IV Administration Guidelines

Pharmacy Department

South Infirmary Victoria University Hospital

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Introduction

- These guidelines have been prepared using the most up to date material available at the time of writing. Every attempt has been made to ensure the content is clear and accurate. This document serves a complementary role to the drug data information that is contained in specific SPCs (Summary of Product Characteristics) and in the BNF (British National Formulary).

- The monographs refer to the particular products that are available in SIVUH at the time of publication. On occasion, there may be switches of brands due to supply issues or cost considerations. The Pharmacy Department will endeavour to update the Intranet document in a timely manner where the change in brand impacts the administration details. However, be aware of this and check the product against the monograph prior to administration.

- The information in this document is not exhaustive. The monographs contain practical information to aid with the administration of the medicine. Further detailed information on dosing, indication, cautions, contraindications and adverse effects, etc, may be found in the prescribing guidelines, the SPC or BNF as appropriate, or contact the Pharmacy Department on 26166 for further discussion.

- The information in this document is for the treatment of adult patients.

- It is essential that good aseptic technique is used to prepare and administer parenteral drugs in order to prevent bacterial contamination. Deviation from this may affect the chemical stability of the drug.

- The drug monographs are arranged in two different sections; Antimicrobials and General Medicines. Within these two sections the monographs are organised in alphabetical order by approved generic name – see the table of contents for full list.

- This document was prepared for use within SIVUH only. The document is not for replication or further distribution.

- See last two pages of the document for legend of acronyms and abbreviations, and for record of document history.

Contents

ANTIMICROBIAL AGENTS:

GENERAL MEDICINES:

ANTIMICROBIAL AGENTS

ACICLOVIR	
Available preparations	Aciclovir 250mg per 10mL vial (Pfizer) Aciclovir 500mg per 20mL vial (Pfizer)
Reconstitution	Already in solution. Dilute further before administration.
Method of intravenous administration	**Intermittent intravenous infusion (administer using an electronically controlled infusion device):** Dilute with Sodium Chloride 0.9% to a concentration not greater than 5mg/mL (0.5%w/v), then: • Doses of 250mg to 500mg: Dilute with 100mL infusion fluid. After dilution the mixture should be shaken to ensure thorough mixing. Administer required dose over 60 minutes (to reduce the risk of renal tubular damage) • Doses between 501mg and 1000mg: Dilute with 250mL infusion fluid. After dilution the mixture should be shaken to ensure thorough mixing. Administer required dose over 60 minutes (to reduce the risk of renal tubular damage) Discard if any visible turbidity or crystallisation appears in the solution before or during the infusion. Do not refrigerate Shake to ensure thorough mixing
Compatibility & Stability	Dilute with Sodium Chloride 0.9%
Comments	• Monitor renal function regularly • Ensure adequate hydration • Monitor for neurological side-effects • Each 10mL of solution contains 26.7 mg sodium • In obese patients use Adjusted Body Weight to calculate the IV dose (no adjustment necessary in po dosing)
References	• *Aciclovir Pfizer SPC: PA 0822/215/001* • *CUH Adult Antimicrobial Guide (Accessed through Eolas App on 23/12/24)* • *Galway Guide. Accessed on 23/12/24 https://medinfogalway.ie/ivguides/aciclovir-intravenous-infusion-adults*

AMOXICILLIN	
Amoxicillin is a penicillin - check patient's allergy status before administration.	
Available preparations	Amoxicillin 500mg vial
Reconstitution	Add 10ml of Water for Injection to each 500mg vial. Shake vigorously and administer immediately after reconstitution. A transient pink colouration may or may not develop during reconstitution. Reconstituted solutions are normally colourless or a pale straw colour.
Method of intravenous administration	Can use either method of administration- choice depends on practicalities such as time available, fluid status of patient, etc. **Slow intravenous injection (doses up to 1g):** Administer over 3 to 4 minutes **Intermittent intravenous infusion: (all doses):** Add 500mg dose to 50ml of infusion fluid. Add doses greater than 500mg to 100ml of infusion fluid. Administer over 20 to 30 minutes
Compatibility & Stability	Sodium Chloride 0.9%
Comments	• All solutions should be shaken vigorously before injection and administered immediately after reconstitution. • Monitor for convulsions in patients with impaired renal function, those with predisposing factors (e.g. history of seizures) or those receiving high doses of amoxicillin.
References	• Galway guide: Accessed on 24/05/24 https://medinfogalway.ie/ivguides/amoxicillin-intravenous-adults • Amoxicillin Delbert SmPC. Accessed on 24/05/24 , PA23217/001/001 https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA23217-001-001_11042024161453.pdf • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 24/05/24)

AMBISOME

RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL	
Available preparations	AmBisome® 50mg vial (Gilead) **AmBisome is NOT interchangeable with other amphotericin products**
Reconstitution	• Add 12mL Water for Injection to each 50mg vial. Immediately shake vials vigorously for 30 seconds or longer. • This produces a solution of 50mg in 12.5mL (4mg/mL). • Withdraw calculated amount of Ambisome into a sterile syringe and **dilute further prior to administration** • **U**sing the 5 micron filter provided, add the required dose to a suitable volume of infusion fluid
Method of intravenous administration	Flush line before and after administration with Glucose 5% **Intermittent intravenous infusion (using an electronically controlled infusion device):** **Test dose required (1mg over 10 minutes):** All patients must receive a test dose before a new course of AmBisome. Prepare as follows: • Make up the dose for day 1 in the largest allowable volume e.g. 200mg in 1000mL • Calculate the volume which contains 1mg • Set the pump at a rate which will deliver the 1mg dose over 10 minutes • Stop the infusion pump, and observe the patient for 30 minutes • If no severe allergic or adverse reactions develop, restart the infusion pump and administer the remainder of the dose over 30 to 60 minutes **Intermittent intravenous infusion (using an electronically controlled infusion device):** The volume for dilution depends on dose as the final concentration must be between 0.2 and 2mg/mL (see table below*) • Withdraw the same volume from the infusion bag as the volume of drug to be added e.g. 100mg dose - remove 25mL from bag before addition of drug • Administer dose over 30-60 minutes and over 2 hours for dose greater than 5mg/kg/day
Compatibility & Stability	Glucose 5%
Comments	• Initial test dose must be given before each new course of this drug in case of anaphylaxis • Preferably, administer via a central venous access device to avoid potential venous irritation. If given peripherally use a large vein and monitor the injection site closely. • Line must be flushed before and after with Glucose 5% • Prescribe by brand name - Ambisome is not interchangeable with other amphotericin preparations. • Monitor potassium, magnesium, and renal function, LFTs, blood counts and pulmonary function. **AMBISOME CONTINUED ON NEXT PAGE**

AMBISOME CONTINUED	• If infusion related reactions occur (non-anaphylactic) - the rate of infusion should be slowed (administer over two hours), or routine doses of chlorphenamine, paracetamol and/or hydrocortisone may be given (unless contraindicated) • AmBisome contains soya oil. Do not give if patient is allergic to **peanuts** or **soya**.
References	• Galway guide: Accessed on 24/05/24 https://medinfogalway.ie/ivguides/amphotericin-liposomal-ambisome-intravenous-infusion-adults • Ambisome SmPC. Accessed on 24/05/24 , PA2322/001/001, https://www.medicines.ie/medicines/ambisome-liposomal-amphotericin--31254/spc • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 24/05/24)

***AmBisome Final concentration table:**

Dose	Final recommended infusion volume	Nearest available bag/bottle size
50mg (in 12.5ml)	25 to 250ml	100 or 250ml bag (**see below)
70mg (in 17.5ml)	35 to 350ml	100 or 250ml bag (**see below)
100mg (in 25ml)	50 to 500ml	100, 250ml or 500ml bag (**see below)
150mg (in 37.5ml)	75 to 750ml	100, 250 or 500ml bag
200mg (in 50ml)	100 to 1000ml	100, 250, 500 or 1000ml bag
300mg (in 75ml)	150 to 1500ml	250, 500 or 1000ml bag
400mg (in 100ml)	200 to 2000ml	250, 500 or 1000ml bag
500mg (in 125ml)	250 to 2500ml	250, 500 or 1000ml bag

** A 50ml infusion may be used if required (eg fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing

ANIDULAFUNGIN	
RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL	
Available preparations	Anidulafungin 100mg vial (Stored in Refrigerator in original packaging prior to use)
Reconstitution	Add 30mL Water for Injection to each 100mg vial. Reconstitution time can take up to five minutes. Dilute further prior to administration. **Further dilution:** • Add 100mg reconstituted vial (30mL) to 100ml infusion fluid • Add 200mg reconstituted vials (60mL) to 200ml infusion fluid (withdraw 50mL from 250mL bag)
Method of intravenous administration	**Intermittent intravenous infusion:** • Administer at a rate of 1.4mL per minute • i.e. 100mg dose (in 130mL) over 90 minutes • i.e. 200mg dose (in 260mL) over 180 minutes
Compatibility & Stability	Sodium Chloride 0.9% Glucose 5%
Comments	• Infusion-related adverse events have been reported, including rash, urticaria, flushing, pruritus, dyspnoea, bronchospasm and hypotension. Infusion-related adverse events are infrequent when the rate of infusion does not exceed 1.1 mg/min. • Isolated cases of significant hepatic dysfunction, hepatitis or worsening hepatic failure have been reported. Patients with hepatic impairment should be monitored for worsening hepatic function while on anidulafungin, and evaluated for risk benefit of continuing anidulafungin therapy
References	• Galway guide: Accessed on 24/05/24 https://medinfogalway.ie/ivguides/anidulafungin-intravenous-infusion-adults • Ecalta SmPC. Accessed on 24/05/24, EU/1/07/416/002, Rowex Anidualgungin, PA0711/278/001 https://www.medicines.ie/medicines/ecalta-100-mg-powder-for-concentrate-for-solution-for-infusion-31957/spc#tabs • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 24/05/24)

AZTREONAM	
Available preparations	Azactam® 1g vial Azactam® 2g vial
Reconstitution	For intravenous injection: To the contents of the vial add 6mL- 10mL of Water for Injection and shake well For intravenous infusion: Add at least 3ml Water for Injection to 1g Add at least 6ml Water for Injection to 2g Upon the addition of water for injection to the aztreonam powder, the vial should be shaken immediately and vigorously. Further dilution required
Method of intravenous administration	Can use either method of administration- choice depends on practicalities such as time available, fluid status of patient, etc. **Slow intravenous injection:** Administer over 3 to 5 minutes **Intermittent intravenous infusion:** • Add required dose to 100mL infusion fluid and administer over 20 to 60 minutes • A 1g in 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant under dosing
Compatibility & Stability	Sodium Chloride 0.9% Glucose 5%
Comments	• Use with caution in patients who have experienced a reaction to cefTAZidime (as the drugs share a side chain)
References	• Galway guide: Accessed on 30/05/24 https://medinfogalway.ie/ivguides/aztreonam-intravenous-adults • Azactam SmPC. Accessed on 30/05/24, PA0002/052/002 (1g), PA0002/052/003 (2g), https://www.medicines.ie/medicin es/azactam-1g-and-2g-powder-for-solution-for-injection-or-infusion-31382/spc • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 30/05/24)

BENZYLPENICILLIN	
Benzylpenicillin is a penicillin – check patient's allergy status before administration	
Available preparations	Crystapen® 600mg (1 mega unit) powder
Reconstitution	**For slow intravenous injection:** • Add 4mL - 10ml of Water for Injection or Sodium Chloride 0.9% to each 600mg vial • Dilute to a final volume of 600mg/10mL, 1.2g/20mL **For intravenous infusion:** • Add 10mL of Water for Injections or Sodium chloride 0.9% to each 600mg vial • A transfer device may be used to add the contents of the Benzylpenicillin vial to an infusion bag

Method of intravenous administration	**Can use either method of administration- choice depends on practicalities such as time available, fluid status of patient, etc**
	
	Slow intravenous injection:
	• Administer at a rate not exceeding 300mg/minute (see Comments): For example:
	  ○ Give 1.2g dose over at least 4 minutes
	  ○ Give 2.4g dose over at least 8 minutes (may be preferable to give this dose as infusion due to time required for slow intravenous injection)
	
	Intermittent intravenous infusion:
	• Add required dose to **100mL sodium chloride 0.9%** and administer over 30 to 60 minutes
	• A 50mL infusion may be used for doses of 2.4g or less if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing

Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• **Skin sensitisation** may occur in persons handling benzylpenicillin - care should be taken to avoid contact with the substance • Too rapid an injection rate may result in high levels, causing irritation to the central nervous system and/or electrolyte imbalance • Do not give if there is known hypersensitivity to penicillin and use with caution if sensitive to other beta-lactam antibiotics. • Contains 1.68mmol sodium per 600mg
References	• Galway guide: Accessed on 30/05/24 https://medinfogalway.ie/ivguides/benzylpenicillin-intravenous-adults • Crystapen SmPC. Accessed on 30/05/24 PA0126/313/001 https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA0126-313-001_21062021150428.pdf • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 30/05/24)

<table>
<tr><th colspan="2">CASPOFUNGIN</th></tr>
<tr><td colspan="2">RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL</td></tr>
<tr><td>Available preparations</td><td>Caspofungin 50mg vial

(Stored in Refrigerator in original packaging prior to use)</td></tr>
<tr><td>Reconstitution</td><td>Bring vial to room temperature.
Add 10.5mL of Water for Injection to each 50mg vial. Mix gently until a clear solution is obtained.

<table><tr><th>Dose</th><th>Volume of reconstituted caspofungin for transfer to intravenous bags</th></tr><tr><td>35mg</td><td>7ml</td></tr><tr><td>50mg</td><td>10ml</td></tr><tr><td>70mg</td><td>14ml (use two 50mg vials)</td></tr></table>
Dilute further prior to administration</td></tr>
<tr><td>Method of intravenous administration</td><td><u>Intermittent intravenous infusion:</u>
Add required dose to 250mL of infusion fluid and administer over 60 minutes
If necessary, doses of 50mg or 35mg may be added to 100mL of infusion fluid</td></tr>
<tr><td>Compatibility & Stability</td><td>Sodium chloride 0.9%</td></tr>
<tr><td>Comments</td><td>Do not use any diluents containing glucose, as caspofungin is not stable in diluents containing glucose.</td></tr>
<tr><td>References</td><td>Galway guide: Accessed on 30/05/24 https://medinfogalway.ie/ivguides/caspofungin-intravenous-infusion-adults
Caspofungin SmPC. Pinewood brand, Accessed on 30/05/24, PA0281/246/001 https://www.medicines.ie/medicines/caspofungin-50-mg-powder-for-concentrate-for-solution-for-infusion-35048/spc
CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 30/05/24)</td></tr>
</table>

CefoTAXime	
Cefotaxime contains a penicillin-like structure. Check patient's allergy status before administration	
Available preparations	Claforan® 500mg vial Claforan® 1g vial
Reconstitution	500mg vial: Add 2ml Water for Injection to each 500mg vial. Shake well until dissolved. 1g vial: Add 4mL Water for Injection to each 1g vial. Shake well until dissolved. When initially dissolved in the Water for Injection, a straw-coloured solution is formed.
Method of intravenous administration	**Slow intravenous injection:** • Administer over 3 to 5 minutes **Intermittent intravenous infusion:** • Add 1-2g to 100mL infusion fluid and administer over 20 to 60 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Each gram of Claforan contains approximately 48mg (2.09mmol) of sodium. • Potentially life-threatening arrhythmia has been reported when patients received rapid IV administration through a central venous catheter.
References	• Galway guide: Accessed on 30/05/24 https://medinfogalway.ie/ivguides/cefotaxime-intravenous-adults • SmPC. Accessed on 30/05/24 PA1142/041/001 (500mg), PA1142/041/002 (1g)https://www.medicines.ie/medicines/claforan-powder-for-solution-for-injection-1g-35423/spc • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 30/05/24)

CefTAZIdime	
Ceftazidime contains a penicillin-like structure. Check patient's allergy status before administration	
Available preparations	Ceftazidime 1g & 2g vial
Reconstitution	1g vial: Add 10mL Water for Injection to each 1g vial. Shake to dissolve: carbon dioxide is released and a clear solution will be obtained in about 1 or 2 minutes. 2g vial: Add 10mL Water for Injection to each 2g vial. Shake to dissolve: carbon dioxide is released and a clear solution will be obtained in about 1 or 2 minutes.
Method of intravenous administration	**Slow intravenous injection:** • After reconstitution invert the vial with the syringe plunger fully depressed. Insert the needle into the solution and withdraw the total volume of solution into the syringe, ensure the needle remains in solution. • No further dilution needed. Administer over 3 to 5 minutes. **Intermittent intravenous infusion (may be used for all doses):** • After reconstitution, once the product has dissolved, insert a second needle to relieve internal pressure in the vial. • Add required dose to 50-100mL and administer over 20 to 30 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Each 1g vial contains 52mg (2.26mmol) of sodium • Reconstituted solution ranges in colour from light yellow to amber. Product potency is not adversely affected by such colour variations.
References	• Galway guide: Accessed on 30/05/24 https://medinfogalway.ie/ivguides/ceftazidime-intravenous-adults • SmPC.Pinewood Brand Accessed on 30/05/24 PA0281/224/001 (1G), PA0281/224/002 (2g) https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA0281-224-001_13082021163849.pdf • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 30/05/24)

CefTAZidime/Avibactam

RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL

Contains a penicillin-like structure. Check patient's allergy status before administration

Available preparations

Ceftazidime/Avibactam 2g/0.5g (Pfizer)

Reconstitution

Add 10ml WFI to each 2g/0.5g vial.
Insert a gas relief needle through the vial closure after the product has dissolved to relieve the internal pressure (this is important to preserve product sterility).

The total time interval between starting reconstitution and completing preparation of the intravenous infusion should not exceed 30 minutes.

