.80	7.93	9.07	10.20	11.33	12.47	13.60	14.73	15.87	17.00	18.13	19.27	20.40	21.53	22.67
90	1.20	2.40	3.00	3.60	4.80	6.00	7.20	8.40	9.60	10.80	12.00	13.20	14.40	15.60	16.80	18.00	19.20	20.40	21.60	22.80	24.00
95	1.27	2.53	3.17	3.80	5.07	6.33	7.60	8.87	10.13	11.40	12.67	13.93	15.20	16.47	17.73	19.00	20.27	21.53	22.80	24.07	25.33
100	1.33	2.67	3.33	4.00	5.33	6.67	8.00	9.33	10.67	12.00	13.33	14.67	16.00	17.33	18.67	20.00	21.33	22.67	24.00	25.33	26.67

CLONIDINE CONTINUOUS INFUSION (Catapres®) [Critical Care] (page 3 of 4)

Allergy	Hypersensitivity reactions possible
Contra-indications	Previous hypersensitivity or severe bradyarrhythmia resulting from either sick sinus syndrome or AV block of 2nd or 3rd degree.
Usual dose range	**Loading dose:** 0.5 micrograms/kg infused over 10-20 minutes. Loading dose is generally omitted in patients being transitioned from other sedative agents or inpatients at risk of hypotension or bradycardia. **Maintenance dose:** Initial infusion rate of 0.5 microgram/kg/hr, adjusted stepwise in increments of 0.2 microgram/kg/hr every 1-2 hours within the range 0.2-2 microgram/kg/hour to achieve desired sedation level. In exceptional circumstances, doses up to 4 micrograms/kg/hour can be used; however, this should only be done after discussion with a consultant intensivist. Higher doses are often limited by a reduction in blood pressure. Consider a lower starting infusion rate for frail patients. Monitor sedation score (RASS) and GCS. Patients failing to achieve an adequate level of sedation at maximum dosage should be switched to an alternative sedative agent.
Renal or Hepatic Impairment	Renal impairment/RRT: dose as in normal renal function.
Dose if underweight / obese	No special advice from manufacturer. Use ideal body weight for continuous infusion.
Infusion-related adverse effects	Bradycardia, hypotension, fluid retention, sedation. Monitor BP and HR.
Extravasation	Likely to cause tissue damage due to low pH.
Other common adverse effects	Constipation, depression, dizziness, dry mouth, headache, malaise, nausea, postural hypotension, salivary gland pain, sexual dysfunction, sleep disturbances, vomiting.
ECG/ telemetry?	ECG monitoring required.
Special giving set?	No special requirements

CLONIDINE CONTINUOUS INFUSION (Catapres®) [Critical Care] (page 4 of 4)

Other notes	Prolonged use of a continuous clonidine infusion (> 7 days) may result in diminishing sedative effects. Clonidine withdrawal: risk of rebound hypertension and agitation if drug is abruptly withdrawn; tapering required. **Flushing:** **Central venous access device**: when the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with compatible fluid. **Peripheral cannula:** flush the cannula with the same solution used to prepare the syringe; at the same speed as the rate of infusion. Converting from IV to PO clonidine: • Calculate the total dose of clonidine given over the previous 24 hours. • Divide the total daily dose into 4-6 even doses (Rounded to the nearest 25 micrograms), to be administered enterally or intravenously. • Enteral and intravenous doses of clonidine are bioequivalent.

Prepared by:	Cillian O'Donovan	09/09/2022	Checked by:	Mary Coyle	02/12/2022

Information provided relates to Catapres® brand manufactured by Glenwood GmbH.

References (other than SPC)

1. Medusa Injectable Medicines Guide. Available online at http://www.injguide.nhs.uk (password restricted). Last updated 2022 May. Accessed 2022 Aug 23.
2. Cloesmeijer et al. Optimising the dose of clonidine to achieve sedation in intensive care unit patients with population pharmacokinetics. British Journal of Clinical Pharmacology 2020 Aug;86(8):1620-1631.
3. Pichot et al. Dexmedetomidine and clonidine: from second- to first-line sedative agents in the critical care setting? J Intensive Care Med. 2012 Jul-Aug;27(4):219-37.

CO-TRIMOXAZOLE (SEPTRIN®) [Critical Care] (page 1 of 2)

Form: 480mg in 5ml ampoule (400mg sulfamethoxazole & 80mg trimethoprim)

Reconstitution: Already in solution
Faintly yellow to brown solution
Further dilute before administration

Compatible Fluid: Sodium Chloride 0.9%
Glucose 5%

Administration: Peripheral or central (preferred) IV route

Intermittent IV infusion
Dilute in compatible infusion fluid according to the following:
1 ampoule (480mg in 5ml) in 125ml
2 ampoules (960mg in 10ml) in 250ml
3 ampoules (1440mg in 15ml) in 500ml
4 ampoules (1920mg in 20ml) in 500ml
Administer over 90 minutes. Mix thoroughly before use.

If more than 4 ampoules are required for a dose, consider revising the dose and administration schedule to TDS or QDS; alternatively consider switching to fluid restricted protocol to avoid fluid overload.

In fluid restricted patients, each 5ml ampoule may be diluted with 75ml of **glucose 5% only** (total 80mL). Once prepared the solution should be infused over a period not exceeding one hour. Monitor the infusion carefully and discard the infusion if it becomes cloudy or crystals form[1].

Example: 80kg patient requires 2.4g QDS
2.4g QDS = 5 ampoules QDS.
Each ampoule should be diluted with at least 75ml glucose 5% = 375ml glucose 5% for 5 ampoules (total volume 400mL).

Critical Care Patients only (central IV route)
Draw up the required dose into a syringe. Administer the undiluted solution via a syringe pump over 2 hours[1,2].

CO-TRIMOXAZOLE (SEPTRIN®) [Critical Care] (page 2 of 2)

Allergy	Possible. NOTE: Sulfamethoxazole is a Sulphonamide. Use with caution in patients with asthma.
Contra-Indications	- Hypersensitivity to sulphonamides or trimethoprim. - Severe hepatic impairment/ porphyria. - Existent or severe blood dyscrasias. - Glucose-6-phosphate dehydrogenase deficiency.
Usual dose range	PCP treatment: 120mg/kg daily in 2-4 divided doses. Standard dose for treatment of other infections: 960-1440mg BD
Renal or Hepatic Impairment	- Dose reduction may be required if GFR is less than 30ml/min: consult clinical pharmacist. - Manufacturer advises to avoid in severe liver disease.
Dose if underweight / obese	No specific advice from manufacturer, contact pharmacy if further information required.
Infusion-related adverse effects	Localised pain, inflammation and irritation may occur. This infusion is alkaline, and may cause tissue damage in the event of extravasation.
Other common adverse effects	- Candidal overgrowth - Headache, nausea, diarrhoea, hyperkalaemia - Rash (discontinue immediately) - Liver damage and blood disorders may also occur.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements.
Other notes	- Maintain adequate fluid intake. Note however that fluid overload is possible, especially when very high doses are administered to patients with underlying cardio-pulmonary disease. If the volume of fluid is problematic, contact the clinical pharmacist for further advice. - Monitor FBCs on prolonged treatment. - Monitor potassium and sodium. - Discard the infusion if it becomes cloudy or crystals form.

Updated by:	Mary Coyle	23/02/2016	Checked by:	J Mcgillycuddy	13/05/16
Updated by:	Terry Smeaton	28/05/18	Checked by:	Mary Coyle	20/09/2018

Information provided relates to Septrin 80mg/400mg and co-trimoxazole manufactured by Aspen and Merckle

1. NHS Injectable Medicines Guide. Co-trimoxazole Adult Monograph. Version 6. Last updated 28/02/2016. Available online at www.injguide.nhs.uk (password-protected). Accessed 28/05/2018.
2. UKCPA. Minimum Infusion Volumes for Fluid Restricted Critically Ill Patients. Version 4.4. December 2012. Electronic copy logged on Midatabank #5246.
3. Renal Drug Database. Co-trimoxazole (Trimethoprim + Sulfamethoxazole) monograph. Last updated 19/12/2017. Available online at http://renaldrugdatabase.com/ (password-protected). Accessed 28/05/2018.

DANTROLENE (AGILUS®) (page 1 of 3) [RDSC, Critical Care, ECT]

Use under expert supervision for treatment of malignant hyperthermia. Information can be accessed online via TOXBASE. Serious cases of toxicity should be discussed with the National Poisons Information Service (Tel: 01-8092166).

Form: 120 mg dry powder vial

Reconstitution:
Reconstitute each 120 mg vial with 20 mL water for injections. Shake the vial until the solution is dissolved (this may take longer than 1 minute)[1]. Do not further dilute.
After reconstitution, the solution contains 5.3 mg per 1 mL.[1,2] Reconstituted solution is a yellow-orange solution. Do not use if solution contains particles.

Administration:
Peripheral or central IV route (central preferred)

IV injection: Give by rapid injection[1] over at least one minute[2]

Table 1: Agilus® (Dantrolene) dosing

Round patient weight to the nearest 5kg as per table below. E.g. if weight = 56kg, dose as for 55kg, if weight = 68kg, dose as for 70kg.

Weight (kg)	Dose to be administered (2.5 mg / kg)	Volume of reconstituted solution to be administered (mL)*
30	75 mg	14 mL
35	87.5 mg	17 mL
40	100 mg	19 mL
45	112.5 mg	21 mL
50	125 mg	24 mL
55	137.5 mg	26 mL
60	150 mg	28 mL
65	162.5 mg	31 mL
70	175 mg	33 mL
75	187.5 mg	35 mL
80	200 mg	38 mL
85	212.5 mg	40 mL
90	225 mg	42 mL
95	237.5 mg	45 mL
100	250 mg	47 mL
105	262.5 mg	50 mL
110	275 mg	52 mL
115	287.5 mg	54 mL
120	300 mg	57 mL
*Volume based on Dantrolene (Agilus®) reconstituted solution containing 5.3 mg per mL. Rounded to the nearest mL.		

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

DANTROLENE (AGILUS®) (page 2 of 3) **[RDSC, Critical Care, ECT]**

Allergy	Possible
Contra-indications	Hypersensitivity to Dantrolene[1] Hyperkalaemia has been seen with concomitant use of Dantrolene and calcium channel blockers - monitor potassium if co-administration required.
Usual dose range	2.5 mg/kg immediate IV bolus, pause and observe; repeat 2.5 mg/kg bolus every 10 minutes until $EtCO_2$ less than 6 kPa and temperature is less than 38.5°C. If cumulative dose exceeds 10mg/kg, re-examine malignant hyperthermia diagnosis. See Table 1. If a relapse or recurrence occurs, re-administer at a dose of 2.5 mg/kg every 10 minutes until the signs of malignant hyperthermia regress once more.
Renal or Hepatic Impairment	No dose adjustment required [1]
Dose if underweight / obese	Manufacturer recommends for all bodyweights, the initial dose and any repeat doses should not exceed 300 mg[1]
Infusion-related adverse effects	Hypersensitivity reactions including urticaria, anaphylaxis[1,2] Injection site reactions including erythema, tissue necrosis, thrombophlebitis.
Extravasation	Dantrolene has a high pH and may cause venous irritation and tissue damage in cases of extravasation. If a central venous access device is unavailable, administer via a large peripheral vein monitoring insertion site closely. Re-site cannula at first signs of inflammation. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	• Hyperkalaemia-symptoms include muscle paralysis; ECG changes, cardiac arrhythmias [1,2] • Dizziness, seizure, headache, muscle weakness [1,2] • Visual impairment[1] • Respiratory depression • Abdominal pain, Nausea, Vomiting, Gastrointestinal haemorrhage, Diarrhoea, Dysphagia[1] • Abnormal liver function
ECG/ telemetry?	ECG monitoring advised
Special giving set?	No special requirements[4]

DANTROLENE (AGILUS®) (page 3 of 3) **[RDSC, Critical Care, ECT]**

Other notes	Do not infuse or dilute with any other medicines or infusion fluids(1) Do not administer by IV injection via a line being used for an infusion containing a medicine additive without first stopping the running infusion. Flush the line with a small volume of water for injection (e.g. 10mL) before and after giving the injection. Spill of solution on skin should be avoided. If solution gets on the skin, it must be removed with sufficient water. Contains Hydroxypropylbetadex (a cyclodextrin); possible association with hearing impairment especially in high doses Agilus® (dantrolene) more than 10mg/kg.[1,2]

Prepared by:	Laura McCabe	June 2025	Checked by:	Mary Coyle Dr C Frith-Keyes (Anaesthetist and Perioperative Medicine Consultant) D Stewart	03/07/2025

Information provided relates to Agilus® brand manufactured by Norgine. Dose banding agreed with Dr C Frith-Keyes July 2025.

References

1. Agilus® (Dantrolene sodium heptahydrate) 120 mg powder for solution for injection, Summary of Product Characteristics accessed online at https://www.ema.europa.eu/en/medicines/human/EPAR/agilus, June 2025
2. Medusa- NHS Injectable Medicines Guide. Dantrolene sodium (Agilus®), accessed online June 2025
3. Martindale: The complete drug reference. Dantrolene sodium monograph accessed online June 2025 (last updated 10/6/2025)
4. Personal Communication Norgine Ltd, March 2025 (MI databank enquiry ref 18662)

DEXMEDETOMIDINE [Critical Care] (page 1 of 3)

Indication: Sedation of adult ICU patients requiring a RASS score between 0 and -3
Ancillary sedative agent for ICU patients as it has analgesic and analgesic-sparing properties

Form: 400 micrograms in 4ml concentrate for infusion

Reconstitution: Already in solution
Dilute further prior to administration

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central IV route

Continuous IV infusion
Draw up 400 micrograms (4mls of 100 microgram/ml concentrate) in a syringe. Withdraw and discard 4mls from a 100ml bag of compatible infusion fluid and then add the 400 micrograms to this bag to give a 4 micrograms/ml solution. The solution should be shaken gently to mix well and should be inspected visually for particulate matter and discoloration prior to administration.

Weight (Kg) [Use ideal body wt if obese]	**Dose (microgram/kg/hour)**												
	0.2	0.3	0.4	0.5	0.6	0.7 Usual start dose	0.8	0.9	1.0	1.1	1.2	1.3	1.4 Max dose
	Infusion rate (mL/hour of 4microgram/mL solution)												
45	2.2	3.4	4.5	5.6	6.7	7.9	9.0	10.1	11.2	12.4	13.5	14.6	15.7
50	2.5	3.8	5.0	6.3	7.5	8.8	10.0	11.3	12.5	13.8	15.0	16.3	17.5
55	2.8	4.1	5.5	6.9	8.3	9.6	11.0	12.4	13.8	15.1	16.5	17.9	19.3
60	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0
65	3.3	4.9	6.5	8.1	9.8	11.4	13.0	14.6	16.3	17.9	19.5	21.1	22.8
70	3.5	5.3	7.0	8.8	10.5	12.3	14.0	15.8	17.5	19.3	21.0	22.8	24.5
75	3.8	5.6	7.5	9.4	11.3	13.1	15.0	16.9	18.8	20.6	22.5	24.4	26.3
80	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0	26.0	28.0
85	4.3	6.4	8.5	10.6	12.8	14.9	17.0	19.1	21.3	23.4	25.5	27.6	29.8
90	4.5	6.8	9.0	11.3	13.5	15.8	18.0	20.3	22.5	24.8	27.0	29.3	31.5
95	4.8	7.1	9.5	11.9	14.3	16.6	19.0	21.4	23.8	26.1	28.5	30.9	33.3
100	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0	27.5	30.0	32.5	35.0
105	5.3	7.9	10.5	13.1	15.8	18.4	21.0	23.6	26.3	28.9	31.5	34.1	36.8
110	5.5	8.3	11.0	13.8	16.5	19.3	22.0	24.8	27.5	30.3	33.0	35.8	38.5
115	5.8	8.6	11.5	14.4	17.3	20.1	23.0	25.9	28.8	31.6	34.5	37.4	40.3
120	6.0	9.0	12.0	15.0	18.0	21.0	24.0	27.0	30.0	33.0	36.0	39.0	42.0

DEXMEDETOMIDINE [Critical Care] (page 2 of 3)

Allergy	No specific reports of allergy
Contra-indications	Use of dexmedetomidine as sole sedative agent in a patient on neuromuscular blockers is PROHIBITED. Advanced heart block (grade 2 or 3 unless paced); Uncontrolled hypotension; Hypersensitivity; Acute cerebrovascular conditions; Malignant hyperthermia.
Usual dose range	Intubated and sedated patients may switch to dexmedetomidine with an initial infusion rate of 0.7microgram/kg/hr (started 2 hours before stopping other sedative medications) which then may be adjusted stepwise in the range 0.2-1.4 microgram/kg/hour to achieve desired sedation level. Consider a lower starting infusion rate for frail patients. Monitor sedation score (RASS) and GCS. After dose adjustment, a new steady state sedation level may not be reached for up to 1 hour. Thus bolus administration of dexmedetomidine is inappropriate. Patients failing to achieve an adequate level of sedation at maximum dosage should be switched to an alternative sedative agent.
Renal or Hepatic Impairment	No dose adjustment required in renal impairment Dose reduce in mild-moderate impairment; caution in severe hepatic impairment (accumulation may occur).
Dose if underweight / obese	No special advice from manufacturer. Dose as per Ideal Body Weight in obesity. If not reaching adequate sedation, consider using actual body weight in conjunction with the consultant.
Infusion-related adverse effects	Bradycardia, hypotension at lower doses, peripheral vasoconstriction leading to hypertension at higher doses, vasoconstriction (reduce or discontinue if signs of myocardial or cerebral ischaemia), hypo or hyperglycaemia, hyperthermia (discontinue in sustained unexplained fever).
Other common adverse effects	Agitation, respiratory depression, nausea & vomiting, dry mouth.
ECG/ telemetry?	ECG monitoring required.
Special giving set?	No special requirements
Other notes	There is no experience using dexmedetomidine for greater than 14 days. Dexmedetomidine should not be bolused: alternative sedatives may be required for acute control of agitation. Alpha-2 agonists such as dexmedetomidine have been associated with withdrawal reactions when stopped abruptly. Not appropriate as a sole agent for status epilepticus as it does not suppress seizure activity. If transfer to HDU is planned, consider switching to an alternative agent.

DEXMEDETOMIDINE [Critical Care] (page 3 of 3)

Prepared by:	J Mcgillycuddy	02/07/2014	Checked by:	Mary Coyle	03/11/2014
Reviewed by:	Dr G. Fitzpatrick, M.Coyle, J.Hayde	14/07/2015	Checked by:	J. Hayde	20/07/2015
Reviewed by:	Terry Smeaton	29/05/18	Checked by:	M Coyle	04/09/2018
Brand change	J Mcgillycuddy	14/04/2022	Checked by:	T Matthews	14/04/2022
Information provided relates to Dexmedetomidine 100 micrograms/mL concentrate for solution for infusion manufactured by EVER Pharma.					

DOPAMINE [Critical Care] (page 1 of 3)

Form: 200mg per 5ml ampoule

Reconstitution: Already in solution.
Further dilute before administration

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Central (preferred) or Peripheral (only for dilute solutions*) IV route

IMPORTANT NOTE on calculating rate:
** If you are using the drug library on the BBraun smartpump (as recommended), enter the patient's body weight in **kg** and the desired dopamine dose in **microgram/kg/min**. The pump will calculate rate in **mL/hour**. Otherwise, use the table below to calculate the infusion rate. **

Continuous IV infusion by the peripheral or central IV route
Withdraw 400mg (10ml) of dopamine into a syringe. Remove and discard 10ml from a 250ml bag of compatible fluid. Add 400mg of dopamine to the infusion bag and mix well. This gives a 1600microgram/mL solution.
Infuse the prescribed dosage using a rate-controlled infusion pump as per the corresponding rate in the following table:

Table 2: Administration rates in mL/hour for 1600microgram/mL solution

Dose microgram /kg/min	Patients weight (kg)												
	40	45	50	55	60	65	70	75	80	85	90	95	100
	Infusion rate in mL/hour												
1	1.5	1.7	1.9	2.1	2.3	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8
2.5	3.8	4.2	4.7	5.2	5.6	6.1	6.6	7	7.5	8.0	8.4	8.9	9.4
5	7.5	8.4	9.4	10.3	11.3	12.2	13.1	14.1	15	15.9	16.9	17.8	18.8
10	15	16.9	18.8	20.6	22.5	24.4	26.3	28.1	30	31.9	33.8	35.6	37.5
15	22.5	25.3	28.1	30.9	33.8	36.6	39.4	42.2	45	47.8	50.6	53.4	56.3
20	30	33.8	37.5	41.3	45	48.8	52.5	56.3	60	63.8	67.5	71.4	75
30	45	50.1	56.3	61.9	67.5	73.1	78.8	84.4	90	95.6	101	107	113
40	60	67.5	75	82.5	90	97.5	105	113	120	128	135	143	150
50	75	84.4	93.8	103	113	122	131	141	150	159	169	178	188

DOPAMINE [Critical Care] (page 2 of 3)

Continuous IV infusion by the **central** IV route (fluid restricted)

Dilute 200mg of dopamine to 50ml with compatible infusion fluid. This gives a 4000microgram/mL solution. Infuse the prescribed dosage using a rate-controlled infusion pump as per the corresponding rate in the following table:

Table 2: Administration rates in mL/hour for 4000microgram/mL solution

Dose microgram / kg/min	Patients weight (kg)												
	40	45	50	55	60	65	70	75	80	85	90	95	100
	Infusion rate in mL/hour												
1	0.6	0.7	0.8	0.8	0.9	1	1.1	1.1	1.2	1.3	1.4	1.4	1.5
2.5	1.5	1.7	1.9	2.1	2.3	2.4	2.6	2.8	3	3.2	3.4	3.6	3.8
5	3	3.4	3.8	4.1	4.5	4.9	5.3	5.6	6	6.4	6.8	7.1	7.5
10	6	6.8	7.5	8.3	9	9.8	10.5	11.3	12	12.8	13.5	14.3	15
15	9	10.1	11.3	12.4	13.5	14.6	15.8	16.9	18	19.1	20.3	21.4	22.5
20	12	13.5	15	16.5	18	19.5	21	22.5	24	25.5	27	28.5	30
30	18	20.1	22.5	24.8	27	29.3	31.5	33.8	36	38.3	40.5	42.8	45
40	24	27	30	33	36	39	42	45	48	51	54	57	60
50	30	33.8	37.5	41.3	45	48.8	52.5	56.3	60	63.8	67.5	71.3	75

Allergy	Hypersensitivity to dopamine or to any of the excipients.
Contra-indications	Phaeochromocytoma, hyperthyroidism, uncorrected atrial or ventricular tachyarrhythmias, ventricular fibrillation. Cyclopropane and halogenated hydrocarbon anaesthetics should be avoided.
Usual dose range	The infusion rate must be titrated to the optimum patient response and constantly evaluated in relation to the patient's changing condition. Initial rate 2.5mcg/kg/min or in severe case initial rate 5mcg/kg/min. Titrate gradually in 5-10 microgram/kg/min increments. Up to 20-50mcg/kg/minute may be required in seriously ill patients.
Renal or Hepatic Impairment	Dose reduction not required in renal impairment.
Dose if underweight / obese	No special advice from manufacturer

DOPAMINE [Critical Care] (page 3 of 3)

Infusion-related adverse effects	Nausea, vomiting, tachyarrhythmias (especially ventricular), peripheral vasoconstriction, hypertension and hypotension. Extravasation may cause tissue ischaemia, sloughing and necrosis - refer to the Guideline for the Initial Management of Extravasation of Non-Chemotherapy Drugs
Other common adverse effects	Headache, angina pain, shortness of breath. Decreased urinary output secondary to reduced renal blood flow, particularly for patients on high dose regimens (>20mcg/kg/min).
ECG/ telemetry?	ECG monitoring required
Special giving set?	No special requirements
Other notes	Patients who have been treated with MAO inhibitors prior to dopamine should be given reduced doses; the starting dose should be one tenth (1/10th) of the usual dose. Administration of I.V. phenytoin to patients receiving dopamine has resulted in hypotension and bradycardia; some clinicians recommend that phenytoin be used with extreme caution, if at all, in patients receiving dopamine. Dopamine infusion should be withdrawn gradually, to avoid unnecessary hypotension. Preferably administer centrally. If given peripherally, choose a large vein and monitor the injection site closely.*Concentrations greater than 1600 microgram/mL must be given via central line. Flushing: **Central venous access device**: when the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with sodium chloride 0.9%. **Peripheral cannula:** flush the cannula with sodium chloride 0.9% at the same speed as the rate of infusion.

Prepared by:	Mary Coyle	04/05/2016	Checked by:	J Mcgillycuddy	13/05/2016
Reviewed by:	T Smeaton	29/05/18	Checked by:	Mary Coyle	04/09/2018

Information provided relates to Dopamine Hydrochloride 40mg/ml manufactured by Hospira.

Other References

1. NHS Injectable Medicines Guide. Dopamine adult monograph. Version 6. Last updated 28/08/14. Available online at www.injguide.nhs.uk. (password-protected). Accessed 29/05/2018.

ECULIZUMAB (Soliris®) [Renal patients] (page 1 of 3)

IV monoclonal antibodies are on the exclusion list of drugs not generally to be administered by nursing staff as per the Intravenous Drug Administration Policy

Form: 300mg/30mL concentrate for dilution

Reconstitution: Already in solution.
Further dilute before administration.

Compatible Fluid: Sodium chloride 0.9%
Glucose 5%

Administration: Peripheral or central IV route
Must **only** be given as an IV infusion

Intermittent IV infusion
Prepare as per the details in the table below. Allow the infusion bag containing the diluted drug to reach room temperature prior to administration. Administer the infusion to adults over a period of 25 to 45 minutes. If the infusion is slowed due to an adverse event, the total infusion time must not exceed 2 hours in adults. Observe all patients for 1 hour post infusion.

Preparation at ward level, using aseptic technique, to give 5mg/mL:

1. Visually inspect the eculizumab solution in the vial for particulate matter and discolouration.
2. Check the table below for the volumes appropriate to the required dose. The aim is to dilute eculizumab to a concentration of 5mg/mL.
3. Select the correct size infusion bag.
4. Remove & discard the appropriate volume from the infusion bag
5. Draw up the required volume of eculizumab which corresponds to the required dose.
6. Add the volume to the infusion bag (which already has volume taken out).
7. **Gently** agitate the infusion bag containing the diluted solution to ensure thorough mixing of the product and diluent. Do not shake the infusion bag (potential for frothing).
8. The diluted solution should be **allowed to warm to room temperature** prior to administration.
9. Inspect visually prior to administration: it should be a clear colourless liquid, free from any particles.
10. After dilution, the medicinal product should be used immediately.

Dose	Infusion bag size	Volume to remove & discard	Volume of drug to add to bag	Final concentration of drug (5mg/mL)
300mg	100mL	70mL	30mL (=300mg)	300mg/60mL
600mg	100mL	40mL	60mL (=600mg)	600mg/120mL
900mg	250mL	160mL	90mL (=900mg)	900mg/180ml
1200mg	250mL	130mL	120mL (=1,200mg)	1200mg/240mL

ECULIZUMAB (Soliris®) [Renal patients] (page 2 of 3)

Allergy	Infusion reactions or immunogenicity can occur that could cause allergic or hypersensitivity reactions (including anaphylaxis, though the occurrence of such reactions is rare). Eculizumab administration should be interrupted in all patients experiencing severe infusion reactions and appropriate medical therapy administered. Emergency equipment, such as adrenaline, antihistamines, corticosteroids and an artificial airway must be available. **All patients administered eculizumab should be observed for 1 hour post infusion.**
Contra-Indications	Hypersensitivity to eculizumab or murine (mouse) proteins. Unresolved Neisseria meningitidis infection. PNH patients who are not currently vaccinated against Neisseria meningitidis. aHUS patients who are not currently vaccinated against Neisseria meningitidis or do not receive prophylactic treatment with appropriate antibiotics until 2 weeks after vaccination.
Usual dose range	600mg – 1200mg (300mg in certain circumstances)
Renal or Hepatic Impairment	No dose adjustment required in renal impairment. The safety and efficacy of eculizumab have not been studied in patients with hepatic impairment.
Dose if underweight / obese	No specific recommendations
Infusion-related adverse effects	Administration of eculizumab may result in infusion reactions or immunogenicity that could cause allergic or hypersensitivity reactions (including anaphylaxis, though the occurrence of such reactions is rare). Eculizumab administration should be interrupted in all patients experiencing severe infusion reactions and appropriate medical therapy administered as outlined under in the Allergy section above. If an adverse event occurs during the administration (other than a severe infusion reaction or anaphylaxis), the infusion may be slowed or stopped at the discretion of the physician. If the infusion is slowed, the total infusion time may not exceed two hours in adults. **All patients administered eculizumab should be observed for 1 hour post infusion.**
Extravasation	No special requirements
Other common adverse effects	Headache, dizziness, influenza like illness (pyrexia, chills, fatigue), chest pain, oedema, infusion site paraesthesia, infusion site pain, back pain and gastro-intestinal disturbances (abdominal pain, diarrhoea, nausea and vomiting). Cases of Aspergillus infections have been reported.
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements

ECULIZUMAB (Soliris®) [Renal patients] (page 3 of 3)

Other notes	Product is stored in the fridge until being prepared for administration. Prior to initiating therapy, patients should initiate immunisations according to current immunisation guidelines. Additionally, all patients must be vaccinated against meningococcus at least 2 weeks prior to receiving eculizumab. If available, tetravalent, conjugated vaccines are recommended. PNH patients who are treated with eculizumab less than 2 weeks after receiving a meningococcal vaccine must receive treatment with appropriate prophylactic antibiotics until 2 weeks after vaccination. Patients should be instructed that if they develop fever, headache accompanied with fever and/or stiff neck or sensitivity to light, they should immediately seek medical care as these signs may be indicative of meningococcal infection. Treatment discontinuation: In aHUS, thrombotic microangiopathy (TMA) complications have been observed as early as 4 weeks and up to 127 weeks following discontinuation. In PNH, closely monitor for signs and symptoms of serious intravascular haemolysis for at least 8 weeks post discontinuation. The name and the batch number of the administered product should be recorded.

Prepared by:	J.Hayde	22/06/2015	Checked by:	C O'Brady	24/06/2015
Updated by:	H. O'Hara	20/03/2023	Checked by:	JMcgillycuddy	13/06/2023

Information provided refers to Soliris brand by Alexion

References

1. Soliris SPC, Updated 10/11/2022. Accessed via: https://www.medicines.ie/medicines/soliris-33776/spc 22/06/2023.
2. Medusa Injectable Medicines Guide. Available online at http://www.injguide.nhs.uk (password restricted). Accessed 20/03/2023
3. Soliris dosing and administration product information. Alexion, July 2014

ENOXIMONE (Perfan®) [Critical Care] (page 1 of 3)

Form: 100 mg in 20 mL vial

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Sodium Chloride 0.9%[1]

Administration: Central IV route preferred[1]. If administered peripherally, administer via a large vein and monitor administration site closely for phlebitis[1].

Inspect visually for particulate matter and discolouration prior to administration (diluted solution should be yellow in colour).

IV Injection (Bolus Dosing Regimen)
Withdraw the required dose and dilute with an **equal volume** of compatible fluid to give a 2.5mg/mL solution. (Do not use more dilute solutions as crystal formation may occur). For doses **>100mg,** two syringes are required. Administer as a slow IV injection (max. rate=12.5mg/min).

Dosage table for Enoximone Bolus Dosing

Weight (kg)	Dose (mg/kg)					
	0.5	0.6	0.7	0.8	0.9	1
	Dose (mL of a 2.5mg/mL solution))					
40	8	9.6	11.2	12.8	14.4	16
50	10	12	14	16	18	20
60	12	14.4	16.8	19.2	21.6	24
70	14	16.8	19.6	22.4	25.2	28
80	16	19.2	22.4	25.6	28.8	32
90	18	21.6	25.2	28.8	32.4	36
100	20	24	28	32	36	40
110	22	26.4	30.8	35.2	39.6	44

ENOXIMONE (Perfan®) [Critical Care] (page 2 of 3)

Continuous Intravenous Infusion
Withdraw 100mg and dilute with 20mL of compatible fluid in a syringe pump to give a final concentration of 2.5mg/mL, final volume 40mL.