Method of intravenous administration

Required Dose	Volume to withdraw from reconstituted vial	Volume of Infusion Bag	Infusion Time
2.5g (2g/0.5g)	Entire reconstituted vial (approximately 12mls)	100-250ml	2 hours
1.25g (1g/0.25g)	6ml	100ml	
937.5mg (750mg/187.5 mg)	4.5ml	87ml (remove 13ml from 100ml bag)	

Compatibility & Stability

Sodium Chloride 0.9% or Glucose 5%

Comments

- Contains approximately 146 mg sodium per vial.
- The final concentration of the infusion must be between 8 and 40mg/ml of ceftazidime component, hence the specific infusion bag volumes recommended above

References

- Zavicefta SPC: EU/1/16/1109/001
- CUH Adult Antimicrobial Guide (Accessed through Eolas App on 27/06/25)
- Galway Guide. Accessed on 27/06/25 https://medinfogalway.ie/ivguides/aciclovir-intravenous-infusion-adults

CefTRIAXone	
Ceftriaxone contains a penicillin-like structure. Check patient's allergy status before administration.	
Available preparations	Ceftriaxone 1g vial
Reconstitution	Add 10mL Water for Injection to each 1g vial
Method of intravenous administration	**<u>Slow intravenous injection (for 1g dose only):</u>** • Administer over 5 minutes, preferably using a large vein **<u>Intermittent intravenous infusion (preferred route):</u>** • Add 1g dose to 50ml of compatible infusion fluid and give over at least 30 minutes • Add 2g dose to 100ml of compatible infusion fluid and give over at least 30 minutes • A 50mL infusion may be used for 2g dose if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant under dosing
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Each gram contains approximately 82mg (3.6mmol) of sodium • Calcium-containing solutions (including TPN, Hartmann's solution), are **NOT** compatible with ceftriaxone. Do **NOT** mix these two products. DO **NOT** give these two products to any patient SIMULTANEOUSLY. SEQUENTIAL administration is permitted in patients older than 28 days, provided a) the infusion line is rinsed or flushed between solutions, or b) the infusions are given via different infusion lines at different sites. • Ceftriaxone when dissolved in Water for Injections forms a pale yellow to amber solution. Variations in the intensity of colour of the freshly prepared solutions do not indicate a change in potency or safety. • For information regarding IM administration please contact Pharmacy.
References	• Galway guide: Accessed on 30/05/24 https://medinfogalway.ie/ivguides/ceftriaxone-intravenous-adults • SmPC. Pinewood Accessed on 30/05/24, PA0281/225/001 https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA0281-225-001_26112021100514.pdf • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 30/05/24)

CEFAZOLIN	
Cefazolin contains a penicillin-like structure. Check patient's allergy status before administration	
Available preparations	Cefazolin 1g Cefazolin 2g
Reconstitution	Add 4mL Water for Injection to each 1g vial Add 8ml Water for Injection to each 2g vial
Method of intravenous administration	**<u>Slow intravenous injection (for 1g dose only):</u>** • Administer over 3-5 minutes, preferably using a large vein **<u>Intermittent intravenous infusion (preferred route):</u>** • Add required dose to 100ml of infusion fluid and administer over 30 to 60 minutes • A 50ml infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant under dosing
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Each gram contains approximately 50.6mg (2.2mmol) of sodium.
References	• Galway guide: Accessed on 30/05/24 https://medinfogalway.ie/ivguides/cefazolin-intravenous-adults • Noridem Cefazolin Package Leaflet. Accessed on 30/05/24, PL24598/0053 • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 30/05/24)

CefUROXime	
Cefuroxime contains a penicillin-like structure. Check patient's allergy status before administration	
Available preparations	Cefuroxime 750mg vial & Cefuroxime 1.5g vial (Fresenius Kabi) Zinacef® 250mg
Reconstitution	**<u>250mg vial:</u>** **Add 2mL Water for Injection to each 250mg vial** **<u>750mg vial:</u>** **Add 6mL Water for Injection to each 750mg vial** **<u>1.5g vial:</u>** **Add 15mL Water for Injection to each 1.5g vial**
Method of intravenous administration	**<u>Slow intravenous injection (for all doses, but preferable to use infusion if dose greater than 750mg):</u>** • Administer over 3 to 5 minutes **<u>Intermittent intravenous infusion (all doses):</u>** • Add required dose to 100mL and administer over 30 to 60 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Each 750mg cefuroxime contains 40.6mg sodium • Cefuroxime IV is mainly used for surgical prophylaxis. PO cefuroxime is rarely indicated for treatment of infections and has poor bioavailability. Please consult with Microbiology/ID if considering oral switch from IV cefuroxime
References	• Galway guide: Accessed on 10/06/24 https://medinfogalway.ie/ivguides/cefuroxime-intravenous-adults • SmPC. Accessed on 10/06/24, PL 48870/0039 (250mg), PA2059/006/001 (750mg), PA2059/006/002 (1.5g) https://www.hpra.ie/img/uploaded/swedocuments/3fad6298-f01c-4a4c-aa26-2ebeb930bb68.pdf https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA2059-006-002_20112023094956.pdf • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 10/06/24)

CIPROFLOXACIN	
Available preparations	Ciprofloxacin 200mg per 100mL Ciprofloxacin 400mg per 200mL
Reconstitution	Already in solution
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** • Administer 200mg over 30 minutes. • Administer 400mg over 60 minutes. • Slow infusion will minimise patient discomfort and reduce risk of venous irritation
Compatibility & Stability	Product already in solution, does **not** require further dilution, however it is compatible with the following; Sodium Chloride 0.9%, Glucose 5%
Comments	• Pharmacokinetic studies have shown that: 400mg BD IV dose is equivalent to 500mg BD PO 400mg TDS IV is equivalent to 750mg BD PO • Ciprofloxacin has excellent oral bioavailability. Consider **intravenous to oral** switch as soon as possible. (Consult with Pharmacy if patient on enteral nutrition) • Incompatible with Heparin. If patient is receiving concomitant heparin ensure line is thoroughly flushed with Sodium chloride 0.9% before and after administration of ciprofloxacin. • Ensure adequate hydration to prevent crystalluria • Keep in original container to protect from light until required for use. Use immediately after the pouch is opened. If removed from outer packaging must be used within 24 hours • Contains 30.8mmol (707.70mg) sodium per 200mL • Fluoroquinolones may be associated with side effects relating to musculoskeletal, peripheral and central nervous systems, some of which may be serious, disabling and potentially permanent. Quinolones should be used with special caution in the elderly, patients with kidney disease, those who have had an organ transplantation or in patients being treated concomitantly with corticosteroids. These patients are at a higher risk of tendon injury. Patients should be informed of the risks and advised to stop treatment and contact prescriber if they experience pain or swelling in tendons / joints /muscle or neuropathy , severe tiredness, depressed mood, anxiety, problems with your memory or severe problems sleeping. Avoid fluoroquinolones where possible in those at risk of aortic aneurysm or dissection.
References	• Galway guide: Accessed on 10/06/24 <u>https://medinfogalway.ie/ivguides/ciprofloxacin-intravenous-infusion-adults</u> • SmPC.Noridem Brand, Accessed on 10/06/24 PA1122/005/001 <u>https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA1122-005-001_05022021114930.pdf</u> • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 10/06/24)

CLARITHROMYCIN	
Available preparations	Klacid® 500mg vial (Mylan)
Reconstitution	Add 10mL Water for Injection to each 500mg vial **Dilute further prior to administration**
Method of intravenous administration	**Intermittent intravenous infusion (using an electronically controlled infusion device- due to risk of thrombophlebitis):** • Add to 250mL infusion fluid and administer over 60 minutes • Administer through a large proximal vein
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• **NOT FOR BOLUS INJECTION - MUST BE DILUTED** (can cause cardiac arrhythmias). • Clarithromycin has excellent oral bioavailability. Consider IV to oral switch if appropriate. • Monitor injection site for inflammation or phlebitis
References	• Galway guide: Accessed on 10/06/24 https://medinfogalway.ie/ivguides/clarithromycin-intravenous-infusion-adults • SmPC. Accessed on 10/06/24, PA23355/013/003 or PA2010/004/003 https://www.medicines.ie/medicines/klacid-iv-500mg-powder-for-concentrate-for-solution-for-infusion-32607/spc#tabs • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 10/06/24)

CLINDAMYCIN	
Available preparations	Clindamycin 600mg per 4mL ampoule (Fresenius Kabi)
Reconstitution	Already in solution **Dilute further prior to administration**
Method of intravenous administration	**Intermittent intravenous infusion:** • Add 300mg to 50mL * infusion fluid and administer over at least 10 minutes • Add 600mg to 50mL * infusion fluid and administer over at least 20 minutes • Add 900mg to 100mL infusion fluid and administer over at least 30 minutes • Add 1.2g to 100mL infusion fluid and administer over at least 60 minutes • Maximum rate of administration 30mg per minute. Maximum concentration after dilution should not exceed 18mg/ml. *** 50mL volumes:** the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Contains 8.5mg sodium per mL • Clindamycin has excellent oral bioavailability. Consider intravenous to oral switch if appropriate. • Review ongoing use if patient develops diarrhoea. Clindamycin is known to cause antibiotic-associated diarrhoea, including C. difficile infection.
References	• Galway guide: Accessed on 10/06/24 https://medinfogalway.ie/ivguides/clindamycin-intravenous-adults • SmPC. Accessed on 10/06/24, Kabi Brand, PA2059/007/001 https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA2059-007-001_21102021160706.pdf • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 10/06/24)

CO-AMOXICLAV	
Co-amoxiclav is a penicillin - check patient's allergy status before administration	
Available preparations	Co-amoxiclav 1.2g vial Co-amoxiclav 600mg vial
Reconstitution	600mg vial: Add 10mL Water for Injection to each 600mg vial 1.2g vial: Add 20mL Water for Injection to each 1.2g vial
Method of intravenous administration	Can use either method of administration- choice depends on practicalities such as time available, fluid status of patient, etc. **Slow intravenous injection (all doses):** • Administer over 3 to 4 minutes **Intermittent intravenous infusion (all doses):** • Dilute 600mg in 50ml of compatible infusion fluid. • Dilute 1.2g in 100ml of compatible infusion fluid. • Administer over 30 to 40 minutes
Compatibility & Stability	Sodium chloride 0.9%
Comments	• **Co-amoxiclav contains a penicillin - check patient's allergy status before administration.** • Reconstituted solutions for injection should be administered within 15 minutes after reconstitution • The time interval between the beginning of reconstitution and the end of intravenous infusion should not exceed one hour • The dose is expressed in terms of the sum of amoxicillin and clavulanic acid content e.g. 1.2g co-amoxiclav = 1g amoxicillin and 200mg clavulanic acid. • The sodium content of each 1.2g vial is 2.7mmol. The potassium content of each 1.2g vial is 1.0mmol. • A transient pink colour may appear during reconstitution. Reconstituted are normally colourless or a pale yellow/straw colour.
References	• Galway guide: Accessed on 14/06/24 https://medinfogalway.ie/ivguides/co-amoxiclav-intravenous-adults • SmPC. Accessed on 14/06/24, Co-amoxiclav Instituto Biochimico Italiano G. Lorenzini License no: PA2220/002/002 (1.2g), PA2220/002/001(600mg) https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA2220-002-002_20102023145919.pdf • CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 10/06/24)

CO-TRIMOXAZOLE	
Available preparations	Septrin® 480mg per 5ml ampoule 480mg = 400mg sulfamethoxazole and 80mg of trimethoprim (doses refer to the combination)
Reconstitution	Already in solution Draw up using a 5 micron filter needle Dilute further prior to administration
Method of intravenous administration	**Intermittent intravenous infusion (using an electronically- controlled infusion device):** **a: Fluid restricted e.g. PJP treatment:** • To avoid crystallisation each 5mL (480mg/5mL) of injection solution MUST be diluted to a minimum of 75mL Glucose 5% • Administer required dose over 60 minutes **b: If not fluid restricted - (non PJP treatment):** • Add 5mL solution (480mg) to 125mL infusion solution • Add 10mL solution (960mg) to 250mL infusion solution • Add 15mL solution (1440mg) to 500mL infusion solution • Administer required dose over 60 to 90 minutes **c: Central line:** • Anecdotal evidence suggests that as a **last resort**, co-trimoxazole may be administered undiluted as an infusion via a central line, over 90 to 120 minutes (unlicensed) Should visible turbidity or crystallisation appear in the solution at any time before or during an infusion, the mixture should be discarded.
Compatibility & Stability	**Glucose 5% must be used for all fluid restricted patients under (a) above** Sodium chloride 0.9% or Glucose 5% can be used if using dilution specified under **(b)** above
Comments	• Dilution should be carried out IMMEDIATELY before use. • After adding co-trimoxazole to the infusion fluid, shake thoroughly to ensure complete mixing • Monitor FBC when given long term, or in folate deficient patients, or in elderly patients. • Check serum potassium and sodium in patients at risk of hyperkalaemia and hyponatraemia • Ensure adequate hydration to prevent crystalluria • Glucose 5% is the only suitable infusion fluid for fluid restricted regimens - for stability reasons • Contains 38.25 mg of sodium, 0.5 mg ethanol and 2.25 g of propylene glycol per 5ml ampoule. • Monitor closely in patients with impaired renal or hepatic functions because various adverse events attributed to propylene glycol have been reported such as acute renal failure, lactic acidosis and liver dysfunction (particularly with high doses or prolonged use of IV co-trimoxazole)
References	Galway guide: Accessed on 14/06/24 https://medinfogalway.ie/ivguides/co-trimoxazole-intravenous-infusion-adults SmPC. Septrin Aspen Accessed on 14/06/24, PA1691/010/005 https://www.medicines.ie/medicines/septrin-80mg-400mg-per-ampoule-solution-for-infusion-33709/spc CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 10/06/24)

COLISTIMETHATE (COLISTIN)	
RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL	
Available preparations	Colomycin® 1 million international units dry powder vial (Colomycin Teva)
Reconstitution	Usually: Add 10mL Water for Injection or Sodium Chloride 0.9% to each vial. Do not shake (which can lead to foam formation). Instead, roll in the hand to aid reconstitution
Method of intravenous administration	**Intravenous infusion (preferred method):** • Dilute to 100mL with infusion fluid and administer over 30 to 60 minutes • The residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing • **For the 9 Million unit dose:** Reconstitute each 1 million unit vial with **5ml.** Remove 50ml infusion fluid from a 100ml bag and add 45ml (9 million units) of drug solution to produce a final volume of 95ml **Slow intravenous injection (Patient must have Totally Implantable Venous Access Device):** • This route is only for doses of up to 2 million units (in 10mL) • Administer required dose over at least 5 minutes
Compatibility & Stability	Sodium chloride 0.9%
Comments	• Monitor carefully for paraesthesia, which may indicate neurotoxicity as a sign of overdose • Monitor renal function carefully at the start of, and regularly during treatment • The manufacturers recommend the monitoring of levels, especially in renal impairment and in CF patients • Levels are not routinely available- if required consult microbiology • Confusion and medication errors have occurred because of the different expression of dose in the EU (units) and the US (mg) markets: ○ 1 million units of Colistin is approximately equal to 80mg Colistin
References	• *Galway Guide. Accessed on 26/06/24. https://medinfogalway.ie/ivguides/colistimethate-colistin-intravenous-adult-patients* • *Colomycin Teva SmPC. Accessed on 26/06/24. , PA: 1986-046-001 https://www.hpra.ie/img/uploaded/swedocuments/Licence_PA1986-046-001_17072023113515.pdf* • *CUH Adult Antimicrobial Guide (Accessed through MicroGuide App on 26/06/24)*

DAPTOMYCIN	
RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL	
Available preparations	Daptomycin Noridem 350 mg and 500mg powder for solution for injection/infusion
Reconstitution	**Sodium chloride 0.9% ONLY** • Add 7ml Sodium Chloride 0.9% to each 350mg vial (using a sterile transfer needle that is 21 gauge or smaller in diameter, or a needleless device). • Add 10ml Sodium Chloride 0.9% to each 500mg vial (using a sterile transfer needle that is 21 gauge or smaller in diameter, or a needleless device). • GENTLY ROTATE the vial to ensure complete wetting of the product • Allow to stand for 10 minutes • Finally, the vial should be GENTLY rotated/swirled for a few minutes as needed to obtain a clear reconstituted solution • Vigorous shaking/agitation should be avoided to prevent foaming of the product • Reconstitution is normally complete within 15 minutes
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** • Slowly remove the appropriate reconstituted liquid from the vial using a new sterile needle that is 21 gauge or smaller in diameter, or a needless device. • Add required dose to 50mL infusion fluid and administer over 30 minutes • The residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing **<u>Slow intravenous injection:</u>** • Administer over 2 minutes (**only if infusion is not possible** as studies conducted in healthy subjects only)
Compatibility & Stability	Sodium chloride 0.9%
Comments	• Plasma creatine phosphokinase (CPK) must be measured at baseline and at least once-weekly during therapy in all patients • Plasma CPK should be measured more frequently, (every 2-3 days at least in the first 2 weeks), in patients at risk of myopathy e.g. where eGFR is less than 80mL/minute/1.73m^2, or where the patient is on other medication which has also been associated with myopathy e.g. statins, fibrates or ciclosporin • Patients should be reviewed regularly while on therapy for any signs or symptoms that might represent myopathy. Any patient that develops unexplained muscle pain, tenderness, weakness or cramps should have CPK levels monitored every 2 days. • Daptomycin should be discontinued in the presence of unexplained muscle symptoms if the CPK level reaches greater than 5 times upper limit of normal.
References	*Information provided relates to Daptomycin Noridem manufactured by Noridem* *[SPC last update 15/09/21. SPC checked 10/05/24]* *PA; EU/1/05/328/001, EU/1/05/328/003, EU/1/05/328/002, EU/1/05/328/004*