Dosage table for Enoximone Continuous Infusion

Weight (kg)	Infusion rate (micrograms/kg/minute)				
	Loading rate: 90 (administer for 10-30 minutes)	5	10	15	20
	Rate of infusion (mL/hr of a 2.5mg/mL solution)				
40	86.4	4.8	9.6	14.4	19.2
50	108	6	12	18	24
60	129.6	7.2	14.4	21.6	28.8
70	151.2	8.4	16.8	25.2	33.6
80	172.8	9.6	19.2	28.8	38.4
90	194.4	10.8	21.6	32.4	43.2
100	216	12	24	36	48
110	237.6	13.2	26.4	39.6	52.8

Allergy	Not reported.
Contra-indications	Hypersensitivity to the active substance or to any of the excipients.
Usual dose range	Treatment of Severe Congestive Heart Failure ***Regimen 1:*** *Slow IV Injection (Bolus Dosing Regimen)* Initial dose: 0.5-1mg/kg. Further doses of 0.5mg/kg may be given every 30 minutes until a satisfactory response is achieved, or a total initial dose of 3mg/kg is administered. Maintenance dose: The initial dose (max. 3mg/kg) may be repeated as required every 3-6 hours and adjusted downwards according to response. Max. dose in 24 hours (including loading) is 24mg/kg.[2] ***Regimen 2:*** *Continuous IV Infusion* Initial dose: 90 microgram/kg/minute administered for 10 – 30 minutes until required haemodynamic response is achieved. Maintenance Dose: 5-20 microgram/kg/minute. Max. dose in 24 hours (including loading) is 24mg/kg.[2] Treatment of Bronchospasm Dosing as per Critical Care Consultant. **Sample Regimen**: 25-100mg via slow IV injection (dose may be repeated if sufficient response). May be followed by continuous IV infusion: rate 3.2mL/hour. [3]

ENOXIMONE (Perfan®) [Critical Care] (page 3 of 3)

Renal or Hepatic Impairment	In patients with renal impairment, the dosage or dosage frequency may need to be reduced.
Dose if underweight / obese	No specific advice from manufacturer.
Infusion-related adverse effects	This injection is highly alkaline and may produce local tissue damage in event of extravasation. If symptomatic decrease in blood pressure occurs, reduce the rate of infusion, or stop if necessary.
Other common adverse effects	Insomnia, headache, thrombocytopenia, increased transaminases, hypotension, arrhythmias and increased bilirubin.
ECG/ telemetry	Continuous ECG monitoring recommended for administration of loading dose and for infusion(s) due to risk of arrhythmia. Continuous monitoring of blood pressure and heart rate recommeded.[4]
Special giving set	Plastic giving set must be used.
Other notes	Use only plastic syringes to dilute and administer enoximone. Glass materials must not be used due to the risk of crystal formation. Other drugs or fluids must not be mixed in the same container as enoximone. A dedicated line is recommended for its administration. After dilution, the product must be stored at room temperature. Dilutions must not be refrigerated as crystal formation may occur. **Flushing:**[1] Do not flush the central venous access device. After the infusion is stopped, disconnect the administration set, aspirate the cannula contents and then flush with sodium chloride 0.9% w/v. Flush peripheral cannula with sodium chloride 0.9% at the same rate as the enoximone was infused to avoid adverse haemodynamic effects.
Special giving set?	Plastic giving set must be used.

Prepared by:	Terry Smeaton	09/03/2017	Checked by:	Mary Coyle	23/03/2017
			Approved by:	G Fitzpatrick	31/07/2018

Information provided relates to Perfan Injection 100mg/20mL manufactured by Carinopharm GmbH.

References

1. NHS Injectable Medicines Guide. Enoximone Intravenous Adult Monograph. Version 7. Last updated: 19/05/15. Available online http://medusa.wales.nhs.uk (password-protected). Accessed 30/01/17.
2. UCLH Injectable Medicines Administration Guide. Wiley-Blackwell: London; 2010.
3. Beute, J. Emergency treatment of status asthmaticus with enoximone. British Journal of Anaesthesia. 2014; 112 (6):1105-8.
4. Gray A et al. Injectable Drugs Guide. 1st Edition. London; 2011.

EPTIFIBATIDE [Cardiology/Critical Care] (page 1 of 3)

Form: 2mg/mL 10mL solution for injection vial
0.75mg/mL 100mL solution for infusion vial

Reconstitution: Already in solution

Compatible Fluid: Sodium chloride 0.9%

Administration:* Intracoronary route [1]
Peripheral or central IV route

Bolus injection
Administer the 2mg/mL solution for injection dose (see usual dose below) undiluted by slow intracoronary or IV injection (depending on route prescribed) over 1-2 minutes [2]

Infusion (after bolus dose)
Administer the 0.75mg/mL solution for infusion product undiluted by intracoronary or IV infusion (depending on route prescribed) at the prescribed rate via a volumetric infusion pump for the specified duration

*Cardiac Cath Lab consultant's preferred route of administration is intracoronary

Pt wt (kg)	**Bolus dose** (180 microgram/kg) over 1-2 mins **using 2mg/mL solution**		**Infusion** (2 microgram/kg/min) **using 0.75mg/mL solution**	**Renal impairment (CrCl** ≥30 to <50mL/min) **Infusion** (1microgram/kg/min) **using 0.75mg/mL solution**
	Dose (mg)	Vol of **2mg/mL** solution	**Infusion rate** (mL/hr) of a **0.75mg/mL** solution) for 2microgram/kg/min infusion	**Infusion rate** (mL/hr) of a **0.75mg/mL** solution) for 1microgram/kg/min infusion
40	7.2mg	3.6mL	6.4mL/hr	3.2mL/hr
45	8.1mg	4.1mL	7.2mL/hr	3.6mL/hr
50	9mg	4.5mL	8mL/hr	4mL/hr
55	9.9mg	5mL	8.8mL/hr	4.4mL/hr
60	10.8mg	5.4mL	9.6mL	4.8mL/hr
65	11.7mg	5.9mL	10.4mL/hr	5.2mL/hr
70	12.6mg	6.3mL	11.2mL/hr	5.6mL/hr
75	13.5mg	6.8mL	12mL/hr	6mL/hr
80	14.4mg	7.2mL	12.8mL/hr	6.4mL/hr
85	15.3mg	7.7mL	13.6mL/hr	6.8mL/hr
90	16.2mg	8.1mL	14.4mL/hr	7.2mL/hr
95	17.1mg	8.6mL	15.2mL/hr	7.6mL/hr
100	18mg	9mL	16mL/hr	8mL/hr
105	18.9mg	9.5mL	16.8nL/hr	8.4mL/hr
110	19.8mg	9.9mL	17.6mL/hr	8.8mL/hr
115	20.7mg	10.4mL	18.4mL/hr	9.2mL/hr
120	21.6mg	10.8mL	19.2mL/hr	9.6mL/hr

EPTIFIBATIDE [Cardiology/Critical Care] (page 2 of 3)

Allergy	Anaphylactic reactions have occurred very rarely
Contra-indications	Hypersensitivity, GI or GU bleeding, other abnormal bleeding within 30 days, stroke within 30 days or history of haemorrhagic stroke, intracranial disease, major surgery or severe trauma within past 6 weeks, history of bleeding diathesis, thrombocytopenia (<100,000 cells/mm3), PT >1.2 times control, INR ≥ 2.0, severe hypertension (SBP >200 mm Hg or DBP >110 mm Hg on antihypertensives), CrCl <30ml/min or on dialysis, clinically sig. hepatic impairment, concomitant/ planned admin of another parenteral GP IIb/IIIa inhibitor
Usual dose range	Intracoronary or IV bolus injection of 180 microgram/kg, which can be repeated 10 minutes later and which may be followed by an intracoronary or IV infusion of 2 microgram/kg/min for up to 18 hours [21,3] (or longer as per consultant decision)
Renal or Hepatic Impairment	Contra-indicated in severe renal impairment (CrCl <30mL/min), in dialysis and in clinically significant hepatic impairment. CrCl ≥30 to <50mL/min: give bolus as normal and give infusion at a rate of 1microgram/kg/minute
Dose if underweight / obese	Patients with low body weight may have an increased risk of bleeding: monitor closely with regard to bleeding
Administration-related adverse effects	Hypotension, anaphylaxis, cardiac arrest, heart failure, and arrhythmias. Observe all potential bleeding sites carefully. There is a potential safety consideration regarding cardiac arrhythmia risk due to product acidity (pH 5.0-5.5)[1]: consultant decision not to buffer product
Other common adverse effects	Patient must be observed carefully for indications of bleeding during treatment, especially women, the elderly and patients with low body weight or with moderate renal impairment
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Pre-treatment, check PT, aPTT, serum creatinine, platelet count, Hb and haematocrit levels. Monitor Hb, haematocrit & platelet counts prior to treatment, within 6 hours of administration and at least once daily thereafter while on therapy and immediately at clinical signs of unexpected bleeding tendency. If the platelet count falls below 100,000/mm3, further platelet counts are required to rule out pseudothrombocytopenia. Discontinue unfractionated heparin. In patients undergoing PCI, measure the ACT.

EPTIFIBATIDE [Cardiology/Critical Care] (page 3 of 3)

Prepared by:	JMcgillycuddy	06/02/2020	Checked by:	Carol O'Brady	07/02/2020
Cath lab sign-off:	Dr Bryan Loo				
Updated by:	JMcgillycuddy	23/01/2024	Checked by:	LMcCabe	25/01/2024
Minor update (shortage) re products included: D Stewart 11/03/2025					

Information provided relates to Integrilin brand manufactured by GSK for the 2mg/mL 10mL product, eptifibatide US product manufactured by Athenex for the 75mg/ 100mL product and UK EMP manufactured by Kensington Pharma 75 mg /100 ml product.

References

1. Administration of eptifibatide via intra-coronary route. Midatabank #13354. Available from Pharmacy
2. Medusa Injectable Medicines. Eptifibatide monograph. Available online at http://medusa.wales.nhs.uk/IVGuide (subscription required). Date published 29/06/2016. Accessed 19/06/2019.
3. The Task Force on myocardial revascularization of the ESC & EACTS. 2018 ESC/EACTS Guidelines on myocardial revascularization. Available online at www.escardio.org/guidelines. Online publish-ahead-of-print 25 August 2018. Accessed 19/06/2019.
4. Athenex Prescribing Information (US) (2 mg / ml and 0.75 mg / ml). Information on file in Medicines Information. 16/01/2024.
5. Kensington Pharmacy SPC (UK) (0.75mg/ml 100ml product). Information on file.
6. TUH Medicines Information department MI enquiry no. 18660.

EPTINEZUMAB (Vyepti®) [page 1 of 1]

IV monoclonal antibodies are on the exclusion list of drugs not generally to be administered by nursing staff as per Intravenous Drug Administration Policy

Form: 100mg/ 1mL vial

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route

Intermittent IV infusion
Withdraw the required dose and add to a 100mL bag of sodium chloride 0.9%. Gently invert bag to mix; do not shake. Administer over 30 minutes using a giving set with a 0.2 micron filter–see below.

Allergy	Serious hypersensitivity reactions including anaphylactic reactions may develop within minutes
Contra-indications	Hypersensitivity
Usual dose range	100mg every 12 weeks; 300mg every 12 weeks in some patients
Renal or Hepatic Impairment	No dose adjustment as per manufacturer
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	Nasal congestion, rhinorrhoea, throat irritation, cough, sneezing, dyspnoea [1]
Extravasation	Likely to cause tissue damage due to Polysorbate 80
Other common adverse effects	Fatigue
ECG/ telemetry?	No special requirements
Special giving set?	Flush with 20mL sodium chloride 0.9%. Administer using Infusomat Space Line including 0.2 micron filter, NSV code: FSB03230 (8700098SP) for BBraun pumps. Use the diluted solution must within 8 hours. Store the unopened product in the fridge in the outer carton.
Other notes	Before treatment, check for a history suggesting hereditary fructose intolerance [1]

Prepared by:	J Mcgillycuddy	14/11/2023	Checked by:	M Harty	18/12/2023

Information provided relates to Vyepti brand of eptinezumab.

References (other than SPC)

1. Medusa NHS Injectable Medicines Guide. Eptinezumab monograph v2. Available online at www.medusaimg.nhs.uk (subscription required). Accessed 14/11/2023.

ESMOLOL HYDROCHLORIDE [Critical Care] (page 1 of 3)

Indication: Supraventricular tachycardia (SVT), rapid control of ventricular rate and perioperative tachycardia and hypertension

Form: 10mg/ml in 10ml vial
10mg/ml in 250ml pre-mixed infusion bag

Reconstitution: Already in solution

Compatible Fluid: Not applicable

Administration: Peripheral or central (preferred due to low pH) IV route

IV Injection- rate specific to indication:
SVT: Administer 500 microgram/kg undiluted by IV injection over 1 minute
During anaesthesia: Administer 80mg undiluted by IV injection over 15-30 seconds (see usual dose range below)

Continuous IV infusion (after IV bolus dose)
Administer undiluted at the required rate using a volumetric infusion pump.

Titrate the dose as per the steps below.

Esmolol Loading & Maintenance Dose Regimens in SVT Treatment [1]		
	Loading IV bolus dose	**Maintenance infusion rate**
Initially	500 microgram/kg over 1 min	50microgram/kg/min for 4 mins
If desired response	Maintain infusion rate of 50microgram/kg/min	
Inadequate response	500 microgram/kg over 1 min	100microgram/kg/min for 4 mins
If desired response	Maintain infusion rate of 100 microgram/kg/min	
Inadequate response	500 microgram/kg over 1 min	150microgram/kg/min for 4 mins
If desired response	Maintain infusion rate of 150 microgram/kg/min	
Inadequate response	500 microgram/kg over 1 min	200microgram/kg/min for 4 mins
If desired response	Maintain infusion rate of 200 microgram/kg/min	

When full response is achieved, maintain infusion rate for 30mins, then consider decreasing the dose and switching the patient to alternative agent – see Other Notes

As the desired therapeutic effect or a safety endpoint (e.g. lowered BP) is approached, omit the loading dose and reduce the incremental infusion rate to 12.5 to 25 microgram/kg/minute. Also, if necessary, increase the interval between titration steps from 5 to 10 minutes.

ESMOLOL HYDROCHLORIDE [Critical Care] (page 2 of 3)

LOADING IV BOLUS DOSE TABLE		
Patient weight (kg)	**Loading dose (500 micrograms/kg over 1 minute)**	
	Dose (mg)	**Volume of 10mg/mL solution administered over 1 minute**
40	20 mg	2 mL
50	25 mg	2.5 mL
60	30 mg	3 mL
70	35 mg	3.5 mL
80	40 mg	4 mL
90	45 mg	4.5 mL
100	50 mg	5 mL
110	55 mg	5.5 mL
120	60 mg	6 mL

MAINTENANCE INFUSION TABLE							
Patient Weight (kg)	**Infusion Dose Rate (microgram/kg/min)**						
	12.5	**25**	**50**	**100**	**150**	**200**	**300**
	Infusion Rate (mL/hour of a 10mg/mL solution)						
40	3	6	12	24	36	48	72
50	3.75	7.5	15	30	45	60	90
60	4.5	9	18	36	54	72	108
70	5.25	10.5	21	42	63	84	126
80	6	12	24	48	72	96	144
90	6.75	13.5	27	54	81	108	162
100	7.5	15	30	60	90	120	180
110	8.25	16.5	33	66	99	132	198
120	9	18	36	72	108	144	216

Allergy	Hypersensitivity to esmolol, excipients or other beta-blockers (beta-blocker cross sensitivity possible).
Contra-indications	Severe sinus bradycardia (< 50 beats/ minute) Sick sinus syndrome; severe AV-nodal conductance disorders (without pacemaker); 2nd or 3rd degree AV-block, Cardiogenic shock, Severe hypotension, Decompensated heart failure, Pulmonary hypertension, Acute asthmatic attack, Metabolic acidosis, non-treated phaeochromocytoma. Concomitant or recent IV verapamil. Esmolol must not be administered within 48 hours of discontinuing verapamil.
ECG/ telemetry?	Continuous ECG, BP and HR monitoring required
Special giving set?	No special requirements
Usual dose range (continued overleaf	**SVT treatment:** effective maintenance dose is 50-200 micrograms/kg/min, although doses as low as 25 and as high as 300 micrograms/kg/min have been used.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

ESMOLOL HYDROCHLORIDE [Critical Care] (page 3 of 3)

Usual dose range (continued from previous page)	**<u>Perioperative hypertension/tachycardia:</u>** **Intraoperative treatment:** bolus injection of 80mg over 15-30 secs, followed by a 150microgram/kg/min infusion, titrated up to 300microgram/kg/min. **On waking from anaesthesia:** 500mcg/kg/min infusion for 4 mins, followed by a 300mcg/kg/min infusion as required or titrate as in tables above if time allows.
Renal or Hepatic Impairment	Dose as in normal renal function. An active metabolite is renally excreted and may accumulate–monitor effect.
Dose if obese/underweight	No special advice from manufacturer
Infusion-related adverse effects	Infusion site reaction, hyperkalaemia, hypotension, bradycardia, sweating, dizziness, headache, nausea, bronchospasm, extravasation may cause tissue damage
Extravasation	Extravasation likely to cause tissue damage due to low pH –use large vein or administer through a butterfly catheter.
Other common adverse effects	Pyrexia, GI disturbances, arthralgia, peripheral oedema, anorexia, depression, anxiety, parathesia, agitation, confusional state
Other notes	There is little information on esmolol infusions longer than 24 hours; withdraw infusion gradually to avoid rebound hypertension and tachycardia. When switching from esmolol infusion to an alternative agent, within the first hour of administering the first dose of the alternative agent, halve esmolol infusion rate. After the second dose of the alternative agent, monitor the patient and if satisfactory control has been achieved, discontinue the esmolol infusion. Caution when using esmolol to treat hypertension following induced hypothermia. An esmolol 250ml infusion bag contains 30.45 mmol Na. Water may be present between the inner PVC infusion bag and overpouch; provided the inner bag isn't leaking when removed from the overpouch, it is fine to use. **Flushing:** Do not flush the central venous access device. After the infusion is discontinued, disconnect the administration set, aspirate the cannula contents and then flush with sodium chloride 0.9% or glucose 5%.

Prepared by:	Mary Coyle	18/04/2016	Checked by:	J Mcgillycuddy	12/05/2016
Reviewed by:	T Smeaton	30/05/18	Checked by:	Mary Coyle	05/09/2018
Reviewed by:	A McGowan	13/03/2023	Checked by:	Aidan Morris	23/05/2023
Minor update (shortage) re products included: D Stewart 11/08/2025					

Information provided relates to Brevibloc manufactured by Baxter and AOP Orphan Esmolol (UK product).

References

1. Gray A et al. Injectable Drugs Guide, 1st ed. London: Pharmaceutical Press; 2011.
2. Medusa Injectable Medicines Guide. Esmolol hydrochloride monograph 28/09/2022. Available at https://medusa.wales.nhs.uk/IVGuideDisplay.asp (subscription required). Accessed 13/03/2023.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

FENTANYL in Procedural Sedation [Adult X-ray/ Endoscopy/ Renal Dept] (page 1 of 2)

Indication: Strong opioid used as analgesic and as sedative to induce procedural sedation

Form: 100 microgram in 2ml ampoule

Reconstitution: Already in solution

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central IV route

IV bolus
Administer the undiluted solution as a slow IV bolus over 2-3 minutes; see under "Dose" for full instructions. Fentanyl must only be administered under the direct supervision of a doctor proficient in procedural sedation.

Allergy	Allergic reactions can occur. Do not administer to patients with known opiate hypersensitivity.
Contra-indications	Respiratory depression, cyanosis, excessive bronchial exudation, bronchoconstriction (reversible or irreversible), in acute alcoholism, increased intracranial pressure or chronic pulmonary disease and in patients who are receiving, or have within two weeks received monoamine oxidase inhibitors
Usual dose range	**Initial dose (adult)** 25-50* micrograms fentanyl as undiluted solution as a slow IV injection over 2-3 minutes. **Wait 3-5 minutes**, then assess sedation score. If inadequately sedated, **further increments** may be given at 3-5 minute intervals. **Subsequent dose (adult)** 25 micrograms* fentanyl as undiluted solution as a slow IV injection over 2-3 minutes. **Maximum 2 micrograms/kg fentanyl.** *Where fentanyl is being used alone (not in combination with midazolam), some patients may require higher dosing, e.g. 50-100 micrograms, with increments of 50 micrograms.

FENTANYL in Procedural Sedation [Adult X-ray/ Endoscopy/ Renal Dept] (page 2 of 2)

Renal or Hepatic Impairment	A dose reduction may be required in renal or hepatic impairment: consult ward pharmacist.
Dose if underweight / obese	Fentanyl dosing should be based on ideal body weight in obese patients, therefore obese patients don't necessarily need higher doses. Refer to Tallaght Hospital Adult Medicines Guide for ideal body weight.
Infusion-related adverse effects	Hypotension (exaggerated in hypovolaemia and with concomitant sedatives), bradycardia and respiratory depression: monitor for same
Extravasation	Potential for tissue damage as pH of undiluted solution can be as low as 3.8.
Other common adverse effects	Other side effects include nausea, vomiting, itch, drowsiness and confusion.
ECG/ telemetry?	No special requirements
Special giving set?	N/A
Other notes	Naloxone must be available before the procedure begins.

Prepared by:	J Mcgillycuddy	08/05/2014	Checked by:	Mary Coyle	02/07/2014
Updated by:	Iarlaith Doherty	08/01/2023	Checked by:	Aidan Morris	13/03/2023

Information provided relates to fentanyl brand manufactured by Mercury.

References

1. Administration of Intravenous Conscious Sedation and / or Analgesia by a Registered Nurse during an Interventional Procedure in the Interventional Radiology Department, Adult Services – Procedure Oct 2021.
2. Administration of Intravenous Conscious Sedation and / or Analgesia by a Registered Nurse during an Endoscopy in the Endoscopy Unit Procedure. Sept 2020.
3. Administration of Intravenous Conscious Sedation and/ or Analgesia by a Registered Nurse during an Interventional Procedure in the Adult Renal Dept Procedure. June 2017.
All available on Qpulse via hospital intranet.
4. Medusa Injectable Medicines Guide. Fentanyl monograph. Date published 10/01/2023. Available at https://medusa.wales.nhs.uk/IVGuideDisplay.asp (subscription required). Accessed 13/03/2023.

FENTANYL [Critical Care] (page 1 of 2)

Indication: Strong opioid used as analgesic post procedure and post extubation

Form: 100 microgram in 2ml ampoule
500 microgram in 10ml ampoule
2500 microgram in 50ml vial

Reconstitution: Already in solution

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central IV route

IV bolus
Administer the undiluted solution as a slow IV bolus over 3-5 minutes

Continuous Infusion
Draw up 50ml (2500mcg) and administer via a syringe pumpunder the direction of a senior anaesthetist in PACU/ICU

Allergy	Allergic reactions can occur. Do not administer to patients with known opioid hypersensitivity.
Contra-indications	Respiratory depression, cyanosis, excessive bronchial exudation, bronchoconstriction (reversible or irreversible), chronic pulmonary disease, in patients who are receiving, or have within two weeks received, monoamine oxidase inhibitors, post biliary tract operations, acute alcoholism, increased intra-cranial pressure, or coma.
Usual dose range	**Initial bolus dose (adult)** 25-50 micrograms fentanyl undiluted solution as a slow IV injection over 3-5 minutes. **Wait 3-5 minutes**, then assess sedation score. If inadequately sedated, **further increments** may be given at 3-5 minute intervals. **Subsequent dose (adult)** 25 micrograms fentanyl as undiluted solution as a slow IV injection over 3-5 minutes. **Total maximum 2 micrograms/kg fentanyl** **Continuous infusion (adult)** Administer via a rate-controlled infusion pump at a 25 – 200 micrograms/hr. Higher doses may be required for sedation in ventilated patients.

FENTANYL [Critical Care] (page 2 of 2)

Renal or Hepatic Impairment	A dose reduction may be required in renal or hepatic impairment: consult ward pharmacist.
Dose if underweight / obese	Fentanyl dosing should be based on ideal body weight in obese patients, therefore obese patients don't necessarily need higher doses. Refer to Tallaght Hospital Adult Medicines Guide for ideal body weight.
Infusion-related adverse effects	Hypotension (exaggerated in hypovolaemia and with concomitant sedatives), bradycardia, muscle rigidity and respiratory depression: monitor for same
Extravasation	Potential for tissue damage as pH of undiluted solution can be as low as 3.8.
Other common adverse effects	Other side effects include nausea, vomiting, itch,drowsiness, and confusion.
ECG/ telemetry?	No special requirements
Special giving set?	N/A
Other notes	Naloxone must be available before the procedure begins. Co-administration with other drugs affecting the serotonergic neurotransmitter systems (e.g. SSRI, SNRI, linezolid, MAOI) may increase the risk of serotonin syndrome – monitor for same.

Prepared by:	Mary Coyle	20/04/2016	Checked by:	JMcgillycuddy	23/11/2016
Reviewed by:	Terry Smeaton	30/05/2018	Checked by:	Mary Coyle	05/09/2018
Addition by:	JMcgillycuddy	11/04/19	Checked by:	Mary Coyle	11/04/2019
Reviewed by:	Aisling McGowan	14/03/2023	Checked by:	Aidan Morris	22/05/2023

Information provided relates to Fentanyl Solution for Injection manufactured by Mercury and Hameln (UK product: 50ml vial only) and Piramal (Sublimaze brand)

References:

1. Medusa Injectable Medicines Guide. Fentanyl monograph. Date published 10/01/2023. Available at https://medusa.wales.nhs.uk/IVGuideDisplay.asp (subscription required). Accessed 13/03/2023.

FILGRASTIM (Neupogen Singleject®) [Critical Care] (page 1 of 2)

Form: Neupogen® Singleject 30 million units/ 0.5mL solution for injection prefilled syringe (0.6mg/mL)
Neupogen® Singleject 48 million units/ 0.5mL solution for injection prefilled syringe (0.96mg/mL)

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5%

Administration: **Central route preferred** (If a central venous access device is unavailable, administer via a large peripheral vein)

Subcutaneous administration is preferred in most cases due to the potential shortened duration of effect when administered IV; but individual clinical circumstances must be considered (e.g. presence of shock).

IV infusion
Inject the required dose from the Neupogen Singleject PFS into the barrel of a 20mL syringe, dilute to 20ml with Glucose 5% and administer over 30 minutes, or 24 hours in the case of continuous IV infusion. Do not shake; invert syringe.
When filgrastim is diluted to concentrations below 1.5 million units (15 micrograms) in 1mL [i.e. doses lower than 30million units (300 micrograms) in 20mL glucose 5%], add 0.2mL of 20% human albumin solution (HAS) to give a final HAS concentration of 2mg in 1mL.

Allergy	Hypersensitivity, including anaphylactic reactions, occurring on initial or subsequent treatment have been reported in patients treated with filgrastim.
Contra-indications	Hypersensitivity to active substance or excipients
Usual dose range	**See chemo kardex for dosing information but in general, doses generally rounded to 30 or 48 million units (MU) daily. See product literature for full dosing information.**

FILGRASTIM (Neupogen Singleject®) [Critical Care] (page 2 of 2)

Renal or Hepatic Impairment	Dose adjustment not required
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	Injection site reactions include erythema, swelling, inflammation or pruritus.
Extravasation	Extravasation is likely to cause venous irritation and tissue damage due to low pH.
Other common adverse effects	Pyrexia, musculoskeletal pain, capillary leak syndrome, anaemia, vomiting, and nausea. The most serious adverse reactions that may occur during filgrastim treatment include: anaphylactic reaction, serious pulmonary adverse events (including interstitial pneumonia and ARDS), severe splenomegaly/splenic rupture, transformation to myelodysplastic syndrome or leukaemia in SCN patients, GvHD in patients receiving allogeneic bone marrow transfer or peripheral blood cell progenitor cell transplant and sickle cell crisis in patients with sickle cell disease.
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Filgrastim is incompatible with 0.9% sodium chloride so use glucose 5% to flush.

Prepared by:	Grace Power	05/01/2020	Checked by:	Mary Coyle	05/01/2021
Updated by:	JMcgillycuddy	12/03/2024	Checked by:	Kate Burke	13/03/2024

Information provided relates to Neupogen Singleject solution for injection prefilled syringe manufactured by Amgen

References

1. Medusa Injectable Medicines Guide. Available online at http://www.injguide.nhs.uk (password restricted). Accessed 12/03/2024.

HEPARIN during Haemodialysis via AV fistula [Dialysis unit]

Form: 5000 units in 5ml ampoule

Reconstitution: Already in solution

Compatible Fluid: Sodium chloride 0.9%

Administration: Via AV fistula

Use 5,000 units/ 5ml ampoule. Dilute 5,000 units (5ml) with 5ml 0.9% sodium chloride to give a final concentration of 500units / ml, using a 20ml syringe. Administer using the syringe pump on the dialysis machine.

Allergy	Heparin-induced thrombocytopaenia can occur. Hypersensitivity reactions include urticaria, angioedema and anaphylaxis have been reported.
Contra-indications	Thrombocytopenia, including a history of HIT; Haemophilia and other haemorrhagic disorders; Recent peptic ulcer or cerebral haemorrhage; severe hypertension; severe liver disease (including oesophageal varices); after major trauma or recent surgery to eye or nervous system; spinal or epidural anaesthesia while on treatment doses of heparin, though individual clinical circumstances may warrant the use of unfractionated heparin while an epidural catheter is in situ), hypersensitivity to heparin or low molecular weight heparin (LMWH), acute or subacute septic endocarditis, threatened abortion.
Usual dose range	Prior to haemodialysis session, the patient must be assessed for signs or symptoms of bleeding such as bloodshot eyes, bruising or haematuria. Liaise with the medical team if the patient is pre or post any procedure. Usual initial bolus dose: 500 – 1000 units The dose of heparin bolus may be adjusted (usually in increments of 500 units). This will depend on previous experience of any clots in the haemodialysis circuit or clots in the dialyser on washback. Higher bolus doses may be indicated. Continuous infusion not generally indicated but if it is, the infusion should be stopped 30mins – 1 hour before the end of dialysis.

HEPARIN during Haemodialysis via AV fistula [Dialysis unit] (page 2 of 2)

Renal/ Hepatic Impairment	Renal impairment: N/A. Contact pharmacy or renal team re hepatic impairment
Dose if underweight / obese	N/A
Infusion-related adverse effects	N/A
Extravasation	May increase the risk of extravasation or cause a compartmental injury by increasing local bleeding. Preparations containing benzyl alcohol as preservative may be more irritant [1]
Other common adverse effects	Heparin-induced thrombocytopaenia, hyperkalaemia
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Pre-dialysis sampling: ensure complete removal of CVAD locking solution prior to sample collection Post-dialysis sampling: ensure blood is sampled from the arterial port prior to heparin administration after the blood pump. The mixing of heparin with other drug substances may result in its precipitation or loss of potency.

Prepared by:	J Mcgillycuddy	07/05/2014	Checked by:	Mary Coyle C McCrohan	02/07/2014 23/10/2014
Reviewed by:	Lisa Nolan	13/06/2023	Checked by:	JMcgillycuddy	17/08/2023
Information provided relates to heparin brand manufactured by Wockhardt.					

References

1. NHS Injectable Medicines Guide. Heparin monograph V8. Available at https://www.medusaimg.nhs.uk/IVGuideDisplay.asp. Accessed 17/08/2023.

HEPARIN during Haemodialysis via CVAD [Dialysis unit] (page 1 of 2)

Form: 5000 units in 5ml ampoule

Reconstitution: Already in solution

Compatible Fluid: Sodium chloride 0.9%

Administration: Via tunnelled or non-tunnelled CVAD

Bolus injection
Use 5,000 units/ 5ml ampoule. Administer bolus using the syringe pump on the dialysis machine.

Continuous infusion
Use 5,000 units/ 5ml ampoule.
Dilute 5000 units (5ml) with 5ml sodium chloride 0.9% to give a final concentration of 500 units/ ml, using a 20ml syringe. Administer using the syringe pump on the dialysis machine.

Allergy	Heparin-induced thrombocytopaenia can occur. Hypersensitivity reactions include urticaria, angioedema and anaphylaxis have been reported.
Contra-indications	Thrombocytopenia, including a history of HIT; Haemophilia and other haemorrhagic disorders; Recent peptic ulcer or cerebral haemorrhage; severe hypertension; severe liver disease (including oesophageal varices); after major trauma or recent surgery to eye or nervous system; spinal or epidural anaesthesia while on treatment doses of heparin, though individual clinical circumstances may warrant the use of unfractionated heparin while an epidural catheter is in situ), hypersensitivity to heparin or low molecular weight heparin (LMWH), acute or subacute septic endocarditis, threatened abortion.
Usual dose range	Prior to haemodialysis session, the patient must be assessed for signs or symptoms of bleeding such as bloodshot eyes, bruising or haematuria. Liaise with the medical team if the patient is pre or post any procedure. Minimal heparinisation may be indicated. Standard heparinisation via CVAD: Bolus 1000 units; continuous infusion of 1000 units/ hr Minimal heparinsation via CVAD: Bolus 500 units; continuous infusion of 500 units/ hr

HEPARIN during Haemodialysis via CVAD [Dialysis unit] (page 2 of 2)

Renal/ Hepatic Impairment	Renal impairment: N/A. Contact pharmacy or renal team re hepatic impairment
Dose if underweight / obese	N/A
Infusion-related adverse effects	N/A
Extravasation	May increase the risk of extravasation or cause a compartmental injury by increasing local bleeding. Preparations containing benzyl alcohol as preservative may be more irritant [1]
Other common adverse effects	Heparin-induced thrombocytopaenia, hyperkalaemia
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Pre-dialysis sampling: ensure complete removal of CVAD locking solution prior to sample collection Post-dialysis sampling: ensure blood is sampled from the arterial port of the blood lines. The mixing of heparin with other drug substances may result in its precipitation or loss of potency.

Prepared by:	J Mcgillycuddy	07/05/2014	Checked by:	Mary Coyle C McCrohan	02/07/2014 23/10/2014
Reviewed by:	Lisa Nolan	17/08/2023	Checked by:	JMcgillycuddy	17/08/2023
Information provided relates to heparin brand manufactured by Wockhardt.					

References

1. NHS Injectable Medicines Guide. Heparin monograph V8. Available at https://www.medusaimg.nhs.uk/IVGuideDisplay.asp. Accessed 17/08/2023.

HEPARIN as CVAD Locking Solution [Dialysis unit/ ICU]

Form: 25000 units in 5ml ampoule

Reconstitution: Already in solution

Compatible Fluid: Sodium chloride 0.9%

Administration: Via tunnelled or non-tunnelled CVAD

<u>After Haemodialysis</u>

Heparin 5000 unit/ml locking solution is administered as follows:

1. Both the arterial and venous lumen of the CVAD must be flushed with 10mL 0.9% NaCl using a Posiflush XS pre-filled syringe.

- Attach a 10mL 0.9% NaCl Posiflush XS pre-filled syringe to the TEGO needle free connector of the arterial lumen and flush the lumen.
- Clamp the CVAD lumen after flushing. Repeat the procedure above for the venous lumen.
- Leave the Posiflush XS syringe attached until ready to insert locking solution.

2. Withdraw the exact volume of heparin 5000 units/ml from the ampoule using a 2 ml syringe to prime the CVAD lumen to ensure accuracy. This volume will be based upon the priming volumes detailed on the arterial and venous lumen on the CVAD catheter plus any adjustments made previously for this particular patient.

3. Inject the Heparin into both the arterial and venous lumen. It is very important to inject SLOWLY, taking 8-10 seconds for each lumen.

- Attach the 2mL syringe containing heparin 5000 unit/ mL to the TEGO needle-free connector on the CVAD lumen.
- Unclamp the CVAD lumen.
- Inject heparin 5000 unit/ mL slowly
- Clamp the CVAD lumen.
- Remove the empty heparin syringe from the TEGO needle-free connector and discard the syringe as per Infection Prevention and Control Healthcare Waste Management Policy (PPPG ENV-GUI-21).

HEPARIN as CVAD Locking Solution [Dialysis unit/ ICU]

4. Document the volume of heparin 5000 units/ml used in each lumen on the Haemodialysis flow sheet. If any side effects were experienced or if the volume needs to be reduced next time, document this in the Haemodialysis flow sheet and on Drug Kardex.

Before Haemodialysis

1. Prior to the next dialysis session withdraw the heparin locking solution instilled at the previous dialysis session from each line.

- Attach a 5mL syringe to the TEGO needle-free connector on the CVAD lumen and unclamp the CVAD lumen.
- Withdraw the locking solution that was instilled at the previous dialysis session from each line using the 5 ml syringe withdrawing a 5 ml volume.
- Clamp the CVAD lumen.
- Leave the 5 ml syringe in-situ until ready to flush the lumen.

2. Flush both the arterial and venous lumen of the CVAD catheter using a 10mL 0.9% NaCl Posiflush XS pre-filled syringe to ensure adequate blood flow, before beginning dialysis.

- Remove the 5ml syringe.
- Attach a 10mL 0.9% NaCl Posiflush XS pre-filled syringe to the TEGO needle-free connector on the CVAD lumen.
- Unclamp the CVAD lumen.
- Check for adequate blood flow and flush the lumen.
- Clamp the CVAD lumen.
- Leave the Posiflush XS pre-filled syringe connected to the TEGO needle-free connector until ready to begin dialysis.

If unable to aspirate heparin CVAD Lock Solution

1. If unable to aspirate from both lumens inform the Medical Team and follow the procedures below if recommended by the Medical Team.
2. If unable to withdraw Heparin solution from ONE lumen,

- Attempt to inject the dwelling heparin lock solution previously inserted into the patient slowly (over 20-30 seconds)) using a 10ml 0.9% NaCl Posiflush XS pre-filled syringe.

3. If unable to withdraw Heparin solution from BOTH lumens

- Inject the dwelling Heparin lock solution into the Arterial lumen of the CVAD slowly (over 20-30 seconds) using a 10ml 0.9% NaCl Posiflush XS pre-filled syringe.
- Inject the Heparin lock solution into the Venous lumen of the CVAD slowly (over 20-30 seconds) using a 10ml 0.9% NaCl Posiflush XS pre-filled syringe.
- Liaise with medical team re further action required.

HEPARIN as CVAD Locking Solution [Dialysis unit/ ICU]

Allergy	Heparin-induced thrombocytopaenia can occur. Hypersensitivity reactions include urticaria, angioedema and anaphylaxis have been reported.
Contra-indications	Thrombocytopenia, including a history of HIT; Haemophilia and other haemorrhagic disorders; Recent peptic ulcer or cerebral haemorrhage; severe hypertension; severe liver disease (including oesophageal varices); after major trauma or recent surgery to eye or nervous system; spinal or epidural anaesthesia while on treatment doses of heparin, though individual clinical circumstances may warrant the use of unfractionated heparin while an epidural catheter is in situ), hypersensitivity to heparin or low molecular weight heparin (LMWH), acute or subacute septic endocarditis, threatened abortion.
Usual dose range	Prior to haemodialysis session, the patient must be assessed for signs or symptoms of bleeding such as bloodshot eyes, bruising or haematuria. Liaise with the medical team if the patient is pre or post any procedure.
Renal/ Hepatic Impairment	Renal impairment: N/A. Contact pharmacy re hepatic impairment
Dose if underweight / obese	N/A
Infusion-related adverse effects	N/A
Extravasation	N/A
Other common adverse effects	Heparin-induced thrombocytopaenia, hyperkalaemia (Unlikely when used as locking solution)
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Pre-dialysis sampling: ensure complete removal of CVAD locking solution prior to sample collection Post-dialysis sampling: ensure blood is sampled from the arterial port from the blood lines. The mixing of heparin with other drug substances may result in its precipitation or loss of potency.

Prepared by:	J Mcgillycuddy	07/05/2014	Checked by:	Mary Coyle C McCrohan	04/07/2014 23/10/2014
Updated by:	Lisa Nolan	13/06/2023	Checked by:	JMcgillycuddy	17/08/2023
Information provided relates to heparin brand manufactured by Wockhardt.					

HYDRALAZINE (page 1 of 3)

Form: 20 mg powder for injection

Reconstitution: Reconstitute each vial with 1mL Water for injection
Further dilute before administration.

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route

Slow IV Injection
Further dilute the 20mg in 1mL concentrate with sodium chloride 0.9% to give a 20mg to 10mL (2mg in 1mL) solution. Give the required dose slowly over at least 3 minutes.

Continuous IV infusion by the peripheral or central IV route
Dilute the 20mg in 1mL concentrate with sodium chloride 0.9% to 500mL (40micrograms in 1mL). Infuse the prescribed dosage using a rate-controlled infusion pump as per the corresponding rate in the following table:

Table 1: Administration rates for 20 mg in 500 mL = 40 micrograms/mL

Dose (micrograms/min)	**Infusion Rate (mL/hr)**
50 mcg/min	75 mL/hr
75 mcg/min	112.5 mL/hr
100 mcg/min	150 mL/hr
125 mcg/min	187.5 mL/hr
150 mcg/min	225 mL/hr
175 mcg/min	262.5 mL/hr
200 mcg/min	300 mL/hr
225 mcg/min	337.5 mL/hr
250 mcg/min	375 mL/hr
275 mcg/min	412.5 mL/hr
300 mcg/min	450 mL/hr

HYDRALAZINE (page 2 of 3)

Continuous IV infusion by the **central** IV route (fluid restricted) [2]

Dilute the 60mg of concentrate (3mL) with sodium chloride 0.9% to 60mL (1mg in 1mL). Infuse the prescribed dosage using a rate-controlled infusion pump as per the corresponding rate in the following table:

Table 2: Administration rates for 60 mg in 60 mL = 1mg/mL

Dose (micrograms/min)	**Infusion Rate (mL/hr)**
50 mcg/min	3 mL/hr
75 mcg/min	4.5 mL/hr
100 mcg/min	6 mL/hr
125 mcg/min	7.5 mL/hr
150 mcg/min	9 mL/hr
175 mcg/min	10.5 mL/hr
200 mcg/min	12 mL/hr
225 mcg/min	13.5 mL/hr
250 mcg/min	15 mL/hr
275 mcg/min	16.5 mL/hr
300 mcg/min	18 mL/hr

Allergy	Hypersensitivity to the hydralazine or to any of the excipients.
Contra-indications	Severe tachycardia and heart failure with a high cardiac output (e.g. in thyroxicosis). Myocardial insufficiency due to mechanical obstruction (e.g aortic or mitral stenosis or constriction pericarditis). Idiopathic systemic lupus erythematosus (SLE) and related diseases. Isolated right ventricular failure due to pulmonary hypertension (cor pulmonale). Dissecting aortic aneurysm. Porphyria
Usual dose range	**Slow IV injection:** Initial dose: 5 to 10 mg as a slow intravenous injection. If necessary, repeat after 20-30 minutes. **Continuous infusion:** Beginning with a flow rate of 200-300 microgram/min. Maintenance flow rates must be determined individually and are usually within the range 50-150 microgram/minute.

HYDRALAZINE (page 3 of 3)

Renal or Hepatic Impairment	If CrCl is less than 30 ml/min, start at the lower end of the dosing range. Titrate slowly based on clinical response In patients with hepatic dysfunction, the dose or interval between doses should be adjusted according to clinical response.
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	**Acute reactions:**[1] • hypersensitivity reactions • rapid administration can cause a large fall in arterial blood pressure with a critical reduction in cerebral or utero-placental perfusion • tachycardia, palpitations, angina, flushing • headache, dizziness • fluid retention **Monitor:** Blood pressure and heart rate throughout treatment. Intra-arterial BP monitoring is preferable[1]
Extravasation	Extravasation is likely to cause venous irritation and tissue damage due to the low pH. If administering via peripheral IV route use a large peripheral vein and monitor injection site closely. Resite cannula at the first signs of inflammation. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	Gastrointestinal disturbances, SLE-like syndrome, Arthralgia, joint swelling, myalgia
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Hydralazine undergoes a colour change in most infusion solutions[1]. Note: syringe/bag must be changed every 12 hours.[1]

Prepared by:	Áine Sweeney	04/06/2025	Checked by:	Mary Coyle	07/07/2025

Information provided relates to Hydralazine 20mg Powder for Concentrate for Solution for Injection/Infusion manufactured by Advanz Pharma.

References

1. Injectable Medicines Administration Guide Medusa
2. UKCPA Critical care group. Minimum infusion volumes for fluid restricted critically ill patients. V4.4. 2012.

IBUPROFEN (B Braun brand) [ED only]

Form: 400 mg in 100ml bottle

Reconstitution: Already in solution

Compatible Fluid: Glucose 5% [1]
Sodium chloride 0.9% [1]

Administration: Peripheral or central IV route

Intermittent IV infusion
Administer over 30 minutes.

Allergy	Severe hypersensitivity reactions very rarely reported
Contra-indications	Hypersensitivity to ibuprofen, NSAIDs or excipients; history of bronchospasm, asthma, rhinitis, angioedema or urticaria associated with taking NSAIDs; conditions involving increased tendency or active bleeding such as thrombocytopenia; recurrent peptic ulcer/haemorrhage; history of GI bleeding or perforation, related to previous NSAIDs therapy; cerebrovascular or other active bleeding; severe hepatic or renal insufficiency; severe heart failure; severe dehydration; pregnancy (3rd trimester).
Usual dose range	400 mg ibuprofen, every 6 to 8 hours prn **or** 600 mg stat; if clinically justified, another 600 mg dose can be administered after 6 to 8 hours depending on condition & response. **Maximum daily dose 1200mg**
Renal or Hepatic Impairment	Contra-indicated in severe renal or hepatic impairment; review dose & duration in mild-mod. impairment
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	Hypersensitivity reactions; discontinue at 1st appearance of skin rash, mucosal lesions or other sign Hypertension: monitor BP
Other common adverse effects	GI disorders; headache, fatigue or dizziness; vertigo. As for NSAIDs in general
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Similar packaging to other B Braun products- please ensure **correct product is selected**. In case of dehydration, ensure sufficient fluid intake. Use special caution in dehydrated patients, eg due to diarrhoea, as could be a trigger factor for kidney failure development.

Prepared by:	J Mcgillycuddy	21/11/19	Checked by:	M Coyle	18/12/2019

Information provided relates to the IV ibuprofen brand manufactured by B Braun.

Reference 1. MiDatabank # 13759.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

ISOPRENALINE HYDROCHLORIDE * [CRY unit/Critical Care] (Page 1 of 4)

Form: 1mg in 5mL ampoule

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5%

Administration: Peripheral or central IV route (preferred)

Continuous IV infusion

2 microgram/mL solution: Dilute 5mL (1mg) up to 500ml with compatible infusion fluid to make a 2 microgram/ mL solution. Administer via rate controlled infusion pump as per table 1 below.

Table 1: Dosing table for **2 microgram/mL** solution

Dose Prescribed (micrograms/minute)	Rate of Administration (mL/hour)	Dose Prescribed (micrograms/minute)	Rate of Administration (mL/hour)
1	30	11	330
2	60	12	360
3	90	13	390
4	120	14	420
5	150	15	450
6	180	16	480
7	210	17	510
8	240	18	540
9	270	19	570
10	300	20	600

ISOPRENALINE HYDROCHLORIDE * [CRY unit/Critical Care] (Page 2 of 4)

4 micrograms/mL solution: Dilute 5ml (1mg) up to 250ml with compatible infusion fluid to make a 4 microgram/mL solution. Administer via rate controlled infusion pump as per table 2 below.

Table 2: Dosing table for **4 microgram/mL** solution

Dose Prescribed (micrograms/minute)	Rate of Administration (mL/hour)	Dose Prescribed (micrograms/minute)	Rate of Administration (mL/hour)
1	15	11	165
2	30	12	180
3	45	13	195
4	60	14	210
5	75	15	225
6	90	16	240
7	105	17	255
8	120	18	270
9	135	19	285
10	150	20	300

Continuous IV infusion via central IV line (fluid restricted)
Dilute 10mL (2mg) up to 50mL with compatible infusion fluid to give a concentration of 40 microgram/mL. Administer via syringe pump as per table below.

Table 3: Dosing table for **40 microgram/mL** solution **(fluid restricted)**

Dose Prescribed (micrograms/minute)	Rate of Administration (mL/hour)	Dose Prescribed (micrograms/minute)	Rate of Administration (mL/hour)
1	1.5	11	16.5
2	3	12	18
3	4.5	13	19.5
4	6	14	21
5	7.5	15	22.5
6	9	16	24
7	10.5	17	25.5
8	12	18	27
9	13.5	19	28.5
10	15	20	30

ISOPRENALINE HYDROCHLORIDE * [CRY unit/Critical Care] (Page 3 of 4)

Allergy	Possible
Contra-indications	Hypersensitivity to active substance or excipients; Concomitant use with adrenaline; Pre-existing ventricular arrhythmias; tachyarrythmias; cardiac glycoside intoxication; myocardial infarction; angina pectoris, digitalis intoxication, uncontrolled hyperthyroidism
Usual dose range	**Electrical Storm in Brugada Syndrome** Continuous infusion commencing initially at 1 microgram/ minute gradually increased if necessary while carefully monitoring the patient.[4] **Bradyarrhythmia/ AV block while awaiting pacing wire placement** Continuous infusion commencing initially at 1 micrograms/ minute this may be increased up to 20 micrograms per minute when treating cardiogenic shock due to bradycardia.
Renal or Hepatic Impairment	No specific advice from manufacturer.
Dose if underweight / obese	No special advice from manufacturer.
Infusion-related adverse effects	Tachycardia, arrhythmias, palpitations, hypotension, tremor, headache, sweating and facial flushing. Monitor ECG, arterial BP, HR, urine flow, central venous pressure, blood pH, blood pCO2 or bicarbonate, and cardiac output. If HR exceeds 110 beats per minute, it may be advisable to decrease the infusion rate or temporarily discontinue the infusion.[6]
Extravasation	Extravasation is likely to cause tissue damage/necrosis due to low pH. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other adverse effects	Angina pectoris, restlessness, anxiety, weakness, dizziness, nausea.
ECG/ telemetry?	Monitor ECG.
Special giving set?	No special requirements

ISOPRENALINE HYDROCHLORIDE * [CRY unit/Critical Care] (Page 4 of 4)

Other notes	*Isoprenaline hydrochloride = Isoproterenol hydrochloride (US nomenclature). Glucose 5% is the preferred diluent as isoprenaline hydrochloride is acidic and is less stable in sodium chloride 0.9%. Flushing: do not flush the vascular access device. After the infusion is discontinued, disconnect the giving set, aspirate the cannula contents and then flush with sodium chloride 0.9% or glucose 5%. Discard the injection if it is pinkish or darker than slightly yellow or contains a precipitate[6] The Macure brand of isoprenaline is stored in the **fridge**.

Prepared by:	J Mcgillycuddy	18/06/2014	Checked by: Reviewed by:	Mary Coyle Dr D Ward H Connaughton	22/07/2014 02/10/2014
Updated by:	C O'Brady	11/01/2017	Checked by:	JMcgillycuddy	25/01/2017
Updated by:	A Morley/G Power	01/10/2020	Checked by:	Roisin Logan	22/02/2021
Updated by:	H O'Hara	23/03/2023	Checked by:	J Mcgillycuddy	17/08/2023
Updated by:	D Stewart	01/05/2025	Checked by:	K Burke	26/05/2025

Information provided relates to Isoprenaline Hydrochloride Macure 0.2mg/mL concentrate for solution for infusion manufactured by Macure Pharma ApS.

References

1. Medusa Injectable Medicines Guide. Available online at www.medusaimg.nhs.uk (password restricted). Accessed 15/04/2025.
2. BNF online. Available online at www.medicinescomplete.com (subscription required). Accessed 15/04/2025.
3. Jongman J, Jepkes-Bruin N et al. Electrical storms in Brugada Syndrome successfully treated with isoproterenol infusion and quinidine orally. Neth Heart J. 2007:15; 151-4.
4. AHFS Drug Information. Isoproterenol hydrochloride Monograph. Available online at www.medicinescomplete.com (subscription required). Accessed 01/05/2025.

HUMAN NORMAL IMMUNOGLOBULIN (IVIg) FLEBOGAMMA DIF® 5% (page 1 of 2)

See separate monograph for Flebogamma DIF 10%

Form: IVIg 2.5g in 50mL (5%)
IVIg 5g in 100mL (5%)
IVIg 10g in 200mL (5%)
IVIg 20g in 100mL (5%)

Reconstitution: Already in solution

Compatible Fluid: Should not be mixed with intravenous fluids

Administration: Peripheral or central IV route

Intermittent IV infusion
Flebogamma DIF® 5% should be infused at a rate of 0.6mL/kg/hour or 1.2ml/kg/hour for the first 30 minutes. If the patient does not experience any discomfort the rate may be increased in increments, see table overleaf. Maximum infusion rate = 6mL/kg/hour. Subsequent treatment to the same patient can be increased gradually to the maximum rate previously tolerated.

Allergy	Anaphylactic reactions are possible.
Contra-Indications	Patients who have known antibody against IgA, Fructose intolerance.
Usual dose range	See product literature.
Infusion-related adverse effects	Patients should be carefully monitored during infusions and for at least 20 mins afterwards (at least 1 hour if first infusion). Monitoring should include blood pressure, temperature, pulse, respiratory rate. Monitor urine output and serum creatinine levels[1]. If adverse effects occur the rate should be reduced or the infusion interrupted until the symptoms subside. The infusion may then be resumed at a rate that is tolerated by the patient. For patients who experience an adverse reaction related to the infusion rate, reduce the infusion rate in subsequent infusions
Other common adverse effects	Pain at site, pyrexia, rigors, headache, nausea, tachycardia, hypotension, nausea, myalgia and back pain may occur. Adverse effects are more common in patients receiving IVIg for the first time, or following a prolonged period between treatments.

HUMAN NORMAL IMMUNOGLOBULIN (IVIg) FLEBOGAMMA DIF® 5% (page 2 of 2)

Renal or Hepatic Impairment	Monitor for acute renal failure; consider discontinuation if renal function deteriorates.
Dose if underweight / obese	No specific advice from manufacturer, contact pharmacy if further information required.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements, however IVIg should be administered by a separate intravenous line.
Other notes	

IVIg is prepared from pooled plasma and is therefore a **blood product**. IVIg should be prescribed and administration documented on a blood product prescription form. Record the name of product and batch no.
Adequate **hydration** must be ensured before the initiation of the infusion.Avoid concomitant use of loop diuretics.
Thromboembolic complications have been associated with the use of IVIg. Caution is recommended for patients with thrombotic risk factors.
Consider administering at a slower rate in patients at risk of thromboembolic complications or those at high risk of acute renal failure.
Vaccines: After administration of IVIg, an interval of at least 3 months should elapse before vaccination with live attenuated virus vaccines. In some cases it may take up to a year for full response to live attenuated vaccines.
Do not use solutions that are cloudy or have any deposits.

Infusion Rate Chart for Flebogamma DIF® – 5% solution.

Prescribed rate in mL/ kg/ hour	**Patients weight (kg)**						
	40	**50**	**60**	**70**	**80**	**90**	**100**
	Infusion rate in mL/hour						
0.6	24	30	36	42	48	54	60
30 mins	↓	↓	↓	↓	↓	↓	↓
1.2	48	60	72	84	96	108	120
30 mins	↓	↓	↓	↓	↓	↓	↓
2.4	96	120	144	168	192	216	240
30 mins	↓	↓	↓	↓	↓	↓	↓
3.6	144	180	216	252	288	324	360
30 mins	↓	↓	↓	↓	↓	↓	↓
4.8	192	240	288	336	384	432	480
30 mins	↓	↓	↓	↓	↓	↓	↓
6	240	300	360	420	480	540	600

Prepared by:	J McGillycuddy	01/12/2021	Checked by:	M Harty	02/12/2021

Information provided relates to Flebogamma DIF® 5% manufactured by Grifols.
Reference: 1. Medusa Injectable Medicines Guide. Flebogamma DIF 5%. Available at http://www.injguide.nhs.uk (password restricted). Accessed 01/12/2021.

HUMAN NORMAL IMMUNOGLOBULIN (IVIg) FLEBOGAMMA DIF® 10% (page 1 of 2)

See separate monograph for Flebogamma DIF 5%

Form: IVIg 5g in 50ml (10%)
IVIg 10g in 100ml (10%)
IVIg 20g in 200ml (10%)

Reconstitution: Already in solution

Compatible Fluid: Should not be mixed with intravenous fluids

Administration: Peripheral or central IV route

Intermittent IV infusion
Flebogamma DIF® 10% should be infused at a rate of 0.6ml/kg/hour for the first 30 minutes. If the patient does not experience any discomfort the rate may be increased to 1.2ml/kg/hour for a further 30 minutes and if tolerated, increased further, see table overleaf. Maximum infusion rate = 4.8ml/kg/hour. Subsequent treatment to the same patient can be increased gradually to the maximum rate previously tolerated.

Allergy	Anaphylactic reactions are possible.
Contra-Indications	Patients who have known antibody against IgA, Fructose intolerance.
Usual dose range	See product literature.
Infusion-related adverse effects	Patients should be carefully monitored during infusions and for at least 20 mins afterwards (at least 1 hour if first infusion). Monitoring should include blood pressure, temperature, pulse, respiratory rate. Monitor urine output and serum creatinine levels[1]. If adverse effects occur the rate should be reduced or the infusion interrupted until the symptoms subside. The infusion may then be resumed at a rate that is tolerated by the patient. For patients who experience an adverse reaction related to infusion, reduce the infusion rate in subsequent infusions, limiting it to a maximum rate of 2.4ml/kg/hour, or switch to 5% concentration.
Other common adverse effects (continued overleaf)	Pain at site, pyrexia, rigors, headache, nausea, tachycardia, hypotension, nausea, myalgia and back pain may occur. Adverse effects are more common in patients receiving IVIg for the first time, or following a prolonged period between treatments.

HUMAN NORMAL IMMUNOGLOBULIN (IVIg) FLEBOGAMMA DIF® 10% (page 2 of 2)

Renal or Hepatic Impairment	Monitor for acute renal failure; consider discontinuation if renal function deteriorates.
Dose if underweight / obese	No specific advice from manufacturer, contact pharmacy if further information required.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements, however IVIg should be administered by a separate intravenous line.
Other notes	

IVIg is prepared from pooled plasma and is therefore a **blood product**. IVIg should be prescribed and administration documented on a blood product prescription form. Record the name of product and batch no.
Adequate **hydration** must be ensured before the initiation of the infusion.
Avoid concomitant use of loop diuretics.
Thromboembolic complications have been associated with the use of IVIg. Caution is recommended for patients with thrombotic risk factors.
Consider administering at a slower rate in patients at risk of thromboembolic complications or those at high risk of acute renal failure.
Vaccines: After administration of IVIg, an interval of at least 3 months should elapse before vaccination with live attenuated virus vaccines. In some cases it may take up to a year for full response to live attenuated vaccines.
Do not use solutions that are cloudy or have any deposits.

Infusion Rate Chart for Flebogamma DIF® – 10% solution.

Prescribed rate in mL/ kg/ hour	**Patients weight (kg)**						
	40	**50**	**60**	**70**	**80**	**90**	**100**
	Infusion rate in mLs/hour						
0.6	24	30	36	42	48	54	60
30 mins	↓	↓	↓	↓	↓	↓	↓
1.2	48	60	72	84	96	108	120
30 mins	↓	↓	↓	↓	↓	↓	↓
2.4	96	120	144	168	192	216	240
30 mins	↓	↓	↓	↓	↓	↓	↓
3.6	144	180	216	252	288	324	360
30 mins	↓	↓	↓	↓	↓	↓	↓
4.8	192	240	288	336	384	432	480

Prepared by:	Muriel Pate	8th Aug 2011	Checked by:	C.Gowing	19/08/2011
Updated by:	Phil O'Byrne	22/08/2018	Check by:	Mary Coyle	03/09/2018
Updated by:	JMcgillycuddy	02/12/2021	Checked by:	Maeve Harty	02/12/2021

Information provided relates to Flebogamma DIF® 10% manufactured by Grifols.
Reference: 1. Medusa Injectable Medicines Guide. Flebogamma DIF 5%. Available at http://www.injguide.nhs.uk (password restricted). Accessed 02/12/2021.

HUMAN NORMAL IMMUNOGLOBULIN (IVIg) (INTRATECT 5% & 10%) (page 1 of 2)

Form: IVIg 5g in 100mL (5%)

IVIg 10g in 200ml (5%)
IVIg 5g in 50mL (10%)
IVIg 10g in 100mL (10%)

Reconstitution: Already in solution

Compatible Fluid: Should not be mixed with intravenous fluids

Administration: Peripheral or central IV route

Intermittent IV infusion

Intratect® should be infused at an initial rate of not more than 0.3mL/kg/hour for 30 minutes. If well tolerated, the rate of administration may gradually be increased to 1.9mL/kg/hour for the remainder of the infusion. If tolerated, subsequent infusions on subsequent days to the same patient may be at the higher rate.

If the patient has previously been on a different brand of IVIg, it is important to use the slower initial rate for the first 30 minutes.

If an adverse reaction occurs, either the rate of administration must be reduced or the infusion stopped, depending on the severity of the reaction.

Infusion rate for Intratect® 5% & 10% solution.

Prescribed rate in mL/kg/hour	**Patients weight (kg)**						
	40	**50**	**60**	**70**	**80**	**90**	**100**
	Infusion rate in mL/hour						
Initial rate: 0.3mL/kg/ hour	**12**	**15**	**18**	**21**	**24**	**27**	**30**
0.6mL/kg/ hour	**24**	**30**	**36**	**42**	**48**	**54**	**60**
1.2mL/kg/ hour	**48**	**60**	**72**	**84**	**96**	**108**	**120**
1.9mL/kg/ hour *	**76**	**95**	**114**	**133**	**152**	**171**	**190**

*Replacement Therapy: in patients who have tolerated the infusion rate of 1.9 mL/kg/h well, the rate may be gradually increased to 6 mL/kg/h and if still tolerated well, it may be further increased gradually to a maximum of 8 mL/kg/h.

Allergy	Rarely, IVIg can cause hypotension with anaphylactic reaction, even if IVIg has been previously tolerated.
Contra-indications	Hypersensitivity to active substance or excipients; patients with selective IgA deficiency who have developed antibodies against IgA.
Usual dose range	See product literature.

HUMAN NORMAL IMMUNOGLOBULIN (IVIg) (INTRATECT 5% & 10%) (page 2 of 2)

Renal or Hepatic Impairment	In patients at risk for acute renal failure, the minimum rate and dose practicable for IVIg should be used.
Dose if underweight / obese	Adjusted body weight may be used for dosing in obese and overweight patients [1, 2]
Infusion-related adverse effects	IVIg may cause hypotension (monitor blood pressure). Adverse reactions such as chills, fever, headache, nausea, vomiting, rash and mild back pain may occur.
Extravasation	N/A
Other common adverse effects	Acute renal failure has also been reported – monitor urine output and serum creatinine levels. Consider IVIg discontinuation in case of renal impairment.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements. Use a separate IV line.

Other notes

IVIg is prepared from pooled plasma and is a **blood product**. IVIg should be prescribed by brand name and administration documented on a blood product prescription form. Record the name and batch no.
Do not use solutions that are cloudy or have any deposits.

Thromboembolic complications have been associated with the use of normal IVIg. Caution is recommended for patients with thrombotic risk factors. Ensure **adequate hydration** before the initiation of IVIG. Avoid concomitant use of loop diuretics. Patients should be carefully monitored during infusions and for at least 1 hour after the first infusion or 20 minutes after subsequent infusions. Patients who have had a long interval since last administration of IVIg should be monitored for 1 hour after infusion.

Vaccines: Immunoglobulin administration may interfere with the development of an immune response to live attenuated virus vaccines such as rubella, mumps, measles and varicella for up to 3 months. After administration, 3 months should elapse before vaccination with live attenuated virus vaccines. In the case of measles, this impairment may persist for up to 1 year. Therefore patients receiving measles vaccine should have their antibody status checked.

Prepared by:	J Mcgillycuddy	31/01/23	Checked by:	Carol O'Brady	1/2/2023

References

1. HSE Guidelines for Immunoglobulin Use in Neurological Conditions June 2022. Available online at https://www.hse.ie/eng/about/who/acute-hospitals-division/drugs-management-programme/guidelines/hse-guidelines-for-immunoglobulin-use-in-neurological-conditions.pdf. Accessed 31/01/2023.
2. 2021 NHS Immunoglobulin Commisioning guidelines. Available at https://www.england.nhs.uk/wp-content/uploads/2021/12/cpag-policy-for-therapeutic-immunoglobulin-2021-update.pdf. Accessed 31/01/2023.

KETAMINE (Ketalar®) [Critical Care] (page 1 of 3)

Form: 500mg in 10ml vial (50mg/mL)
100mg in 10mL* or 200mg in 20mL vial (10mg/mL)

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5%
Sodium Chloride 0.9%

Administration: Central IV route preferred[1]. If administered peripherally, administer via a large vein and monitor administration site closely for phlebitis[1].

IV Injection
Administer the required dose over **at least** 60 seconds.

IV Infusion
Using the **50mg/mL** vial (500mg in 10mL):
Withdraw and discard 10mL from a 250mL bag of compatible fluid. Add 500mg (10mL of the 50mg/ml vial) of ketamine to the infusion bag and administer via an infusion pump (final concentration 2mg/mL).

Weight (kg)	Dose (mg/kg/hr)				
	0.1	0.15	0.2	0.25	0.3
	Rate of infusion (mL/hr of 2mg/mL solution)				
40	2	3	4	5	6
50	2.5	3.75	5	6.25	7.5
60	3	4.5	6	7.5	9
70	3.5	5.25	7	8.75	10.5
80	4	6	8	10	12
90	4.5	6.75	9	11.25	13.5
100	5	7.5	10	12.5	15
110	5.5	8.25	11	13.75	16.5
120	6	9	12	15	18

Allergy	Anaphylaxis is a rare reported side effect.
Contra-indications	Known hypersensitivity to ketamine or any excipients, where an elevation in blood pressure would constitute a serious hazard, pre-eclampsia or eclampsia, severe coronary or myocardial disease, cerebrovascular accident, known history of psychiatric problems.

KETAMINE (Ketalar®) [Critical Care] (page 2 of 3)

Usual dose range	<u>Bronchospasm</u> Dosing as per Critical Care Consultant on a patient-by-patient basis. Lower doses than those used for anaesthesia may be prescribed. *Example regimen* [2] Initial IV Injection: 0.1-2mg/kg over **at least** 60 seconds. Maintenance IV Infusion: 0.15 – 2.5mg/kg/hr <u>Analgesia</u> Dosing as per Critical Care Consultant on a patient-by-patient basis. Lower doses than those used for anaesthesia may be prescribed. <u>Anaesthesia (for information purposes only)</u> *Regimen 1: Using IV Injection(s) only* Induction: 1-2mg/kg (max. 4.5mg/kg), producing 5-10 minutes of surgical anaesthesia. Maintenance: Depending on the patient's reaction and response, subsequent doses may be 50-100% of the administered induction dose. *Regimen 2: IV Infusion* Total Dose Induction: 0.5-2mg/kg administered over at least one minute. Maintenance: 0.6-2.7mg/kg/hour (approximately 1-3 mg/min).
Renal or Hepatic Impairment	Consider a dosage reduction in patients with cirrhosis or other types of liver impairment. No special requirements in renal impairment (incl. dialysis).[3]
Dose if underweight / obese	No special advice from manufacturer.
Infusion-related adverse effects	This injection is acidic and may produce local tissue damage in event of extravasation. Over-rapid administration of ketamine (i.e.<60 seconds) may result in transient respiratory depression or apnoea and enhanced pressor response.