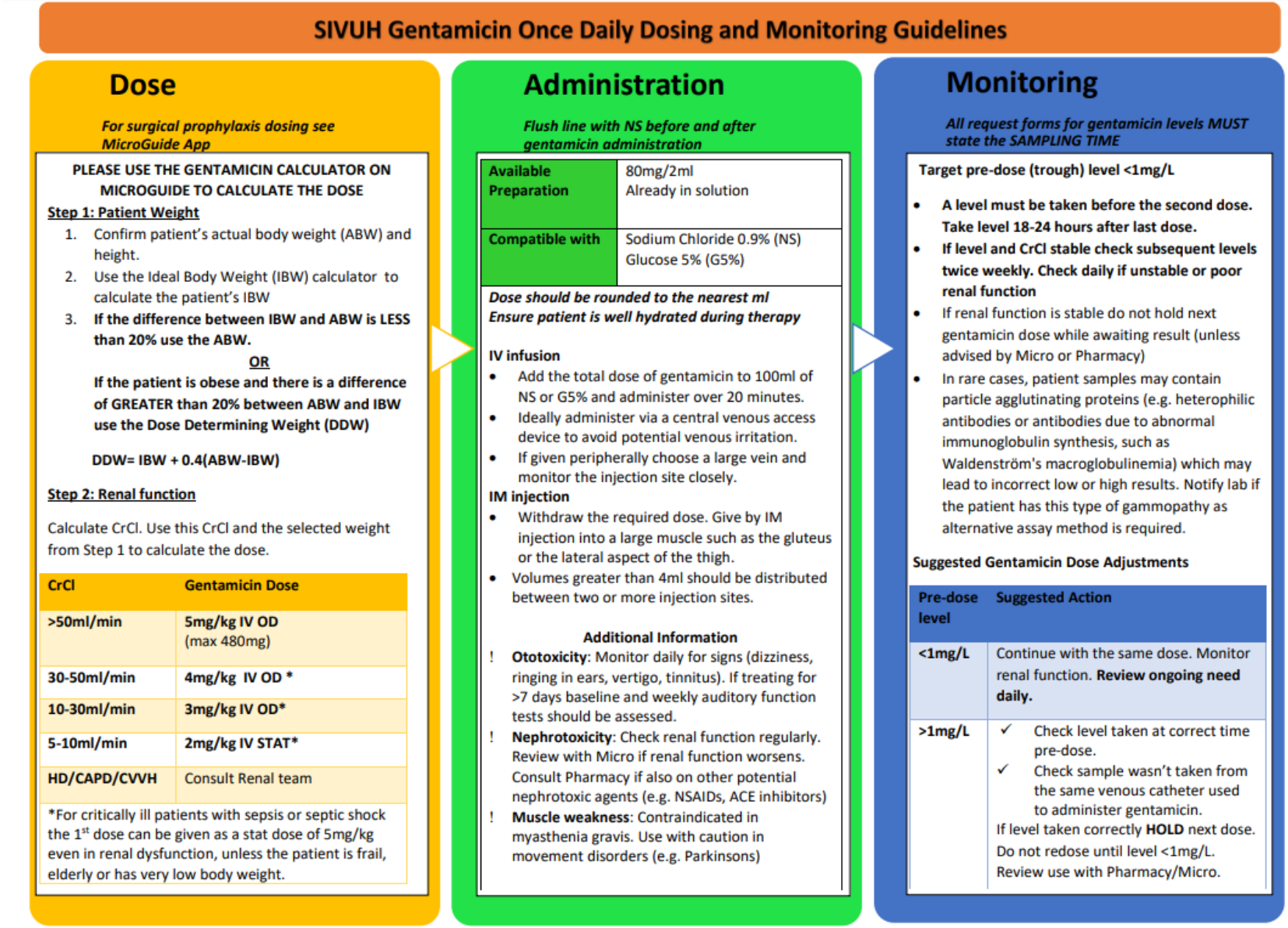
ERTAPENEM	
RESERVE ANTIMICROBIAL- REQUIRES MICRO/ID APPROVAL	
Ertapenem contains a PENICILLIN-LIKE structure- check patient's allergy status before administration	
Available preparations	Ertapenem 1g (Invanz) powder for concentrate for solution for infusion
Reconstitution	Reconstitute the contents of 1g vial with 10ml Water for Injections or sodium chloride 0.9% (this will yield a reconstituted solution of approx. 100mg/ml) Shake well to dissolve. **Dilute further prior to administration**
Method of intravenous administration	For a 1g dose; transfer the contents of the reconstituted vial to a bag of 50ml Sodium chloride 0.9% Infuse over 30 minutes Solutions of ertapenem range from colourless to pale yellow. Variations of colour within this range do not affect potency.
Compatibility & Stability	Sodium chloride 0.9%
Comments	• During administration, the residual volume in the infusion line must be flushed through and the same rate to avoid significant underdosing. • Ertapenem is a carbapenem. Avoid if history of immediate or severe hypersensitivity reaction to penicillins or cephalosporins • Caution in renal impairment – there is an increased risk of seizures in renal impairment, contact pharmacy to discuss dose. • Seizures have been reported with the use of Ertapenem, and occurred most commonly in elderly patients and those with pre-existing CNS disorders, and/or compromised renal function. • Co-administration with valproate may result in a decrease in valproic acid levels below the therapeutic range – therefore concurrent use is not recommended. • Each 1g dose contains approximately 137mg of Sodium.
References	*Information provided relates to Ertapenem (Invanz) manufactured by Merck Sharp & Dohme B.V., EU/1/02/216/001, EU/1/02/216/002 [SPC last update 02/02/2022. SPC checked 24/05/2024] Medinfo; Galway.ie accessed 24/05/2024*

ERYTHROMYCIN	
Available preparations	Erythrocin® 1g vial (Amdipharm)
Reconstitution	Add 20mL Water for Injection to each 1g vial **Dilute further prior to administration**
Method of intravenous administration	**<u>Intermittent intravenous infusion ONLY (using an electronically controlled infusion device due to risk of thrombophlebitis):</u>** • Add doses of 500mg or less to 100mL infusion fluid and administer over 60 minutes • Add doses of between 500mg and 1g to 250mL infusion fluid and administer over 60 minutes • Longer infusion times are recommended in patients with risk factors for arrhythmias or previous evidence of arrhythmias **<u>Fluid restricted patients:</u>** • Add 1g to 100mL infusion fluid, and administer via central line. Monitor carefully • If catheter in ventricle can cause extension of Q-R interval
Compatibility & Stability	Sodium Chloride 0.9%
Comments	• **Not first line** in SIVUH for treatment of infection or surgical prophylaxis- seek advice from pharmacy/microbiology for alternative agent. • Erythromycin may be used for gastro-intestinal stasis (but it is not licensed for this indication) • Monitor closely for thrombophlebitis-consider IV to PO switch as soon as is appropriate (can use same doses orally)
References	*Information provided relates to Erythrocin manufactured by Amdipharm* *[SPC last update 27/03/2023. SPC checked 10/05/2024] PA; 1142/8/1; Medinfo, Galway.ie accessed 10/05/2024*

FLUCLOXACILLIN	
FLUCLOXACILLLIN IS A PENICILLIN ANTIBIOTIC – CHECK ALLERGY STATUS	
Available preparations	Flucloxacillin 1g vial and 2g vial (Teva)
Reconstitution	1g vial: Add 20mL Water for Injection to each 1g vial 2g vial: Add 40mL Water for Injection to each 2g vial
Method of intravenous administration	Can use either method of administration- choice depends on practicalities such as time available, fluid status of patient, etc. **Slow intravenous injection:** • Doses up to 1g only: give slowly over 3 to 4 minutes • 2g: give slowly over 6 to 8 minutes **Intermittent intravenous infusion (can be used for all doses):** • Add required dose to 100mL infusion fluid and administer over 30 - 60 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• **Flucloxacillin is a penicillin - check patient's allergy status before administration.** • Monitor renal function and hepatic function when using prolonged and high dose therapy • Each 1g vial contains 2.2mmol (51mg) sodium and 2g vial contains 4.4mmol (102mg) sodium. • Regular paracetamol, when given with high doses of IV flucloxacillin, can in very rare cases lead to high anion gap metabolic acidosis. Monitor closely particularly if the maximum daily dose of paracetamol is used in those with severe renal impairment, sepsis or malnutrition.
References	*Information provided relates to Flucloxacillin manufactured by Teva 1g SPC last update 06/23][2g SPC last update 06/23] [SPCs checked 24/05/2024], PA1986/111/003, PA1986/111/004, Medinfo, Galway.ie accessed 24/05/2024, MicroGuide, CUH accessed 24/05/2024*

FLUCONAZOLE	
Available preparations	Fluconazole 200mg per 100mL (B Braun)
Reconstitution	Already in solution
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** • Administer at a maximum rate of 20mg (10mL) per minute • Give 200mg over 10 to 30 minutes • Give 400mg over 20 to 30 minutes
Compatibility & Stability	
Comments	• Consider IV to oral switch as soon as possible as excellent oral bioavailability (use same dose orally) • Fluconazole interacts with multiple medications. Check BNF or contact Pharmacy if concerned about possible interactions. • Monitor LFTs • Monitor QTc interval • Each mL contains 0.15mmol (3.5mg) sodium
References	*Information provided relates to Fluconazole manufactured by B. Braun* *[SPC last update 03/24. SPC checked 17/05/2024] PA0736/030/001, Medinfo, Galway.ie accessed 17/05/2024*

GENTAMICIN	
Available preparations	Gentamicin 80mg per 2mL vial (Amdipharm)
Reconstitution	Already in solution
Method of intravenous administration	**<u>Slow intravenous injection (not suitable for once daily dosing):</u>** • Administer slowly over at least 3 minutes undiluted. • For multiple daily dose regimens only **<u>Intravenous infusion (for once daily doses):</u>** • Add to 100mL infusion fluid and administer over 30 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant under-dosing
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Dose MUST be individualised according to renal function and weight. See SIVUH Gentamicin Once Daily Dosing and Monitoring Guidelines for full details. • Use Actual Body Weight (ABW) to calculate dose unless patient is obese (see below). • In obese patients with a difference of greater than 20% between IBW (Ideal Body weight) and ABW (Actual Body Weight) use Dose Determining Weight to calculate the dose. • DDW = IBW + 0.4(ABW – IBW) • Monitor for auditory and vestibular function during treatment. Treatment duration should be kept as short as possible to minimise risk of ototoxicity and nephrotoxicity. • Monitor gentamicin levels, renal function and urine output. • Dose should be rounded to the nearest ml.
References	*Information provided relates to Gentamicin manufactured by Amdipharm [SPC last update 04/24. SPC checked 17/05/2024] PA1142/013/001,* *Microguide, CUH accessed 17/05/2024*
SIVUH Gentamicin Once Daily Dosing and Monitoring Guideline on next page	


SIVUH Gentamicin Once Daily Dosing and Monitoring Guidelines
Dose
For surgical prophylaxis dosing see MicroGuide App
PLEASE USE THE GENTAMICIN CALCULATOR ON MICROGUIDE TO CALCULATE THE DOSE
Step 1: Patient Weight
1. Confirm patient's actual body weight (ABW) and height.
2. Use the Ideal Body Weight (IBW) calculator to calculate the patient's IBW
3. If the difference between IBW and ABW is LESS than 20% use the ABW.
OR
If the patient is obese and there is a difference of GREATER than 20% between ABW and IBW use the Dose Determining Weight (DDW)
DDW= IBW + 0.4(ABW-IBW)
Step 2: Renal function
Calculate CrCl. Use this CrCl and the selected weight from Step 1 to calculate the dose.
CrCl
Gentamicin Dose
>50ml/min
5mg/kg IV OD (max 480mg)
30-50ml/min
4mg/kg IV OD *
10-30ml/min
3mg/kg IV OD*
5-10ml/min
2mg/kg IV STAT*
HD/CAPD/CVVH
Consult Renal team
*For critically ill patients with sepsis or septic shock the 1st dose can be given as a stat dose of 5mg/kg even in renal dysfunction, unless the patient is frail, elderly or has very low body weight.
Administration
Flush line with NS before and after gentamicin administration
Available Preparation
80mg/2ml Already in solution
Compatible with
Sodium Chloride 0.9% (NS)
Glucose 5% (G5%)
Dose should be rounded to the nearest ml
Ensure patient is well hydrated during therapy
IV infusion
• Add the total dose of gentamicin to 100ml of NS or G5% and administer over 20 minutes.
• Ideally administer via a central venous access device to avoid potential venous irritation.
• If given peripherally choose a large vein and monitor the injection site closely.
IM injection
• Withdraw the required dose. Give by IM injection into a large muscle such as the gluteus or the lateral aspect of the thigh.
• Volumes greater than 4ml should be distributed between two or more injection sites.
Additional Information
! Ototoxicity: Monitor daily for signs (dizziness, ringing in ears, vertigo, tinnitus). If treating for >7 days baseline and weekly auditory function tests should be assessed.
! Nephrotoxicity: Check renal function regularly. Review with Micro if renal function worsens. Consult Pharmacy if also on other potential nephrotoxic agents (e.g. NSAIDs, ACE inhibitors)
! Muscle weakness: Contraindicated in myasthenia gravis. Use with caution in movement disorders (e.g. Parkinsons)
Monitoring
All request forms for gentamicin levels MUST state the SAMPLING TIME
Target pre-dose (trough) level <1mg/L
• A level must be taken before the second dose. Take level 18-24 hours after last dose.
• If level and CrCl stable check subsequent levels twice weekly. Check daily if unstable or poor renal function
• If renal function is stable do not hold next gentamicin dose while awaiting result (unless advised by Micro or Pharmacy)
• In rare cases, patient samples may contain particle agglutinating proteins (e.g. heterophilic antibodies or antibodies due to abnormal immunoglobulin synthesis, such as Waldenström's macroglobulinemia) which may lead to incorrect low or high results. Notify lab if the patient has this type of gammopathy as alternative assay method is required.
Suggested Gentamicin Dose Adjustments
Pre-dose level
Suggested Action
<1mg/L
Continue with the same dose. Monitor renal function. Review ongoing need daily.
>1mg/L
✓ Check level taken at correct time pre-dose.
✓ Check sample wasn't taken from the same venous catheter used to administer gentamicin.
If level taken correctly HOLD next dose.
Do not redose until level <1mg/L.
Review use with Pharmacy/Micro.

LEVOFLOXACIN	
Available preparations	Levofloxacin 500mg/100mL (Tavanic®)
Reconstitution	Already in solution
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** Administer: • 500mg over at least 60 minutes • 250mg over at least 30 minutes
Compatibility & Stability	Not required - product ready for infusion
Comments	• Consider **intravenous to oral** switch as soon as possible as excellent bioavailability. The oral dose is the same as the IV dose. • Quinolones may be associated with side effects relating to musculoskeletal, peripheral and central nervous systems, and mental health, some of which may be serious, disabling and potentially permanent. Quinolones should be used with special caution in the elderly, patients with kidney disease, those who have had an organ transplantation or in patients being treated concomitantly with corticosteroids. These patients are at a higher risk of tendon injury. Patients should be informed of the risks and advised to stop treatment and contact prescriber if they experience pain or swelling in tendons / joints /muscle or neuropathy, severe tiredness, depressed mood, anxiety, problems with your memory or severe problems sleeping. • Use with caution where predisposition to QT interval prolongation (including cardiac disease, congenital long QT syndrome, electrolyte disturbances, concomitant use with other drugs known to prolong QT interval (e.g.amiodarone), elderly patients) • Contraindicated in patients with a history of epilepsy • Contains 15.8 mmol (363mg) sodium per 100mL
References	*Information provided relates to Levofloxacin manufactured by Sanofi. [SPC last update 01/02/23. SPC checked 07/06/2024, PA 540/77/001]*

LINEZOLID	
RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL	
Available preparations	Linezolid 600mg per 300ml solution for infusion
Reconstitution	Already in solution
Method of intravenous administration	**Intermittent intravenous infusion:** • Administer over 30 to 120 minutes
Compatibility & Stability	Not required - product ready for infusion
Comments	• Consider intravenous to oral switch as soon as possible as excellent oral bioavailability (approx.100%) - use same dose orally as intravenously • Remove overwrap only when ready to use, then check for minute leaks by squeezing the bag firmly • Monitor FBC (including haemoglobin, platelets, and total and differential leucocyte counts) weekly in all patients. Myelosuppression (including anaemia, thrombocytopenia, leucopenia and pancytopenia) has been reported particularly in elderly. • Monitor blood pressure closely in uncontrolled hypertension, phaeochromocytoma, carcinoid, thyrotoxicosis, bipolar depression, schizoaffective disorder, acute confusional state or in patients taking SSRIs, tricyclic antidepressants, triptans, sympathomimetic agents, vasopressive agents, dopaminergic agents, pethidine or buspirone • Monitor for signs and symptoms of serotonin syndrome if used with serotonergic agents • Monitor for signs of metabolic acidosis • Linezolid should not be used in patients taking any drug which inhibits Monoamine oxidases A or B (e.g. phenelzine, selegiline, moclobemide, isocarboxazid) or within two weeks of having taken such drugs • The safety and efficacy of linezolid when administered for periods longer than 28 days have not been established. Severe peripheral or optic neuropathy may occur, especially if linezolid is used for longer than 28 days • Contains 114mg sodium per 300mL • Contains 13.7g glucose per 300mL • A High-Tech prescription is needed if discharging a patient on oral linezolid (Contact Pharmacy for details)
References	*Information provided relates to Linezolid manufactured by KRKA PA1347/057/002.* *[SPC last update 07/23. SPC checked 17/05/24*

MEROPENEM

RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL

Meropenem contains a PENICILLIN-LIKE structure- check patient's allergy status before administration	
Available preparations	Meropenem 1 g vial
Reconstitution	**<u>If for IV injection:</u>** • Add 20mL Water for Injections to each 1g vial
Method of intravenous administration	**Can use either method of administration- choice depends on practicalities such as time available, fluid status of patient, etc.** **<u>Slow intravenous injection (for doses up to 1g only):</u>** • Administer doses up to 1g slowly over approximately 5 minutes **<u>Intermittent intravenous infusion:</u>** • Add required dose to 100mL compatible infusion fluid and administer over 15 to 30 minutes. Final concentration should not exceed 20mg/ml. • The solution should be shaken before use • A 50mL infusion may be used for 1g dose only if required (e.g, fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Meropenem is a carbapenem. Avoid if history of immediate or severe hypersensitivity reaction to penicillins or cephalosporins • Co-administration with valproate may result in a 60-100% decrease in valproic acid levels within two days- therefore concurrent use with valproic acid/sodium valproate is not recommended • Patients with pre-existing liver disorders should have LFTs monitored during treatment with meropenem. • Each 1g vial contains 4 mmol of sodium (approx. 90mg)
References	*Information provided relates to Meropenem manufactured by Aurobindo, PA 1445/014/002. [SPC last update 07/2021. SPC checked 10/06/2024],* *Medinfo Galway.ie accessed 10/06/2024*

METRONIDAZOLE	
Available preparations	Metronidazole 500mg per 100mL infusion bag
Reconstitution	Already in solution
Method of intravenous administration	**Intermittent intravenous infusion:** • Usually administered over a minimum of 20 minutes (range 20 to 60 minutes)
Compatibility & Stability	Not required - product ready for infusion
Comments	• Consider intravenous to oral switch as soon as possible as metronidazole has excellent oral bioavailability • Maximum infusion rate is 5mL/min • Should not be given as an IV push • Contains 14mmol sodium per 100mL • Intake of alcoholic beverages must be avoided during treatment and up to 48 hours after administration due to the possibility of a disulfiram-like reaction
References	*Information provided relates to Metronidazole manufactured by B. Braun, PA0736/002/001* *[SPC last update 06/23. SPC checked 17/05/24*]

PIPERACILLIN-TAZOBACTAM	
Piperacillin-tazobactam is a penicillin - check patient's allergy status before administration	
Available preparations	Piperacillin-tazobactam (4g/0.5g)
Reconstitution	Using Sodium chloride 0.9% or Water for injection: • Add 20mL to each 4.5g vial • Shake the vial vigorously for one to two minutes • The displacement value is significant - withdraw the whole volume in the vial after reconstitution for administration of the whole dose
Method of intravenous administration	**Intermittent intravenous infusion:** • Add the reconstituted solution to minimum 50ml of compatible infusion fluid and administer over 30 minutes • While an infusion volume of 50mL may be used, a 100mL volume is recommended in order to reduce the amount of drug lost in the 'residual volume' of the administration set (which can be up to 20mL - i.e. 40% of drug lost). A smaller volume infusion of 50mL may be used, but care must be taken to flush through the drug solution remaining in the line.
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5% **Glucose 5% may be preferred for high doses (to avoid Sodium load)**
Comments	• **Piperacillin/Tazobactam is a Penicillin antibiotic**. Enquire and clearly document the patient's allergy status prior to giving or prescribing this medicine • Flush the line before and after giving Piperacillin/Tazobactam, particularly where gentamicin or other aminoglycosides are concerned (in order to avoid inactivation of the aminoglycosides) • Contains 9 mmol (206.6mg) sodium per 4.5g vial. • Monitor FBC, renal and hepatic function during prolonged treatment
References	*Information provided relates to Piperacillin-tazobactam manufactured by Mylan/ McDermott Lab, PA0577/204/002, [SPC last update 09/23. SPC checked 10/06/2024],* *Medinfo Galway.ie, accessed 10/06/2024*

RIFAMPICIN	
RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL	
Available preparations	Rifadin 600mg vial
Reconstitution	**Solvent provided (water for injections):** • 10ml solvent per 600mg vial • Swirl vial gently to completely dissolve powder • The solution is red in colour **Dilute further prior to administration**
Method of intravenous administration	**Intermittent intravenous infusion:** • Add required dose to 500mL infusion fluid and administer over 2 to 3 hours • Infusion must be completed within 6 hours. • Fluid restricted (use a large vein): 600mg in 100mL infusion fluid over 30 minutes (unlicensed). This solution is less stable, watch closely for precipitation
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Monitor baseline LFTs, FBC and platelets. Monitor bilirubin, serum creatinine • Hypersensitivity phenomena may occur (affecting platelets, vascular tissues and renal function) • Anaphylaxis may occur, especially with intermittent therapy (e.g. two to three times weekly dosing) • In hepatic impairment, use with caution. Use lower doses and monitor LFTs every two to four weeks during therapy • Avoid extravasation during injection; local irritation and inflammation due to extravascular infiltration of the infusion have been observed. If these occur, the infusion should be discontinued and restarted at another site • Multiple significant drug interactions occur when rifampicin is prescribed in combination with other medications. Check for drug interactions when prescribing and contact pharmacy for advice if needed. • May cause red discolouration of urine, sweat, sputum and tears. Patients should not wear contact lenses during treatment or for a few days afterwards. • Rifampicin has excellent oral bioavailability. Consider IV to PO switch if appropriate. • Contains 16mg Sodium per vial
References	*Information provided relates to Rifampicin manufactured by Sanofi, PA 540/66/3 [SPC last update 02/24. SPC checked 10/06/2023], Medinfo Galway.ie, accessed 10/06/2024*

TIGECYCLINE	
RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL	
Available preparations	Tigecycline Accord 50 mg powder for solution for infusion
Reconstitution	Reconstitute the vial with 5.3ml of Sodium Chloride 0.9% The vial should be gently swirled until dissolved. 5ml of the reconstituted solution contains 50mg of Tigecycline (concentration of 10mg/ml), note overage in vial **Dilute further prior to administration**
Method of intravenous administration	**Intermittent intravenous infusion** Add required dose to 100ml infusion fluid and administer over 30 to 60 minutes
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Reconstituted solutions are yellow to orange in colour - if not the solution should be discarded. Also discard if any particulate matter or discoloration (e.g. green or black) noted. • This formulation of Tigecycline contains maltose and may result in falsely elevated glucose readings leading to unrecognized hypoglycemia or inappropriate insulin administration. Glucose testing methods that do not react with maltose should be used when patients are receiving this formulation of tigecycline • Tigecycline may prolong both prothrombin time (PT) and activated partial thromboplastin time (aPTT). **Monitoring of coagulation tests** such as PT and aPTT or other suitable anticoagulation test, including blood fibrinogen, should be completed prior to treatment initiation with tigecycline and regularly while on treatment. Special care is recommended in **seriously ill patients** and in patients also using **anticoagulants**. • In patients with **severe hepatic impairment** (Child Pugh C) the dose should be reduced to 25mg every twelve hours following the initial 100mg loading dose. Child-Pugh classification applies to patients with cirrhosis. If the patient has hepatic impairment but does not have cirrhosis, dosage adjustment should be discussed with Micro/ID. • Patients hypersensitive to tetracycline class antibiotics may be hypersensitive to tigecycline.
Referenes	*Information provided relates to Tigecycline 50 mg powder for solution for infusion manufactured by Accord, EU/1/19/1394/001 (10 vials) EU/1/19/1394/002 (1 vial)* *[SPC last update 07/2023. SPC checked 26/05/2025],* *Medinfo Galway.ie, accessed 26/05/2025*

VANCOMYCIN

Available preparations

Vancomycin 500mg vial
Vancomycin 1g vial

Reconstitution

Water for injection:
10mL per 500mg vial
20mL per 1g vial
Dilute further prior to administration

Method of intravenous administration

Intermittent intravenous infusion (Using an electronically controlled infusion device due to risk of thrombophlebitis and Vancomycin infusion reaction):

- Dilute to a maximum concentration of **5mg/mL** and infuse at a rate not exceeding **10mg/minute.**

Vancomycin Dose (Max 2g)	Suggested Dilution	Minimum Rate of Administration
2g	500ml NS or G5%	200 minutes
1.75g	500ml NS or G5%	175 minutes
1.5g	500ml NS or G5%	150 minutes
1.25g	250ml NS or G5%	125 minutes
1g	250ml NS or G5%	100 minutes
750mg	250ml NS or G5%	75 minutes
500mg	100ml NS or G5%	50 minutes

Discuss with Micro/Pharmacy if patient is fluid restricted

Compatibility & Stability

Sodium Chloride 0.9% or Glucose 5%

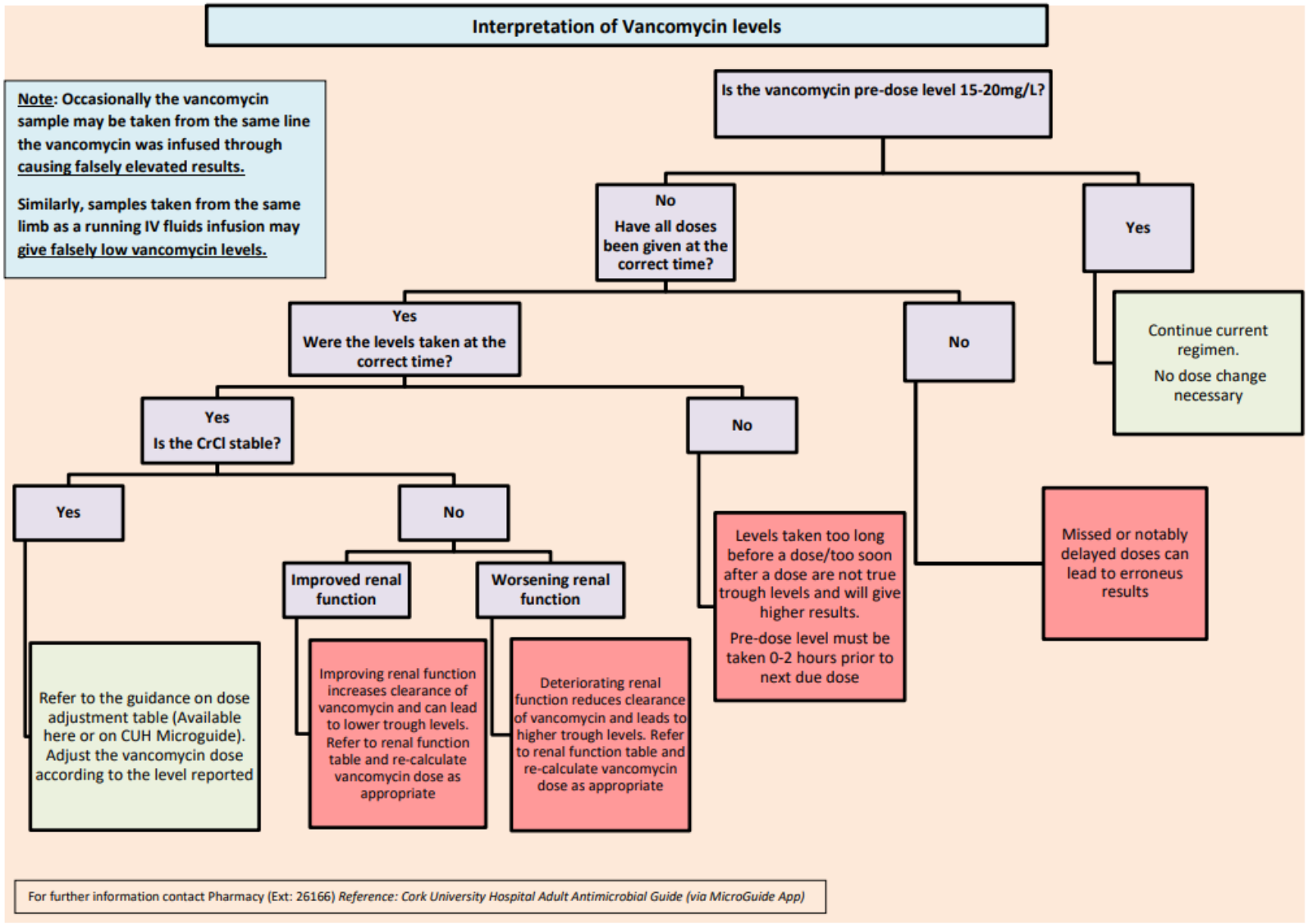
Comments

- Vancomycin blood level monitoring is required to ensure efficacy and minimise toxicity. Refer to SIVUH Vancomycin Dosing and Monitoring Guidelines.
- ALL REQUEST FORMS for vancomycin levels MUST state the SAMPLING TIME
- Monitor creatinine and renal function daily and review dose if necessary
- **AVOID rapid administration** as it has been associated with occasional severe hypotension (including shock and rarely cardiac arrest) as well as **Vancomycin infusion reaction**.
- Infusion of concentrations greater than 5mg/mL may cause **thrombophlebitis**

References

Information provided relates to Vancomycin manufactured by Mylan/McDermott Lab, PA0577/163/001, PA0577/163/002
[SPC last update 01/22. SPC checked 17/06/2024

Vancomycin Dosing and Monitoring Guidelines on next 2 pages


Interpretation of Vancomycin levels
Note: Occasionally the vancomycin sample may be taken from the same line the vancomycin was infused through causing falsely elevated results.
Similarly, samples taken from the same limb as a running IV fluids infusion may give falsely low vancomycin levels.
Is the vancomycin pre-dose level 15-20mg/L?
Yes
Continue current regimen.
No dose change necessary
No
Have all doses been given at the correct time?
No
Missed or notably delayed doses can lead to erroneus results
Yes
Were the levels taken at the correct time?
No
Levels taken too long before a dose/too soon after a dose are not true trough levels and will give higher results.
Pre-dose level must be taken 0-2 hours prior to next due dose
Yes
Is the CrCl stable?
No
Improved renal function
Worsening renal function
Improving renal function increases clearance of vancomycin and can lead to lower trough levels. Refer to renal function table and re-calculate vancomycin dose as appropriate
Deteriorating renal function reduces clearance of vancomycin and leads to higher trough levels. Refer to renal function table and re-calculate vancomycin dose as appropriate
Yes
Refer to the guidance on dose adjustment table (Available here or on CUH Microguide). Adjust the vancomycin dose according to the level reported
For further information contact Pharmacy (Ext: 26166) Reference: Cork University Hospital Adult Antimicrobial Guide (via MicroGuide App)

SIVUH Vancomycin Dosing and Monitoring Guidelines

Dose

For surgical prophylaxis dosing see MicroGuide App

Step 1: Loading Dose

- Give one loading dose to all patients: **25mg/kg IV (up to max 2g)**.
- Calculate dose using actual body weight. Round the dose up to the nearest 250mg.
- Request MRSA screen if prescribed empirically to cover MRSA infection.
- Check renal function (i.e. order U&Es)

Step 2: Maintenance Dose

- Calculate renal function using CrCl calculator. Calculate dose using actual body weight. Do not exceed 2g BD unless advised by Micro or Pharmacy

CrCl	Vancomycin Dose
>50ml/min	**15mg/kg (max 2g) IV BD** at 10am and 10pm Start 6-18 hours after loading dose *1st level due on morning of Day 3*
20-50ml/min	**15mg/kg (max 2g) IV OD** Start 24hours after loading dose *1st level due on Day 2*
<20ml/min	**Discuss with Microbiology**. Generally prescribe stat dose 15mg/kg and hold until levels are known. *1st level due on Day 2.*
HD/CAPD/CVVH	Consult Renal team

Administration

Maximum infusion rate: 10mg/minute

AVOID rapid administration as it has been associated with severe hypotension and Vancomycin infusion reaction.

Available Preparations	500mg vial 1g vial
Reconstitution with **water for injection**	10mL per 500mg vial 20mL per 1g vial. Dilute further prior to administration
Compatible with	Sodium Chloride 0.9% (NS) Glucose 5% (G5%)

Administer via intermittent intravenous infusion (Using an electronically controlled infusion device due to risk of thrombophlebitis and Vancomycin infusion reaction).