KETAMINE (Ketalar®) [Critical Care] (page 3 of 3)

Other common adverse effects	Increased blood pressure, hallucinations, abnormal dreams, nightmare, confusion, agitation, abnormal behaviour, nystagmus, hypertonia, tonic clonic movements, diplopia, tachycardia, increased respiratory rate, nausea, vomiting, erythema, laryngospasm, rash morbilliform (transient)[4]. Ketamine is also associated with hyper-salivation and emergence delirium – see SPC for management.
ECG/ telemetry	Cardiac function should be monitored continually during administration in patients with pre-existing hypertension or cardiac decompensation.
Special giving set	No special requirements
Other notes	• Ketamine is chemically incompatible with barbiturates, diazepam and furosemide.[1] • Once prepared, ketamine infusions should be used immediately. Any unused infusion should be discarded after 12 hours.[1]

Prepared by:	Terry Smeaton	09/03/17	Checked by:	Mary Coyle	23/03/2017
			Approved by:	G Fitzpatrick	31/07/2018
Vial size update: J Mcgillycuddy 24/07/23			Checked by:	Aidan Morris	24/07/2023

*Information relates to Ketalar 10mg/mL and 50mg/mL Solution for Injection/Infusion manufactured by Pzifer Healthcare Ireland as well as EMP Ketamin Sintetica® 10mg/ml solution for injection/infusion 10ml ampoule. .

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1. NHS Injectable Medicines Guide. Ketamine Intravenous Adult Monograph. Version 6. Last updated: 05/0/16. Available online http://medusa.wales.nhs.uk (password-protected). Accessed 30/01/17.
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3. The Renal Drug Database. Ketamine. Last updated: 18/06/14. Available online https://renaldrugdatabase.com (password protected). Accessed 30/01/17.
4. Sasada et al. Drugs in Anaesthesia & Intensive Care. 3rd Edition. Oxford Medical Publications: London; 2003.

LABETALOL [Acute Stroke Unit, ED, Critical Care] (Page 1 of 3)

Indication: Acute hypertension

Form: 100mg in 20mL ampoule

Reconstitution: Already in solution. May be further diluted before administration.

Compatible Fluid: Glucose 5% (preferred[1])
Sodium chloride/ Glucose mix (eg 0.45%/ 5% mix)
Sodium chloride 0.9%

Administration: Peripheral or central (preferred) IV route

IV injection
Administer by IV injection at a maximum rate of 50mg/minute.

Continuous IV infusion
Draw up 200mg of labetalol (40mL) in a syringe. Withdraw 90ml of fluid from a 250mL bag of compatible infusion fluid and discard. Add the 200mg (=40mL) of labetalol to this bag to give a 1mg/mL (200mg/ 200mL) infusion solution. Other volumes of 1mg/mL infusion solution may be prepared. Infuse the prescribed dosage using a rate-controlled infusion pump as per the corresponding rate in the following tables:

Infusion Table for labetalol **1mg/ml** (peripheral or central)

	Dose (mg/min)	**Rate (mL/hr)**
Severe hypertension post MI	Infusion starting rate: 0.25	15
	Increase at 30 minute intervals #	
	Maximum infusion rate: 2	120
Hypertension due to other causes	Usual rate: 2	120
Acute hypertension in stroke after initial bolus dose*; infuse at 2-8mg/min	Increase at 30 minute intervals #	
	2	120
	4	240
	6	360
	8	480
In acute hypertension of stroke, if BP uncontrolled at 6mg/min or if administering more than 600mg in 24 hours, consult registrar/consultant before increasing further/ administering longer (usual maximum duration is 24 hours). [2] # Rate reductions may be made more frequently if patient's target blood pressure is achieved and / or they become bradycardic or hypotensive.		

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

LABETALOL [Acute Stroke Unit, ED, Critical Care] (Page 2 of 3)

Continuous infusion via **central** IV route (fluid restricted)

In fluid restriction may be infused undiluted. Draw up 250mg of labetalol (50mL) in a 50 mL syringe. This results in a 5mg/mL solution. Administer at prescribed rate using syringe driver.

Infusion table for labetalol **5mg/ml** (**central only**)

	Dose (mg/min)	**Rate (mL/hr)**
Severe hypertension post MI	Infusion starting rate: 0.25	3
	Increase at 30 minute intervals #	
	Maximum infusion rate: 2	24
Hypertension due to other causes	Usual rate: 2	24
Acute hypertension in stroke after initial bolus dose*; infuse at 2-8mg/min	Increase at 30 minute intervals #	
	2	24
	4	48
	6	72
	8	96
In acute hypertension of stroke, if BP uncontrolled at 6mg/min or if administering more than 600mg in 24 hours, consult registrar/consultant before increasing further/ administering longer (usual maximum duration is 24 hours). [2] # Rate reductions may be made more frequently if patient's target blood pressure is achieved and / or they become bradycardic or hypotensive.		

Allergy	Bronchospasm, known hypersensitivity to beta-blockers
Contra-indications	– Asthma/ obstructive airways disease (unless compelling indication) – AV block of second- or third-degree – Unstable decompensated cardiac failure (pulmonary oedema, hypoperfusion or hypotension) – Continuous or intermittent inotropic therapy acting through beta-receptor agonism – Bradycardia (<45 bpm) – Sick sinus syndrome – Cardiogenic shock – Severe peripheral arterial circulatory disorders – Untreated phaeochromocytoma – Metabolic acidosis - When suspected acute myocardial infarction is complicated by bradycardia (<45 bpm), first-degree heart block (the P-Q interval is>0.24 sec) or systolic blood pressure <100 mmHg.

LABETALOL [Acute Stroke Unit, ED, Critical Care] (Page 3 of 3)

Usual dose range	**IV injection:** *In hypertension of stroke, usual labetalol IV bolus dose is 10mg: may repeat or double every 10 mins to 200mg (max of 300mg–unlicensed dose), or give initial bolus dose then infusion at 2-8mg/min.[3] For other indications, usual maximum dose is 200mg. **IV infusion:** See above tables
Renal or Hepatic Impairment	Avoid in hepatic impairment. A dose reduction may be needed in renal impairment: consult clinical pharmacist.
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	Orthostatic/ postural hypotension; patients should always receive the drug in the supine or left lateral position. Avoid raising the patient into the upright position within 3 hours of administration. Headache, tiredness.
Extravasation	Extravasation may cause tissue damage.
Other common adverse effects	Bronchospasm in patients with asthma/ obstructive airways disease; may mask signs of hypoglycaemia
ECG/ telemetry?	ECG monitoring
Special giving set?	No special requirements
Other notes	Monitor blood pressure and heart rate regularly throughout infusion. Monitor blood glucose levels. Administration in areas other than monitored critical areas should not be routinely conducted. Clinical decision needed re infusion fluid choice: glucose is preferred in hypertension but if patient is diabetic, sodium chloride/ glucose mix may be preferred. [1]

Prepared by:	Mary Coyle	17/09/2015	Checked by:	J Mcgillycuddy	12/05/2016
Minor update	JMcgillycuddy	22/03/2017	Checked by:	Mary Coyle	23/03/2017
Updated:	T Smeaton	25/06/2018	Checked by:	Mary Coyle	05/09/2018
Minor update	JMcgillycuddy	11/12/2019	Checked by:	Carol O'Brady	11/12/2019
Updated:	JMcgillycuddy	11/04/2022	Checked by:	Gillian England	11/05/2022
Updated by:	JMcgillycuddy	06/09/2023	Checked by:	Carol O'Brady	06/09/2023

Information provided relates to labetalol 5mg/ mL solution for injection by Bowmed- S.A.L.F.

References

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2. Midatabank #15736. April 2022.
3. Tallaght University Hospital. Adult Medicines Guide [online]. Section 4.14: Acute Hypertension Management in Ischaemic Stroke. Last updated 10/05/22.

LEVOSIMENDAN (SIMDAX) [Critical Care] (page 1 of 3)

Form: 12.5mg in 5mL ampoule

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5%

Administration: Central IV route preferred.[1] If administered peripherally, administer via a large vein and monitor administration site closely for phlebitis.[1]

IV Infusion
Dilute 12.5mg in 250mL of compatible fluid (final concentration 50 microgram/mL) [1].
Loading Dose: Administer over 10 minutes.
Maintenance Dose: Administer as a continuous infusion.

Sample Dosage Table for Levosimendan 50 microgram/mL solution

	Loading Dose - given as an infusion over 10 minutes with the infusion rate (mL/hr) below		**Maintenance Dose (microgram/kg/min)**		
Weight (kg)	**Microgram/ kg**		**0.05**	**0.1** Starting rate	**0.2**
	6	**12**			
	Rate of Infusion (mL/hr) (reduce after 10 mins)		Rate of Infusion (mL/hr)		
40	28.8	57.6	2.4	4.8	9.6
50	36	72	3	6	12
60	43.2	86.4	3.6	7.2	14.4
70	50.4	100.8	4.2	8.4	16.8
80	57.6	115.2	4.8	9.6	19.2
90	64.8	129.6	5.4	10.8	21.6
100	72	144	6	12	24
110	79.2	158.4	6.6	13.2	26.4
120	86.4	172.8	7.2	14.4	28.8

Allergy	- Frequency of anaphylaxis is unknown.
Contra-indications	- Known hypersensitivity to levosimendan or any excipients. - Severe hypotension and/or severe tachycardia. - Significant mechanical obstruction(s) affecting ventricular filling or outflow or both. - Severe renal impairment (creatinine clearance <30mL/min) **and** severe hepatic impairment. - History of Torsades de Pointes

LEVOSIMENDAN (SIMDAX) [Critical Care] (page 2 of 3)

Usual dose range	**Loading Dose:** 6* - 12 microgram/kg infused over 10 minutes. *Lower dose recommended for patients already prescribed concomitant intravenous vasodilators and/or inotropes. A Consultant Anaesthetist may decide to omit the loading dose. **Maintenance Dose:** Start infusion at a rate of 0.1 microgram/kg/min. Dose adjusted to 0.05 – 0.2 microgram/kg/min, according to clinical response and tolerability. Assess patient response after loading dose and within 30-60 minutes of dose adjustment. **Duration of Treatment:** 24 hours recommended. Haemodynamic effects will persist for minimum of 24 hours after stopping infusion, and may persist for up to 9 days.
Renal or Hepatic Impairment	Cautioned in mild-moderate renal and hepatic impairment. See contra-indications above.
Dose if underweight / obese	No special advice from manufacturer.
Infusion-related adverse effects	Hypotension, hypokalaemia, extra systoles, atrial fibrillation, arterial tachycardia, ventricular tachycardia, headache.
Other common adverse effects	Insomnia, dizziness, tachycardia, cardiac failure, myocardial infarction, nausea, constipation, vomiting, diarrhoea, decreased haemoglobin.
ECG/ telemetry	ECG monitoring required. Levosimendan may prolong the corrected QT interval.
Special giving set	None specified by manufacturer.

LEVOSIMENDAN (SIMDAX) [Critical Care] (page 3 of 3)

Other notes	- Severe hypovolaemia and hypokalaemia should be corrected prior to starting the infusion. - Due to risk of hypotension, use is cautioned in patients with low baseline blood pressure and/or with concomitant use of other IV vasoactive drugs. - Monitor blood pressure, heart rate, urine output and oxygen saturation for at least 3-5* days after stopping infusion (*longer in renal/hepatic impairment). -Vials are stored in the fridge. The concentrate is yellow in colour but may turn orange during storage without this affecting the medicine. - Discard any unused infusion after 24 hours. - If given via central line, when the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with glucose 5% or sodium chloride 0.9%.

Prepared by:	Terry Smeaton	13/03/18	Checked by:	Mary Coyle C Mc Auliffe	24/09/2018 12/12/2018
			Approved by:	Gerry Fitzpatrick	31/07/2018
Minor update	JMcgillycuddy	25/07/19	Checked by:	Mary Coyle	25/07/2019

Information provided relates to Simdax 2.5mg/mL concentrate for solution for infusion manufactured by Orion Pharma Limited.

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2. Lexicomp Online. Levosimendan. Last updated: 05/03/18. Available online https://online.lexi.com (password-protected). Accessed 12/03/18

MAGNESIUM SULPHATE [Critical Care] (page 1 of 3)

Form:
1g in 2mL vial (4mmol in 2mL) = 50% solution
5g in 10mL vial (20mmol in 10mL) = 50% solution

4g in 100mL Water for Injection premade bag (16mmol in 100mL) = 4% solution (for use in **obstetrics** only)
20g in 500mL Water for Injection premade bag (80mmol in 500mL) = 4% solution (for use in **obstetrics** only)

Reconstitution: Already in solution. **Magnesium sulphate 50% must always be diluted before use.**

Mix thoroughly inverting the syringe or bag at least 5 times to avoid 'layering'

Compatible Fluid:
Glucose 5%
Sodium chloride 0.9%

Administration:
Peripheral (concentrations less than or equal to 5%)
Central (concentrations greater than 5%)

Intermittent IV infusion – hypomagnesaemia

Peripheral administration

Dilute up to 4g (= 16mmol = 8mL of magnesium sulphate 50%) in 100mL for peripheral administration.

Administer 1-2g (4-8mmol) over 1-2 hours through a rate controlled infusion pump (recommended rate 4mmol/hr). Dose greater than 2g should be given over a longer time period – see the Adult Medicines Guide for details.[6]

Central administration in Critical Care

Dilute 5g (= 20mmol = 10mL of magnesium sulphate 50%) with 40mL compatible infusion fluid to give 20mmol in 50mL. This results in a 10% magnesium sulphate infusion.[1]

Administer via a rate controlled infusion pump over at least 35mins using a syringe pump.[1,2] Reduce rate if patient develops bradycardia or hypotension. Preferably give over a longer duration if infusion lines are available (up to 24 hours).

MAGNESIUM SULPHATE [Critical Care] (page 2 of 3)

Management of arrhythmias
Slow IV injection: Typically 2g (8mmol) of magnesium diluted to 10mL and administered over 10-15 minutes.[1]

Management of acute severe asthma (unlicensed)
Intermittent IV infusion (ED only – only after consultation with senior medical staff). Dilute 4.8-8mmol (1.2-2g) in 50mL of infusion fluid and administer over 20 minutes via a syringe pump.[1]

Use in obstetrics
Loading dose in obstetrics: Using the premixed bag (4g in 100mL Water for Injection), administer 100mL over 5-20mins [3, 4] depending on indication.

Maintenance dose in obstetrics: Using the premixed bag (20g in 500mL Water for Injection), infuse at rate of 25mL per hour (1g/hour) via volumetric pump. This infusion should be continued for at least 24 hours or 24 hours after delivery depending on indication[3].

Allergy	Possible
Contra-Indications	Hypermagnesaemia (above 1mmol/L), hypersensitivity, renal failure.
Usual dose range	Dose should be tailored to individual requirements.[4] Repeat as necessary to maintain level above 0.4mmol/L. Up to 40g (160mmol) given over a period of up to 5 days may be necessary for treatment of hypomagnesaemia. See above for other indications.
Renal or Hepatic Impairment	Dose reduction is required in patients with impaired renal function – monitor levels.
Dose if underweight / obese	No specific advice from manufacturer.
Infusion-related adverse effects	Bradycardia, flushing, vasodilation and hypotension can occur during administration, particularly with higher rates. This can be minimised by slowing the rate of administration.
Extravasation	Concentrations exceeding 5% can increase the risk of irritation and tissue damage due to high osmolarity.[3] See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	Usually associated with hypermagnesaemia – signs include flushing, thirst, respiratory depression, nausea and vomiting, loss of patellarreflexes, drowsiness, double vision, slurred speech, hypotension, bradycardia and coma.[1] Hypocalaemia
ECG/ telemetry?	Part of the routine monitoring for all Critical Care patients.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

MAGNESIUM SULPHATE [Critical Care] (page 3 of 3)

Special giving set?	No special requirements.
Other notes	**Premixed bags** for use in obstetrics are available in theatre. Caution required in patients receiving digoxin as hypomagnesaemia may increase risk of toxicity.[9] Parenteral administration of magnesium salts may enhance the effects of neuromuscular blocking agents and central nervous system depressants. Risk of respiratory depression if given with high doses of barbiturates, opioids or hypnotics.[9]

Prepared by:	Mary Coyle	24/06/2019	Checked by: J Mcgillycuddy	16/09/2019
Updated by:	D Stewart	20/05/2025	Checked by: K Burke	01/07/2025

Information provided relates to Magnesium sulphate manufactured by Aurum (Martindale) & premixed bags manufactured by Hospira

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METHYLTHIONINIUM CHLORIDE Proveblue ® (Previously known as Methylene Blue) [Critical Care]

Form: 5mg/mL; 50mg/10mL vial

Reconstitution: Not applicable

Compatible Fluid: Glucose 5%

Administration: Central IV route (if possible)

Administer undiluted over a minimum 5 minutes.
If required, further dilute the required dose with 100mL glucose 5% [1] and give over 5-30 mins.

Allergy	Rare, do not use if you are allergic to methylthioninium chloride or other thiazine dyes.
Contra-indications	G6PD deficiency, NADPH deficiency
Usual dose range	Treatment of Vasodilatory shock 1-2mg/kg. A second dose may be administered after 30-60 minutes[2].
Renal or Hepatic Impairment	Lower doses may be required in moderate to severe renal impairment. No experience in severe hepatic impairment.
Dose if underweight / obese	No special advice from manufacturer. Some references suggest lean body weight[2].
Infusion-related adverse effects	CNS effects, nausea, abdominal pain, dizziness, chest pain, cardiac arrhythmias, headache, mental confusion, sweating, hypotension, hypertension, injection site pain
Extravasation	Extreme low pH may cause tissue damage, administer via central line if possible.
Other common adverse effects	May discolour urine, stools, skin and other secretions blue. Pain in extremity, abnormal taste.
ECG/ telemetry?	Only for administration
Special giving set?	No special requirements
Other notes	Avoid use in combination with other serotonergic drugs e.g. SSRIs, SNRIs, MAOIs, venlafaxine, mirtazapine, clomipramine. In these patients monitor for CNS toxicity for 4 hours after administration. Incompatible with sodium chloride 0.9%, flush line before and after with glucose 5% Store ampoule in original box to protect from light.

Prepared by:	Mary Coyle	21/12/2021	Checked by:	C O'Donovan	11/01/2021
			Approved by:	Prof P.Tierney	03/02/2022
Information relates to Methylthioninium chloride Proveblue manufactured by Provepharm SAS.					

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

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METOPROLOL [Acute Stroke Unit, ED, Critical Care] (page 1 of 2)

Form: 5mg in 5mL vial

Reconstitution: Already in solution

Compatible Fluid[1]: Sodium chloride 0.9%
Glucose 5%

Administration: Peripheral or central IV route

Slow IV injection
Administer as a very slow IV injection at a **rate of 1-2mg/ minute**

Allergy	Rash and bronchospasm can occur, although anaphylaxis not considered likely.
Contra-Indications	– AV block of second- or third-degree – Unstable decompensated cardiac failure (pulmonary oedema, hypoperfusion or hypotension) – Continuous or intermittent inotropic therapy acting through beta-receptor agonism – Bradycardia (<45 bpm) – Sick sinus syndrome – Cardiogenic shock – Severe peripheral arterial circulatory disorders – Untreated phaeochromocytoma – Metabolic acidosis - Known hypersensitivity to beta-blockers. - When suspected acute myocardial infarction is complicated by bradycardia (<45 bpm), first-degree heart block (the P-Q interval is>0.24 sec) or systolic blood pressure <100 mmHg and/or severe heart failure.
Usual dose range	**Arrhythmias**: By IV injection, up to 5mg repeated after 5 minutes if necessary; total dose 10-15mg. **Early intervention within 12 hours of infarction:** by IV injection 5mg every 2 minutes to a total maximum of 15mg (as determined by BP and HR), followed after 15 minutes by 50mg by mouth every 6 hours for 48 hours. **Acute treatment of hypertension in patients who are NPO and without enteral access[2]:** Initial dosages of 1.25-5mg every 6-12 hours recommended, with subsequent dosages based on clinical response.

METOPROLOL [Acute Stroke Unit, ED, Critical Care] (page 2 of 2)

Renal or Hepatic Impairment	No dose adjustments required in renal impairment. Reduce dose in severe hepatic impairment.
Dose if underweight / obese	No specific advice from manufacturer, contact pharmacy if further information required.
Infusion-related adverse effects	Postural disorders, dizziness (see below)
Extravasation	Nil information available.
Other common adverse effects	Bradycardia, postural disorders (very rarely with syncope), cold hands and feet, palpitations Fatigue, dizziness, headache Nausea, abdominal pain, diarrhoea, constipation Dyspnoea on exertion.
ECG/ telemetry?	ECG monitoring is recommended by the manufacturer. If ECG monitoring is not possible, the blood pressure and heart rate must be monitored at the completion of the dose and again after 15 and 30 minutes (see TUH Adult Medicines Guide).
Special giving set?	No special requirements.
Other notes	Because of the risk of a pronounced drop of blood pressure, IV administration of metoprolol to patients with a systolic blood pressure below 100 mmHg should only be given with special care. May be associated with bronchospasm; use with caution in those with obstructive airways disease unless there are compelling clinical reasons for their use. Use with caution in those with diabetes or thyrotoxicosis due to metoprolol masking symptoms. In patients with a phaeochromocytoma, an alpha-blocker should be given concomitantly. Intravenous administration of calcium antagonists of the verapamil type should not be given to patients treated with beta-blockers. Flushing: if administering peripherally, flush the cannula at the same speed as the rate of infusion to avoid adverse haemodynamic effects. If administering centrally, after the infusion is discontinued, disconnect the administration set, aspirate the cannula contents and then flush.

Prepared by:	Muriel Pate	23/04/12	Checked by:	Jane Strong	24/04/12
Updated by:	J Mcgillycuddy	09/07/13	Checked by:	C Gowing	11/07/2013
Updated by:	Mary Coyle	29/06/2020	Checked by:	M Vaughan	15/07/2020

Information relates to Betaloc brand of metoprolol manufactured by Astra Zeneca.

References: 1. Injectable Medicines Guide (Medusa). Available at http://www.injguide.nhs.uk (password restricted). Accessed 18/06/2020.
2. Adult Medicines Guide 2020/2021, Tallaght University Hospital

MIDAZOLAM in Procedural Sedation [Adult X-Ray/ Endoscopy/ Renal Dept.] (Page 1 of 3)

Indication: Benzodiazepine drug used as anxiolytic and as sedative to induce procedural sedation

Form: 10mg in 5ml ampoule
10mg in 2ml ampoule

Reconstitution: Already in solution

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central (preferred) IV route

IV injection
Midazolam can be administered as undiluted solution or it can be diluted with compatible fluid to a final concentration of 1mg/mL. Administer as a slow IV injection at a maximum rate of 2mg/ min.
Midazolam must only be administered under the direct supervision of a doctor proficient in procedural sedation.

Allergy	Hypersensitivity reactions and anaphylaxis have been reported. Do not administer midazolam to patients with known benzodiazepine hypersensitivity.
Contra-indications	Patients with severe respiratory failure or acute respiratory depression.
Usual dose range	Special caution (and lower doses) should be used when administering midazolam to high-risk patients: • Adults over 60 years • Chronically ill or debilitated patients • Patients with chronic respiratory insufficiency • Patients with impaired renal, hepatic or cardiac function • Patients with myasthenia gravis **Initial dose (adult)** 2-2.5mg midazolam (elderly 0.5-1mg) as a slow IV injection at a maximum rate of 2 mg/minute. **Wait at least 2 minutes** (onset of action 2 minutes, maximum effect 5-10 minutes after injection), then assess sedation score. If patient is restless, suspect hypoxaemia; check pulse oximetry. Paradoxical stimulation (e.g. agitation, tremor, convulsions, aggression) can also occur, particularly with rapid or high dose infusion, and is not a sign of inadequate sedation.

MIDAZOLAM in Procedural Sedation [Adult X-Ray/Endoscopy/ Renal Dept.] (Page 2 of 3)

Usual dose range (continued)	If inadequately sedated and patient's oxygen saturations are acceptable, further increments may be given at approximately 5 minute intervals. **Subsequent dose(s) (adult)** 1-2 mg midazolam (elderly 0.5-1mg) as a slow IV injection at a maximum rate of 2 mg/min. **Doses of more than 5mg are usually not necessary; maximum 7.5mg (3.5mg in elderly).**
Renal or Hepatic Impairment	Use lower dose in renal or hepatic impairment
Dose if underweight / obese	The mean half-life is greater in obese than in non-obese patients (5.9 vs 2.3 hours) due to a 50% increase in the volume of distribution corrected for total body weight. The clearance is not significantly different in obese and non-obese patients.
Infusion-related adverse effects	Respiratory depression, respiratory arrest, laryngospasm, cardiac arrest, bradycardia, hypotension, vasodilation Severe cardiorespiratory adverse events/life threatening incidents are more likely to occur in older patients with pre-existing respiratory and cardiac conditions, particularly when IV doses are given too rapidly and when higher doses are used. Erythema and pain at injection site.
Extravasation	Extravasation is likely to cause venous irritation and tissue damage due to low pH. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	Alertness decreased, anxiety, ataxia (more common in elderly), confusion (more common in elderly), depression, dizziness, drowsiness, dysarthria, fatigue, headache, mood altered, muscle weakness, nausea, sleep disorders, tremor, vision disorders, vomiting, withdrawal syndrome. Paradoxical reactions including agitation and involuntary movement have been reported, particularly with high-dose or rapid injection, more common in children and older patients.
ECG/ telemetry?	No special requirements
Special giving set?	N/A
Other notes	Ensure the reversal agent flumazenil is available when Midazolam is being administered.

Prepared by:	J Mcgillycuddy	08/05/2014	Checked by:	Mary Coyle	06/07/2014
Updated by:	Iarlaith Doherty	10/01/2023	Checked by:	Aidan Morris	07/03/2023
Updated by:	D Stewart	21/05/2025	Checked by:	K Burke	23/05/2025
Information provided relates to Hypnovel brand by Roche and Midazolam Accord by Accord.					

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

MIDAZOLAM in Procedural Sedation [Adult X-Ray/Endoscopy/ Renal Dept.] (Page 3 of 3)

References

1. Administration of Intravenous Conscious Sedation and / or Analgesia by a Registered Nurse during an Interventional Procedure in the Interventional Radiology Department, Adult Services - Procedure. April 2025. Accessed via Qpulse 21/05/2025.
2. Administration of Intravenous Conscious Sedation and / or Analgesia by a Registered Nurse during an Endoscopy in the Endoscopy Unit Procedure. March 2024. Accessed via Qpulse 21/05/2025.
3. Administration of Intravenous Conscious Sedation and/ or Analgesia by a Registered Nurse during an Interventional Procedure in the Adult Renal Dept. Procedure. June 2017. Accessed via Qpulse 21/05/2025.
4. Medusa Injectable Medicines Guide. Available online at www.medusaimg.nhs.uk (password restricted). Accessed 21/05/2025.
5. BNF. Available online at www.medicinescomplete.com (subscription required). Accessed 21/05/2025.

MIDAZOLAM [Critical Care] (page 1 of 4)

Indication: Sedation in either as a sole or combination agent

Form: 10mg in 5mL ampoule
10mg in 2mL ampoule

Reconstitution: Already in solution

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central (preferable) IV route

IV bolus
Give the IV loading dose slowly over 20 to 30 seconds allowing 2 minutes between successive increments.

Continuous infusion (**single strength – 1mg/mL**)
Draw up 50mg (note concentration on vial) of midazolam in a 50mL syringe, make up to 50mL with compatible fluid (final concentration 1mg/mL).

Midazolam is administered as a continuous infusion via a volumetric pump and adjusted according to depth of sedation (Refer to ICU Sedation Policy).

Rate of Administration of Midazolam 1mg/ml solution:

	Infusion rate (mg/kg/hr)					
	0.03	**0.05**	**0.1**	**0.2**	**0.3**	**0.4**
Weight		Rate in mL/hour of **1mg/mL** solution				
40kg	1.2	2	4	8	12	16
50kg	1.5	2.5	5	10	15	20
60kg	1.8	3	6	12	18	24
70kg	2.1	3.5	7	14	21	28
80kg	2.4	4	8	16	24	32
90kg	2.7	4.5	9	18	27	36
100kg	3	5	10	20	30	40

MIDAZOLAM [Critical Care] (page 2 of 4)

Continuous infusion (**double strength – 2mg/mL**)
Draw up 100mg (note concentration on vial) of midazolam in a 50mL syringe, make up to 50mL with compatible fluid (final concentration 2mg/mL).

Midazolam is administered as a continuous infusion via a volumetric pump and adjusted according to depth of sedation (Refer to ICU Sedation Policy).

Rate of Administration of Midazolam 2mg/ml solution:

	Infusion rate (mg/kg/hr)					
	0.03	**0.05**	**0.1**	**0.2**	**0.3**	**0.4**
Weight		Rate in mL/hour of **2mg/mL** solution				
40kg	0.6	1	2	4	6	8
50kg	0.75	1.25	2.5	5	7.5	10
60kg	0.9	1.5	3	6	9	12
70kg	1.05	1.75	3.5	7	10.5	14
80kg	1.2	2	4	8	12	16
90kg	1.35	2.25	4.5	9	13.5	18
100kg	1.5	2.5	5	10	15	20

Allergy	Generalised hypersensitivity reactions and anaphylaxis have been reported. Do not administer midazolam to patients with known benzodiazepine hypersensitivity.
Contra-indications	Patients with severe respiratory failure or acute respiratory depression without the appropriate support measures in place.

MIDAZOLAM [Critical Care] (page 3 of 4)

Usual dose range	**IV Loading Dose for Sedation in ICU** 0.03 – 0.3mg/kg in increments of 1 – 2.5 mg over 20-30 seconds allowing 2 minutes between increments. **IV Maintenance Dose for Sedation in ICU** 0.03 – 0.2 mg/kg/hour (0.03 – 0.1mg/kg/hour when used as a component in combined therapy) titrated according to sedation score **Status Epilepticus:** 0.1-0.2mg/kg loading dose, followed by 0.05-0.4mg/kg/hr titrated to response[1]. Evidence exists to support use of higher maintenance doses if required (max. recommended 0.6mg/kg/hr) [2]. Special caution (and lower doses) should be used when administering midazolam to high-risk patients: • Adults over 60 years • Chronically ill or debilitated patients • Patients with chronic respiratory insufficiency • Patients with impaired renal, hepatic function or cardiac function • Patients with myasthenia gravis Dose reduction may be necessary for hypovolaemic, vasoconstricted or hypothermic patients.
Renal or Hepatic Impairment	Use lower dose in renal or hepatic impairment as accumulation may occur especially in patients receiving prolonged infusions.
Dose if underweight / obese	No special advice from manufacturer. Note accumulation may occur in patients who are obese.
Infusion-related adverse effects	Hypotension (exaggerated with concomitant sedatives), bradycardia and respiratory depression; monitor patient for same. Severe cardiorespiratory adverse events have occurred including cardiac arrest, respiratory arrest, apnoea and bradycardia. Life threatening incidents are more likely to occur in older patients with pre-existing respiratory and cardiac conditions, particularly when IV doses are given too rapidly and when higher doses are used. Midazolam has a low pH so can cause venous irritation if given peripherally. [3]
Other common adverse effects	Other side effects include nausea, vomiting, headache, ataxia, drowsiness and confusion. Paradoxical reactions including agitation and involuntary movements have been reported with midazolam, particularly with high-dose or rapid injection. These reactions are more common in children and older patients.

MIDAZOLAM [Critical Care] (page 4 of 4)

ECG/ telemetry?	No special requirements
Special giving set?	N/A
Other notes	Physical dependence may develop; avoid abrupt withdrawal of therapy. Accumulation may occur in patients who are obese, in patients with hypoalbuminemia or renal failure. Flumazenil can be used as a reversal agent of midazolam, but note re-administration may be necessary as flumazenil has a shorter duration of action than midazolam.

Prepared by:	Mary Coyle	13/10/2016	Checked by:	J Mcgillycuddy	10/11/2016
Updated by:	T Smeaton	25/06/18	Checked by:	Mary Coyle	05/09/2018
Updated by:	Mary Coyle	07/04/2020	Checked by:	Carol O'Brady	07/04/2020
Minor update	JMcgillycuddy	16/10/2023	Checked by:	Mary Coyle	16/10/2023

Information provided relates to Hypnovel 10mg/5mL solution for injection by Roche Products Limited and Midazolam 5mg/mL by Accord Pharmaceuticals.

Reference

1. Meierkord H, Boon P, Engelsen B, Göcke K, Shorvon S, Tinuper P, et al. EFNS guideline on the management of status epilepticus in adults. Eur J Neurol. 2010;17(3):348-55.
2. Rossetti AO, Lowenstein DH. Management of refractory status epilepticus in adults: Still more questions than answers. *Lancet neurology*. 2011;10(10):922-930.
3. NHS Injectable Medicines Guide. Midazolam Adult Monograph. Version 5. Last updated 29/05/13. Available online at http://www.injguide.nhs.uk (password protected). Accessed 25/06/2018.

MILRINONE (PRIMACOR) [Critical Care] (page 1 of 3)

Form: 10mg in 10mL ampoule

Reconstitution: Already in solution

Compatible Fluid: Glucose 5%
Sodium Chloride 0.9%

Administration: Central IV route preferred.[1] If administered peripherally, administer via a large vein and monitor administration site closely for phlebitis.[1]

IV Injection (Loading Dose Only)
Dilute volume of drug required to a total volume of 10mL – 20mL with sodium chloride 0.9% or glucose 5%. Administer **over 10 minutes.**

Continuous IV Infusion (Maintenance Dose)
Dilute 10mg up to 50mL of compatible fluid in a syringe pump (final concentration **200 microgram/mL**).

Dosage Table for Milrinone

	Loading Dose (IV Injection)	**Continuous Infusion Rate (microgram/kg/min)**					
	50 microgram/kg	**0.375**	**0.4**	**0.5**	**0.6**	**0.7**	**0.75**
Weight (kg)	Volume of **undiluted drug** required (mL)	Rate of Infusion (mL/hr) **200 microgram/mL solution**					
40	2	4.5	4.8	6.0	7.2	8.4	9.0
50	2.5	5.6	6.0	7.5	9.0	10.5	11.3
60	3	6.8	7.2	9.0	10.8	12.6	13.5
70	3.5	7.9	8.4	10.5	12.6	14.7	15.8
80	4	9.0	9.6	12.0	14.4	16.8	18.0
90	4.5	10.1	10.8	13.5	16.2	18.9	20.3
100	5	11.3	12.0	15.0	18.0	21.0	22.5
110	5.5	12.4	13.2	16.5	19.8	23.1	24.8

For fluid restricted patients see next page

MILRINONE (PRIMACOR) [Critical Care] (page 2 of 3)

Fluid-restricted Patients

IV Injection (Loading Dose Only): The volume of drug required can be administered undiluted **over 10 minutes**.

Continuous IV Infusion (Maintenance Dose):
Dilute 20mg up to 50mL of compatible fluid in a syringe pump (final concentration **400 microgram/mL**)

Dosage Table for Milrinone (Fluid restricted patients)

	Loading Dose (IV Injection)	**Continuous Infusion Rate (microgram/kg/min)**					
	50 microgram/kg	**0.375**	**0.4**	**0.5**	**0.6**	**0.7**	**0.75**
Weight (kg)	Volume of **undiluted drug** required (mL)	Rate of Infusion (mL/hr) **400 microgram/mL solution**					
40	2	2.3	2.4	3.0	3.6	4.2	4.5
50	2.5	2.8	3	3.8	4.5	5.3	5.6
60	3	3.4	3.6	4.5	5.4	6.3	6.8
70	3.5	3.9	4.2	5.3	6.3	7.4	7.9
80	4	4.5	4.8	6.0	7.2	8.4	9
90	4.5	5.0	5.4	6.8	8.1	9.5	10.1
100	5	5.6	6.0	7.5	9.0	10.5	11.3
110	5.5	6.1	6.6	8.3	9.9	11.6	12.4

Allergy	Anaphylactic shock has been reported as a very rare undesirable effect. Stop infusion immediately if anaphylaxis occurs.
Contra-indications	- Known hypersensitivity to milrinone or any excipients. - Severe hypovolaemia. - Concomitant use with anagrelide and/or riociguat.[2] - Not recommended immediately following acute myocardial infarction due to limited data on safety and efficacy. - Not recommended in place of surgical intervention for relief of obstruction in obstructive aortic disease, pulmonary valvular disease or hypertrophic sub-aortic stenosis.

MILRINONE (PRIMACOR) [Critical Care] (page 3 of 3)

Usual dose range	**Loading Dose:** 50 microgram/ kg administered via IV injection over 10 minutes. **Maintenance Dose:** 0.375 – 0.75 microgram/kg/min via continuous IV infusion. Dose adjusted according to haemodynamic and clinical response. **Maximum Daily Dose**: 1.13mg/kg/day. Duration of Treatment Dependent on clinical and haemodynamic response. In congestive heart failure, infusion may continue for **up to 5 days** (usual duration 2-3 days). In acute states following cardiac surgery, unlikely that treatment will be required for more than 12 hours.
Renal or Hepatic Impairment	Reduce maintenance infusion rate if eGFR <50mL/min/1.73m^2. Contact Pharmacy for dosing advice.
Dose if underweight / obese	As per product manufacturers, use actual body weight for dosing, even in obese patients.[3]
Infusion-related adverse effects	This injection is acidic and may produce local tissue damage in event of extravasation. Monitor for hypotension, arrhythmia, tachycardia and hypokalaemia during infusion.
Other common adverse effects	Headache, ventricular ectopic activity, ventricular tachycardia, supraventricular arrhythmia.
ECG/ telemetry?	Continuous ECG monitoring required – stop infusion if arrhythmia develops.[1]
Special giving set?	No special requirements
Other notes	- Clinical response, fluid balance and serum creatinine should be carefully monitored during treatment. - For patients with uncontrolled atrial fibrillation/ flutter, milrinone may increase ventricular response rate; consider **pre-treatment** with digoxin or other agents which prolong AV node conduction time. -Incompatible with furosemide, sodium bicarbonate and imipenem with cilastin. [4] - Once prepared, the injection/infusion should be used immediately. However, prepared infusions can be stored at 2-8ºC in the fridge. Discard any unused infusion after 24 hours.

Prepared by:	Terry Smeaton	07/03/18	Checked by:	Mary Coyle	26/04/2018
			Approved by:	G Fitzpatrick	31/07/2018

Information provided relates to Primacor 1mg/mL Solution for Injection/Infusion manufactured by Aventis Pharma Limited. **References**

1. NHS Injectable Medicines Guide. Milrinone Intravenous Adult Monograph. Version 4. Last updated: 20/08/13. Available online http://medusa.wales.nhs.uk (password-protected). Accessed 06/03/18.
2. Lexicomp Online. Milrinone. Last updated: 08/02/18. Available online https://online.lexi.com (password-protected). Accessed 06/03/18
3. MiDatabank Query No. 11837. Pharmacy Department, Tallaght University Hospital.
4. Gray A et al. Injectable Drugs Guide. 1st Edition. London; 2011.

MORPHINE SULFATE [Critical Care] (page 1 of 2)

IV Morphine is on the exclusion list of drugs not generally administered by nursing staff as per the Intravenous Drugs Administration policy. Certain specialised ward areas may have approved policies for nurses to administer IV Morphine e.g. CCU

Indication: Sedation in either as a sole or combination agent

Form: 10mg in 1mL ampoule (Mercury brand)
30mg in 1mL ampoule (Martindale brand)

Reconstitution: Already in solution.
Further dilute before administration.

Compatible Fluid: Glucose 5% or sodium chloride 0.9%

Administration: Peripheral or central IV route
Draw up 60mg (i.e. 2mL from 30mg in 1mL ampoules) in a 60mL syringe, make up to 60mL with compatible fluid (final concentration 1mg/mL)[1].

Administered via a volumetric pump. If an IV bolus is required, the bolus function on the smart pump should be utilised, using the diluted solution. The continuous infusion is adjusted according to depth of sedation required and pain score achieved (Refer to Tallaght Hospital ICU Sedation Policy).

Allergy	Anaphylaxis can occur (rare).
Contra-Indications	Acute respiratory depression without the appropriate support measures in place. Patients with excessive bronchial exudation, status asthmaticus, risk of paralytic ileus, raised intracranial pressure, head injury or coma. Biliary colic, following biliary tract surgery or surgical anastomosis. Heart failure secondary to chronic lung disease. Phaeochromocytoma. Patients on mono-amine oxidase inhibitors or within 14 days of stopping treatment. Acute alcoholism. Convulsive disorders. Delayed gastric emptying, acute abdomen[2].
Usual dose range	The infusion rate should be adjusted according to the depth of sedation and pain score achieved. A reduced dose is required in old age, frailty, in patients in shock or patients with adrenocortical insufficiency. Reduction also needed in hypotension, hypothyroidism and prostatic hypertrophy.

MORPHINE SULFATE [Critical Care] (page 2 of 2)

Renal or Hepatic Impairment	Patients with renal or hepatic impairment require lower doses of morphine. May cause respiratory depression in renal disease: avoid if GFR less than 20mL/min. Avoid in severe liver disease.
Dose if underweight / obese	No specific advice from manufacturer, contact pharmacy if further information required.
Infusion-related adverse effects	Pain at injection site, thrombophlebitis reported rarely.
Other common adverse effects	Nausea, vomiting, constipation & dry mouth. Hypotension and respiratory depression. Drowsiness and confusion.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements.
Other notes	Older and/or debilitated patients may require lower doses of morphine. Physical dependence may develop; avoid abrupt withdrawal of therapy. Tolerance may develop resulting in increased in dosage to achieve the required effect. Do not use any other morphine sulphate product for intravenous administration.

Prepared by:	Mary Coyle	13/10/16	Checked by:	J Mcgillycuddy	07/11/2016
Reviewed by:	Terry Smeaton	25/06/18	Checked by:	Mary Coyle	06/09/2018

Information provided relates to Morphine Sulphate Injection BP 30mg/mL solution for injection manufactured by Martindale.

References:

1. Gray A et al. Injectable Drugs Guide, 1st ed. London: Pharmaceutical Press; 2011.
2. BNF 75th edition. Available online at www.medicinescomplete.com (subscription required). Accessed 06/09/2018.
3. NHS Injectable Medicines Guide. Morphine Sulphate Adult Monograph. Version 5. Last updated 10/03/17. Available online at http://www.injguide.nhs.uk (passwordprotected). Accessed 25/06/2018.

NALOXONE in Procedural Sedation [Adult X-ray/ Endoscopy/ Renal] (page 1 of 2)

Indication: Opioid antagonist to reverse the effects of fentanyl used in procedural sedation.[1-3] It may reverse opioid-induced life-threatening respiratory depression indicated by:

- Respiratory rate < 8 respirations/min.
- O_2 sat < 85%, patient cyanosed.

If less severe opioid toxicity:

- Avoid administering any further opioid doses;
- Review analgesia, monitor patient closely, maintain hydration, oxygenation.

Form: 400 microgram per 1ml vial

Reconstitution: Already in solution

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central IV route

Dilute 400 microgram naloxone (1 ampoule) to 10ml with sodium chloride 0.9% injection in a 10ml syringe.[4, 5]
Initial dose: administer 80 microgram (2ml of diluted solution) as a slow IV injection. Flush the cannula with sodium chloride 0.9% after administering naloxone. Repeat at 2 minute intervals as necessary until adequate response (respiratory rate above 8).
If life-threatening respiratory depression persists, administer higher doses: 1.5-3 micrograms/kg (100-200 micrograms) over a few seconds. If response inadequate, give subsequent doses of 100 micrograms every 2 minutes.[6] Patients usually respond to 160-320 micrograms naloxone; a few patients may require higher doses (1-2mg).

Allergy	Not considered likely
Contra-indications	Previous hypersensitivity to naloxone
Usual dose range	The doses above are appropriate for reversal of the fentanyl doses used in procedural sedation. In case of opioid overdose or use of another drug, larger doses and/or naloxone infusion may be needed. See the general naloxone monograph for further details.

NALOXONE in Procedural Sedation [Adult Xray/Endoscopy/ Renal] (page 2 of 2)

Renal or Hepatic Impairment	No special requirements from manufacturer, contact pharmacy if further information is required.
Dose if underweight / obese	No special requirements from manufacturer, contact pharmacy if further information is required.
Infusion-related adverse effects	A reversal of opioid effects too rapidly may induce nausea, vomiting, sweating or tachycardia, seizures, hypertension, tremulousness, and cardiac arrest.
Extravasation	Likely to cause extravasation due to its low pH
Other common adverse effects	Hypotension, hypertension, ventricular tachycardia and fibrillation have occurred in postoperative patients following naloxone. Patients with pre-existing cardiovascular disease are at more risk of side effects
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Naloxone is not indicated for opioid-induced delirium or drowsiness that are not life-threatening or for patients on opioids who are dying. Patients on regular opioids for pain and symptom control are physically dependent; if naloxone is given in too large a dose or too quickly, an acute withdrawal reaction can occur & an abrupt return of pain that is difficult to control. Patients must be kept under observation following a satisfactory response because the duration of action of some opioids outlasts that of naloxone (15-90 mins)

Prepared by:	JMcgillycuddy	17/06/2014	Checked by:	Mary Coyle	15/07/2014
Updated by:	Iarlaith Doherty	08/02/2023	Checked by:	Aidan Morris	07/03/2023

Information provided relates to naloxone brand manufactured by Mercury.

References

1. Administration of Intravenous Conscious Sedation and / or Analgesia by a Registered Nurse during an Interventional Procedure in the Interventional Radiology Department, Adult Services - Procedure. Oct 2021.
2. Administration of Intravenous Conscious Sedation and / or Analgesia by a Registered Nurse during an Endoscopy in the Endoscopy Unit Procedure. Sept 2020.
3. Administration of Intravenous Conscious Sedation and/ or Analgesia by a Registered Nurse during an Interventional Procedure in the Adult Renal Dept Procedure. June 2017. All available on Qpulse via hospital intranet.
4. Lexicomp Online. Naloxone: Drug information. Last updated 2023 Mar 03. Available from http://online.lexi.com/.
5. Scottish Palliative Care Guidelines. 2019 version. Available at https://www.palliativecareguidelines.scot.nhs.uk/guidelines/medicine-information-sheets/naloxone.aspx. Accessed 2023 Mar 07.
6. BNF 84. September 2022 – March 2023.

NATALIZUMAB (Tysabri®) [Neurology] (page 1 of 2)

IV monoclonal antibodies are on the exclusion list of drugs not generally administered by nursing staff as per the Intravenous Drug Administration Policy

Form: 300mg in 15mL vial

Reconstitution: Not applicable

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route

Intermittent IV infusion
Add the 15 mL concentrate solution for infusion to 100 mL sodium chloride 0.9% solution for injection. Gently invert the solution to mix completely. **Do not shake.** Administer the infusion over approximately 1 hour at a rate of approximately 2 mL/minute. After the infusion is complete, flush the intravenous line with sodium chloride 0.9%.

Allergy	Hypersensitivity reactions have been associated with Natalizumab, including serious systemic reactions **Emergency resuscitation equipment must be available where Natalizumab is administered.** Patients who have experienced a hypersensitivity reaction must be permanently discontinued from treatment with Natalizumab. Patients should be advised that interruptions in therapy, particularly in the early months of treatment, may increase the risk of hypersensitivity reactions.
Contra-Indications	- Hypersensitivity to natalizumab - Progressive multifocal leukoencephalopathy (PML). - Patients with increased risk for opportunistic infections, including immunocompromised patients - Combination with other disease modifying therapy. - Known active malignancies.
Usual dose range	300mg once every 4 weeks.
Renal or Hepatic Impairment	Monitor liver function (liver dysfunction reported). Advise patients to report symptoms such as jaundice or dark urine. No dose adjustments recommended by manufacturer, if further information required, contact pharmacy.
Dose if underweight / obese	No specific advice from manufacturer, contact pharmacy if further information required.

NATALIZUMAB (Tysabri®) [Neurology] (page 2 of 2)

Infusion-related adverse effects	Infusion related reactions include dizziness, nausea, rigors and urticaria. Hypersensitivity reactions include rash, urticaria, hypotension, hypertension, chest pain, chest discomfort, dyspnoea, angioedema. If side effects occur stop infusion and contact doctor.
Other common adverse effects	Infections, urticaria, headache, dizziness, arthralgia, vomiting, pyrexia and fatigue. Liver dysfunction has been reported.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements.
Other notes	- Patients must be monitored during the 1 hour infusion and for 1 hour afterwards. - A nurse may administer Natalizumab in line with the Administration of Intravenous Natalizumab in the Adult Services of Tallaght Hospital Procedure. - Physicians must discuss the benefits and risks of natalizumab therapy with the patient and provide them with a Patient Alert Card. Patients should be instructed that if they develop any infection or symptoms of Progressive Multifocal Leukoencephalopathy (PML), then they should inform their physician immediately. After 2 years the patient should be re-informed about the risk of PML with TYSABRI. - Do not shake the infusion bag due to the potential for frothing to occur.

Prepared by:	Florence Lelieur	23/08/2011	Checked by:	Muriel Pate	28/11/2011
Updated by:	Mary Coyle	19/06/2018	Checked by:	Phil O'Byrne	04/07/2018

NICARDIPINE (Aguettant) [Acute Stroke Unit, ED] (Page 1 of 2)

Form: 10mg in 10ml vial

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Glucose 5%

Administration: Preferably administer via a central line. If given by a peripheral vein, the infusion site should be changed every **12 hours** to minimise venous irritation. [1]

Continuous IV infusion
Draw up 50mg of nicardipine (5x10ml of the 10mg/10mL ampoules i.e. 50mL in total) in a syringe. Withdraw 50mls of fluid from a glucose 5% 500mL bag and discard. Add the 50mg (i.e. 50mL) of nicardipine to this bag to give a 0.1mg/mL infusion solution and administer using a rate-controlled pump.

Infusion Rate for Nicardipine 0.1mg/mL

Rate mg/hour	Rate mL/hour of 0.1mg/mL solution
5mg/hour	50mL/hour
7.5mg/hour	75mL/hour
10mg/hour	100mL/hour
12.5mg/hour	125mL/hour
15mg/hour	150mL/hour

Allergy	Nicardipine is a calcium channel blocker. The formulation contains fructose
Contra-Indications	Acute porphyrias; cardiogenic shock; significant or advanced aortic stenosis; unstable or acute attacks of angina; avoid within 8 days of myocardial infarction; compensatory hypertension
Usual dose range	Nicardipine 5mg/hour IV continuous infusion, may increase by 2.5mg/hour every 5 minutes to a maximum rate of 15mg/hour (see infusion rate table). Once the target blood pressure (BP) has been reached, the rate of infusion should be gradually reduced usually to between 2-4mg/ hour to maintain the target BP. [2]
Renal or Hepatic Impairment	Dose reductions may be required in moderate renal impairment and in hepatic impairment.

NICARDIPINE (Aguettant®) [Acute Stroke Unit, ED] (Page 2 of 2)

Dose if underweight/Obese	Nil specific
Infusion –related adverse effects	Infusion site reactions can occur, particularly with prolonged duration of administration and in peripheral veins. It is advised to change the infusion site in case of any suspicion of infusion site irritation.
Extravasion	Low pH: may cause venous irritation and tissue damage in cases of extravasion
Other common adverse effects	Abdominal pain; dizziness; drowsiness; flushing; headache; nausea; palpitations; peripheral oedema; skin reactions; tachycardia; vomiting, hypotension
ECG/ Telemetry?	N/A
Special giving set?	N/A
Other notes	Flush with 0.9% sodium chloride

Prepared by:	C' O Riordan	29/11/11	Checked by:	Caitriona Gowing	29/11/11
Updated by:	Eimear Ni Loingsigh	16/03/23	Checked by:	Joan Mcgillycuddy	18/05/23

Information provided relates to Aguettant 10mg/10ml (exempt medicinal product) manufactured by Novartis Pharma.

References

1. Medusa NHS Injectable Medicines Guide. Nicardipine monograph v6. Available online at https://medusa.wales.nhs.uk (subscription required). Accessed 18/05/2023.
2. TUH Adult Medicines Guide Online. Guidelines for Acute Hypertension Management in Ischaemic Stroke. Accessed 18/05/2023.

NIMODIPINE (Nimotop®) [Critical Care/Acute Stroke]

Indication: Treatment of ischaemic neurological deficits following aneurysmal subarachnoid haemorrhage

Form: 10 mg/50mL vial

Reconstitution: Already in solution. Do not dilute further for administration. Must not be added to an infusion bag/bottle and must not be mixed with other drugs.

Compatible Fluid: Must not be added to an infusion bag or bottle. Y-siting compatible fluids* are sodium chloride 0.9% and glucose 5%.

Administration: Central IV route only

Central IV continuous infusion

Draw up 50mL of nimodipine 10mg/50mL solution into a 50mL syringe and connect to a three-way stopcock using the standard vygon giving set (or any other PVC-free giving set). The stopcock must allow for concomitant flow of the nimodipine solution and a co-infusion solution. Nimodipine solution must be administered with a co-infusion running at a minimum rate of 40 mL/hour of compatible infusion fluid* which is connected to the second port of the three-way stopcock prior to its connection with the central line catheter.

Rate of administration of nimodipine 0.2mg/mL (i.e. 10mg in 50mL)

Dose	500 micrograms/hour	1mg/hour	2mg/hour
Rate of administration (mL/hour)	2.5mL/hr	5mL/hr	10mL/hr

Allergy	Allergic reactions are uncommon.
Contra-indications	Hypersensitivity to nimodipine or excipients.
Usual dose range	Initially 1mg/hour (use 500 microgram/hour if body weight <70kg or if blood pressure unstable), increased after 2 hours to 2mg/hour if no severe fall in blood pressure; continue for at least 5 days (max 14 days).

NIMODIPINE (Nimotop®) [Critical Care/Acute Stroke]

Renal or Hepatic Impairment	No dose adjustment in renal impairment or dialysis. Dose reduction may be necessary in patients with cirrhotic patients.
Dose if underweight / obese	See 'Usual dose range'. Lower initial starting dose needed for patients <70kg.
Infusion-related adverse effects	Hypotension (BP should be monitored continuously), variation in heart rate, flushing, headache, GI disorders, nausea, sweating, feeling of warmth[1]. Rarely thrombophlebitis. Likely to cause tissue damage in the event of extravasation due to alcohol content and high osmolarity.[1]
Other common adverse effects	As above
ECG/ telemetry?	No special requirements
Special giving set?	**Nimodipine is incompatible with PVC. Use the infusion line provided if there is one available with the product. Otherwise administer using a syringe pump as both the syringes and the giving sets (standard Vygon sets– e.g. Lectro Cath Ref: 1155.15 and Lectro Spiral Ref: 1155:80) in Tallaght University Hospital are PVC-free.
Other notes	Nimodipine must be protected from light. Store the vials in original cardboard boxes. During administration, protect the syringe from direct sunlight, but the nimodipine is stable in diffuse sunlight or artificial light for 10 hours. The solution must be clear and yellow; inspect visually for particular matter or discoloration prior to administration and discard if present. Nimodipine contains ethanol therefore caution is required with other drugs that interact with alcohol e.g. metronidazole. To penetrate the coated injection stoppers correctly, fine acute injection needles (e.g. 21 gauge) are recommended. DO NOT use large-core infusion needles. Take patient's BP into account in deciding when to commence oral or NG nimodipine. *For patients at risk of fluid overload, SPC alternatively allows y-siting administration of blood, human albumin or mannitol 10%: see SPC available at www.hpra.ie for further details.

Prepared by:	JMcgillycuddy	07/11/2016	Checked by:	Mary Coyle	09/11/2016
Reviewed by:	Terry Smeaton	27/06/18	Checked by:	Mary Coyle	06/09/2018
Minor update (shortage) re products included and special giving set by D. Stewart 26/05/2025.					
Information provided relates to Nimotop 0.02% w/v Concentrate for Solution for Infusion manufactured by Bayer including					

UK EMP.
References: 1. NHS Injectable Medicines Guide. Nimodipine Adult Monograph. Version 6. Last updated 20/02/17. Available online at http://www.injguide.nhs.uk (password-protected). Accessed 27/06/18.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

NORADRENALINE (Norepinephrine)

Noradrenaline (Norepinephrine) 1mg/mL (1:1000) Concentrate For Solution For Infusion [Critical care] (page 1 of 2)

Form: **1mg/mL** (noradrenaline base)
Different brands and vial sizes available

Reconstitution: Already in solution
Further dilute before administration.

Compatible Fluid: Glucose 5% (preferred diluent)
Sodium chloride 0.9% (unlicensed) [1]

Administration: Central IV route only [1]

Continuous IV infusion
Noradrenaline can be administered as either a single, double or quadruple strength infusion. Further dilute as per the following table with compatible infusion fluid to 50mL and administer using a syringe pump:

Strength	Amount of Noradrenaline	Diluted to (final volume)	Strength (microgram/ml)
Single	3mg	50ml	60 microgram/ml
Double	6mg		120 microgram/ml
Quadruple	12mg		240 microgram/ml

IMPORTANT NOTE on calculating rate:
Dosage is often prescribed in terms of microgram/minute. If you are using the drug library on the BBraun smartpump (as recommended), select the **noradrenaline strength in use (Single/ Double/ Quadruple) and the desired **noradrenaline dose in microgram/minute**. The pump will calculate rate in mL/hour. **

See page 2 also

NORADRENALINE (Norepinephrine)
Noradrenaline (Norepinephrine) 1mg/mL (1:1000) Concentrate For Solution For Infusion brand [Critical care]

Allergy	Do not use in patients with hypersensitivity to noradrenaline.
Contra-indications	Do not use with cyclopropane and halothane anaesthetics.
Usual dose range	Infusion rate adjusted according to patient's BP.
Renal or Hepatic Impairment	Special caution should be used for patients with liver failure and severe renal dysfunction.
Dose if underweight/obese	No special advice from manufacturer.
Infusion-related adverse effects	Hypertension, bradycardia and arrhythmias. Headache, anxiety, peripheral ischaemia, vasoconstriction and peripheral ischaemia. Hyperglycaemia, decreased urinary output, tissue hypoxia and metabolic acidosis.
Other common adverse effects	As above.
ECG/ telemetry?	Continuous ECG and BP monitoring required.
Special giving set?	No special requirements.
Other notes	Glucose 5 % is the preferred diluent as the glucose content provides protection against significant loss of potency due to oxidation. Noradrenaline infusion must not be used if it is discoloured (e.g. pink, dark yellow, brown) or contains precipitate. Noradrenaline should be used only in conjunction with appropriate blood volume replacement. A replacement infusion must always be prepared before the infusion being administered is completed. Unit policy in ICU recommends double pumping with a three way tap connection with all inotropes. Start double pumping with at least 5mL left to administer or as per rate of infusion. Use single strength infusion for rates up to 10microgram/min, double strength for 10-20microgram/min and quadruple strength for rates greater than 20microgram/min. When the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with sodium chloride 0.9%. Infusions should be reduced gradually, avoiding abrupt withdrawal.

Prepared by:	Mary Coyle	11/11/2014	Checked by:	J Hayde	10/02/2015
Amended by:	Mary Coyle	21/04/2015	Checked by:	J.Hayde	08/05/2015
			Approved by:	Dr Fitzpatrick	14/07/2015
Last updated:	J Mcgillycuddy	08/05/2019	Checked:	Carol O'Brady	08/05/2019
Minor update due to shortage of Pfizer brand:	D. Stewart	07/10/2024	Checked:	Laura McCabe	07/10/2024

Information provided relates to Noradrenaline (Norepinephrine) 1mg/mL (1:1000) Concentrate For Solution For Infusion Pfizer, Aguettant, AS Kalceks brands

References: 1. NHS Injectable Medicines Guide. Noradrenaline Adult Monograph. Version 12. Available online at medusaimg.nhs.uk (password-protected). Accessed 07/10/24.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

OCRELIZUMAB (Ocrevus®) [Neurology] (page 1 of 3)

IV monoclonal antibodies are on the exclusion list of drugs not generally to be administered by nursing staff as per the Intravenous Dr Administration Policy

Form: 300 mg/10ml vial

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route

Infusion 1 and 2:
Intermittent IV infusion
Further dilute the 10 mL (300mg) with 250mL of compatible infusion fluid. Do not shake. Ocrelizumab should be infused at a rate of 30mL/hour for 30 mins, increasing in 30mL/hour increments every 30 mins to a maximum rate of 180mL/hour via an infusion pump. Patients should be monitored during the infusion and for at least 1 hour after completion of the infusion.

Subsequent infusions:
Intermittent IV infusion
Further dilute the 20 mL (600mg) i.e. two 300mg vials, with 500mL of compatible infusion fluid. Do not shake. Ocrelizumab should be infused at a rate of 40mL/hour for 30 mins, increasing in 40mL/hour increments every 30 mins to a maximum rate of 200mL/hour via an infusion pump. In carefully-selected patients, there is an option to administer infusion at a faster infusion rate (see other notes below)* Patients should be monitored during the infusion and for at least 1 hour after completion of the infusion.

Infusion table for Ocrelizumab:

	Rate of infusion (mL/hour)				
	Starting rate	➡	➡	➡	**Max Rate**
Infusion 1 and 2:	30	60	90	120	180
Subsequent infusions:	40	80	120	160	200
Carefully-selected patients	100	200	250	300	300

OCRELIZUMAB (Ocrevus®) [Neurology] (page 2 of 3)

Allergy	Acute infusion reactions including anaphylactic reactions can occur.
Contra-indications	Current active infection Patients who are severely immunocompromised Patients with known active malignancies
Usual dose range	**First dose as 2 infusions:** 300mg infusion followed 2 weeks later by a second 300mg infusion. **Subsequently:** 600mg infusion every 6 months
Renal or Hepatic Impairment	No formal pharmacokinetic studies of those with moderate to severe renal or hepatic impairment have been conducted.
Dose if underweight / obese	No special advice from manufacturer.
Infusion-related adverse effects	Pruritus, rash, urticaria, erythema, throat irritation, oropharyngeal pain, dyspnoea, pharyngeal or laryngeal oedema, flushing, hypotension, pyrexia, fatigue, headache, dizziness, nausea and tachycardia.
Extravasation	No information available
Other common adverse effects	Infections, cough, catarrh, blood immunoglobulins decreased, neutropenia, nasopharyngitis, sinusitis, bronchitis, conjunctivitis.
ECG/ telemetry?	No special requirements.
Special giving set?	For IV infusion, BBraun infusion pumps: Infusomat Space Line giving set with in-line filter including 0.2 micron filter NSV code: FSB03230 (8700098SP).
Other notes	Premedication with methylprednisolone 100mg and an antihistamine ± antipyretic is recommended 30mins before administration. The name and the batch number of the product should be recorded on the kardex. Patients should be brought up to date with all immunisations in agreement with current immunisation guidelines prior to initiating vedolizumab treatment. **Life-threatening Infusion Related Reaction (IRR)** e.g. acute hypersensitivity, acute respiratory distress syndrome – stop the infusion immediately. It must be permanently discontinued. **Severe IRR** e.g. dyspnoea; complex of flushing, fever, throat pain – stop the infusion temporarily; treat symptoms; restart the infusion at half the previous rate only after all the symptoms have resolved. **Mild to moderate IRR** e.g. headache – reduce the rate of infusion to half the rate at the onset of symptoms for at least 30 mins. If tolerated, the infusion rate may be increased by the increments outlined in the above infusion table. In the cases of severe/mild-moderate IRR, no infusion adjustment is necessary for subsequent infusions unless the patient experiences an IRR again.

OCRELIZUMAB (Ocrevus®) [Neurology] (page 2 of 3)

	*In carefully selected patients who have not experienced an infusion related reaction to any previous infusion, consideration may be given to administering subsequent infusions at a faster rate. Ocrelizumab can be infused at a rate of 100mL/hour for 15 mins, increasing to 200mL/hour for the next 15 minutes, increasing to 250mL/hour for the next 30 minutes and finally to 300mL/hour for the remaining 60 minutes via an infusion pump.

Prepared by:	Mary Coyle	25/09/2018	Checked by:	Colette Morris	28/11/2018
Updated by:	Maeve Harty	27/01/2021	Checked by:	Roisin Logan	12/02/2021
Giving set product code and NSV code update by:				JMcgillycuddy	11/05/2022

Information provided relates to Ocrevus® manufactured by Roche.

Reference

1. Medusa Injectable Medicines Guide. Available online at http://www.injguide.nhs.uk (password restricted). Accessed 27/01/2021

PARICALCITOL (Zemplar®) [Dialysis Unit]

Form: 5 micrograms in 1ml ampoule

Reconstitution: Already in solution

Compatible Fluid: Not applicable

Administration: Slow IV injection
Administer by slow IV injection over 3-5 mins[1] via venous port on the dialysis circuit.

Allergy	Hypersensitivity reactions reported (uncommon)
Contra-Indications	Hypersensitivity, vitamin D toxicity or hypercalcemia.
Usual dose range	Initial dose should be calculated based on baseline parathryroid hormone (iPTH) levels- See SPC.
Renal or Hepatic Impairment	For use in patients with chronic renal failure undergoing haemodialysis. No dose change required in hepatic impairment.
Dose if underweight / obese	No specific advice from manufacturer, contact pharmacy if further information required.
Infusion-related adverse effects	N/A
Extravasation	Likely to cause tissue damage as solution contains propylene glycol and ethanol and has high osmolarity.
Other common adverse effects	Abdominal pain; headache; hypercalcaemia; hypercalciuria; nausea; skin reactions; electrolyte imbalance; hypoparathyroidism; taste altered.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements.
Other notes	Monitor plasma calcium and phosphate during dose titration and at least monthly when stabilised; serum intact PTH measurement advised every 3 months. Contains 20% v/v of ethanol (alcohol). Each dose contains up to 1.3g ethanol. May be harmful for those with alcoholism or patients taking metronidazole. Digoxin toxicity is potentiated by hypercalcaemia of any cause, so caution should be applied when digoxin is prescribed concomitantly with paricalcitol. Paricalcitol also contains propylene glycol which binds to heparin, therefore should not be administered through the same injection port as heparin.