Dilute to a **maximum concentration of 5mg/ml**

Vancomycin Dose (Max 2g)	Suggested Dilution	Minimum Rate of Administration
2g	500ml NS or G5%	200 minutes
1.75g	500ml NS or G5%	175 minutes
1.5g	500ml NS or G5%	150 minutes
1.25g	250ml NS or G5%	125 minutes
1g	250ml NS or G5%	100 minutes
750mg	250ml NS or G5%	75 minutes
500mg	100ml NS or G5%	50 minutes

Monitoring

All request forms for vancomycin levels MUST state the SAMPLING TIME

Target pre-dose (trough) level 15-20mg/L

- **Take level 0-2 hours prior to next due dose.**
- Send blood sample in a red top bottle. Ensure the bottle is labelled with patient details and sampling time.
- If renal function stable do not hold next vancomycin dose while awaiting result (unless advised by Micro or Pharmacy)

Suggested Vancomycin Dose Adjustments

Pre-dose level	Suggested Action
<6 mg/L	Discuss with Micro/Pharmacy
6-10 mg/L	Increase each dose by 100% *e.g. 1g BD to 2g BD*
10 – 12.9 mg/L	Increase each dose by 50% *e.g. 1g BD to 1.5g BD*
13 – 14.9 mg/L	Increase each dose by 25% *e.g. 1g BD to 1.25g BD*
15 – 20 mg/L	No change necessary
20.1- 25 mg/L	Reduce each dose by 25%. Give 1 dose then check level before subsequent dose
25.1 – 39 mg/L	Hold dose until level <20mg/L Reduce each dose by 50%
>39 mg/L	Hold dose until level <20mg/L Discuss with Micro/Pharmacy

VORICONAZOLE

RESERVE ANTIMICROBIAL – REQUIRES MICRO/ID APPROVAL

Available preparations

Voriconazole 200mg vial

Reconstitution

Water for injections:
Add 19mL per 200mg vial
This produces a solution with a concentration of 200mg in 20ml
Dilute further prior to administration

Method of intravenous administration

Intermittent intravenous infusion:

- Final concentration of infusion must be between 0.5mg/mL and 5mg/mL - use the following table as guidance:

Dose	Volume of infusion
Less than 140mg	100mL
140mg to 500mg	100mL to 250mL
Greater than 500mg	250mL
Administer at a rate as per table below	

Rate of administration:

- Maximum rate of administration is 3mg/kg/hour - for simplicity use the following guidance:

Rate of administration	Administration time
Doses of 4mg/kg	90 minutes
Doses of 6mg/kg	120 minutes
Doses over 6mg/kg (on micro/ID advice only)	180 minutes

Compatibility & Stability

Sodium Chloride 0.9% or Glucose 5%

Comments

- Voriconazole has high oral bioavailability so switching to oral therapy is appropriate when clinically indicated
- There are numerous, potentially life-threatening interactions with antimicrobials, anticoagulants and transplant rejection drugs for example - check the manufacturer's SPC (or the BNF)
- If possible, avoid any drugs known to prolong the QT interval
- Electrolyte disturbances such as hypokalaemia, hypomagnesaemia and hypocalcaemia should be monitored and corrected if necessary, prior to and during voriconazole therapy
- Infusion related reactions, predominantly flushing and nausea, have been observed during administration of the intravenous formulation of voriconazole. Depending on the severity of symptoms, consideration should be given to stopping treatment
- Monitor serum creatinine in all patients
- Monitor liver function before starting treatment, then at least weekly for one month, and then monthly during treatment. Consider treatment discontinuation if LFTs become markedly elevated
- Monitor pancreatic function - serum amylase or lipase
- Each vial contains up to 69mg sodium
- A High-Tech prescription is needed if discharging a patient on oral voriconazole (Contact Pharmacy for details)

References

Information provided relates to Voriconazole manufactured by Fresenius Kabi, PA2059/020/001 [SPC last update 05/24. SPC checked 17/05/24], Galway Guide accessed; 17/05/2024

GENERAL MEDICINES

ACETAZOLAMIDE	
Available preparations	Acetazolamide (500mg powder) Diamox® (unlicensed)
Reconstitution	Reconstitute each 500mg vial with at least 5mL Water for Injections (ideally 10mL to reduce injection pain).
Method of intravenous administration	**Slow intravenous injection (preferred method):** Administer required dose over 3 to 5 minutes
Compatibility & Stability	
Comments	
References	*Information provided relates to Diamox manufactured by Advanz Pharma [SPC last update 03/04/20. SPC checked 24/02/23 & 18/06/2024]* *PL12762/0146*

ACETYLCYSTEINE	
Available preparations	Acetylcysteine 2g per 10 mL ampoule - Parvolex®
Reconstitution	Already in solution Dilute further prior to administration Draw up using a 5 micron filter needle
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** See package insert for information on appropriate diluent volume, dosing and infusion rates.
Compatibility & Stability	Glucose 5% preferred diluent (or Sodium Chloride 0.9%)
Comments	• For emergency treatment of poisoning. Contact the National Poisons Centre. • Each 10mL contains 322.6mg sodium.
References	*Information provided relates to Parvolex manufactured by Pheonix Labs [SPC last update 09/19. SPC checked 24/02/23 & 18/06/2024] PA1113/8/1*

ADDITRACE N (TRACE ELEMENTS)	
Available preparations	Additrace N® 10mL ampoule (Fresenius Kabi)
Reconstitution	Already in solution. **Dilute further prior to administration.**
Method of intravenous administration	**Intermittent intravenous infusion:** • Add one vial (10mL) to 100mL infusion fluid and administer over at least 2 to 3 hours • If also on Solvito N and Vitlipid N, the Additrace may be added to the same infusion bag (refer to Appendix 3 of DIET0002ORG Guidelines on the provision of PN in adult pts, available on the intranet, for advice): o Must use Sodium chloride 0.9% as the infusion fluid in this situation o Must protect from light if this combination is used o Invert the infusion bag several time to ensure adequate mixing
Compatibility & Stability	Glucose 5% or Sodium Chloride 0.9%
Comments	• Licensed in adults and children over 40kg body weight
References	*Information provided relates to Additrace N manufactured by Fresenius Kabi [SPC last update 03/20. SPC checked 24/02/23 & 18/06/2024] PA2059/023/002*

ADENOSINE	
Available preparations	Adenocor® 6mg per 2mL vial (Sanofi) Adenosine 6 mg per 2 mL pre-filled syringe (Fresenius Kabi) - **Should be used in preference**
Reconstitution	Already in solution No further dilution required – product ready to use.
Method of intravenous administration	**<u>Intravenous bolus (for all uses except for cardiac angio):</u>** • Give as a rapid IV bolus over 2 seconds • Inject as proximally as possible and follow with a rapid flush of Sodium chloride 0.9%
Compatibility & Stability	Not required – product ready for use
Comments	• To ensure it reaches the systemic circulation, if given via an IV line follow with a rapid flush of Sodium Chloride 0.9% • Monitor heart rate and blood pressure closely • ECG monitoring is essential during adenosine administration • Cardiorespiratory resuscitation equipment must be available for immediate use • Food and drinks containing xanthines (tea,coffee, chocolate and cola) should be avoided for at least 12 hours prior to use of Adenosine • Each vial contains 0.3mmol of sodium per 2 mL (Sanofi) • Each 1 mL of solution contains 0.15mmol (3.54mg) sodium (Fresenius Kabi)
References	*Information provided relates to Adenocor manufactured by Sanofi [SPC last update 05/15] and Adenosine PFS manufactured by Fresenius Kabi [SPC last update 08/18] [SPCs checked 24/02/23 & 18/06/2024] PA540/139/1, PA2059/004/001*

ADRENALINE (EPINEPHRINE)	
Available preparations	Adrenaline 1mg in 1mL ampoule (1:1000) (Mercury Pharma) Adrenaline 1mg in 10mL pre-filled syringe (1:10,000) (Aguettant) – **Should be used in preference**
Reconstitution	**Pre-filled syringe:** Already in solution **Ampoule:** Already in solution Dilute further prior to administration Draw up using a 5 micron filter needle
Method of intravenous administration	**Bolus intravenous injection:** Resuscitation: as per hospital resuscitation guidelines (pre-filled syringe used as it is, ampoules diluted with 9mL Water for Injection) **Continuous intravenous infusion (using an electronically controlled infusion device):** • **ICU, HDU only** • **Central line administration** • Prepare a solution containing either 3mg in 50mL or 6mg in 50mL • A 3 mg per 50mL solution contains 60 micrograms per mL • A 6 mg per 50mL solution contains 120 micrograms per mL • Administer at a suitable rate, titrated to response
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• For administration by infusion in specialist units only – ITU/HDU • Resuscitation use: any area • Infusion route is an unlicensed method of administration • Pre-filled syringe: each mL of solution contains 3.54mg (0.154mmol) sodium • Ampoule: contains less than 1mmol sodium (23mg) per mL, i.e. essentially 'sodium-free'
References	*Information provided relates to Adrenaline manufactured by Mercury Pharmaceuticals [SPC last update 08/18] and Adrenaline PFS manufactured by Laboratoire AGUETTANT [SPC last update 08/19] [SPCs checked 24/02/23 & 18/06/2024]* *PA73/35/1, PA1968/002/001*

ALTEPLASE	
Available preparations	Actilyse Cathflo® 2mg vial (Use: For unblocking central venous catheters) Cathflo® Activase® 2mg vial (unlicensed – for use when Actilyse Cathflo® unavailable) Actilyse® 10mg, 20mg, 50mg vials (Use: All other uses)
Reconstitution	**Cathflo 2mg vial (for unblocking central venous catheters):** Add 2.2mL Water for Injection, to produce a 1mg/mL solution. May be further diluted with Sodium Chloride 0.9% up to a maximum volume of 10mL, if lumen volume is more than 2mL. **10mg, 20mg and 50mg vials:** Final concentration required: 1mg/mL: 10mg vial: Add 10mL of solution provided 20mg vial: Add 20mL of solution provided 50mg vial: Add 50mL of solution provided Final concentration required: 2mg/mL: 10mg vial: Add 5mL of solution provided 20mg vial: Add 10mL of solution provided 50mg vial: Add 25mL of solution provided Note: • For the 10mg vial size, a syringe may be used to transfer the required volume of diluent to the vial. • For the 20mg and 50mg vial, a transfer needle is provided. • **AVOID VIGOROUS SHAKING OF THE PRODUCT- as foaming may occur.**
Method of intravenous administration	The choice of route (bolus injection vs infusion depends on the indication (check manufacturers guidance). **Bolus intravenous injection:** • Administer required dose over 1 to 2 minutes (Pulmonary embolism) • Administer required dose over 3 to 5 minutes (Myocardial infarction) **Intermittent intravenous infusion (administer using an electronically controlled infusion device):** • No need for further dilution • Administer required dose over time specified – see manufacturer's information for guidance on dose • The residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing **For central venous catheter clearance method of administration, see below*, or refer to manufacturer's guidance.**
Compatibility & Stability	• Can be used without further dilution once reconstituted as above • If required, it can be diluted further with Sodium chloride 0.9% to a concentration NOT less than 0.2mg/ml (i.e. at least 20**mg** drug in 100mL) **ALTEPLASE CONTINUED ON NEXT PAGE**

ALTEPLASE CONTINUED

***Central venous catheter clearance**

Method (Use Actilyse Cathflo/ Cathflo Activase preparation)

- Instil the appropriate dose into the blocked catheter after prescribing the treatment on the drug chart
- For catheters with an internal volume of 2ml or less - use the reconstituted Actilyse Cathflo (2mg in 2ml)
- For catheters with an internal volume of greater than 2ml- dilute the product further with Sodium chloride 0.9%- e.g. if the catheter volume is 2.7ml, dilute up the Actilyse Cathflo to 2mg in 2.7ml (maximum allowable dilution is 2mg in 10ml)
- After 30 minutes of dwell time, assess catheter function by attempting to aspirate blood
- If the catheter is still not functional, leave the Actilyse in the catheter for a further 90 minutes (total dwell time 120 minutes), and then try and aspirate blood
- If catheter function is still not restored, a second dose (same amount as first dose), can be instilled. Again, leave this 30 minutes before trying to aspirate blood, and if still not working, then another 90 minutes, as before)
- If it is still not functional, consider device replacement
- If catheter function has been restored (at any point during the above sequence), aspirate 4 to 5ml blood, to remove Actilyse Cathflo and residual clot, and gently irrigate the catheter with Sodium Chloride 0.9%
- Maximum dose 4mg (2 x 2mg) for any one occasion

References	*Information provided relates to Actilyse Cathflo [SPC last update 05/19] and Actilyse manufactured by Boehringer Ingelheim Int. [SPC last update 06/21] and Cathflo Activase manufactured by Genentech, Inc (unlicensed, when Actilyse Cathflo unavailable). [SPC last update 10/20] [SPC checked 27/02/23 & 18/06/2024]* *PA775/11/1, PA775/11/3*

AMINOPHYLLINE	
Available preparations	Aminophylline 250mg per 10mL ampoule (Mercury Pharmaceuticals)
Reconstitution	Already in solution Draw up using a 5 micron filter needle
Method of intravenous administration	**<u>Slow intravenous injection/Intermittent intravenous infusion (loading dose only):</u>** • Add required dose to 100mL infusion fluid and give over at least 20 minutes • Maximum recommended rate 25mg/minute • <u>Fluid restricted:</u> can be administered undiluted, ideally via central line **<u>Continuous intravenous infusion (administer using an electronically controlled infusion device):</u>** • Add required dose to a suitable volume of infusion fluid (e.g. 500mg to 500mL = 1mg/mL). <u>Example:</u> o Remove 20 mL from a 500 mL bag of infusion fluid and discard. o Withdraw 500 mg aminophylline (20 mL of 25 mg/mL solution) and add to the prepared infusion bag. o Mix well to give a solution containing 1 mg/mL. • Administer at a rate as per 'dose' – refer to manufacturers guidance • <u>Fluid restricted:</u> can be administered undiluted, ideally via central line
Compatibility & Stability	Sodium Chloride 0.9% Glucose 5%
Comments	• Aminophylline has a narrow therapeutic range, therefore serum levels should be monitored regularly, particularly during initiation of therapy • In patients with impaired hepatic or renal function, the half-life may be prolonged • In cigarette smokers, the half life may be reduced • Monitor potassium - may cause hypokalaemia • Rapid administration has been associated with **acute hypotension, arrhythmias and convulsions** • Do not use in patients hypersensitive to ethylenediamine or those allergic to xanthine derivatives, e.g. theophylline, caffeine. • Do not use in acute porphyria.
References	*Information provided relates to Aminophylline manufactured by Mercury Pharmaceuticals* *[SPC last update 10/20. SPC checked 27/02/23 & 18/06/2024]* *PA73/99/1*

AMIODARONE	
Available preparations	Cordarone X® 150mg per 3mL ampoule (Sanofi) Amiodarone 300mg in 10mL pre-filled syringe (for resuscitation trolley) (Aurum brand – Martindale)
Reconstitution	Already in solution **Dilute further prior to administration** Use a 5 micron filter needle when drawing up contents of ampoule
Method of intravenous administration	**Flush line before and after with Glucose 5%.** See under 'Comments' re **central** vs peripheral **line** **<u>Intermittent intravenous infusion (Loading dose only) (administer using an electronically controlled infusion device):</u>** • Add to 250mL infusion fluid and administer over 60 minutes (20 to 120 minutes is acceptable) **<u>Continuous intravenous infusion (Maintenance dose) (administer using an electronically controlled infusion device)</u>**: • Add required dose to 500mL infusion fluid and administer over 24 hours (23 hours on day 1) **<u>Central line administration only:</u>** • Loading dose may be given in 50mL infusion fluid over 60 minutes (20 to 120 minutes is acceptable) • Maintenance dose: Add required dose to make total volume of 50mL for infusion via syringe driver over 24 hours **Ventricular fibrillation** May be given faster in such circumstances (see manufacturers guidance)
Compatibility & Stability	Glucose 5% Infusion solutions containing less than 0.6mg/ml (e.g. 300mg in 500ml) are unstable and should not be used
Comments	• Flush li**ne before and after** with Glucose 5% as **amiodarone is incompatible with Sodium Chloride** 0.9%. • When repeated or continuous infusion is anticipated, administration by a central venous catheter is recommended (**repeated or continuous infusion via the peripheral veins may lead to injection site reactions**)**.** • There are numerous important interactions - check latest BNF or contact pharmacy for advice. • Non-PVC infusion bottles and administration sets are preferable (to reduce potential exposure to plastisizers). The use of a non-PVC infusion bottle (eg Braun Ecoflac, Baxter Viaflo or Technopharm Macoflex) and a low adsorption giving set **AMIODARONE CONTINUED ON NEXT PAGE**

AMIODARONE CONTINUED	(e.g. Baxter VMC9606, VMC9627 or Braun 8700110SP) is preferable to reduce plastisizer (DEHP - di-2-ethylhexphtalate) exposure. • Mini-jet formulation is occasionally unavailable. If minijet is not available, the dose may be drawn from the ampoule and diluted to 10mls with Glucose 5%. • Too rapid administration can cause circulatory collapse. • Where possible, administer via a **central line** to minimise vein irritation. However, it may be given via a large **peripheral vein** if a patient does not have central access. • ECG and blood pressure monitoring is required • Monitor site of infusion- can cause thrombophlebitis and extravasation may cause tissue damage • Monitor LFTs closely. Amiodarone dose should be reduced or stopped if transaminases increase to greater than three times the normal range • Telemetry monitoring required • Monitor thyroid function • Interstitial pneumonitis has been rarely reported • Amiodarone injection contains iodine • Injection solution contains benzyl alcohol
References	*Information provided relates to Cordarone X Intravenous manufactured by Sanofi [SPC last update 05/20] and Amiodarone PFS manufactured by Aurum Pharmaceuticals Ltd T/A Martindale Pharma [SPC last update 12/08/21] [SPCs checked 27/02/23 & 18/06/2024]* *PA540/142/3, PL12064/10047*

ATENOLOL	
Available preparations	Tenormin® Injection 0.5mg/mL (unlicensed) (AstraZeneca)
Reconstitution	Already in solution
Method of intravenous administration	**<u>Bolus intravenous injection:</u>** • Withdraw the required dose. • Give by IV injection at a maximum rate of 1 mg/minute (2 mL/minute). **<u>Intermittent intravenous infusion:</u>** • Withdraw the required dose • Add to a suitable volume (usually 100 mL) of infusion fluid • Give by IV infusion over 20 minutes.
Compatibility & Stability	Sodium Chloride 0.9% Glucose 5%
Comments	• Atenolol is likely to worsen pre-existing uncontrolled heart failure, ↓BP, bradyarrhythmias or obstructive airways disease and the risk/benefits should be considered before use. • Use with extreme caution in asthmatics. • Dosage requirements may be reduced in patients with impaired renal function. • Monitor: Blood pressure, bodyweight (for infusion), Pulse, Renal function: Urea, Cr, CrCl (or eGFR) • The solution should be clear and colourless. Inspect visually for particulate matter or discoloration prior to administration and discard if present.
References	*Information provided relates to Tenormin manufactured by AstraZeneca* *[SPC last update 10/06/21. SPC checked 27/02/23 & 18/06/2024]* *PL43252/0041*