Prepared by:	Florence Lelieur	11/08/2011	Checked by:	Muriel Pate	29/11/2011
Updated by:	Helen O'Hara	15/03/2023	Checked by:	JMcgillycuddy	15/03/2023

Reference 1. NHS Medusa Injectable Medicines Guide. Paricalcitol monograph. V8 Available at www.injguide.nhs.uk (password restricted). Accessed 15/03/2023.

PATISIRAN (Onpattro®) [Rynd Unit] (page 1 of 2)

prepared by the Aseptic Unit in Pharmacy

Form: Required dose in 200mL bag

Reconstitution: Patisiran is reconstituted in the Aseptic Unit in Pharmacy

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route

Intermittent IV infusion

Patisiran is reconstituted in the Aseptic Unit in Pharmacy. This infusion should be administered at an initial rate of 60mL/hour for the first 15 minutes, followed by an increase to 180mL/L per hour for the remainder of the infusion. The duration of infusion may be extended in the event of an infusion-related reaction (see table further on). Use an infusion set with a 1.2 micron PES in-line infusion filter. The Braun proset infusomat giving set with a 1.2 micron filter will be supplied from the Aseptic Unit, together with the infusion bag. This must be used with the BBraun Infusion pump.

Allergy	If anaphylactic reaction to any excipients
Contra-Indications	Severe hypersensitivity (anaphylaxis) to patisiran or any excipients. Pregnancy.
Usual dose range	0.3mg/kg once every three weeks (capped at 30mg per dose). *Dose rounded to the nearest 0.4mg dose (to match the smallest syringe graduation used to draw up required dose).
Infusion-related adverse effects	IRR have been observed, with the majority experienced during the first two infusions. The most common symptoms are flushing, back pain, nausea, abdominal pain, dyspnoea and headaches. Hypotension and syncope may also be experienced.
Extravasation	Non-vesicant
Other common adverse effects	Peripheral oedema (very common), bronchitis, sinusitis, rhinitis, vertigo, dyspnoea, dyspepsia, erythema, arthralgia, muscle spasms, extravasation (uncommon)

PATISIRAN (Onpattro)® [Rynd Unit] (page 2 of 2)

Renal or Hepatic Impairment	Not studied in patients with severe renal impairment (CrCl<30mls/min) or end-stage renal disease. Not studied in moderate to severe liver disease.
Dose if underweight / obese	Weight-based dose (capped at 100kg)
ECG/ telemetry?	No
Special giving set?	The Braun proset infusomat giving set with a 1.2 micron filter which is DEHP-free will be supplied from the Aseptic Unit with the infusion bag.
Other notes	Patient should be treated with the pre-medications specified in the TUH Patisiran protocol **at least 60 minutes prior to the start of the patirisan infusion.** If an IRR occurs, slowing or interrupting the infusion and institution of medical management should be considered, as clinically indicated. If the infusion is interrupted, resumption of the infusion at a slower infusion rate may be considered after symptoms have resolved. The patisiran infusion should be discontinued in the case of a serious or life-threatening IRR. The infusion bag provided by the Aseptic Unit is stored in the refrigerator. Please contact the Aseptic Unit if stored incorrectly. Inspect visually prior to administration. Gently agitate the infusion bag containing the diluted solution to ensure thorough mixing of the product and diluent. Do not shake the infusion bag.

Prepared by:	JMcgillycuddy	14/12/2021	Checked by:	Maeve Harty	14/12/2021

Information provided relates to Patisiran (Ontpattro).

References

1. HSE Patisiran Medicines Management Programme template. Published 26/11/2021. AHDMP Protocol Code: PATIS001. Version 1.
2. Onpattro 2 mg/mL concentrate for solution for infusion. Available at: https://www.ema.europa.eu/en/documents/product-information/onpattro-epar-product-information_en.pdf . Accessed 2nd December 2021.

PHENYLEPHRINE [Critical Care] (page 1 of 2)

Indication: Acute hypotension

Form: 500microgram per 10ml prefilled syringe
10mg per 1ml ampoule

Reconstitution: Already in solution
Further dilute ampoule before administration

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central (preferred) IV route

IV bolus
It is preferable to use the prefilled syringe for bolus dosing. Administer prescribed dose over 3-5 minutes. Injections should be repeated no more often than every 15 minutes.

Continuous IV infusion- peripheral or central
Dilute 10mg (1ml of a 10mg/ml solution) to **100ml** compatible infusion fluid to give a 100microgram/ml solution. 50ml of this solution is drawn up into a syringe and administered using the BBraun **syringe pump** after selecting the Phenylephrine **Theatre** entry in the **Theatre drug library.**
Initial maximum rate 180 microgram/ minute, adjusted to 30-60 microgram/ minute according to response, via syringe pump.

Infusion Concentration & Route	**Rate of infusion (ml/hour)**		
	Suggested starting rate		
	180 microgram/min	**60 microgram/min**	**30 microgram/min**
Peripheral or Central 100microgram/ml, 50ml syringe	108ml/hour	36ml/hour	18ml/hr

PHENYLEPHRINE [Critical Care] (page 2 of 2)

Allergy	May rarely occur
Contra-indications	Hypersensitivity to phenylephrine or any of the excipients, patients taking monoamine oxidase inhibitors or within 14 days of ceasing such treatment. Severe hypertension or peripheral vascular disease due to risk of vascular thrombosis or ischemic gangrene. In patients with severe hyperthyroidism. Avoid in patients with prostatic enlargement.
Usual dose range	Usual IV bolus dose=0.2mg; range 0.1-0.5mg. Continuous IV infusion: initial maximum rate 180 microgram/ minute, adjusted to 30-60 microgram/minute according to response
Renal or Hepatic Impairment	Lower doses may be required. Titrate to effect.
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	-Increased blood pressure, tachycardia or reflex bradycardia; monitor blood pressure and heart rate -May precipitate angina pain in patients with angina pectoris -Paraesthesia in the extremities -Extravasation may cause tissue necrosis; monitor injection site
Extravasation	Tissue damage/necrosis if given peripherally as potent vasoconstrictor and has low pH
Other common adverse effects	The most common adverse effects of phenylephrine are bradycardia, nausea, vomiting, angina pain in patients with angina, paraesthesia and hypertensive episodes (at higher doses)
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Contact Pharmacy re y-site compatibility information if required. When an IV infusion is discontinued, slow the infusion rate gradually; do not stop it abruptly.

Updated by:	Maeve Harty	21/12/2022	Checked by:	JMcgillycuddy	19/04/2023
Minor update	JMcgillycuddy	29/05/2023	Checked by:	Maeve Harty E Morrissey	29/05/2023

Reference

1. Medusa Injectable Medicines Guide. Available online at http://www.injguide.nhs.uk (password restricted). Accessed 19/04/2023.

POTASSIUM CHLORIDE for administration within CRITICAL CARE ONLY (page 1 of 3)

(Refer to IV Potassium Policy in Adult Medicines Guide also)

Glucose 5% should not be used in the initial treatment of severe hypokalaemia as it can cause a reduction in potassium levels.

Concentrated Preparations

1. Potassium Chloride mini-plasco - 20mmol K^+ and 20mmol Cl^- per 10ml
This preparation must be further diluted prior to administration.
Bolus injection can be fatal.
2. Potassium chloride 40mmol in 100mL sodium chloride 0.9%w/v

Safety Precautions for IV Potassium

All 4 safety points must be considered

1. Storage

Fatalities have occurred when potassium plastic ampoules have been mistaken for sodium chloride 0.9% or water for injections and hence given as a bolus.

- All **ampoules** of concentrated potassium must be **stored in the controlled drugs cabinet** or in the case of ICU in a separate locked cabinet. **This includes ampoules of potassium chloride, potassium phosphate and Addiphos®**

2. Preparation

- All potassium infusions must be mixed thoroughly before administration.
- Use premixed bags where possible.
- If adding concentrated potassium to an infusion bag, it is **essential** to ensure **careful and thorough mixing** by squeezing and inverting at least 10 times.[1,4] The potassium chloride solution is "heavier" than the infusion fluid.

Layering can arise, with subsequent serious toxic effects if these solutions are not mixed thoroughly.

- Compatible infusion fluids are: Sodium chloride 0.9% and Glucose 5%. Use premixed bags where possible. Compound sodium lactate / Hartmann's solution is not recommended as it already contains potassium but may be used in exceptional circumstances. If using, consideration should be given to the potassium content of the bag. 1 litre of Compound Sodium Lactate contains potassium 5mmol.

3. Rate of administration

Rate control is essential: administer via a rate-controlled infusion pump.

- The **maximum recommended rate** of administration is **10mmol/ hour.** Slower rates of administration should be used if possible.
- The **absolute maximum rate** of administration is **20mmol/ hour***. This **must not be exceeded**.

Telemetry is **required if administering at 20mmol/hour: see "ECG/telemetry" below*

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

POTASSIUM CHLORIDE for administration within CRITICAL CARE ONLY (page 2 of 3)

4. Concentration

Central administration:

- A central line is recommended for concentrations **greater than 40mmol/L.**
- The usual **maximum concentration** of potassium chloride within the critical care setting is **40mmol** in 100mL infusion fluid via a central line.
- Telemetry is **required** when the infusion concentration is **greater than 80mmol/L.** Also see "ECG/telemetry" below.

Peripheral administration:

- If a central line is not available the **usual maximum concentration** of potassium chloride for peripheral administration is 40mmol/L (ready-made bags available).
- If fluid restricted, absolute maximum concentration for peripheral administration is 60mmol/L
  - **a. Consult registrar/consultant**.
  - **b.** Use a large vein with a relatively high blood flow.
  - **c.** Monitor for pain or phlebitis, and change to a lower concentration or oral route as soon as possible.
  - **d.** Note that potassium chloride 60mmol in 1 litre sodium chloride 0.9% ready-made bag may be appropriate, although it is only licensed for central use.

Potassium chloride is a **potent vesicant**, it is essential to monitor the patient and injection site for pain or phlebitis occurring during administration.

Allergy	Not considered likely
Contra-Indications	Hyperkalaemia,hyperchloraemia[4]
Usual dose range	According to biochemical monitoring. See Adult Medicines Guide, section 8.1
Renal or Hepatic Impairment	Special care and careful monitoring in renal impairment (risk of hyperkalaemia)
Dose if underweight / obese	No specific advice from manufacturer.
Infusion-related adverse effects	See 4. Concentration above. Local pain, phlebitis, particularly at higher concentrations. Too rapid administration can cause life threatening hyperkalaemia and cardiotoxicity e.g. cardiac depression, arrhythmias or arrest.[4]
Extravasation	Extravasation may cause tissue damage due to high osmolarity and low pH. See 4. Concentration, above. See section B of the IV monograph folder for guidance on the initial management of extravasation.

POTASSIUM CHLORIDE for administration within CRITICAL CARE ONLY (page 3 of 3)

Other common adverse effects	Hyperkalaemia especially in patients with renal impairment.[4]
ECG/ telemetry?	Telemetry is **required** for all patients receiving potassium via the central route.
Special giving set?	No special requirements.

Prepared by:	Mary Coyle	03/11/2014	Checked by:	Jennifer Hayde	06/02/2015
			Approved by:	Dr Fitzpatrick	14/07/2015
Reviewed by:	T Smeaton	16/07/18	Checked by:	Mary Coyle Colette Morris	06/09/2018 08/02/2019
Reviewed by:	Grace Power	17/12/20	Checked by:	Mary Coyle	05/01/2021
Reviewed by:	D Stewart	10/03/2025	Checked by:	K Burke	16/04/2025

References

1. Irish Medication Safety network. Oct 2020. Best practise guidelines for the safe use of intravenous potassium in Irish hospitals. Accessed 10.03.2025.
2. Tallaght University Hospital Adults Medicines Guide. Intravenous potassium supplementation. Sept 2021. Accessed 10.03.2025.
3. Medusa Injectable Medicines Guide. Available online at online at www.medusaimg (password restricted). Accessed 10/03/2025.
4. Injectable Drugs Guide. Available online at www.medicinescomplete.com (subscription required) Accessed 10/03/2025.

POTASSIUM PHOSPHATE [Critical care] (page 1 of 3)

Form: 20mL vial contains 12mmol Phosphate & 20mmol Potassium

Reconstitution: Already in solution.
Bolus injection may be fatal:
further dilute before administration

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central IV route
Intermittent IV infusion (**peripheral route**)
Add each 20mL vial to at least 500mL infusion fluid. Administer over at least 2 hours using a rate controlled infusion pump.[1]

Intermittent IV infusion (**central route**)
Add each 20ml ampoule to at least 100ml of infusion fluid.[2] Administer over at least 2 hours using a rate controlled infusion pump.

Essential safety precautions (IV preparations containing Potassium)

1. **Storage**

Fatalities have occurred when potassium plastic ampoules have been mistaken for sodium chloride 0.9% or water for injections and hence given as a bolus.
In ICU, all **ampoules** of concentrated potassium must be **stored** in a **separate locked cabinet. This includes ampoules of potassium chloride, potassium phosphate** and **Addiphos®.**

2. **Preparation**

All potassium infusions must be mixed thoroughly before administration.
If adding concentrated potassium to an infusion bag, it is **essential** to ensure **careful and thorough mixing** by squeezing and inverting at least 10 times. The potassium solution is "heavier" than the infusion fluid.[1]

Layering can arise, with subsequent serious toxic effects if these solutions are not mixed thoroughly.

POTASSIUM PHOSPHATE [Critical care] (page 2 of 3)

3. Rate of administration

Rate control is essential: administer via a rate-controlled infusion pump.

- The **maximum recommended rate** of potassium administration is **10mmol/hour**. Slower rates of administration should be used if possible.
- The **absolute maximum rate** of potassium administration is **20mmol/hour***. This **must not be exceeded**.

Telemetry **required if administering at 20mmol/hour. Also see "ECG/telemetry" below.*

4. Concentration

- A central line is recommended for concentrations **greater than 40mmol/L.**
- The usual **maximum concentration** of potassium within the critical care setting is **40mmol** in 100mL infusion fluid via a central line.
- Telemetry is **required** when the infusion concentration is **greater than 80mmol/L.** Also see "ECG/telemetry" below.

Allergy	Not considered likely
Contra-Indications	Serum potassium >5mmol/L, hyperphosphataemia, hypocalcaemia. Use in presence of dehydration without fluid replacement.
Usual dose range	Calculate for individual patient. See Adult Medicines Guide, section 8.6 re hypophosphataemia and section 8.1 re hypokalaemia.
Renal or Hepatic Impairment	Caution in renal disease due to high potassium and phosphate content.
Dose if underweight / obese	No specific recommendations
Infusion-related adverse effects	Local pain and phlebitis. Too rapid administration can cause hyperphosphataemia and life threatening hyperkalaemia and cardiotoxicity e.g. cardiac arrhythmias or arrest.
Extravasation	Potassium is a potent vesicant and it is essential to monitor the patient and injection site for pain or phlebitis occurring during administration. Extravasation can cause tissue damage. See 4. Concentration above. See section B of the IV monograph folder for guidance on the initial management of extravasation.

POTASSIUM PHOSPHATE [Critical care] (page 3 of 3)

Other common adverse effects	NA
ECG/ telemetry?	Telemetry is required for all patients receiving potassium via the central route
Special giving set?	No special requirements. Rate control essential. Administer via rate-controlled infusion pump.
Other notes	Store in the potassium cabinet in ICU. Additions should never be made to phosphate infusions. These infusions should always be given separately.[2] Since high levels of phosphate administration can cause hypocalcaemia, it is recommended that calcium levels are monitoring during use. When the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with glucose 5% or sodium chloride 0.9%.

Prepared by:	Mary Coyle	01/07/2019	Checked by:	JMcgillycuddy	16/09/2019
Updated by:	D Stewart	08/05/2025	Checked by:	K Burke	10/07/2025

Information relates to the B Braun brand of potassium phosphate.

References

1. Tallaght University Hospital Adult Medicines Guide. 8.6 Hypophosphataemia. Accessed 13.03.2025.
2. Medusa Injectable Medicines Guide. Medicine and infusions that should be infused separately from other medicines. Jan 2025. Available online at online at www.medusaimg (password restricted). Accessed 13/03/2025.

PROPOFOL-LIPURO 1% [ICU/PACU] (page 1 of 2)

Form: 10 mg in 1mL (20ml ampoule, and 100ml bottle)

Reconstitution: Already in solution.

Compatible Fluid: Do not dilute further.

Administration: Peripheral or central IV administration

2. Shake container before use.
3. If two layers can be seen after shaking, the product should not be used.
4. Before use, the neck of the ampoule or the surface of the rubber stopper of the bottle should be cleaned with medicinal alcohol swabs. Administration must commence without delay as product does not contain antimicrobial preservatives.
5. Propofol is administered as a continuous infusion via a volumetric pump and is adjusted according to depth of sedation (Refer to AMNCH ICU Sedation Policy).
6. Propofol-Lipuro can be administered for a maximum licensed period of 7 days.

Allergy	Known hypersensitivity to propofol or any constituents of the emulsion (soya-bean oil, medium chain triglycerides, glycerol, egg lecithin, sodium oleate). Due to cross sensitivity, propofol is contra-indicated in those patients hypersensitive to peanuts.
Contra-indications	See above
Usual dose range	Sedation of ventilated patients in the ICU * Via continuous infusion: Rate should be adjusted according to the depth of sedation. Usually satisfactory sedation is achieved with administration rates in the range of 0.03 – 0.4mL/kg/hour. **Max infusion rate for all patients in TUH ICU = 0.3mL/kg/hr (i.e. 3mg/kg/hr). Must not exceed 20mL/hr.** * For dosing in other indications, see www.hpra.ie.
Renal or Hepatic Impairment	No dose adjustment required in renal impairment. Use with caution in patient with hepatic impairment.
Dose if underweight / obese	No special advice from manufacturer.

PROPOFOL LIPURO 1% [ICU/PACU] (page 2 of 2)

Infusion-related adverse effects	Injection site pain, hypotension, bradycardia, respiratory depression and headache
Other common adverse effects	As above. Nausea, vomiting, metabolic acidosis, hyperkalaemia, hyperlipidaemia, seizure activity, hepatomegaly, cardiac failure and rhabdomyolysis have been reported in patients receiving propofol. After prolonged exposure, discolouration of urine may occur.
ECG/ telemetry?	ECG monitoring required
Special giving set?	The duration of continuous infusion of Propofol-Lipuro from one infusion system must not exceed 12 hours. The infusion line and bottle of Propofol-Lipuro must be discarded and replaced after 12 hours at the latest. Any portion of Propofol-Lipuro remaining after the end of infusion or after replacement of the infusion system must be discarded.
Other notes	Refer to the AMNCH ICU Sedation Policy for target RASS scores, dosage adjustment advice and information regarding daily awakening trials. Consider monitoring blood lipid levels in patients thought to be at particular risk of fat overload or those on propofol infusion for longer than 3 days. **NB – review propofol prescription if CK is above normal limits**

Prepared by:	Mary Coyle	12/11/2014	Checked by:	Jennifer Hayde	06/02/2015
Amended by:	Mary Coyle	21/04/2015	Checked by:	Jennifer Hayde	08/05/2015
			Approved by:	Dr Fitzpatrick	14/07/2015
Updated by:	T Smeaton	17/07/2018	Checked by:	Mary Coyle	07/09/2018

Information provided relates to Propofol-Lipuro 1% (10mg/mL) emulsion for injection or infusion manufactured by B. Braun Melsungen AG.

References

1. Propofol-lipuro Infusion Policy for the Intensive Care Unit. Date Unknown.
2. NHS Injectable Medicines Guide. Propofol-Lipuro Adult Monograph. Version 2. Last updated 17/07/2018. Available online at www.injguide.nhs.uk. (password-protected). Accessed 17/07/2018.

REMIFENTANIL [Critical Care] (page 1 of 3)

Form: 5mg dry powder vial

Reconstitution: Reconstitute 5mg with 5mL of sodium chloride 0.9% solution for injection OR 5mL of water for injection giving 1mg/ml solution.
Further dilute before administration.

Compatible Fluid: Sodium Chloride 0.9%
Glucose 5%

Administration: Central IV route preferred.[1] If administered peripherally, administer via a large vein and monitor administration site closely for phlebitis.[1]

Continuous IV Infusion
Dilute 2.5mg (2.5mL of 1mg/mL solution) to 50mL with compatible fluid (final concentration 50 microgram/mL) and administer using a syringe pump.

IMPORTANT NOTE on calculating dose

If you are using the drug library on the BBraun smartpump (as recommended), enter the patient's **weight in kg & the **desired dose in microgram/kg/minute.** The pump will calculate rate in ml/hour of a 50microgram/mL solution. Otherwise, use this table to calculate the infusion rate. **

Remifentanil 50 microgram/mL solution Sample Dose Tables

	Continuous Infusion Rate (microgram/kg/min)											
Ideal Body Wt (kg)	**0.025**	**0.05**	**0.075**	**0.1**	**0.125**	**0.15**	**0.175**	**0.2**	**0.225**	**0.25**	**0.275**	**0.3**
				Initial Rate								
	Rate of Infusion (mL/hr of 50 microgram/ mL solution)											
40	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	13.2	14.4
50	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	16.5	18.0
60	1.8	3.6	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	19.8	21.6
70	2.1	4.2	6.3	8.4	10.5	12.6	14.7	16.8	18.9	21.0	23.1	25.2
80	2.4	4.8	7.2	9.6	12.0	14.4	16.8	19.2	21.6	24.0	26.4	28.8
90	2.7	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27.0	29.7	32.4
100	3.0	6.0	9.0	12.0	15.0	18.0	21.0	24.0	27.0	30.0	33.0	36.0

REMIFENTANIL [Critical Care] (page 2 of 3)

Ideal Body Wt (kg)	Continuous Infusion Rate (microgram/kg/min)											
	0.325	0.35	0.375	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8
				NOTE: Dose increments in 0.5 microgram/ kg/min								
	Rate of Infusion (mL/hr of 50 microgram/ mL solution)											
40	15.6	16.8	18.0	19.2	21.6	24.0	26.4	28.8	31.2	33.6	36.0	38.4
50	19.5	21.0	22.50	24.0	27.0	30.0	33.0	36.0	39.0	42.0	45.0	48.0
60	23.4	25.2	27.0	28.8	32.4	36.0	39.6	53.2	46.8	50.2	54.0	57.6
70	27.3	29.4	31.5	33.6	37.8	42.0	46.2	50.4	54.6	58.8	63	67.2
80	31.2	33.6	36.0	38.4	43.2	48.0	52.8	57.6	62.4	67.2	72.0	76.8
90	35.1	37.8	40.5	43.2	48.6	54.0	59.4	64.8	70.2	75.6	81.0	86.4
100	39.0	42.0	45	48.0	54.0	60.0	66.0	72.0	78.0	84.0	90.0	96.0

Allergy	Anaphylaxis is a rare reported undesirable effect.
Contra-indications	- Known hypersensitivity to remifentanil, other fentanyl analogues or to any of the excipients. - Use as sole agent for induction of anaesthesia. - Administration via epidural or intrathecal route.
Usual dose range	**Analgesia in mechanically ventilated patients *** **Starting Rate:** 0.1 – 0.15 microgram/kg/min via continuous IV infusion. **Wait 5 minutes**, then assess pain score. Titrate rate in **0.025 microgram/kg/min increments** every 5 minutes until pain is adequately controlled. Above 0.4 microgram/kg/min, rate can be titrated upwards in 0.05 micrograms/kg/min increments. Assess the patient regularly and adjust the rate of infusion accordingly. DO NOT GIVE BOLUS DOSES. **Maximum Rate:** 0.74 microgram/kg/min. If rate of infusion reaches or exceeds 0.2 microgram/kg/min, an appropriate sedative agent should be initiated (i.e. midazolam or propofol). **Note:** Remifentanil reduces the starting and maintenance doses required for other sedative agents. **Physiotherapy/ Suctioning/ Turning/ Other Painful Interventions:** Increase rate by 20-50% (but to maximum of 0.74 micrograms/kg/min) for 5 minutes before and during the intervention. Reduce to previous rate immediately after the intervention finishes. **Weaning for Extubation/ Discontinuation:** Titrate gradually downwards to 0.1 microgram/kg/min (maintain this rate for at least 60 minutes prior to extubation). After extubation, reduce rate by 25% at a minimum of 10-minute intervals until discontinued. *General/ cardiac anaesthesia dosing: consult SPC (www.hpra.ie)
Renal or Hepatic Impairment	No dose adjustment required in renal or hepatic impairment.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

REMIFENTANIL [Critical Care] (page 3 of 3)

Dose if underweight/ obese	Use ideal body weight for dosing for all patients. No specific information for dosing in underweight patients.
Infusion-related adverse effects	Muscle rigidity (potentially severe), respiratory depression (decrease rate of infusion by 50% or temporarily discontinue), hypotension & bradycardia (consider reducing infusion rate).
Extravasation	This injection is acidic and is likely to produce local tissue damage in event of extravasation.
Other common adverse effects	Apnoea, post-operative hypertension, nausea, vomiting, pruritus, post-operative shivering.
ECG/ telemetry?	Not required.
Special giving set?	No special requirements.
Other notes	Not recommended for post-operative analgesia or during spontaneous ventilation anaesthesia due to lack of data. Remifentanil has a very rapid offset of action (5-10 minutes). Prior to discontinuation, alternative analgesic and sedative agents must be prescribed to prevent hyperalgesia and associated haemodynamic changes. Ensure enough time has been allowed for these agents to reach maximal therapeutic effect before discontinuing remifentanil. During the transition from remifentanil to alternative agents, patients must be carefully monitored for respiratory depression and/or sub-optimal analgesia. Maximum recommended duration is 3 days to reduce risk of withdrawal effects (tachycardia, hypertension, agitation). Use a dedicated IV line for remifentanil. To avoid accidental bolus dosing, do not flush the line. When the infusion is discontinued, disconnect the giving set and aspirate the cannula contents before flushing. Once prepared, use solutions for infusion immediately. Discard any unused infusion after 24 hours.

Prepared by:	Terry Smeaton	24/04/18	Checked by:	Mary Coyle Colette Morris	21/09/2018 06/02/2019
			Approved by:	G Fitzpatrick	31/07/2018
Updated by:	Maeve Harty	21/12/2022	Checked by:	J Mcgillycuddy	23/02/2023
Brand update	JMcgillycuddy	20/02/2024	Checked by:	Laura McCabe	29/02/2024

Information relates to Ultiva 5mg Power for Concentrate for Sol for Infusion by Aspen Pharma and remifentanil by Noridem.

References

1. NHS Injectable Medicines Guide. Remifentanil IV Adult Monograph. V6. Updated: 06/09/13. Available online http://medusa.wales.nhs.uk (password-protected). Accessed 13/03/18.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

RISANKIZUMAB (Skyrizi) [Gastroenterology] (page 1 of 2)

IV monoclonal antibodies are on the exclusion list of drugs not generally to be administered by nursing staff as per the Intravenous Drug Administration Policy

Form: 600 mg/10mL concentrate for solution for infusion

Reconstitution: Already in solution. Should not be shaken.
Further dilute before administration.

Compatible Fluid: Glucose 5%
Sodium Chloride 0.9%

Administration: Peripheral or central IV route
Preferably use an infusion pump.

Intermittent IV infusion
Add the required dose to the infusion bag as per the details in the table below. Invert the bag gently to mix, do not shake. Allow the infusion bag containing the diluted drug to reach room temperature prior to administration.

Dose	**Infusion bag size**	**Final concentration (mg/mL)**	**Minimum Infusion time**
600mg	100ml or 250ml or 500ml	1.2 – 6.0	60 minutes
1200mg	250ml or 500ml	1.2 – 6.0	120 minutes

Allergy	Hypersensitivity including anaphylaxis. If a serious hypersensitivity reaction, including anaphylaxis, occurs, administration of risankizumab should be discontinued immediately and appropriate therapy initiated.
Contra-indications	Hypersensitivity to the active substance or to any of the excipients. Clinically important active infections such as active tuberculosis.

RISANKIZUMAB (Skyrizi) [Gastroenterology] (page 2 of 2)

Usual dose range	*Crohn's Disease:* 600mg by intravenous infusion at week 0, week 4 and week 8. *Ulcerative Colitis*: 1200mg by intravenous infusion at week 0, week 4 and week 8.
Renal or Hepatic Impairment	No studies assessed the effect of hepatic or renal impairment so no dose recommendation can be made.
Dose if underweight / obese	No dose adjustment based on body weight is currently recommended.
Infusion-related adverse effects	Injection site bruising, erythema, haematoma, haemorrhage, irritation, pain, pruritus, reaction, swelling, induration, hypersensitivity, nodule, rash, urticaria, vesicles, warmth; infusion site erythema, extravasation, reaction, swelling.
Extravasation	Extravasation may cause tissue damage due to polysorbate content. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	Upper respiratory infections, nasopharyngitis, tinea infections, headache, pruritus, rash, eczema, fatigue
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Unreconstituted vials should be stored in a refrigerator (2°-8°C) in the outer carton to protect from light. Contact Medicines Information (ext 2558) regarding any temperature excursions. The name and the batch number of the product should be recorded on the drug chart.Patients should be brought up to date with all immunisations in agreement with current immunisation guidelines prior to initiating risankizumab treatment. Patients should be screened for tuberculosis before starting treatment.

Prepared by:	Hannah Berman	06/10/2024	Checked by:	D Stewart	08/10/2024

Information provided relates to Skyrizi manufactured by AbbVie.

References

1. Medusa Injectable Medicines Guide. Available online at http://www.injguide.nhs.uk (password restricted). Accessed 06/10/2024

ROCURONIUM BROMIDE (Esmeron®) [ICU/PACU] (page 1 of 2)

Rocuronium is a neuromuscular blocking agent – respiratory assistance is mandatory.

Form: 50mg in 5mL vial

Reconstitution: Already in solution

Compatible Fluid: Not applicable

Administration: Central IV route

IV Injection (only for supplemental doses in intubated patients):
Administer undiluted solution over 3-5 minutes.

Continuous infusion-central line
After loading dose, give **without further dilution** via syringe pump as per dosing table guide below (Note: dosing is highly variable and may go outside the parameters of the table).
IMPORTANT NOTE on calculating rate:
** If you are using the drug library on the BBraun smartpump (as recommended), enter the patient's ideal body weight in kg and the desired rocuronium dose in mg/kg/hour. The pump will calculate rate in ml/hour. Otherwise, use the table below to calculate the infusion rate. **

Ideal Body Weight (Kg)	**Dose (mg/kg/hour)**								
	0.1	0.2	**0.3**	**0.4**	**0.5**	**0.6**	0.7	0.8	0.9
			Usual dose range 0.3-0.6mg/kg/hr						
	Infusion rate (mL/hour of 10mg/mL solution)								
45	0.45	0.9	**1.35**	**1.8**	**2.25**	**2.7**	3.15	3.6	4.05
50	0.5	1	**1.5**	**2**	**2.5**	**3**	3.5	4	4.5
55	0.55	1.1	**1.65**	**2.2**	**2.75**	**3.3**	3.85	4.4	4.95
60	0.6	1.2	**1.8**	**2.4**	**3**	**3.6**	4.2	4.8	5.4
65	0.65	1.3	**1.95**	**2.6**	**3.25**	**3.9**	4.55	5.2	5.85
70	0.7	1.4	**2.1**	**2.8**	**3.5**	**4.2**	4.9	5.6	6.3
75	0.75	1.5	**2.25**	**3**	**3.75**	**4.5**	5.25	6	6.75
80	0.8	1.6	**2.4**	**3.2**	**4**	**4.8**	5.6	6.4	7.2
85	0.85	1.7	**2.55**	**3.4**	**4.25**	**5.1**	5.95	6.8	7.65
90	0.9	1.8	**2.7**	**3.6**	**4.5**	**5.4**	6.3	7.2	8.1

ROCURONIUM BROMIDE (Esmeron®) [ICU/PACU]

Allergy	The potential for histamine release exists in susceptible patients during administration. Caution should be exercised in patients with a history suggestive of an increased sensitivity to the effects of histamine. In particular, bronchospasm may occur in patients with a history of allergy and asthma.
Contra-indications	Hypersensitivity to rocuronium or to the bromide ion or to any of the excipients.
Usual dose range	After an initial bolus dose of 0.6mg/kg as an IV push, usual dose for continuous infusion in ICU is 0.3-0.6mg/kg/hr. Doses and infusion rates of neuromuscular blockers are highly variable and should be adjusted according to response to Train of Four testing in consultation with the anaesthetist.
Renal or Hepatic Impairment	In older patients and those with hepatic or renal impairment an initial infusion rate of 0.3-0.4mg/kg/hr
Dose if underweight / obese	In obese patients dose as per ideal body weight
Infusion-related adverse effects	Hypotension, tachycardia and pain at the injection site
Other common adverse effects	Bronchospasm, myopathy, prolonged neuromuscular block, circulatory collapse and shock
ECG/ telemetry?	Heart rate and blood pressure should be monitored.
Special giving set?	No special requirements
Other notes	In hypothermic conditions, the neuromuscular blocking effect of rocuronium is increased and the duration prolonged. Preferably administer via a central venous access device to avoid potential venous irritation as the preparation has a low pH and osmolarity. When used as a continuous infusion the syringe must be changed every 24 hours. When the infusion is discontinued, do not flush. Disconnect the administration set, aspirate the contents and then flush with glucose 5% or sodium chloride 0.9%.

Prepared by:	Mary Coyle	27/01/2015	Checked by:	Jennifer Hayde	28/01/2015
Amended by:	Mary Coyle	21/04/2015	Checked by:	Jennifer Hayde	08/05/2015
			Approved by:	Dr Fitzpatrick	14/07/2015
Reviewed by:	Mary Coyle	14/09/2016	Checked by:	JMcgillycuddy	07/11/2016
Updated by:	T Smeaton	17/07/2018	Checked by:	Mary Coyle	07/09/2018
Information provided relates to Esmeron® manufactured by Organon.					

SODIUM PHOSPHATE (BBraun Natrium Phosphate) [Critical care]

Form: 20mL ampoule containing 20mmol of sodium and 12mmol of phosphate

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Sodium chloride 0.9%
Glucose 5%

Administration: Peripheral or central IV route

Intermittent IV infusion
Add one vial of sodium phosphate to 100 – 250 mL [1]. Administer via rate-controlled infusion pump over at least 50 minutes but ideally over 4-12 hours [1-3].

Allergy	Not considered likely.
Contra-Indications	Hyperphosphataemia, hypernatraemia, hypocalcaemia. Severe renal impairment.
Usual dose range	0.2 to 0.5mmol/kg phosphate up to a maximum of 50mmol infused over 6 to 12 hours.[1]
Renal or Hepatic Impairment	Caution in renal impairment
Dose if underweight / obese	No specific advice from manufacturer, contact pharmacy if further information required.
Infusion-related adverse effects	N/A
Other common adverse effects	Hypernatremia
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements.
Other notes	High levels of phosphate administration (20 mmol phosphate/ day or more) can cause hypocalcaemia, therefore monitor corrected calcium and phosphate. Additions should never be made to phosphate infusions. Always give these infusions separately.[1] Note that each vial contains 20 mmol of sodium

Prepared by: Mary Coyle 01/07/2019 Checked by: JMcgillycuddy 16/09/2019

Information provided relates to Sodium Phosphate (exempt medicinal product) manufactured by Braun.

References

1. Sodium Phosphate B. Braun Concentration for Solution for Infusion. Accessed on 16/01/2019. Locally available SPC at: F:\Shared\Pharmacy A\Medicines Information (MIM)\MI service\SPCs & PILS
2. Martindale. The Complete Drug Reference. Phosphate monograph. Available online at www.medicinescomplete.com (subscription required). Accessed 27/06/2018.
3. Sodium phosphate: Drug information Lexicomp®. Topic 10269 Version 140.0. Accessed on 16/01/2019. Available through UpToDate®.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

SODIUM THIOSULFATE [Renal]
Martindale/Ethypharma product

Indication: Calciphylaxis (unlicensed indication)

Form: 10g in 20ml ampoule (50% W/V)

Reconstitution: Already in solution

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central (preferred) IV route

Intermittent IV infusion
Give undiluted or further dilute with a suitable volume of infusion fluid
Administer the required dose using a rate-controlled pump over 30-60 mins after dialysis via CVAD or AVF.[1]

Allergy	Possible
Contra-indications	Hypersensitivity
Usual dose range	IV doses vary from 5-75g, with 25g after each dialysis session the most common dose.
Renal or Hepatic Impairment	Intended for use in patients on haemodialysis.
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	Relatively non-toxic, pain at injection site, nausea and vomiting, hypotension.
Extravasation	May cause venous irritation and tissue damage due to high osmolarity. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other adverse effects	Headache, disorientation, diarrhoea, diuresis, hypernatraemia, prolonged bleeding time, salty taste in mouth, warm sensation over the body, metabolic acidosis.
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Sodium thiosulfate products are not interchangeable. Care should be taken to ensure that the correct brand is used in accordance with the corresponding monograph.[2]

Prepared by:	J Mcgillycuddy	18/06/2014	Checked by:	Mary Coyle C McCrohan	15/07/2014 23/10/2014
Updated by:	Helen O'Hara	16/03/2023	Checked by:	J Mcgillycuddy	21/06/2023

Updated by:	Deirdre Stewart	14/01/2025	Checked by:	Eve Rodgers	06/02/2025

*__References__

1. NHS Medusa Injectable Medicines Guide. Sodium thiosulfate monograph. Available at www.medusaimg.nhs.uk Accessed 08/01/2025.
2. ASHP Injectable Drug Information. Accessed 09/01/2025.
3. MI Databank query #18492. Logged Jan 2025

SODIUM THIOSULFATE [Renal] (page 1 of 2)
Hope Pharmaceuticals product

Indication: Calciphylaxis (unlicensed indication)

Form: 12.5g in 50ml ampoule (25% W/V).

Sodium thiosulfate 25% (25g in 100mls)	
Dose	**Volume in mls**
0.25g	1ml
10g	40mls
12.5g	50mls
20g	80mls
25g	100mls

Reconstitution: Already in solution
Can be given undiluted.

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central (preferred) IV route

Intermittent IV infusion
Administer the required dose using a rate-controlled pump after dialysis via CVAD or AVF.[1]
Maximum rate of 25g over 60 minutes due to potassium content of preparation.

Allergy	Possible
Contra-indications	Hypersensitivity
Usual dose range	IV doses vary from 5-75g, with 25g after each dialysis session the most common dose.
Renal or Hepatic Impairment	Intended for use in patients on haemodialysis.
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	Relatively non-toxic, pain at injection site, nausea and vomiting, hypotension.

SODIUM THIOSULFATE [Renal] (page 2 of 2)
Hope Pharmaceuticals product

Extravasation	May cause venous irritation and tissue damage due to high osmolarity. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other adverse effects	Headache, disorientation, diarrhoea, diuresis, hypernatraemia, prolonged bleeding time, salty taste in mouth, warm sensation over the body, metabolic acidosis.
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	**Sodium thiosulfate products are not interchangeable. Care should be taken to ensure that the correct brand is used in accordance with the corresponding monograph.[2]**

Prepared by:	J Mcgillycuddy	18/06/2014	Checked by:	Mary Coyle C McCrohan	15/07/2014 23/10/2014
Updated by:	Helen O'Hara	16/03/2023	Checked by:	J Mcgillycuddy	21/06/2023
Updated by:	D Stewart	08/01/2025	Checked by	Eve Rodgers	09/01/2025

Hope Pharmaceuticals brand. SPC on file.

References

4. NHS Medusa Injectable Medicines Guide. Sodium thiosulfate monograph. Available at www.medusaimg.nhs.uk Accessed 08/01/2025.
5. ASHP Injectable Drug Information. Accessed 09/01/2025.
6. MI Databank query #18492. Logged Jan 2025

TENECTEPLASE (Metalyse®) [Acute stroke] (page 1 of 2)

IV Thrombolytics (including tenecteplase) are on the exclusion list of drugs not generally administered by nursing staff as per the IV Drug Administration Policy. Exceptions include certain local policies e.g. Emergency Dept

Form: 50mg (10,000units) vial with accompanying pre-filled syringe containing 10mL of diluent (water for injection)

Reconstitution: See below

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route.

Acute Ischaemic Stroke requiring thrombectomy

Reconstitute vial by adding the whole contents of the syringe to the vial via the vial adapter. Add slowly to avoid foaming and reconstitute by gentle swirling, keeping the syringe attached. A colourless to pale yellow, clear solution should be produced. The reconstituted solution contains 5mg/mL. Invert the vial (with syringe attached) and draw up the required amount of solution using the same syringe. Disconnect syringe from the vial adapter.

Administer the required dose as a bolus dose over approximately 10 seconds – see dosing table below. Flush with sodium chloride 0.9% to ensure nil remaining in line.

Dosing table for 0.25mg/kg:

Weight (stone)	Weight (kg)	Dose (mg)	Equivalent dose (mL)*	Weight (stone)	Weight (kg)	Dose (mg)	Equivalent dose (mL)*
6 st 4 lb	40	10	2	11 st 4 lb	72	18	3.6
6 st 9 lb	42	10.5	2.1	11 st 9 lb	74	18.5	3.7
6 st 13 lb	44	11	2.2	12 st	76	19	3.8
7 st 3 lb	46	11.5	2.3	12 st 4 lb	78	19.5	3.9
7 st 8 lb	48	12	2.4	12 st 8 lb	80	20	4
7 st 12 lb	50	12.5	2.5	12 st 13 lb	82	20.5	4.1
8 st 3 lb	52	13	2.6	13 st 3 lb	84	21	4.2
8 st 7 lb	54	13.5	2.7	13 st 8 lb	86	21.5	4.3
8 st 11lb	56	14	2.8	13 st 12lb	88	22	4.4
9 st 2 lb	58	14.5	2.9	14 st 2 lb	90	22.5	4.5
9 st 6 lb	60	15	3	14 st 7 lb	92	23	4.6
9 st 11 lb	62	15.5	3.1	14 st 11 lb	94	23.5	4.7
10 st 1 lb	64	16	3.2	15 st 2 lb	96	24	4.8
10 st 6 lb	66	16.5	3.3	15 st 6 lb	98	24.5	4.9
10 st 10 lb	68	17	3.4	15 st 10 lb	100	25	5
11 st	70	17.5	3.5	Max dose: 25mg (5mL)			

*graduations to 0.1mL as agreed by M Vaughan and Stroke Team; nearest measurable dose 0.2mL

TENECTEPLASE (Metalyse®) [Acute stroke] (page 1 of 2)

Allergy	Contraindicated in those with an anaphylactic reaction to any constituents or gentamicin, unless deemed necessary.
Contra-Indications	There are many contraindications to Tenecteplase use, please refer to the SPC for further information but note decision should be consultant lead. Bleeding disorders at present or in the last 6 months, patients on anticoagulation, CNS damage, major surgery in the last 2 months, severe uncontrolled hypertension.
Usual dose range	Acute Stroke: 0.25mg/kg (0.05mL/kg) as a single dose; max 25mg.
Renal or Hepatic Impairment	Contra-indicated in severe hepatic dysfunction – discuss with stroke consultant oncall
Dose if underweight / obese	Nil information. Max dose 25mg
Infusion-related adverse effects	Injection site haemorrhage
Other common adverse effects	Bleeding including epistaxis, bruising, puncture site haemorrhage, GI and GU bleeding.
ECG/ telemetry?	Appropriate monitoring in line with acute stroke care required.
Special giving set?	Nil required.
Other notes	Incompatible with glucose 5%; do not administer through the same line. Flush before and after with sodium chloride 0.9%.

Prepared by:	Mary Coyle	22/02/2021	Checked by:	Helen Devine	24/02/2021

THIOPENTAL SODIUM [ICU/PACU] (page 1 of 3)

Form: 500mg powder for injection

Reconstitution: Reconstitute 500mg vial with 20mL of water for injection, sodium chloride 0.9% or glucose 5%.[1] This gives a 25mg/mL solution

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Central IV route (preferable) but may be given peripherally into a large vein (unlicensed)

IV injection: Administer over 10-15 seconds.

Continuous IV infusion (convulsive states–central route only)
Reconstitute two 500mg vials and draw up the resultant 40mL in a 50mL syringe, this is a 25mg/mL solution.[2,3] Unused solution must be discarded after 6 hours, and a new syringe prepared.
Administer using a rate-controlled infusion pump.
Do NOT Y-site with other drugs

Patient weight [5, 6] (kg)	Rate of infusion of 25mg/mL solution in **mL/hour**		
	1mg/kg/hour	**2mg/kg/hour**	**3mg/kg/hour**
40	1.6	3.2	4.8
45	1.8	3.6	5.4
50	2	4	6
55	2.2	4.4	6.6
60	2.4	4.8	7.2
65	2.6	5.2	7.8
70	2.8	5.6	8.4
75	3	6	9
80	3.2	6.4	9.6

Allergy	Contra-indicated in patients with hypersensitivity or reactions to barbiturates.
Contra-indications	Respiratory obstruction, acute asthma, severe shock, dystrophia myotonica, porphyria.

THIOPENTAL SODIUM [ICU/PACU] (page 2 of 3)

Usual dose range	Treatment of Convulsive States Single dose of 75-125mg or loading dose of 3-5mg/kg, then further boluses of 1 to 2 mg/kg every 2 to 3 minutes until seizures are controlled, followed by a continuous intravenous infusion at a rate of 3-7 mg/kg per hour for a minimum of 24 hours.[7] A test dose of 25-75mg is recommended (1 to 3mL of 25mg/mL reconstituted solution) over 10-15 seconds. Monitor the patient for at least 60 seconds to assess tolerance or unusual sensitivity. **Higher doses** Higher doses may be required in patients with a history of alcohol or drugs of abuse use. **Lower doses** Lower doses may be required in the elderly, in patients pre-medicated with opioids and in patients with shock, dehydration, severe anaemia, hyperkalaemia, toxaemia or other metabolic disorders e.g. thyrotoxicosis, myxoedema and diabetes. For other indications, see SPC for doses & administration.
Renal or Hepatic Impairment	Dose reduction recommended in patients with hepatic impairment. Cautioned in severe renal impairment.
Dose if underweight / obese	Doses based on ideal body weight.
Infusion-related adverse effects	Bronchospasm, coughing, sneezing, respiratory depression, myocardial depression including reduced BP, arrhythmias, severe arterial spasm and digital ischaemia with inadvertent intra-arterial injection (see SPC for management). Extravasation is likely to cause local tissue necrosis and severe pain due to high pH
Other common adverse effects	Drowsiness, nausea, decreased appetite, malaise, fatigue, dizziness, headache and delirium
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Extravasation may occur and should be treated with an ice pack and local injection of hydrocortisone. Severe or refractory hypokalaemia may occur during thiopental use; severe rebound hyperkalaemia may occur after cessation of thiopental infusion. BP should be monitored. Note 51-56mg sodium per 500mg vial. Unused solution must be discarded after **6 hours**, do not use if the solution is discoloured.

Prepared by:	Mary Coyle	23/11/2016	Checked by:	J McGillycuddy	23/11/2016
Reviewed by:	Terry Smeaton	25/07/18	Checked by:	Mary Coyle	07/09/2018
Reviewed by:	JMcgillycuddy	16/12/21	Checked by:	C O'Brady	20/12/2021

THIOPENTAL SODIUM [ICU/PACU] (page 3 of 3)

Information provided relates to Thiopental Sodium manufactured by Advanz UK (EMP).

References

1. Summary of product characteristics for thiopental sodium poweder for solution for injection (Advanz). Available online at www.medicines.org.uk. Last updated on emc 20/01/2020. Accessed 09/12/2021.
2. UKCPA Minimum Infusion Volumes for Fluid-restricted Critically Ill Patients. 4th edition (4.4). December 2012.
3. Dr Lindi Synman, Consultant Anaesthesiologist, TUH. Personal communication; 15/12/2021.
4. NHS Injectable Medicines Guide. Thiopental sodium monograph. V5. Last updated 10/02/2020. Available online at www.injguide.nhs.uk (password protected). Accessed 09/12/2021.
5. Ingrande J, Lemmens HJM. Dose adjustment of anaesthetics in morbidly obese. British Journal of Anaesthesia 2010 105(S1):i16-i23.
6. Casati A, Putzu M. Anesthesia in the obese patient: Pharmacokinetic considerations. J Clin Anesth 2005; 17(2): 134-45.
7. Martindale. Thiopental monograph. Available online at www.medicinescomplete.com (subscription required). Accessed 20/12/2021.

TINZAPARIN BOLUS (Innohep®) during HAEMODIALYSIS via ARTERIAL PORT [Dialysis unit only] (page 1 of 3)

To be read in conjunction with "Procedure for the administration of Tinzaparin to Haemodialysis and Haemodiafiltration Patients in the Adult haemodialysis Unit and Home Therapies Unit in Tallaght Hospital" -> available on Qpulse

Form: 2,500 units in 0.25mL prefilled syringe
3,500 units in 0.35mL prefilled syringe
4,500 units in 0.45mL prefilled syringe

Reconstitution: Not applicable: already in solution

Compatible Fluid: Sodium chloride 0.9%

Administration: Via arterial port on the dialysis circuit

Clean the arterial port on the Dialysis circuit with 2% Chlorhexidine in 70% Alcohol swab.
Insert the Tinzaparin prefilled syringe and administer the required dose.
Engage the needle safety device and dispose of all sharps in the appropriate sharps bin.

Allergy	Heparin-induced thrombocytopaenia can occur. Hypersensitivity reactions include urticaria, angioedema and anaphylaxis have been reported.
Contra-indications	Hypersensitivity to the active substance or to any of the excipients. Current or history of immune-mediated heparin-induced thrombocytopenia (HIT) (type II). Active major haemorrhage or conditions (such as haemophilia and other haemorrhagic disorders, severe liver disease, severe hypertension) predisposing to major haemorrhage. Major haemorrhage is defined as fulfilling any one of these three criteria: (a) occurs in a critical area or organ (e.g. intracranial, intraspinal, intraocular, retroperitoneal, intra-articular or pericardial, intra-uterine or intramuscular with compartment syndrome) (b) causes a fall in haemoglobin level of 2 g/L or more, or (c) leads to transfusion of two or more units of whole blood or red cells. Septic endocarditis- discuss with the Consultant Nephrologist.

TINZAPARIN BOLUS (Innohep®) during HAEMODIALYSIS via ARTERIAL PORT [Dialysis unit only] (page 2 of 3)

To be read in conjunction with "Procedure for the administration of Tinzaparin to Haemodialysis and Haemodiafiltration Patients in the Adult Haemodialysis Unit and Home Therapies Unit in Tallaght Hospital" -> available on Qpulse

Usual dose range:

The dose of Tinzaparin may be adjusted, depending on previous experience of any clots in the haemodialysis circuit or clots in the dialyser on washback. See also flowchart at end of monograph.

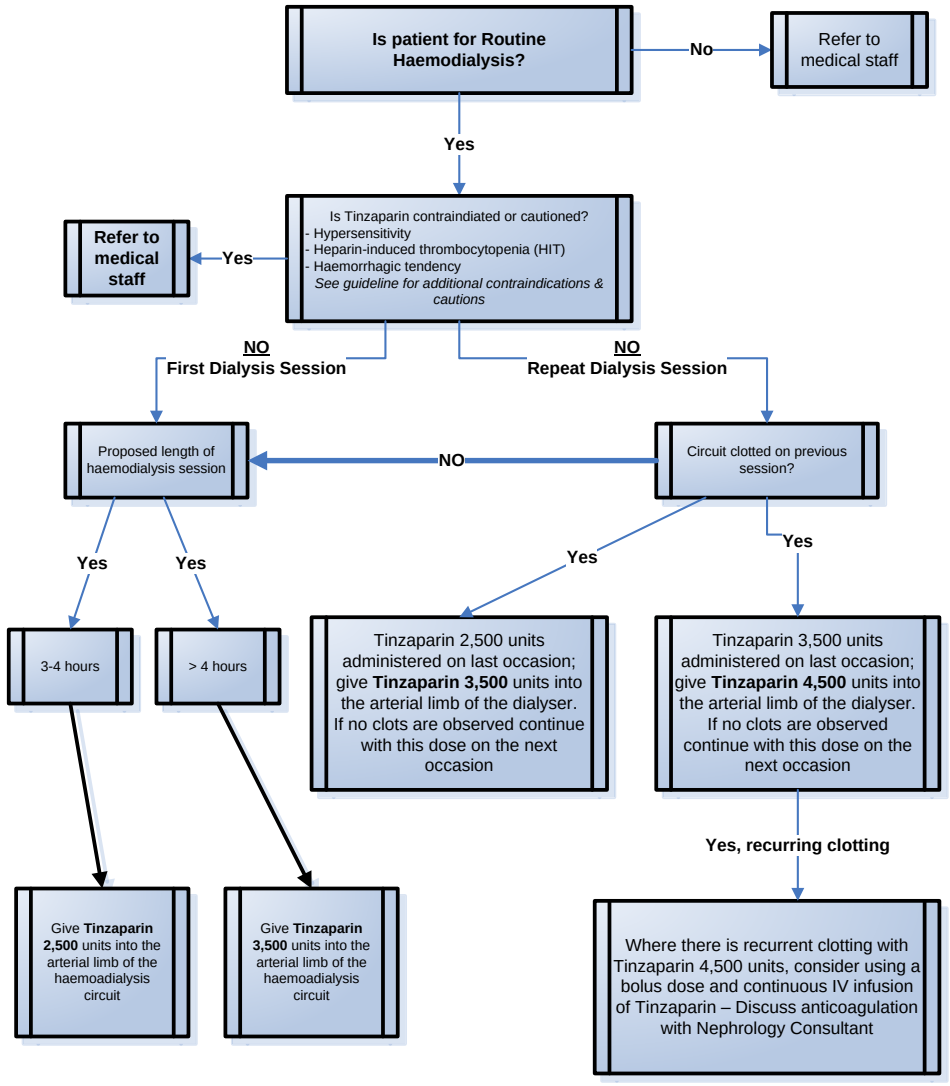
Length of Dialysis Session	Tinzaparin Dose	Notes & Recommendations
3 to 4 Hours	2,500 Unit Bolus	**Patients on dialysis who previously experienced clotting** of the dialysis circuit with Tinzaparin 2,500 units should receive **Tinzaparin 3,500 units** on subsequent dialysis sessions (please refer to Algorithm 1).
More than 4 Hours	3,500 Unit Bolus	**Patients on dialysis who previously experienced clotting** of the dialysis circuit with Tinzaparin 3,500 units should receive **Tinzaparin 4,500 units** on subsequent dialysis sessions (please refer to Algorithm 1).
> 4 Hour and where clotting of the dialysis circuit occurs with Tinzaparin 3,500 units	4,500 Unit Bolus	Where there is recurrent clotting with Tinzaparin 4,500 units, consideration may be given to using a **bolus dose Tinzaparin 2,500 units followed by a continuous intravenous infusion of Tinzaparin (as below). Must discuss with Renal Consultant.**
Prolonged >4 Hours **or** where there is recurrent clotting	2,500 Unit Bolus AND Continuous IV Tinzaparin Infusion via the arterial anticoagulation line on the arterial dialysis circuit	Continuous infusion is not generally indicated but if it is: 1) First administer the 2,500 unit bolus 2) Then refer to the separate IV monograph: TINZAPARIN CONTINUOUS INFUSION (Innohep®) during HAEMODIALYSIS via ARTERIAL ANTICOAGULATION LINE.

Renal/ Hepatic Impairment	Renal impairment: N/A. Contact pharmacy or renal team re hepatic impairment
Dose if underweight / obese	N/A
Infusion-related adverse effects	N/A
Other common adverse effects	Heparin-induced thrombocytopaenia, hyperkalaemia
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Prior to haemodialysis session, the patient must be assessed for signs or symptoms of bleeding such as bloodshot eyes, bruising or haematuria. Liaise with the medical team if the patient is pre or post any procedure or surgery. Assess the patient's current medication for any of the following: anticoagulants, antiplatelets, thrombolytics.

TINZAPARIN BOLUS (Innohep®) during HAEMODIALYSIS via ARTERIAL PORT [Dialysis unit only] (page 3 of 3)

To be read in conjunction with "Procedure for the administration of Tinzaparin to Haemodialysis and Haemodiafiltration Patients in the Adult Haemodialysis Unit and Home Therapies Unit in Tallaght Hospital" -> available on Qpulse

Flowchart:



Prepared by:	J. Hayde	5 May 2015	Checked by:	Dawn Davin Glenda Taylor	June 2015
Information provided relates to Innohep brand of Tinzaparin. Reference: • Procedure for the administration of Tinzaparin to Haemodialysis and Haemodiafiltration Patients in the Adult Haemodialysis Unit and Home Therapies Unit in Tallaght Hospital. Available from Qpulse. Published May 2015.					

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

TINZAPARIN CONTINUOUS INFUSION (Innohep®) during HAEMODIALYSIS via ARTERIAL ANTICOAGULATION LINE on the arterial dialysis circuit [Dialysis unit only]

To be read in conjunction with "Procedure for the administration of Tinzaparin to Haemodialysis and Haemodiafiltration Patients in the Adult haemodialysis Unit and Home Therapies Unit in Tallaght Hospital" -> available on Qpulse

Form: 2,500 units in 0.25mL prefilled syringe

Reconstitution: Make up to a final volume of 20mL in a 20mL luer lock syringe

Compatible Fluid: Sodium chloride 0.9%

Administration: Via arterial anticoagulation line on the arterial dialysis circuit

Add the contents of one 2,500 unit prefilled syringe (=0.25mL) to a 20mL luer lock syringe. Make up to a final volume of 20mL using 19.75mL of sodium chloride 0.9%. Label the syringe, including the contents of 2,500units in 20mL (=125units per 1mL).
Place the 20mL syringe into the anticoagulant infusion mechanism on the dialysis machine prior to testing the dialysis machine. As part of the testing, the line will be primed.

Allergy	Heparin-induced thrombocytopaenia can occur. Hypersensitivity reactions include urticaria, angioedema and anaphylaxis have been reported.
Contra-indications	Hypersensitivity to the active substance or to any of the excipients. Current or history of immune-mediated heparin-induced thrombocytopenia (HIT) (type II). Active major haemorrhage or conditions (such as haemophilia and other haemorrhagic disorders, severe liver disease, severe hypertension) predisposing to major haemorrhage. Major haemorrhage is defined as fulfilling any one of these three criteria: (a) occurs in a critical area or organ (e.g. intracranial, intraspinal, intraocular, retroperitoneal, intra-articular or pericardial, intra-uterine or intramuscular with compartment syndrome) (b) causes a fall in haemoglobin level of 2 g/L or more, or (c) leads to transfusion of two or more units of whole blood or red cells. Septic endocarditis- discuss with the Consultant Nephrologist.

TINZAPARIN CONTINUOUS INFUSION (Innohep®) during HAEMODIALYSIS via ARTERIAL ANTICOAGULATION LINE on the arterial dialysis circuit [Dialysis unit only] (page 2 of 3)

To be read in conjunction with "Procedure for the administration of Tinzaparin to Haemodialysis and Haemodiafiltration Patients in the Adult Haemodialysis Unit and Home Therapies Unit in Tallaght Hospital" -> available on Qpulse

Usual dose range:

The dose of Tinzaparin may be adjusted, depending on previous experience of any clots in the haemodialysis circuit or clots in the dialyser on washback. See also flowchart at end of monograph.

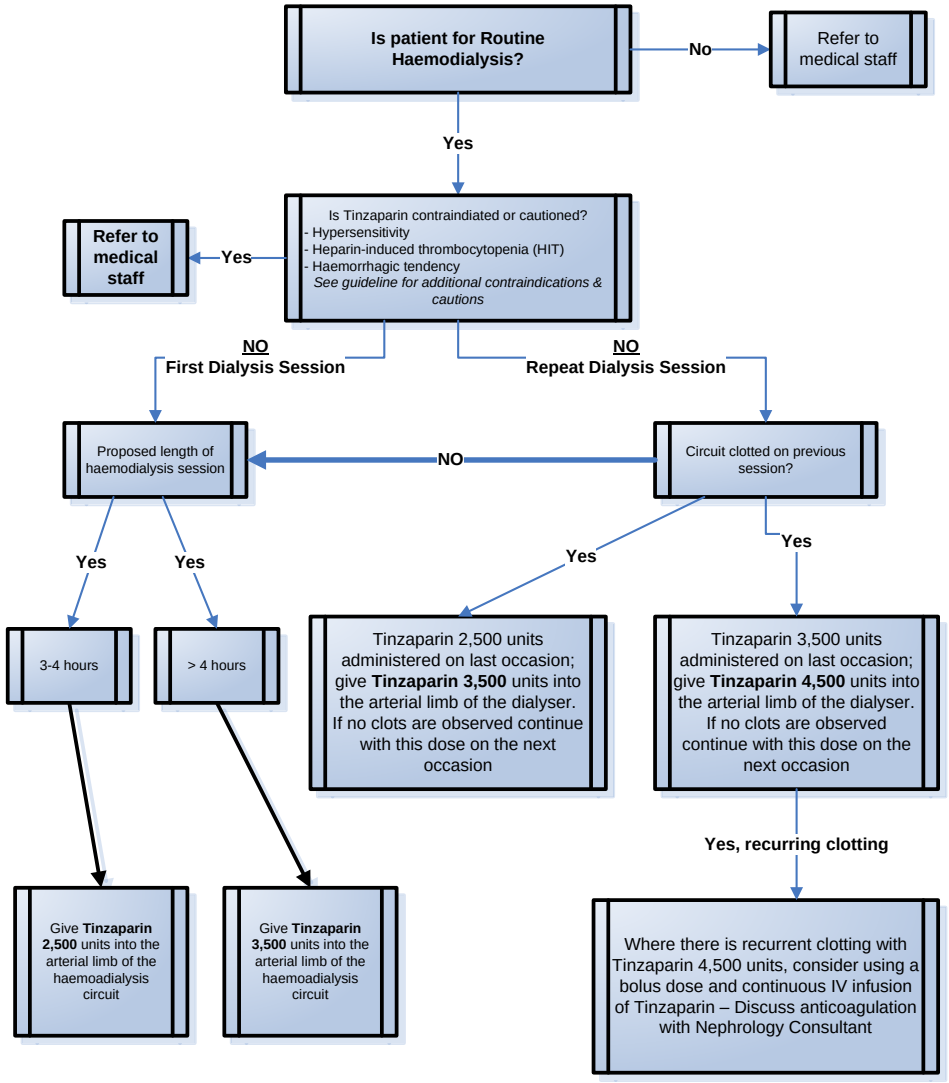
Length of Dialysis Session	Tinzaparin Dose	Notes & Recommendations
Prolonged >4 Hours **or** where there is recurrent clotting A continuous intravenous infusion of Tinzaparin may be required. This should be done in consultation with the Consultant Nephrologist (Refer to Flowchart)	2,500 Unit Bolus AND Continuous IV Tinzaparin Infusion via the arterial anticoagulation line on the arterial dialysis circuit	1) First administer 2,500 unit bolus of Tinzaparin as per separate IV Monograph, TINZAPARIN BOLUS (Innohep®) during HAEMODIALYSIS via ARTERIAL PORT 2) Then administer a continuous infusion of **Tinzaparin 750 units per hour**. To obtain this dose: • Dilute 2,500 unit with 19.75 mL 0.9% Sodium Chloride • Final Concentration: Tinzaparin 2,500 units in 20 mL ➢ 125 units in 1 mL ➢ 750 units in 6 mL **Rate: 6 mL per hour**

Renal/ Hepatic Impairment	Renal impairment: N/A. Contact pharmacy or renal team re hepatic impairment
Dose if underweight / obese	N/A
Infusion-related adverse effects	N/A
Other common adverse effects	Heparin-induced thrombocytopaenia, hyperkalaemia
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Prior to haemodialysis session, the patient must be assessed for signs or symptoms of bleeding such as bloodshot eyes, bruising or haematuria. Liaise with the medical team if the patient is pre or post any procedure or surgery. Assess the patient's current medication for any of the following: anticoagulants, antiplatelets, thrombolytics.

TINZAPARIN CONTINUOUS INFUSION (Innohep®) during HAEMODIALYSIS via ARTERIAL ANTICOAGULATION LINE on the arterial dialysis circuit [Dialysis unit only] (P3 of 3)

To be read in conjunction with "Procedure for the administration of Tinzaparin to Haemodialysis and Haemodiafiltration Patients in the Adult Haemodialysis Unit and Home Therapies Unit in Tallaght Hospital" -> available on Qpulse

Flowchart:



Prepared by:	J. Hayde	5 May 2015	Checked by:	Dawn Davin, Glenda Taylor	June 2015

Information provided relates to Innohep brand of Tinzaparin.

Reference:

1. Procedure for the administration of Tinzaparin to Haemodialysis and Haemodiafiltration Patients in the Adult Haemodialysis Unit and Home Therapies Unit in Tallaght Hospital. Available from Qpulse. Published May 2015.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

TOCILIZUMAB (RoActemra®) (page 1 of 2)

IV cytokine modulators are on the exclusion list of drugs not generally to be administered by nursing staff as per the IV Drug Administration Policy

Form: 80mg in 4mL
200mg in 10mL
400mg in 20mL

Reconstitution: Already in solution
Further dilute before administration

Compatible Fluid: Sodium Chloride 0.9%

Administration: Peripheral or central IV route.

Intermittent IV infusion
Check that the solution is clear to opalescent, colourless to pale yellow and free of visible particles prior to dilution.
From a 100mL bag of compatible infusion fluid, withdraw a volume of solution equal to the volume of reconstituted vials. Add the required dose to make up to a total volume of 100mL. To mix, **gently** invert the infusion bag to avoid foaming. Administer over 60 minutes.
The solution should be used immediately after preparation.