ATROPINE	
Available preparations	Atropine 0.5mg/5mL (100microgram/mL) Prefilled Syringe (Critical care areas only) (Aguettant) – **Should be used in preference** Atropine sulfate 600mcg/mL (unlicensed – Martindale UK)
Reconstitution	Already in solution
Method of intravenous administration	**<u>Rapid IV Injection</u>** • Withdraw the required dose, or select the appropriate pre-filled syringe. • Give rapidly by IV injection (slow IV injection may cause paradoxical slowing of the heart).
Compatibility & Stability	Sodium Chloride 0.9% Glucose 5%
Comments	• May cause paradoxical bradycardia if given by slow IV injection. • The solution should be clear and colourless. Inspect visually for particulate matter or discoloration prior to administration and discard if present. • Each 5mL syringe contains 17.7mg (0.77mmol) sodium – essentially 'sodium free'
References	*Information provided relates to Atropine manufactured by Hameln Pharma [SPC last update 01/04/20] & Martindale Pharma (unlicensed) [SPC last update 10/01/17] and Atropine PFS manufactured by Aguettant [SPC last update 04/19] [SPCs checked 27/02/23 & 18/06/24] PA1968/003/001, PL01883/6169R*

CALCIUM CHLORIDE	
Available preparations	**Calcium chloride ampoule 10 mmol/10mL Injection (Martindale) (unlicensed)**
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow Intravenous injection (in resus situations):</u>** • Administer slowly over 3 to 5 minutes **<u>Intermittent intravenous injection (administer using an electronically controlled infusion pump):</u>** • **Give 10mmol dose in 100mL infusion fluid** • Administer over one hour via a large vein • Rate may be increased if necessary to a maximum rate of 1mmol per minute • A 50mL infusion volume may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium chloride 0.9%
Comments	• Calcium chloride is **second-line** when the gluconate salt is unavailable • **Very irritant** solution – give slowly, and stop if extravasation occurs • The infusion site must be monitored to ensure extravasation injury has not occurred • Calcium chloride should **NEVER** be given by IM or subcutaneous routes, as severe necrosis and sloughing may occur. • Do **NOT** administer through same line as solutions containing **phosphate, bicarbonate or sulphates** • Do **NOT CONFUSE WITH CALCIUM GLUCONATE** • There is a risk of arrhythmias if the drug is given too quickly. Also, nausea, vomiting, hot flushes, sweating, hypotension, tingling, chalky taste and vasomotor collapse may occur if the drug is given too quickly. • Monitor serum calcium and blood pressure • ECG monitoring should be used if slow IV injection being used to treat hyperkalaemia • Calcium chloride 1g = 270mg elemental calcium = 13.6mEq = 6.8mmol
References	*Information provided relates to Calcium chloride manufactured by Martindale (unlicensed)* *[SPC last update 22/03/18. SPC checked 20/05/2024]* *PA: Unlicensed (U.K. PL01883/6174R)*

CALCIUM GLUCONATE	
Available preparations	**Calcium gluconate 10% (2.25mmol) per 10ml ampoule (Braun) (unlicensed)**
Reconstitution	Already in solution
Method of intravenous administration	**<u>Intravenous infusion (administer using an electronically controlled infusion device) (preferred method):</u>** • Add required dose to a suitable volume of infusion fluid and administer • If a 50mL infusion volume is used the residual volume in the infusion line **must be flushed through at the same rate** to avoid significant underdosing **<u>Slow intravenous injection (in emergency- e.g. severe acute hypocalcaemia, cardiac resus):</u>** • Administer **very slowly** (rate should not exceed 2ml per minute i.e. 5 minutes for 10mL) • Administer via a central line or large peripheral vein • There is a **risk of arrhythmias** if the drug is given too quickly • If injection is administered too rapidly, nausea, vomiting, hot flushes, sweating, hypotension and vasomotor collapse, **possibly fatal,** may occur
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• <u>This preparation must not be confused with calcium chloride injections, which have a markedly different Ca^{2+} content.</u> • Monitor U&E's four to six hourly • There is a **risk of arrhythmias** if the drug is given too quickly • Monitor heart rate, blood pressure • Check magnesium and phosphate at baseline • **Post-parathyroidectomy requires a high dose regimen - monitor ionised calcium every two hours. Telemetry** monitoring required • The infusion site must be monitored to ensure **extravasation injury** has not occurred • **ECG** monitoring is required for intravenous injection as there is a risk of arrhythmias if given too quickly • Do **not** give with **phosphates, bicarbonates or sulphates** • Must not be administered simultaneously with **ceftriaxone** (even via a different site or infusion line). May be given sequentially, provided the infusion lines are thoroughly flushed between infusions or different infusion sites are used • Patient should remain lying down for a short time after administration of intravenous calcium • 2 milliequivalent (mEq) Calcium = 1mmol (mmol) Calcium • Calcium gluconate 1g is equivalent to 93mg, 4.5mEq, 2.25mmol calcium
References	Information provided relates to Calcium gluconate manufactured by Braun (unlicensed), *[SPC last update 07/2024. SPC checked 20/05/2024]* *PA: Unlicensed (Germany PZN04208950)*

CHLORPHENAMINE	
Available preparations	Chlorphenamine 10mg/mL solution for Injection (Kyowa Kirin)
Reconstitution	Already in solution Draw up using a 5 micron filter needle
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Administer over 1 minute • May be further diluted with Sodium chloride 0.9% to a convenient volume to aid administration
Compatibility & Stability	Sodium Chloride 0.9%
Comments	• Given slowly by IV injection in order to avoid hypotension or central nervous system stimulation
References	*Information provided relates to Chlorphenamine manufactured by Kyowa Kirin [SPC last update 11/2018. SPC checked 20/05/24] PA2288/001/002*

CLONIDINE	
Available preparations	Catapres® 150 micrograms per 1mL ampoule
Reconstitution	Already in solution Draw up using a 5 micron filter needle
Method of intravenous administration	**<u>Slow intravenous injection (hypertensive crises):</u>** • Administer required dose over 10 to 15 minutes (see under comments regarding rate) • It may be preferable to add to a small volume of infusion fluid and give as a short infusion because a slow IV injection over 10 to 15 minutes is probably not practical **<u>Intermittent intravenous infusion (administer using an electronically controlled infusion device):</u>** • Add required dose to 100mL infusion fluid and administer over 15 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Giving clonidine over 10 to 15 minutes may avoid a possible transient pressor effect • Renal impairment: monitor closely as antihypertensive effect may show high variability • Monitor blood pressure and heart rate while patient is on clonidine • When discontinuing clonidine, monitor blood pressure (to ensure rebound hypertension does not occur), and also, monitor for sedation • Avoid sudden withdrawal as this can cause a hypertensive crisis
References	*Information provided relates to Catapres manufactured by Glenwood [SPC last update 07/2022. SPC checked 20/05/2024] PA2256/002/001*

CYCLIZINE	
Available preparations	Valoid® 50mg/mL ampoule (Amdipharm)
Reconstitution	Already in solution Draw up using a 5micron filter needle
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Administer over at least 3 to 5 minutes • Can be administered undiluted • If the volume is too small to be given as a slow intravenous injection, it may be diluted with 5mL to 10mL Water for injections, Sodium Chloride 0.9% or Glucose 5%. Immediately after dilution, and again just before administration, check the solution for signs of precipitation (increased risk of precipitation if diluted with Sodium Chloride 0.9%). Discard if there is any cloudiness or haze formation (unlicensed)
Compatibility & Stability	Water for Injections or Glucose 5%
Comments	• Case reports of paralysis in patients using intravenous cyclizine - use with particular caution in patients with underlying neuromuscular disorders • Cyclizine can have a hypotensive effect when given by the intravenous route • Rapid intravenous injection can lead to symptoms similar to those of overdose • Cyclizine is extremely irritant and can cause injection site reactions, including vein tracking, erythema, pain, rash, thrombophlebitis and blisters
References	*Information provided relates to Valoid manufactured by Amdipharm [SPC last update 07/2018. SPC checked 20/05/2024] PA1142/001/001*

DEFEROXAMINE/DESFEROXAMINE	
Available preparations	Desferal® 500mg vials powder for solution for infusion (Novartis)
Reconstitution	Reconstitute each 500mg vial in 5mL Water for Injections to make a 10% solution (100 mg/mL).
Method of intravenous administration	**<u>Continuous intravenous infusion (using an electronically- controlled infusion device):</u>** • Withdraw the required dose and add to a convenient volume* of infusion fluid. Mix well. • Give by continuous infusion at an initial rate of 15mg/kg/hour. • Reduce the rate as soon as clinically appropriate (usually after 4 to 6 hours). • Total IV dose not to exceed 80mg/kg in any 24 hour period. * If a 50ml infusion volume is used the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing.
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Care should be taken when flushing the line to avoid the sudden infusion of residual deferoxamine/desferoxamine which may be present in the dead space of the line, as this may lead to flushing, ↓BP and acute collapse. • Caution in renal impairment as metal complexes are eliminated renally. Dialysis will ↑elimination. • May colour the urine reddish-brown.
References	*Information provided relates to Desferal manufactured by Novartis [PA0896/008/001 SPC last update 07/18. SPC checked 27/05/24]* *medinfogalway.ie IV Guides (Adult) accessed 27/05/2024* *ASHP Injectable Drug Information accessed 27/05/2024*
◊ Deferoxamine/desferoxamine can be used as an antidote in acute iron poisoning – Contact Beaumont Poisons Department	

DESMOPRESSIN	
Available preparations	DDAVP/Desmopressin 4 micrograms/mL solution for injection (Ferring)
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Intermittent intravenous infusion (preferred):</u>** • Add required dose to 50mL infusion fluid and administer over 20 minutes • The residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing **<u>Bolus intravenous injection:</u>** • For the treatment of cranial diabetes insipidus only, but can also be given by subcutaneous or intramuscular injection • Administer slowly over 3 to 5 minutes for intravenous injection
Compatibility & Stability	Sodium chloride 0.9%
Comments	• As some patients have shown a diminishing response to successive doses, it is recommended that monitoring of Factor VIII levels should continue • During infusion for haemostatic use, it is recommended that the patient's blood pressure is monitored continuously Precautions to prevent fluid overload must be taken in: • Conditions characterised by fluid and/or electrolyte imbalance • Patients at risk of increased intracranial pressure
References	*Information provided relates to DDAVP/Desmopressin manufactured by Ferring* *[PA1009/001/002 SPC last update 07/18. SPC checked 28/05/2024]* *medinfogalway.ie IV Guides (Adult) accessed 28/05/2024* *ASHP Injectable Drug Information accessed 28/05/2024*

DEXAMETHASONE	
Available preparations	Dexamethasone phosphate 8mg per 2ml vial (Krka) **(equivalent to 6.6mg dexamethasone BASE per 2ml)**
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	Can use either method of administration- choice depends on practicalities such as time available, fluid status of patient, etc. **<u>Slow intravenous injection:</u>** • Administer over at least 2 to 3 minutes (may be diluted with a suitable infusion fluid to facilitate slow administration) • Rapid intravenous administration of large doses may cause cardiovascular collapse • IV administration can cause transient tingling/burning in perineal area, especially with rapid administration or with large doses **<u>Intermittent intravenous infusion:</u>** • Add required dose to 100mL of infusion fluid. • Administer over 15 to 20 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing • IV administration can cause transient tingling/burning in perineal area, especially with rapid administration or with large doses
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Different brands have different compatibility information • Dexamethasone is incompatible with many drugs - flush thoroughly before and after administration • Dexamethasone phosphate injection contains 8mg in 2ml injection. This is equivalent to 6.6mg in 2ml of dexamethasone base. Prescribing practice in SIVUH has been to prescribe intravenous doses in terms of dexamethasone phosphate. The BNF now suggests that doses be prescribed as base. This monograph will be amended to reflect this once prescribing practice changes within the hospital. • Each 2mL ampoule contains approximately 6mg sodium.
References	*Information provided relates to Dexamethasone manufactured by Krka* *[PA1347/091/001 SPC last update 06/22. SPC checked 14/05/2024]* *medinfogalway.ie IV Guides (Adult) accessed 27/05/2024* *ASHP Injectable Drug Information accessed 27/05/2024*

DEXAMETHASONE*	
Available preparations	Dexamethasone sodium phosphate 10mg per 1ml vial (Omega Unidose – unlicensed)
Comments	*Unlicensed medicine, for use under specialist supervision in specific clinical areas only (ENT and Pain Medicine) See previous monograph for use of licensed product
References	*Information provided relates to Dexamethasone Unidose manufactured by Omega [DIN 02387743, Monograph last update 12/06/2012, accessed 05/06/2024]*

DEXKETOPROFEN	
Available preparations	Keral® 50mg per 2mL ampoule (Menarini)
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Intermittent intravenous injection (preferred method):</u>** • Add 50mg to 100mL infusion fluid and administer over 10 to 30 minutes • Protect infusion solution from natural daylight • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing **<u>Bolus intravenous injection:</u>** • If necessary, can be administered undiluted over at least 15 seconds
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Each 2mL ampoule contains 200mg ethanol (96%) and 8mg sodium chloride.
References	*Information provided relates to Keral manufactured by Menarini [PA0865/002/003 SPC last update 04/2023. SPC checked 14/05/2024] medinfogalway.ie IV Guides (Adult) accessed 27/05/24*

DIAZEPAM (SOLUTION)*	
Available preparations	Diazepam 10mg per 2ml ampoule (diazepam solution, Hameln - unlicensed)
Reconstitution	Already in solution. Diazepam should be drawn into the syringe immediately prior to administration. **Use a 5 micron filter needle when drawing up contents of ampoule**
Method of intravenous administration	**<u>Slow intravenous injection (preferred method):</u>** • Administer into a large vein, no faster than 5mg per minute • Do not dilute (as precipitation may occur) **<u>Continuous intravenous infusion (not recommended) (administer using an electronically controlled infusion device):</u>** • Add each 10 mg to at least 250 mL infusion fluid. For larger doses no more than 40mg per 500ml diluent may be added • Mix well • Rate is variable - see manufacturer's guidance or BNF for rate • Incompatible with PVC. Non-PVC infusion container (e.g.Braun Ecoflac, or Baxter Viaflo are suitable) and a low adsorption giving set (e.g. Baxter Baxter Ref VMC 9606, or Braun 8700110SP) must be used. • Fresh infusions must be made every 6 hours
Compatibility & Stability	Glucose 5% or Sodium Chloride 0.9%
Comments	• **Do not confuse with diazepam emulsion** (Emulsion is preferable as it causes less venous irritation) • Each mL contains 250mg of ethanol • Each mL contains 550mg propylene glycol • It is advisable to keep the patient in a supine position, and monitor for at least one hour post dose • Monitor cardiorespiratory function
References	*Information provided relates to Diazepam manufactured by Hameln (Unlicensed)* *[PL 01502/0025 SPC last update 12/01/22. SPC checked 28/05/2024]* *medinfogalway.ie IV Guides (Adult) accessed 27/05/2024* *ASHP Injectable Drug Information accessed 27/05/2024*
*Diazepam solution contains diazepam dissolved in an aqueous medium and should not be confused with diazepam emulsion	

DICLOFENAC	
Available preparations	Diclac® 75mg per 3ml ampoule (Rowex) Voltarol® 75mg per 3ml ampoule (Novartis)
Reconstitution	Already in solution **Draw up using a 5 micron filter needle** Dilute further prior to administration
Method of intravenous administration	**Intermittent intravenous infusion ONLY (administer using an electronically controlled infusion device):** • Buffer 100 to 500mL infusion fluid with 0.5mL of 8.4% sodium bicarbonate before adding Diclac/Voltarol • Add one ampoule (75mg) of Diclac/Voltarol to buffered fluid above and administer over 30 minutes to 2 hours
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Monitor renal function • The maximum permitted dose by any route is 150mg in 24 hours • For intramuscular use there is NO NEED to buffer the Diclac/Voltarol
References	*Information provided relates to Diclac manufactured by Rowex [PA0711/009/010 SPC last update 12/22. SPC checked28/05/2024]* *Information provided relates to Voltarol manufactured by Novartis [PL 00101/0466 SPC last update 04/02/2023. SPC checked 14/07/25]* *medinfogalway.ie IV Guides (Adult) accessed 27/05/24*

DIGOXIN	
Available preparations	Lanoxin® 500 microgram per 2mL ampoule (Aspen)
Reconstitution	Already in solution. **Draw up using a 5 micron filter needle** **Dilute further prior to administration**
Method of intravenous administration	**<u>Intermittent intravenous infusion (using an electronically controlled infusion device) (preferred route):</u>** • Add required dose to 100mL of infusion fluid (usually 100 mL but must be at least 4 times the injection volume). • Mix well. • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing • If loading with repeated fractions of small doses (e.g. 50%, 25%, 25%) the infusion may be given over 10 to 20 minutes. • An assessment of clinical response should be performed before giving each additional dose • However, where large loading doses are required in emergencies (e.g. 750microgram to 1000microgram) a minimum infusion time of 2 hours is suggested • A reduced loading dose may be needed if the patient has received digoxin in the last 2 weeks • If using a two hour infusion time, protect infusion solution from light **<u>Slow intravenous injection (not generally recommended):</u>** Intravenous infusion is preferred but if essential digoxin may be administered by slow intravenous injection as follows: • Bolus administration is more likely to cause adverse effects. Patients should be monitored closely for signs of digoxin toxicity; hypertension and reduced coronary flow • **Either** dilute at least four fold (equates to adding 2mL digoxin to 6mL infusion fluid) and administer over 10 to 20 minutes **OR** • **If fluid-restricted:** administer undiluted via a large vein or central line over at least 5 minutes (unlicensed)
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	**Telemetry monitoring required** <u>Monitoring of levels</u> • At least 6 or more hours after the last dose to allow for redistribution • Each 2mL amp contains 166mg of ethanol • Intramuscular injection is NOT RECOMMENDED, as it is painful and is associated with muscle necrosis.
References	*Information provided relates to Lanoxin manufactured by Aspen [PA1691/001/001 SPC last update 09/22. SPC checked 29/05/2024] References: medinfogalway.ie IV Guides (Adult) accessed 29/05/2024* *ASHP Injectable Drug Information accessed 29/05/2024*

DIGOXIN ANTIBODY FRAGMENTS*	
Available preparations	Digoxin antibody fragments 40mg/vial (DigiFAB)
Comments	**NB Not kept in SIVUH, available from MUH Pharmacy Fridge or CUH resus fridge**
References	*Information provided relates to Digifab*

*** DigiFAB is used as an antidote in digoxin overdose – Contact Beaumont Poisons Department**

DOPAMINE

Available preparations

Dopamine Hydrochloride 200mg per 5mL vial (Pfizer)

Reconstitution

Already in solution

Dilute further prior to administration

Method of intravenous administration

<u>Continuous intravenous infusion (administer using an electronically controlled infusion device):</u>

<u>Central line:</u>

- Add 5mL (200mg) to 45mL infusion fluid (200mg in 50mL) (unlicensed)
- This contains 4mg (4000micrograms) per mL
- Rate is adjusted according to response (refer to manufacturer's guidance)

Dopamine 200mg in 50ml CENTRAL line administration				
Dose (micrograms/kg/minute)	**2.5**	**5**	**7.5**	**10**
	Rate in ml per hour			
40kg	1.5	3	4.5	6
45kg	1.7	3.4	5.1	6.8
50kg	1.9	3.8	5.6	7.5
55kg	2.1	4.1	6.2	8.3
60kg	2.3	4.5	6.8	9
65kg	2.4	4.9	7.3	9.8
70kg	2.6	5.3	7.9	10.5
75kg	2.8	5.6	8.4	11.3
80kg	3	6	9	12
85kg	3.2	6.4	9.6	12.8
90kg	3.4	6.8	10.1	13.5
95kg	3.6	7.1	10.7	14.3
100kg	3.8	7.5	11.3	15
105kg	3.9	7.9	11.8	15.8
110kg	4.1	8.3	12.4	16.5
115kg	4.3	8.6	12.9	17.3
120kg	4.5	9	13.5	18

DOPAMINE CONTINUED ON NEXT PAGE

DOPAMINE CONTINUED

Peripheral line:

- Add 10mL (400mg) to 240mL infusion fluid (400mg in 250mL)
- This contains 1.6mg (1600micrograms) per mL
- To avoid tissue necrosis dopamine is best given via a large vein
- Rate is adjusted according to response (refer to manufacturer's guidance)

Dopamine 400mg in 250ml PERIPHERAL line administration				
Dose (micrograms/kg/minute)	**2.5**	**5**	**7.5**	**10**
	Rate in ml per hour			
40kg	3.8	7.5	11.3	15
45kg	4.2	8.4	12.7	16.9
50kg	4.7	9.4	14.1	18.8
55kg	5.2	10.3	15.5	20.6
60kg	5.6	11.3	16.9	22.5
65kg	6.1	12.2	18.3	24.4
70kg	6.6	13.1	19.7	26.3
75kg	7	14.1	21.1	28.1
80kg	7.5	15	22.5	30
85kg	8	15.9	23.9	31.9
90kg	8.4	16.9	25.3	33.8
95kg	8.9	17.8	26.7	35.6
100kg	9.4	18.8	28.1	37.5
105kg	9.8	19.7	29.5	39.4
110kg	10.3	20.6	30.9	41.3
115kg	10.8	21.6	32.3	43.1
120kg	11.3	22.5	33.8	45

Compatibility & Stability

Sodium Chloride 0.9% or Glucose 5%

Comments

- Monitor blood pressure, ECG and cardiac and urinary output
- When used in patients with a history of occlusive vascular disease, closely monitor for any changes in colour or temperature of the skin of the extremities
- If extravasation occurs, dopamine may cause necrosis and sloughing of surrounding tissue. To prevent sloughing and necrosis, the area should be infiltrated as soon as possible with 10 to 15mL of a Sodium chloride 0.9% solution containing 5 to 10mg phentolamine.

References

Information provided relates to Dopamine manufactured by Pfizer [PA0822/202/001 SPC last update 12/21. SPC checked 29/05/2024] medinfogalway.ie IV Guides (Adult) accessed 29/05/2024 ASHP Injectable Drug Information accessed 29/05/2024

EPHEDRINE	
Available preparations	Ephedrine 30mg in 1ml ampoule (Ethypharm)
Reconstitution	Dilute one ampoule (1mL) with 9mL Sodium Chloride 0.9%. This results in a 3mg/mL solution. **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection:</u>** Administer over 3 to 5 minutes, in increments of 3–6 mg (1–2 mL of the dilute 3 mg/mL injection)
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Monitor blood pressure, heart rate • Side effects include angina pain, nausea and vomiting, headache and confusion
References	*Information provided relates to Ephedrine manufactured by Ethypharm* *[PA0549/027/001 SPC last update 06/19. SPC checked29/05/2024]* *medinfogalway.ie IV Guides (Adult) accessed 29/05/2024* *ASHP Injectable Drug Information accessed 29/05/2024*

ERGOCALCIFEROL	
Available preparations	Ergocalciferol 600,000 UI/1.5ml (STEROGYL 15 “H”) (unlicensed)
Comments	**For intramuscular injection only, not for intravenous administration**
References	*Information provided relates to STEROGYL 15 “H” manufactured by Desma Pharma*

ESMOLOL	
Available preparations	Brevibloc® 100mg per 10mL vial (Baxter)
Reconstitution	Already in solution
Method of intravenous administration	**<u>Bolus intravenous injection (loading doses):</u>** • Withdraw the required dose and give at the rate specified for the particular indication - see product information for full dosing advice **<u>Continuous intravenous infusion (administer using an electronically controlled infusion device):</u>** • 2500mg in 250mL (replace bag every 24 hours), adjust dose every 4 minutes according to response - see product information for full dosing advice
Compatibility & Stability	
Comments	• Monitor blood pressure, heart rate, ECG, respiratory rate and IV site • Contains approximately 1.22mmol (28mg) of sodium per vial • Contains approximately 30.45mmol (or 700mg) of sodium per bag
References	*Information provided relates to Brevibloc manufactured by Baxter [PA2299/021/001 SPC last update 03/19. SPC checked 29/05/2024]* *medinfogalway.ie IV Guides (Adult) accessed 29/05/2024* *ASHP Injectable Drug Information accessed 29/05/2024*

ESOMEPRAZOLE	
Available preparations	Nexium® 40mg solution for injection/infusion (Grunenthal) OR Esomeprazole Tillomed 40 mg powder for solution for injection or infusion
Reconstitution	Add 5 mL infusion fluid to each 40 mg vial to give a solution containing 40mg/5mL (8mg/mL)
Method of intravenous administration	**Bolus intravenous injection:** • Withdraw the required dose and administer over at least 3 minutes **Intermittent intravenous infusion (administer using an electronically controlled infusion device):** • Withdraw the required dose and add to 50 - 100mL infusion fluid. Give over 10 – 30 minutes (30 minutes for 80mg dose) **Continuous intravenous infusion (administer using an electronically controlled infusion device):** • Add 80 mg reconstituted solution to 100 mL infusion fluid. Give over 10 hours (8 mg/hour) (change bag every 10 hours).
Compatibility & Stability	Sodium Chloride 0.9%
Comments	
References	*Information provided relates to Nexium manufactured by Grunenthal [PA2242/013/004 SPC last update 01/22. SPC checked 29/05/2024]* *ASHP Injectable Drug Information accessed 29/05/2024* *Esomeprazole Tillomed 40mg powder for solution for injection or infusion, [PA2321/002/001, date of last renewal; 16/10/2024 SPC checked 15/07/2025]*

FERRIC CARBOXYMALTOSE	
Available preparations	Ferric Carboxymaltose 50mg Iron/mL – Ferinject® or Teva® brand
Reconstitution	Already in solution
Method of intravenous administration	**<u>Bolus intravenous injection:</u>** • Ferric Carboxymaltose may be administered using undiluted solution (max dose by this route is 15mg iron/kg body weight to a max dose of 1000 mg) • Doses of between 201mg and 500mg: Maximum rate is 100mg per minute • Doses of between 501mg and 1000mg: Administer over 15 minutes – **suggest IV infusion in preference.** **<u>Intermittent intravenous infusion:</u>** • The minimum permitted concentration is 2mg/mL • Ferric Carboxymaltose must be administered diluted (max dose by this route is 20mg iron/kg body weight to a max dose of 1,000mg) • Doses of between 100mg and 199mg: Add to 50mL infusion fluid and administer over a suitable time (no minimum time, note the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing) • Doses of between 200mg and 499mg: Add to 100mL infusion fluid and administer over at least 6 minutes • Doses of 500mg to 1000mg: Add to 250mL infusion fluid and administer over at least 15 minutes
Compatibility & Stability	Sodium Chloride 0.9%

Comments	• A single Ferric Carboxymaltose administration should not exceed:
	  ○ 15mg iron/kg body weight (for administration by intravenous injection) or 20mg iron/kg body weight (for administration by intravenous infusion)
	  ○ 1,000mg of iron (20mL)
	• The maximum recommended cumulative dose of Ferric Carboxymaltose is 1000mg of iron (20mL) per week
	• The dose is based on iron need - see SPC for calculation.
	• Repeat the infusion at weekly intervals until the calculated total dose has been given.
	• Please send referral for pharmacist review when ordering IV Iron.
	• Monitor patient for signs and symptoms of hypersensitivity reactions for at least 30 minutes after administration
	• Caution should be exercised to avoid paravenous leakage when administering Ferric Carboxymaltose. Paravenous leakage of Ferric Carboxymaltose at the administration site may lead to irritation of the skin and potentially long lasting brown discolouration at the site of administration. In case of paravenous leakage, the administration of Ferric Carboxymaltose must be stopped immediately.

References	*Information provided relates;* *Ferinject manufactured by Vifor PA0949/004/001* *[SPC last update 04/2023. SPC checked 21/05/24]* *Ferric Carboxymaltose manufactured by Teva PA1986/124/001* *[SPC last update 24/05/2024, SPC checked 31/10/2024*

FLECAINIDE	
Available preparations	Tambocor® 150mg in 15mL (10mg/mL) ampoule (Mylan)
Reconstitution	Already in solution Draw up using a 5micron filter needle
Method of intravenous administration	**<u>Intermittent intravenous infusion (administer using an electronically controlled infusion device):</u>** • May be diluted to any convenient volume with infusion solution (glucose 5% preferred) to a concentration of 1mg per mL • Administer required dose over 10 to 30 minutes using a volumetric pump (see manufacturer's guidance for details on rate) • Whilst unlikely to be practical flecainide may be given undiluted as a slow intravenous injection over SAME DURATION as intermittent infusion above. **<u>Continuous intravenous infusion (administer using an electronically controlled infusion device):</u>** • May be diluted to any convenient volume with glucose 5%. Consider a concentration of 1mg per mL • Give at a suitable rate (see manufacturer's guidance for details on rate)
Compatibility & Stability	Glucose 5% **(preferred)** Sodium chloride 0.9% (less stable- see under comments)
Comments	• Monitor ECG continuously when giving by intravenous injection, when infusing for longer than 24 hours and when using doses at the upper end of the dose range • Therapeutic drug level monitoring is recommended where therapy extends beyond 24 hours, or in those with renal or hepatic impairment (see SPC for details on required levels and contact biochemistry for further details) • Glucose 5% is the preferred infusion fluid. However, if necessary, may use Sodium chloride 0.9% but the concentration cannot exceed 150mg in 500mL (0.3mg/mL) to avoid precipitation • Contains 38mg sodium per ampoule
References	*Information provided relates to Tambocor manufactured by Mylan [SPC last update 06/2023. SPC checked 21/05/2024], PA2010/026/001*

FLUMAZENIL	
Available preparations	Anexate 500microgram per 5ml ampoule
Reconstitution	Already in solution Draw up using a 5 micron filter needle
Method of intravenous administration	**<u>Bolus intravenous injection (preferred method):</u>** • Initial dose over 15 seconds • Further doses at 60 second intervals **<u>Continuous intravenous infusion:</u>** • Dilute to a convenient volume of infusion fluid. Mix well • Rate of infusion then titrated according to response (see manufacturers guidance for dose/rate) • Discontinue the infusion every 6 hours to assess whether re-sedation occurs.
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Monitor for signs of re-sedation - flumazenil is a short-acting agent. Repeat doses may be necessary- benzodiazepine effects may persist for at least 24 hours • In liver impairment, the elimination half-life is longer and total body clearance lower than in healthy subjects • Particular caution is necessary in mixed-drug overdoses, especially those involving tricyclic antidepressants and benzodiazepines • Use on expert advice only • Use with caution in patients with head injury (increased intracranial pressure may develop) • Contains sodium 3.7mg/mL
References	*Information provided relates to Anexate manufactured by Cheplapharm* *[SPC last update 12/2020. SPC checked 21/05/2024], PA1868/002/001*

FOLINIC ACID (CALCIUM FOLINATE, CALCIUM LEUCOVORIN)	
Available preparations	Leucovorin C 50mg/5mL concentrate for infusion (Teva) Leucovorin C 100mg/10mL concentrate for infusion (Teva) Leucovorin C 300mg/30mL concentrate for infusion (Teva) (Contains 10mg folinic acid (as calcium folinate) per mL).
Reconstitution	Already in solution
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** • If part of chemotherapy protocol - administer as per protocol guidelines • Dilute the dose to a convenient volume with suitable infusion fluid • Administer at a rate not exceeding 160mg/minute (due to calcium content) **<u>Slow intravenous injection:</u>** • If part of chemotherapy protocol - administer as per protocol guidelines • If not part of chemotherapy protocol, administer at a rate not exceeding 160mg/minute
Compatibility & Stability	For large doses in methotrexate rescue, reconstitute with **benzyl alcohol FREE diluent.** May dilute with Sodium chloride 0.9% or Glucose 5%
Comments	• Monitor blood counts • The maximum rate of administration of 160mg per minute is due to the calcium content • 50mg/5mL vial: 23mg sodium per vial (essentially sodium free) • 100mg/10mL vial: 30mg sodium per vial • 300mg/30mL vial: 90mg sodium per vial
References	*Information provided relates to Leucovorin-Teva manufactured by Teva [SPC last update 06/2023. SPC checked 21/05/2024], PA0749/001/001*

FUROSEMIDE	
Available preparations	Furosemide injection 20mg per 2mL ampoule Lasix 20mg per 2ml ampoule
Reconstitution	Already in solution Draw up using a 5 micron filter needle
Method of intravenous administration	**<u>Intermittent intravenous infusion (administer using an electronically controlled infusion device)</u>** • May be given diluted in any volume of Sodium Chloride 0.9% (e.g. 50mL), however the rate of administration must not exceed 4mg per minute (i.e. 40mg in 10 minutes, 80mg in 20 minutes, 120mg in 30 minutes) • If a 50mL infusion volume is used the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing • Maximum rate of administration in severe renal impairment (serum creatinine greater than 440micromol/L) is 2.5mg per minute **<u>Continuous intravenous infusion (administer using an electronically controlled infusion device):</u>** • May be given diluted in any volume of Sodium Chloride 0.9% and administered as a continuous infusion, rate adjusted according to the dose required (maximum rate 4mg per minute) • Can also be given undiluted • Maximum rate of administration in severe renal impairment (serum creatinine greater than 440micromol/L) is 2.5mg per minute **<u>Slow intravenous injection (doses of up to 50mg): Not advised. Rate makes this impractical:</u>** • Administer at a maximum rate of 4mg per minute • Maximum rate of administration in severe renal impairment (serum creatinine greater than 440micromol/L) is 2.5mg per minute.
Compatibility & Stability	Sodium chloride 0.9%
Comments	• Monitor serum potassium, sodium and serum creatinine levels • Monitor blood glucose, blood pressure • Furosemide may precipitate in solutions of low pH and therefore Sodium Chloride 0.9% is the ONLY suitable infusion fluid • Rapid administration (greater than 4mg/min) and high doses may cause tinnitus and deafness
References	*Information provided relates to Lasix manufactured by Sanofi* *[SPC last update 02/2023. SPC checked 21/05/2024], PA0540/052/002*

GLUCOSE	
Available preparations	Glucose 5% 50mL, 100mL, 250mL, 500mL, 1,000mL (Fres Kabi) Glucose 10% 500mL, 1000mL (Baxter) Glucose 20% 100ml vial (Hameln) Glucose 50% 50ml vial (Baxter)
Reconstitution	Already in solution
Method of intravenous administration	<u>When used for dilution and delivery of therapeutic additives for administration by IV infusion:</u> • The additive therapeutic substance will dictate the appropriate volume and rate of infusion of glucose Please see insulin prescribing administration record (IPAR) for detail on administration of glucose for hypoglycaemia and in the peri-operative period for diabetic patients. Please see hyperkalaemia guidelines for administration of Glucose 50% (SIVUH Intranet » Departments » Pharmacy/Medicines Management » Clinical Resources » Hyperkalaemia management at SIVUH V1 March 2024)
Compatibility & Stability	N/A
Comments	• Glucose ≥10% is a hypertonic solution. However, in the body, glucose containing fluids can become extremely physiologically hypotonic due to rapid glucose metabolisation. • Correction of fluid and electrolyte deficiencies is essential, especially potassium, as administration on glucose may aggravate hypokalaemia. • Glucose solutions should not be administered through the same infusion equipment, simultaneously with, before, or after administration of blood due to the possibility of pseudo-agglutination.
References	*Information provided relates to Glucose 5% manufactured by Baxter (PA2299/003/001) [SPC last updated 11/23. SPC checked 16/05/24], Glucose 10% manufactured by Baxter (PA2299/003/002) [SPC last updated 10/20. SPC checked 17/05/24], Glucose 20% manufactured by Hameln (PL01502/0083 (ULM)) [SPC last updated 04/20. SPC checked 16/05/24], Glucose 50% manufactured by BBraun (PA0179/001/039) [SPC last updated 07/19. SPC checked 16/05/24].*