<table>
<tr><td>Allergy</td><td>Serious hypersensitivity reactions including anaphylaxis</td></tr>
<tr><td>Contra-Indications</td><td>Active or severe infections.
Previous hypersensitivity to tocilizumab or excipients</td></tr>
<tr><td>Usual dose range</td><td>
<table>
<tr><th>Pt weight</th><th>8mg/ kg Tocilizumab dose (rounded to within a maximum of 10% of calculated dose, to nearest whole vial)*</th></tr>
<tr><td>40-44.4kg</td><td>320mg (4 x 80mg vials)</td></tr>
<tr><td>44.5kg-55.5kg</td><td>400mg (1 x 400mg vial)</td></tr>
<tr><td>55.6kg-66.6kg</td><td>480mg (1 x 400mg and 1x 80mg vial)</td></tr>
<tr><td>66.7kg-77.7kg</td><td>560mg (1x 400mg and 2 x 80mg vials)</td></tr>
<tr><td>77.8kg-88.8kg</td><td>640mg (1 x 400mg and 3 x 80mg vials)</td></tr>
<tr><td>88.9kg-99.9kg</td><td>720mg (1 x 400mg and 4 x 80mg vials)</td></tr>
<tr><td>100kg or greater</td><td>800mg (2 x 400mg vials)</td></tr>
</table>
*rounding agreed with Prof Kane July 2012.
Dose administered every 4 weeks for rheumatoid arthritis; check SPC for dosing in other indications.
See SPC for dose adjustments in liver enzyme abnormalities, low absolute neutrophil counts or low platelet counts.</td></tr>
</table>

TOCILIZUMAB (RoActemra®) (page 2 of 2)

Renal or Hepatic Impairment	See SPC for dose adjustments in patients with liver enzyme abnormalities. Not studied in hepatic or moderate to severe renal impairment (no recommendations made by manufacturers).
Dose if underweight / obese	Adjust dose based on body weight – see table above. For patients > 100kg doses exceeding 800 mg are not recommended.
Infusion-related adverse effects	Hypersensitivity reactions including anaphylaxis, flushing, fever, chills, rash, pruritis, urticaria, headache, nasopharyngitis, hypertension If signs and symptoms of an infusion related reaction occur, slow or stop the infusion and administer appropriate medication/ supportive care immediately
Extravasation	Likely to cause tissue damage due polysorbate 80, which is a tween.[1]
Other common adverse effects	Abdominal pain; gastritis; hypercholesterolaemia; hypofibrinogaemia, infection; leucopenia; mouth ulceration; neutropenia; peripheral oedema; raised hepatic transaminases; upper respiratory-tract infection, nasopharyngitis, headache and hypertension. Uncommonly, diverticular perforations. Thrombocytopaenia has been reported.
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Other notes	Handle with precautions as this is a cytokine modulator. Screen for latent TB and viral hepatitis prior to use. For women of child bearing potential, effective contraception required during and for 3 months after treatment. The name and the batch number of the product should be recorded on the kardex. Patients should be given an alert card. Ongoing monitoring of lipid profile, hepatic transaminases, demyelinating disorders, neutrophil counts and platelet counts are required as specified in the SPC. Patients should be brought up to date with all immunisations in agreement with current immunisation guidelines prior to initiating tocilizumab treatment. Order from Pharmacy in advance, specifying both patient weight and actual dose required (as per earlier rounding table).

Prepared by:	J Mcgillycuddy	14/09/2016	Checked by:	Mary Coyle	19/10/2016
Updated by:	Maeve Harty	02/02/2021	Checked by:	Roisin Logan	12/02/2021
Updated by:	Eimear Ní Loingsigh	22/06/2023	Checked by:	J Mcgillycuddy	17/08/2023

Reference

1. Medusa Injectable Medicines Guide. Available online at www.injguidenhs.uk (password restricted). Accessed 22/06/2023
2. Summary of Product Characteristics for Tocilizumab available at www.medicines.ie. Accessed 22/06/2023.

TRISODIUM CITRATE (C-Lock 46.7%) [Dialysis/ ICU]

(Trisodium citrate = sodium citrate = sodium citrate dihydrate)

Form: 1167.5mg in 2.5ml pre-filled syringes (2 syringes per pack – 1 for each lumen) i.e. 467mg/ml = 46.7%

Reconstitution: Already in solution

Compatible Fluid: Not applicable

Administration: **NOT for direct IV injection or infusion**
Trisodium citrate is a catheter lock administered via Central Venous Access Devices (CVAD)

<u>After Renal Replacement Therapy (RRT), Plasmapheresis or after accessing a renal CVAD</u>

Trisodium citrate is usually administered as a locking solution for CVADs as follows:

1. After RRT etc, both the arterial and venous lumen of the CVAD must be flushed with 10mL 0.9% sodium chloride using a Posiflush XS pre-filled syringe.
   - Attach a 10mL 0.9% sodium chloride Posiflush XS pre-filled syringe to the TEGO needle free connector of the arterial lumen and flush the lumen.
   - Clamp the CVAD lumen after flushing.

Repeat the procedure above for the venous lumen.

   - Leave the Posiflush XS syringe attached until ready to insert locking solution.
2. Hold the trisodium citrate syringe with the cap end up and carefully twist the cap off. To remove any air bubbles, point luer end of syringe up and gently tap the syringe with fingers until air bubbles rise to the top of the syringe. Keep luer end of syringe up and slowly push the plunger up to force air bubbles out of the syringe. With the luer end of the syringe up, slowly push plunger to the line on the syringe which matches the priming volume. This volume will be based upon the priming volumes detailed on the arterial and venous lumen on the CVAD catheter plus any adjustments made previously for this particular patient.
3. Remove the Posiflush XS syringe prior to attaching the trisodium citrate to the TEGO needle free connector on the CVAD lumen.
4. Inject the trisodium citrate into the arterial and venous lumen of the CVAD catheter. It is very important to inject **SLOWLY**, taking 8-10 seconds per lumen.
   - Attach the trisodium citrate syringe containing the appropriate priming volume to the TEGO needle-free connector.
   - Unclamp the CVAD lumen.
   - Inject trisodium citrate slowly
   - Clamp the CVAD lumen.
   - Remove the trisodium citrate syringe from the TEGO needle-free connector and discard the syringe as per Infection Prevention and Control Healthcare Waste Management Policy (PPPG ENV-GUI-21).

TRISODIUM CITRATE (C-Lock 46.7%) [Dialysis/ ICU]

5. Repeat the same syringe preparation step for the 2nd syringe and lumen.
6. Document the volume of trisodium citrate used in each lumen on the Adult Drug Chart. If any side effects were experienced or if the volume needs to be reduced next time, document this in the healthcare record.

Before RRT (or accessing a renal CVAD)

1. Prior to initiating the next dialysis session withdraw the locking solution that was instilled at the previous dialysis session from each line.
    - Attach a 5mL syringe to the TEGO needle-free connector on the CVAD lumen.
    - Unclamp the CVAD lumen.
    - Withdraw the locking solution that was instilled at the previous dialysis session from each line using the 5 ml syringe.
    - Clamp the CVAD lumen.
    - Leave the 5 ml syringe attached until ready to flush the lumen.

2. Flush both the arterial and venous lumen of the CVAD catheter using a 10mL 0.9% sodium chloride Posiflush XS pre-filled syringe to ensure adequate blood flow, before beginning dialysis.
    - Remove the 5ml syringe.
    - Attach a 10mL 0.9% sodium chloride Posiflush XS pre-filled syringe to the TEGO needle-free connector on the CVAD lumen.
    - Unclamp the CVAD lumen.
    - Check for adequate blood flow and flush the lumen.
    - Clamp the CVAD lumen.
    - Leave the Posiflush XS pre-filled syringe connected to the TEGO needle-free connector until ready to begin dialysis.

If unable to aspirate catheter lock solution

1. If unable to withdraw trisodium citrate solution from **ONE** lumen:
    - Attempt to inject the trisodium citrate into the patient slowly (over 20-30 seconds) using 10ml 0.9% sodium chloride Posiflush XS pre-filled syringe
    - Check the patient's calcium level.
2. If **BOTH** lumen are affected
    - Inject the trisodium citrate into the **Arterial lumen** of the CVAD slowly (over 20-30 seconds) using 10ml 0.9% sodium chloride Posiflush XS pre-filled syringe.
    - Wait a minimum of **FIVE** minutes.
    - Inject the trisodium citrate into the **Venous lumen** of the CVAD slowly (over 20-30 seconds) using 10ml 0.9% sodium chloride Posiflush XS pre-filled syringe.
    - Check the patient's calcium level.
    - Liaise with medical team re further action required.
3. Document the volume administered on the Adult Drug Chart.

TRISODIUM CITRATE (C-Lock 46.7%) [Dialysis/ ICU]

(page 3 of 3)

Allergy	Not applicable
Contra-Indications	Using a trisodium citrate volume in excess of the sum of the catheter manufacturer's specified lumen priming volume + 0.2mLs.
Infusion-related adverse effects	Not applicable
Extravasation	No specific information. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	Trisodium citrate chelates calcium with systemic injection and may lead to hypocalcaemia, hypernatraemia.[3] Cardiac instability may occur if more than 10mL is injected.[3] Smaller volumes may be associated with perioral or finger paraesthesiae (tingling) or altered taste[3] which usually disappear within 1 minute and are a sign that the catheter lock volume has been exceeded. The instilled volume should be decreased by 0.1mL each time the locking solution is instilled until the patient no longer experiences the side-effects outlined above.
Usual dose range	The priming volume is directed by the catheter manufacturer's specified lumen priming volume
Renal or Hepatic Impairment	Not applicable
Dose if underweight / obese	No special advice from manufacturer
ECG/ telemetry?	No special requirements
Special giving set?	Not applicable
Other notes	Blood samples contaminated with trisodium citrate could give misleading sodium concentration readings. Do NOT use if the pouch or syringe seal is broken.

Prepared by:	C Gowing	26/07/2013	Checked by:	J Mcgillycuddy	07/10/2013
Updated by:	J Mcgillycuddy	08/07/2014	Checked by:	Mary Coyle C McCrohan	09/07/2014 23/10/2014
Updated by:	Lisa Murphy	13/06/2023	Checked by:	J Mcgillycuddy	17/08/2023
Updated by:	Eve Rodgers	20/03/2025	Checked by:	D Stewart, R Cox	31/03/2025

Information provided relates to
C-Lock manufactured by D.B.M (product switched from DuraLock-C April 2025)

References

1. D.B.M. C-Lock (sodium citrate) 46.7% Prefilled Syringe Technical Sheet. North Bristol NHS Trust Richard Bright Kidney Unit. Duralock-C Citralock. Guidelines for Use of Duralock-C (Citralock-C). March 2006. Copy on file in Pharmacy.
2. Medicines information query no. 18619. Available on MI databank at TUH.
3. Winnett G, Nolan J et al. 2008. Trisodium citrate 46.7% selectively and safely reduces

staphylococcal catheter-related bacteraemia. Nephrol Dial Transplant 23: 3592 – 3598.

USTEKINUMAB (Stelara®) (page 1 of 2)

IV monoclonal antibodies are on the exclusion list of drugs not generally to be administered by nursing staff as per the Intravenous Drug Administration Policy

Form: 130mg/26mL (5mg/mL) concentrate solution for infusion

Reconstitution: Not applicable
Further dilute before administration

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route

Intermittent IV infusion
Calculate volume of concentrate based on the dose. Remove the corresponding volume from a 250mL Sodium Chloride 0.9% bag and discard e.g. 260mg = 2 vials = 52ml - remove 52mls from 250ml bag. Withdraw the appropriate volume of ustekinumab from each vial and add to the prepared Sodium Chloride bag. Final volume = 250mL.
Gently mix. Do not shake the vials.
Visually inspect the diluted solution. Do not use if visibly opaque particles, discoloration or foreign particles observed.

Administer infusion over at least 60 minutes.

<table>
<tr><td>Allergy</td><td>Hypersensitivity including anaphylaxis and angioedema. Monitor carefully during and for an hour after the infusion for hypersensitivity reactions.</td></tr>
<tr><td>Contra-indications</td><td>Clinically important, active infection (e.g. active TB)</td></tr>
<tr><td>Usual dose range</td><td>Initial intravenous dosing of Ustekinumab
<table>
<tr><td>Body weight of patient</td><td>Recommended dose</td><td>Number of vials</td></tr>
<tr><td>Less than or equal to 55kg</td><td>260mg</td><td>2</td></tr>
<tr><td>Greater than 55kg and up to or equal to 85kg</td><td>390mg</td><td>3</td></tr>
<tr><td>Greater than 85kg</td><td>520mg</td><td>4</td></tr>
</table></td></tr>
</table>

USTEKINUMAB (Stelara®) (page 2 of 2)

Renal or Hepatic Impairment	No specific advice from manufacturer.
Dose if underweight / obese	No specific advice from manufacturer.
Infusion-related adverse effects	Injection site erythema and pain.
Other common adverse effects	URTI, nasopharyngitis, dizziness, headache, oropharyngeal pain. Also Diarrhoea, nausea, vomiting, pruritus, back pain, myalgia, arthralgia and fatigue.
ECG/ telemetry?	No special requirements
Special giving set?	BBraun infusion pumps: PVC-Free set including 0.2 micron filter (Infusomat Space Line) NSV code: FSB03230 (8700098SP).
Other notes	Intravenous Ustekinumab is to be given as a single induction dose followed by subcutaneous dosing thereafter (Crohn's disease). See SmPC for details. Patients should be screened for tuberculosis or any active infection before starting treatment. Live vaccines should not be given concurrently with Ustekinumab. Patients receiving ustekinumab may receive concurrent inactivated or non-live vaccinations - see SmPC for more details. The name and the batch number of the product should be recorded on the kardex.

Prepared by:	Phil O'Byrne	15/10/2018	Checked by:	Mary Coyle	19/10/2018
Giving set product code and NSV code update:				J Mcgillycuddy	11/05/2022
Information provided relates to Stelara manufactured by Janssen-Cilag					

VANCOMYCIN [Critical Care] (page 1 of 2)

Form: 500mg dry powder vial
1g dry powder vial

Reconstitution: Add 10ml water for injection to 500mg vial.
Add 20ml water for injection to 1g vial.
Further dilute prior to administration.

Compatible Fluid: Sodium chloride 0.9%
Glucose 5%

Administration: Peripheral or central IV route
Vancomycin should preferably be administered via a central line due to its extreme pH. If a central line is not available, a large peripheral vein can be considered and should be monitored for adverse reactions on injection site. **Only** a central line may be used when given at a concentration ≥5mg/mL e.g. in fluid-restricted patients as described at the bottom of this page. [1]

Intermittent IV infusion (preferred)
Dilute each 500mg in a minimum of 100ml compatible fluid - administer as per the table below.

Dose to be Given	Volume of fluid each reconstituted dose should be added to.	Total Infusion Time
500mg	100ml	60 minutes
750mg	250ml	75 minutes
1g	250ml	100 minutes
1.25g	250ml	125 minutes
1.5g	500ml	150 minutes
2g	500ml	200 minutes

Intermittent IV infusion (Fluid restricted) (central route-critical care only)
In patients who are fluid restricted, vancomycin may be administered via central line to a dilution of 10mg/ml.

Dose to be Given	Volume of fluid each reconstituted dose should be added to.	Total Infusion Time
500mg	50ml	60 minutes
750mg	100ml	75 minutes
1g	100ml	100 minutes
1.25g	100ml	125 minutes
1.5g	250ml	150 minutes
2g	250ml	200 minutes

VANCOMYCIN [Critical Care] (page 2 of 2)

Allergy	Cautioned in patients with previous allergic reaction to teicoplanin. Anaphylactoid reactions including hypotension, wheezing, dyspnoea can occur.
Contra-Indications	Hypersensitivity to vancomycin.
Usual dose range	See ICU Empiric Antibiotic Guidelines.
Renal or Hepatic Impairment	Adjust dose depending on renal function and body weight.
Dose if underweight / obese	Adjust dose depending on renal function and body weight. See Adult Medicines Guide for calculation of creatinine clearance.
Infusion-related adverse effects	**Infusion rates faster than 10mg/min should be avoided.** On rapid infusion, severe hypotension (including shock and cardiac arrest), wheezing, dyspnoea, urticaria, pruritus, flushing of the upper body ('red man' syndrome), pain and muscle spasm of back and chest. Extravasation at the injection site can cause necrosis.
Other common adverse effects	Nephrotoxicity and interstitial nephritis can occur. Ototoxicity can also occur (discontinue if tinnitus develops).
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements.
Other notes	

Prepared by:	Mary Coyle	28/01/2015	Checked by:	Jennifer Hayde	03/02/2015
Amended by:	Mary Coyle	21/04/2015	Checked by:	Jennifer Hayde	08/05/2015
			Approved by:	Dr Fitzpatrick	14/07/2015
Updated by:	Mary Coyle	20/11/2018	Checked by:	Colette Morris	08/02/2019

Information provided relates to Vancocin power for concentrate for solution for infusion manufactured by Flynn Pharma Ltd.

References

1. NHS Injectable Medicines Guide. Vancomycin monograph. Version 7. Last updated 10/12/2018. Available online at www.injguide.nhs.uk. (password-protected). Accessed 13/02/2019.

VASOPRESSIN [Critical Care] (page 1 of 2)

(Vasopressin = Argipressin = Arginine vasopressin = Pitressin®)

Form: 20units in 1mL

Reconstitution: Already in solution

Compatible Fluid: Glucose 5%
Sodium chloride 0.9% (unlicensed)

Administration: Central IV route

Continuous IV infusion
Dilute 20units of vasopressin (1mL) with compatible infusion fluid to 50mL. This gives a **0.4units/mL** solution. Administer as a continuous infusion via a syringe driver at the rate appropriate to the indication specified in the table below:

Refractory Septic Shock: Vasopressin 0.4unit/mL Administration Rate	
Minimum infusion rate i.e. 0.01 units/min	Recommended maximum infusion rate i.e. 0.03 units/min
1.5mL/hr	4.5mL/hr
Potential Organ Harvesting: Vasopressin 0.4 units/mL Administration Rate	
0.5 – 2.4 units/hr (0.008 – 0.04 units/min) to maintain MAP at target range	
1.25 – 6 mL/hr of 0.4 units/mL solution	

Allergy	Local or systemic allergic reactions may occur. Rarely associated with bronchospasm with urticaria and pruritus.
Contra-indications	Chronic nephritis (until reasonable blood nitrogen attained). Extreme caution in vascular disease, especially disease of the coronary arteries.
Usual dose range	As per table above
Renal or Hepatic Impairment	No information available
Dose if underweight / obese	No special advice from manufacturer
Infusion-related adverse effects	Peripheral vasoconstriction, tremor, sweating, vertigo, myocardial ischaemia, arrhythmia, bradycardia. Extravasation is likely to cause tissue damage due to high pH.

VASOPRESSIN [Critical Care] (page 2 of 2)

(Vasopressin = Argipressin = Arginine vasopressin = Pitressin®)

Other common adverse effects	Fluid retention, pounding headache, abdominal cramps, nausea, vomiting, urticaria, bronchial constriction, symptoms of angina.
ECG/ telemetry?	Continuous ECG and BP monitoring required
Special giving set?	No special requirements
Other notes	

Prepared by:	Mary Coyle	20/04/2016	Checked by:	J Mcgillycuddy	13/05/2016
Reviewed by:	T Smeaton	26/07/18	Checked by:	Mary Coyle	11/09/2018

Information provided relates to Vasopressin Injection USP manufactured by Fresenius Kabi.

References

1. NHS Injectable Medicines Guide. Vasopressin (argipressin) monograph. Version 2. Last updated 16/06/2014. Available online at www.injguide.nhs.uk. (password-protected). Accessed 26/07/2018.
2. Organ Donation Transplant Ireland. Damodar Solanki. Hormonal Therapy in Organ Donation Guideline. Ref ODTI-F-0032, Rev 1.

VEDOLIZUMAB (Entyvio®) [Gastroenterology] (page 1 of 2)

IV monoclonal antibodies are on the exclusion list of drugs not generally to be administered by nursing staff as per the Intravenous Drug Administration Policy

Form: 300mg powder for concentrate solution for infusion

Reconstitution: Allow vial to reach room temperature. Add 4.8mL water for injections directing the liquid down the wall of the vial to avoid excessive foaming (using a syringe with a 21-25 gauge needle). Gently swirl the vial for at least 15 seconds. Do not shake vigorously or invert. Leave for 20 minutes to allow foam to settle; the vial can be gently swirled occasionally during this time. If not fully dissolved, leave for another 10 minutes. The solution should be clear or opalescent and colourless to light yellow. Reconstituted solution contains 60mg/mL.
Further dilute before administration.

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route
Give over 30 minutes preferably using an infusion pump

Intermittent IV infusion
Invert the reconstituted vial gently three times before withdrawing 5mL of the reconstituted solution. Add to a 250mL infusion bag of compatible infusion fluid. Gently mix the contents of the bag. Give over 30 minutes using an infusion pump. See table below for monitoring requirements during and post infusion.

Allergy	Hypersensitivity including anaphylaxis. All patients administered vedolizumab should be observed continuously during and for **2 hours post infusion** for the first 2 infusions and for **1 hour post infusion** for subsequent infusions. Full resuscitation equipment must be available. If a severe infusion-related reaction (IRR), anaphylactic reaction or other severe reaction occurs, administration should be discontinued immediately and appropriate treatment initiated (e.g. adrenaline and antihistamines). If a mild to moderate IRR occurs, the infusion rate can be slowed or interrupted and appropriate treatment initiated. Once the mild or moderate IRR subsides, continue the infusion. Doctors should consider pre-treatment (e.g. with antihistamine, hydrocortisone and/ or paracetamol) prior to the next infusion for patients with a history of mild to moderate IRR, to minimise their risks.

VEDOLIZUMAB (Entyvio®) [Gastroenterology] (page 2 of 2)

Contra-Indications	Hypersensitivity to vedolizumab or any of its excipients. Active severe infection such as TB, sepsis, CMV, listeriosis and opportunistic infections such as progresive multifocal leukoencephalopathy.
Usual dose range	300mg at weeks zero, two and six, and then every eight weeks thereafter. Four weekly dosing may be appropriate in certain circumstances.
Renal or Hepatic Impairment	Not studied in renal or hepatic impairment so no dose recommendation can be made.
Dose if underweight / obese	No specific recommendations.
Infusion-related adverse effects	Hypersensitivity, including anaphylaxis, and infusion-related reactions; see above under "Allergy" for management of hypersensitivity and IRRs. Headache, dizziness, dyspnoea, hypertension, nausea, rash, pruritus, pyrexia, infusion site reactions.
Extravasation	No information available
Other common adverse effects	Abdominal distension, Anal abscess, anal fissure, acne, arthralgia, back pain, bronchitis, constipation, cough, dyspepsia, eczema, erythema, fatigue, flatulence, gastroenteritis, haemorrhoids, hypertension, increased susceptibility to infections, malaise, muscle spasms, muscular weakness, nasal congestion, nasopharyngitis, night sweats, oropharyngeal pain, paraesthesia, pharyngitis, sinusitis.
ECG/ telemetry?	No special requirements
Special giving set?	No special requirements
Notes	Monitoring: Take BP, HR and temperature, and screen for infection, before start of infusion. Unreconstituted vial should be stored in a refrigerator (2°-8°C) in the outer carton to protect from light. Contact Medicines Information (ext 2558) regarding any temperature excursions. The name and the batch number of the product should be recorded on the kardex. Patients should be brought up to date with all immunisations in agreement with current immunisation guidelines prior to initiating vedolizumab treatment. Patients should be screened for tuberculosis before starting treatment. Patients should be provided with a patient alert card.

Prepared by:	JMcgillycuddy	04/04/2017	Checked by:	Mary Coyle	04/04/2017
Updated by:	Maeve Harty	29/01/2017	Checked by:	Roisin Logan	12/02/2021
Updated by:	E Ní Loingsigh	22/06/2023	Checked by:	JMcgillycuddy	17/08/2023
Information provided refers to Entyvio brand of vedolizumab					

Reference: Medusa Injectable Medicines Guide. Available online at www.injguidenhs.uk (password-restricted). Accessed 22/06/2023.

This information has been summarised to act as a guide for those administering IV medication in Tallaght Hospital. Information on dose, adverse effects, cautions and contra-indications is not complete. Further information is available from the SPC, BNF, Tallaght Hospital Adult Medicines Guide & ward pharmacist.

Ublituximab (Briumvi) [Neurology] (page 1 of 2)

IV monoclonal antibodies are on the exclusion list of drugs not generally to be administered by nursing staff as per the Intravenous Drug Administration Policy

Form: 150mg/6mL concentrate for solution for infusion.

Reconstitution: Already in solution. Should not be shaken.
Further dilute before administration.

Compatible Fluid: Sodium chloride 0.9%

Administration: Peripheral or central IV route

Intermittent IV infusion

	Dose and Infusion bag size	**Final concentration (mg/mL)**	**Infusion rate**	**Minimum Infusion time**
First infusion	150mg in 250mL bag of sodium chloride 0.9%	0.6mg/mL	• Start at 10 ml per hour for the first 30 minutes • Increase to 20 ml per hour for the next 30 minutes • Increase to 35 ml per hour for the next hour • Increase to 100 ml per hour for the remaining 2 hours	4 hours
Second infusion (2 weeks after first infusion) **Subsequent infusions (once every 24 weeks) ***	450mg in 250mL bag of sodium chloride 0.9%	1.8mg/mL	• Start at 100 ml per hour for the first 30 minutes • Increase to 400 ml per hour for the remaining 30 minutes	1 hour

Allergy	Hypersensitivity including anaphylaxis. If a serious hypersensitivity reaction, including anaphylaxis, occurs, administration of ublituximab should be discontinued immediately and appropriate therapy initiated.

Ublituximab (Briumvi) [Neurology] (page 2 of 2)

Contra-indications	Hypersensitivity, severe active infection, patients in a severely immunocompromised state, known active malignancies.
Usual dose range	First infusion: 150mg on Day 1 Second infusion: 450mg on Day 15 *Subequent infusions: 450mg every 24 weeks – first subsequent infusion should be administered 24 weeks after the first infusion.
Renal or Hepatic Impairment	No studies assessed the effect of moderate – severe renal impairment or hepatic impairment. No specific advice from manufacturer.
Dose if underweight / obese	No specific advice from manufacturer.
Infusion-related adverse effects	Pyrexia, chills, headache, tachycardia, nausea, abdominal pain, throat irritation, erythema, and anaphylactic reaction.
Extravasation	No specific information available. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	Respiratory tract infections, herpes virus infections, neutropenia, pain in extremities.
ECG/ telemetry?	No special requirements.
Special giving set?	No special requirements.
Other notes	Unreconstituted vials should be stored in a refrigerator (2°-8°C) in the outer carton to protect from light. Contact Medicines Information (ext 2558) regarding any temperature excursions. The name and the batch number of the product should be recorded on the drug chart. Patients should be brought up to date with all immunisations in agreement with current immunisation guidelines prior to initiating ublituximab treatment. Patients should be monitored for at least one hour after the completion of the first two infusions. Subsequent infusions do not require monitoring post-infusion unless an infusion related reaction and/or hypersensitivity has been observed. Patients should be advised that infusion related reactions can occur up to 24 hours after the infusion.

Prepared by:	D. Stewart	08/05/2025	Checked by:	K Burke	10/07/2025
Information provided relates to Briumvi® manufactured by Neuraxpharm Pharmaceuticals S.L					

VERNAKALANT (Brinavess®) [ED] (page 1 of 5)

Form: 500 mg concentrate for solution for infusion

Reconstitution: Already in solution.
Further dilute before administration.

Compatible Fluid: Glucose 5%
Sodium chloride 0.9%

Administration: Peripheral or central IV route
IV infusion given over 10 minutes
Preferably given using an infusion pump

Dose

Dose is based on body weight.

There are two different dose regimens depending on first or second infusion.
If conversion to sinus rhythm does not occur with the first infusion or within the 15 minute observation period, then a second infusion may be administered.

Vernakalant dose for first infusion	**Vernakalant dose for second infusion (if required – see note above)**
3mg/kg (maximum dose of 339mg)	2mg/kg (maximum dose of 226mg)

IV infusion
Prepare a **4mg/mL** infusion solution as outlined in the table below.

Patient weight	**Volume of Vernakalant concentrate solution**	**Infusion bag size**	**Volume to remove before adding Vernakalant**
Less than or equal to 100kg	25ml (500mg)	100ml	None
Greater than 100kg	30ml (600mg)	250ml	130ml

VERNAKALANT (Brinavess®) [ED] (page 2 of 5)

Infusion volume and vernakalant dose calculation tables

Round patient weight to the nearest 2.5kg or 5kg as per table below.
E.g. if weight = 56kg, dose as for 55kg, if weight = 68kg, dose as for 70kg.

First infusion of vernakalant is administered as a 3mg/kg dose over 10 minutes.

Patient weight	**Vernakalant dose (mg)**	**Volume of the 4mg/mL solution as prepared above**
40kg	120mg	30mL
42.5kg	127.5mg	32mL
45kg	135mg	34mL
47.5kg	142.5mg	36mL
50kg	150mg	38mL
55kg	165mg	41mL
60kg	180mg	45mL
65kg	195mg	49mL
70kg	210mg	53mL
75kg	225mg	56mL
80kg	240mg	60mL
85kg	255mg	64mL
90kg	270mg	68mL
95kg	285mg	71mL
100kg	300mg	75mL
Note: preparation of solution differs for weights greater than 100kg. See above.		
105kg	315mg	79mL
110kg	330mg	83mL
113kg	339mg	85mL
For patients weighing greater than 113kg, do not exceed the maximum dose of 339 mg for the first dose		

The second infusion (if needed) is given as a dose of 2mg/kg dose over 10 minutes

Patient weight	**Vernakalant dose (mg)**	**Volume of the 4mg/mL solution as prepared above**
40kg	80mg	20mL
42.5kg	85mg	21mL
45kg	90mg	23mL
47.5kg	95mg	24mL
50kg	100mg	25mL
55kg	110mg	28mL
60kg	120mg	30mL
65kg	130mg	33mL
70kg	140mg	35mL
75kg	150mg	38mL
80kg	160mg	40mL

VERNAKALANT (Brinavess®) [ED] (page 3 of 5)

85kg	170mg	43mL
90kg	180mg	45mL
95kg	190mg	48mL
100kg	200mg	50mL
Note: preparation of solution differs for weights greater than 100kg. See above.		
105kg	210mg	53mL
110kg	220mg	55mL
113kg	226mg	57mL
For patients weighing greater than 113kg, do not exceed the maximum dose of 226mg for the second dose		

Allergy	Possible
Contra-indications	Hypersensitivity to the active substance or to any of the excipients. Severe aortic stenosis, systolic blood pressure < 100 mm Hg, heart failure class NYHA III and NYHA IV, prolonged QT at baseline (uncorrected > 440 ms), severe bradycardia, sinus node dysfunction, second or third degree heart block in the absence of a pacemaker, use of intravenous rhythm control antiarrhythmics (class I and class III) within 4 hours prior to, as well as in the first 4 hours after vernakalant administration, acute coronary syndrome including myocardial infarction within the last 30 days.
Usual dose range	Dosed by patient body weight. See table above. Cumulative doses of greater than 5 mg/kg should not be administered within 24 hours.
Renal or Hepatic Impairment	No dose adjustment necessary.
Dose if underweight / obese	For patients **weighing greater than 113kg**, **do not exceed** the maximum of 339mg for first dose and 226mg for second dose. Cumulative doses above 565 mg have not been evaluated.
Infusion-related adverse effects	Infusion site pain, feeling hot, infusion site paraesthesia.
Extravasation	No specific information available. See section B of the IV monograph folder for guidance on the initial management of extravasation.
Other common adverse effects	Dysgeusia, sneezing, paraesthesia, bradycardia, atrial flutter, hypotension, nausea, vomiting, pruritus, hyperhydrosis. Cases of serious hypotension have been reported during and immediately following vernakalant infusion. See 'Other notes' below.
ECG/ telemetry?	Continuous ECG monitoring for duration of ECG and for at least 15 minutes after completion of infusion.
Special giving set?	No special requirements

VERNAKALANT (Brinavess®) [ED] (page 4 of 5)

Other notes	**Administer vernakalant in a monitored clinical setting appropriate for cardioversion.** Precautions before infusion • Ensure patients are adequately hydrated and haemodynamically optimised including anticoagulation if necessary. • **Potassium levels** less than 3.5mmol/l should be corrected • Assess for signs or symptoms of cardiac failure prior to administration of vernakalant (higher incidence of hypotensive adverse reaction and ventricular arrythmias) Monitoring during and after infusion Patients should be carefully observed for the entire duration of the infusion and for at least 15 minutes after completion of the infusion, for any signs and symptoms of a sudden decrease in blood pressure or heart rate, with assessment of vital signs and continuous cardiac rhythm monitoring. If any of the following signs or symptoms occurs, the administration of vernakalant should be discontinued and these patients should receive appropriate medical management: • A sudden drop in blood pressure or heart rate, with or without symptomatic hypotension or bradycardia • Hypotension • Bradycardia • ECG changes (such as a clinically meaningful sinus pause, complete heart block, new bundle branch block, significant prolongation of the QRS or QT interval, changes consistent with ischaemia or infarction and ventricular arrhythmia) If these events occur during the first infusion of vernakalant, patients should not receive the second dose.The patient should be further monitored for 2 hours after the start of the infusion and until clinical and ECG parameters have been stabilised. The standard solution recommended contains an excess of drug and there is a risk of overdose if the whole volume prepared is administered. Calculate the volume required to administer each dose and check carefully the total volume set in the pump. See infusion volume and dose calculations table above.

VERNAKALANT (Brinavess®) [ED] (page 5 of 5)

Prepared by:	Hannah Berman Deirdre Stewart	04/11/2024	Checked by:	Kate Burke	07/11/2024

Information provided relates to Brinavess manufactured by Correvio. Dose rounding agreed with Dr A McCabe Nov 2024.

References

1. Medusa Injectable Medicines Guide. Available online at http://www.injguide.nhs.uk (password restricted). Accessed 06/10/2024