GLYCERYL TRINITRATE	
Available preparations	Glyceryl trinitrate 50mg per 10mL Sterile Concentrate ampoule (Pfizer)
Reconstitution	Concentrate for solution for infusions (Sterile Concentrate) **Dilute further prior to administration** **Draw up using a 5 micron filter needle (ampoule)**
Method of intravenous administration	**Continuous intravenous infusion (administer using an electronically controlled infusion device):** • **MUST** be diluted prior to infusion. Suggest: withdraw 10 mL of the 5 mg/mL strength and make up to 50 mL with sodium chloride 0.9%. Cap the syringe and mix well to give a solution containing 1 mg/mL • Administer as a continuous intravenous infusion as per dosage guidelines (refer to manufacturers guidelines for dose and rate as per indication) • The drug must be prepared in a syringe pump (as syringe pumps are low adsorption), and must be given via a low-adsorption giving set (e.g Vygon Lectro-spiral 1155.80 or Braun Original Perfusor -Leitung PE 8723060)
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• **Adsorbs on to PVC.** If the product is to be given as a large volume infusion, e.g. final volume 500mL of either Sodium chloride 0.9% or Glucose 5%, it must be in a low adsorption infusion bottle (e.g. Braun Ecoflac, Baxter Viaflo or Technopharm Macoflex), and it must be given via a low adsorption giving set (Baxter VMC9606, Baxter VMC9627 or Braun 8700110SP) • Monitor blood pressure and heart rate • Also consider pulmonary capillary wedge pressure, cardiac output, and precordial electrocardiogram, depending on the clinical picture. • There are subtle differences in doses between the different manufacturers, for different indications - titrate the dose to effect • Each 5mL ampoule contains 2639.2mg of anhydrous ethanol • Example of admixture preparation: To obtain an admixture of GTN at a concentration of 100 microgram/mL add 10 mL (containing 50 mg glyceryl trinitrate) to 490 mL of infusion vehicle to give a final volume of 500 ml.
References	*Information provided relates to Glyceryl Trinitrate manufactured by Pfizer. PA0822/204/001.* *[SPC last updated 04/22. SPC checked 07/05/24]*

GRANISETRON	
Available preparations	Kytril (Granisetron) 1mg per 1mL ampoules (Atnahs)
Reconstitution	Already in solution **Dilute further prior to administration** **Draw up using a 5 micron filter needle**
Method of intravenous administration	Can use either method of administration - choice depends on practicalities such as time available, fluid status of patient, etc. **Bolus intravenous injection:** • Dilute 1mg to 5mL with infusion fluid and give over at least 30 seconds • Dilute 3mg to 15mL with infusion fluid and give over at least 30 seconds **Intermittent intravenous infusion:** • Dilute required dose in 20 to 50mL of infusion fluid and administer over five minutes • The residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Monitor QTc, especially in patients with cardiac co-morbidities, on cardiotoxic chemotherapy and/or with electrolyte abnormalities
References	*Information provided relates to Kytril manufactured by Atnahs Pharma. PA22657/003/001.* *[SPC last updated 03/21. SPC checked 07/05/24]*

HEPARIN (UNFRACTIONATED HEPARIN) – For Infusion

Available preparations

Route	Preparation		**Manufacturer**
For infusion	Heparin sodium 5,000 units in 5mL (with preservative)	Vial	Wockhardt

Reconstitution

For infusion: Heparin sodium 5,000 units in 5ml:
Already in solution

Method of intravenous administration

<u>Heparin sodium 5,000 units in 5ml:</u>
<u>Slow intravenous injection (loading dose only):</u>

- Administer undiluted injection solution over at least 3 minutes
- Injection volume should not exceed 15ml
- As the effects of heparin are short-lived, administration by intravenous infusion is preferable to intermittent intravenous injections

<u>Continuous intravenous infusion (maintenance dose) (administer using an electronically controlled infusion device):</u>

- Draw up 25mL of UFH 1,000 units/mL in a syringe (use five vials of 5,000 units/ 5mL) and add to 225mL of Sodium Chloride 0.9% to give an infusion containing 100 units/mL.
- Invert bag six times to ensure adequate mixing
- Set up as a continuous infusion, and adjust rates according to aPTT (activated partial thromboplastin time) ratio
- Change UFH infusion and giving set every 24 hours.

Compatibility & Stability

Sodium Chloride 0.9% or Glucose 5%

Comments

For infusion: Heparin sodium 5,000 units in 5ml:

- Monitor aPTT
- Monitor patient for signs of bleeding
- All patients receiving intravenous unfractionated heparin should have baseline platelet counts and repeat measurements on alternate days
- For patients who have received unfractionated heparin within the last 100 days, a repeat platelet count should be taken within 24 hours of starting heparin
- Hyperkalaemia can occur - plasma potassium levels should be measured regularly. Patients particularly at risk include those with diabetes mellitus, chronic renal failure, acidosis, raised plasma potassium, or those on potassium-sparing drugs
- The blood sample for aPTT should be taken from a site separate to that at which heparin is being infused (and not immediately 'downstream' of it)
- Antidote : Protamine Sulphate

References

Information provided relates to Heparin manufactured by Wockhardt/Pinewood PA 0281/229/004 [SPC last update 12/20. SPC checked 24/7/24]
References: SPC, Galway Guide accessed 16/08/2024

HEPARIN SODIUM – FLUSHING SOLUTION

Available preparations

Route	Preparation		**Manufacturer**
For flushing of devices only	Heparin sodium 50 units in 5mL (10iu in 1ml)	Ampoule preservative free	Wockhardt (unlicensed)
For flushing of devices only	Heparin sodium 200 units in 2ml (100 units in 1ml)	Ampoule preservative free	Wockhardt (unlicensed)

Reconstitution

Already in solution

Method of Flushing

- For cleaning indwelling cannulae only

Compatibility & Stability

- The following drugs are incompatible with heparin:
  Amikacin sulphate, gentamicin sulfate, netilmicin sulphate, pethidine hydrochloride, promethazine hydrochloride and tobramycin sulfate
- Heparin and reteplase are incompatible when combined in solution

Comments

- Caution should be exercised in patients with known hypersensitivity to low molecular weight heparins
- Rigorous aseptic technique should be observed at all times in its use
- Platelet counts should be measured in patients receiving regular and repeated use of heparin flush solutions for longer than 5 days or earlier in patients with previous exposure to heparin
- In patients who develop thrombocytopenia or paradoxical thrombosis, heparin treatment should be stopped immediately and heparin eliminated from all flushes and ports
- Heparin induced thrombocytopenia (HIT) and heparin induced thrombocytopenia with thrombosis (HITT) can occur up to several weeks after discontinuation of heparin therapy.
- Repeated flushing of a catheter device with heparin may result in a systemic anticoagulant effect

References

Information provided relates to Heparin manufactured by Wockhardt Heparin sodium 10iu in 1ml: PA 0281/230/001 (SPC last update 12/20. SPC checked 26/7/24]
Heparin sodium 100iu in 1ml: unlicensed [PL 29831/0112 checked 26/7/24]

HUMAN NORMAL IMMUNOGLOBULIN (IVIg)

Available preparations

Kiovig® 100mg/mL:

Kiovig 2.5g in 25ml vial, Kiovig 5g in 50ml vial, Kiovig 10g in 100ml vial, Kiovig 20g in 200ml vial, Kiovig 30g in 300ml vial

Reconstitution

Already in solution

Method of intravenous administration

<u>Intermittent intravenous infusion (using an electronically controlled infusion device):</u>

- Use undiluted.
- Should be infused intravenously at an initial rate of 0.5mL/kg BW per hour for 30mins (BW = body weight)
- If well tolerated, the rate of administration may gradually be increased to a maximum of 6mL/kg BW/hour.
- Can be used undiluted, but if dilution is required, dilute required volume of Kiovig with an equal volume of 5% glucose
- Administer using a blood giving set. Bottles must be vented.
- When prescribed as a daily dose over several days, the rate will need to be titrated again on each day. However, if well tolerated the previous day the rate may be increased more quickly on subsequent day.
- For patients with BMI ≥30kg/m^2, or if actual weight >20% more than IBW, the dose must be capped, by using a Kiovig Dosing Weight, to avoid adverse effects.
- For patients with BMI ≥30kg/m^2, or if actual weight >20% more than IBW calculate a **<u>Kiovig Dosing Weight</u>**
- Kiovig Dosing weight = IBW + [0.4 x (Actual Body Weight - IBW)]

- IBW calc: IBW (male) = 50.0kg + 2.3kg (each inch >5 ft)
  IBW (female) = 45.5kg + 2.3kg (each inch >5 ft)

Infusion rates for KIOVIG- sample calculations. *(NB; see notes after table prior to use)*

Weight (kg)	First 30 minutes (ml/hr)	Second 30 minutes (ml/hr)	Third 30 minutes (ml/hr)	Fourth 30 minutes (ml/hr)	Maximum rate (ml/hr)
	0.5ml/kg/hour	1ml/kg/hour	2ml/kg/hour	4ml/kg/hour	6ml/kg/hour
50	25	50	100	200	300
55	27.5	55	110	220	330
60	30	60	120	240	360
65	32.5	65	130	260	390
70	35	70	140	280	420
75	37.5	75	150	300	450
80	40	80	160	320	480
85	42.5	85	170	340	510
90	45	90	180	360	540
95	47.5	95	190	380	570
100 (max weight to use for RATE calculations*)	50	100	200	400	600

IVIg CONTINUED ON NEXT PAGE

IVIg CONTINUED	• If a patient's weight falls between two values in the table, use the lower infusion rate- e.g. patient weight 59kg- use rates for 55kg rather than for 60kg • Increase rate as per table above, every 30 mins as tolerated - until full dose admin • *Maintain low rate of infusion throughout if patient has acute renal disease, or thromboembolic disorders* Rates above are for most patients. *max 100kg used to calculate dose RATE – based on requirement not to overload heavy patients with high rate of large volume infusions
Compatibility & Stability	Can administer undiluted. If dilution required dilute required volume of Kiovig with an equal volume of Glucose 5%
Comments	• This is a blood product, therefore batch and expiry date should be recorded in the patient's medical notes (chart) • Kiovig is to be prescribed in the **continuous section** of the Kardex • Round doses to nearest vial size • Contraindicated in individuals with known class specific antibody to Immunoglobulin A • Thromboembolism: Use caution with IVIg in obese patents and in patients with pre-existing risk factors for thrombotic events. In patients at risk of thromboembolic adverse reactions, IVIg products should be administered at the minimum rate of infusion and dose practicable • Patients must be closely monitored and carefully observed for any adverse reactions throughout the infusion period and for at least twenty minutes after administration. Monitoring should be extended to one hour for immunoglobulin naïve patients, those switched from another product, or when there has been a long interval since previous infusion • Management of infusion related reactions: depending on the severity of the reactions, the infusion rate may be either slowed or stopped • Adequate hydration prior to infusion is essential • Monitor urinary output and creatinine. Avoid concomitant loop diuretics. • Precautions need to be taken during administration to prevent possible air embolism – particularly in central line administration • Bottles must be vented in one of two ways: Directly by means of a filter needle into the bottle which goes through the rubber stopper and opens into the air, or Direct air vent on the air inlet of the administration set, located between the drip chamber and piercing pin, it is covered with a bacterial retentive filter to reduce the chance of contamination • In the absence of compatibility studies, this medicinal product must not be mixed with other medicinal products, nor with any other IVIg products. • The product should be inspected visually for particulate matter and discolouration prior to administration. The solution should be clear or slightly opalescent and colourless or pale yellow. Solutions that are cloudy or have deposits should not be used. • The product should be brought to room or body temperature before use. • Keep the vial in the outer carton to protect from light.
References	*Information provided relates to Kiovig manufactured by Takeda* *[SPC last update 24/06/22. SPC checked 24/5/24] PA number: EU/1/05/329/001-006* *References: 1. SPC, 2. Galway Guide and 3. HSE Guideline for Immunoglobulin Use in Neurology Conditions June 2024*

HYDRALAZINE	
Available preparations	Hydralazine Hydrochloride Injection 20mg/ml Ampoule, 1ml (Auro Pharma) Unlicensed
Reconstitution	Already in solution
Method of intravenous administration	**<u>Direct injection</u>** • Administer required dose by slow intravenous injection over 3 to 5 minutes. • For ease of administration the solution may be further diluted with 0.9% Sodium Chloride • Can also be given by continuous infusion with an initial rate of 0.2 to 0.3mg/minute
Compatibility & Stability	Sodium Chloride 0.9%
Comments	• Blood pressure and heart rate should be checked frequently (i.e., every 5 minutes). • Blood pressure levels may begin to fall within a few minutes after injection, with an average maximal decrease occurring in 10 to 80 minutes. In cases where there has been increased intracranial pressure, lowering the blood pressure may increase cerebral ischemia. • ECG should be monitored during administration • Caution in renal impairment – reduce dose if eGFR <30ml/min/1.73m^2 • Caution in hepatic dysfunction • Not to be added to other infusion solutions • **Parenteral Products**: The injection solution should be used immediately after the vial is opened. Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration, whenever solution and container permit. • Monitor complete blood counts and ANA titre, before and periodically during prolonged hydralazine therapy, even in asymptomatic patients Slow acetylators, female patients and patients receiving more than 100mg per age (chronically) are at higher risk for developing SLE like syndrome
References	*Information provided relates to Hydralazine manufactured by Auro Pharma (unlicensed)* *[SPC last update 05/23. SPC checked 28/05/24]* *References: SPC, Galway Guide accessed 16/08/2024*

HYDROCORTISONE SODIUM SUCCINATE	
Available preparations	Solu-Cortef 100mg Vial
Reconstitution	Dilute each 100mg vial with exactly 2mL Water for Injection and shake to mix
Method of intravenous administration	**<u>Slow intravenous injection (Preferred method of administration for initial emergency use):</u>** • Administer required dose over 1 to 10 minutes • High doses of 500mg to 1000mg should be given over 10 minutes **<u>Intermittent intravenous infusion:</u>** • Add required dose to 100ml to 1000mL (not less than 100mL) infusion fluid and administer over 20 to 30 minutes • If fluid restricted, can add 100mg to 50mL infusion fluid (unlicensed) • If using the fluid restricted volume of 50mL infusion fluid, the residual fluid in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5% (see under 'Comments' re choice)
Comments	• Sodium chloride 0.9% may be the preferred infusion solution, to try and avoid hyperglycaemia • However, Sodium chloride 0.9% is more likely to cause hypernatremia • After prolonged treatment, withdrawal should be gradual • Each vial contains 10.1mg of sodium • **Preparation of solutions**: **For intravenous or intramuscular injection** prepare the solution aseptically by adding not more than 2 ml of Sterile Water for Injections to the contents of one vial of Solu-Cortef 100 mg, shake and withdraw for use. **For intravenous infusion**, first prepare the solution by adding not more than 2 ml of Sterile Water for Injections to the vial; this solution may then be added to 100 ml – 1000 ml (but not less than 100 ml) of 5% dextrose in water (or isotonic saline solution or 5% dextrose in isotonic saline solution if patient is not on sodium restriction). When reconstituted as directed the pH of the solution will range from 7.0 to 8.0. No diluents other than those referred to are recommended. Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration. Use solution only if it is clear. After reconstitution with Water for Injection, use immediately, discard any remaining solution
References	*Information provided relates to Solu-Cortef manufactured by Pfizer [SPC last update 09/23. SPC checked 27/05/24] PA822/137/1* *References: SPC, Galway Guide*

HYOSCINE BUTYLBROMIDE	
Available preparations	Buscopan 20mg/mL, 1ml ampoule (Sanofi)
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow Intravenous Injection:</u>** • Administer over 3 to 5 minutes (rapid administration may cause a marked drop in blood pressure) • May be diluted with 10 mL Sodium chloride 0.9% or Glucose 5% to enable slow administration if required
Compatibility & Stability	Sodium Chloride 0.9% Glucose 5%
Comments	• Intravenous injection should be performed slowly, (in rare cases a marked drop in blood pressure and even shock may be produced by Buscopan). • In case severe, unexplained abdominal pain persists or worsens, or occurs together with symptoms like fever, nausea, vomiting, changes in bowel movements, abdominal tenderness, decreased blood pressure, fainting, or blood in stool, appropriate diagnostic measures are needed to investigate the etiology of the symptoms • Buscopan Ampoules can cause tachycardia, hypotension and anaphylaxis, therefore, use with caution in patients with cardiac conditions, such as cardiac failure, coronary heart disease, cardiac arrhythmia or hypertension, and in cardiac surgery. Monitoring of these patients is advised. Emergency equipment and personnel trained in its use must be readily available. • Because of the possibility that anticholinergics may reduce sweating, Buscopan should be administered with caution to patients with pyrexia. • Elevation of intraocular pressure may be produced by the administration of anticholinergic agents such as Buscopan in patients with undiagnosed and therefore untreated narrow angle glaucoma. Therefore, patients should seek urgent ophthalmological advice in case they should develop a painful, red eye with loss of vision after the injection of Buscopan. • After parenteral administration of Buscopan, cases of anaphylaxis including episodes of shock have been observed. As with all drugs causing such reactions, patients receiving Buscopan by injection should be kept under observation.
References	*Information provided relates to Buscopan manufactured by Sanofi PA23180/016/001 [SPC last update 11/23. SPC checked 28/5/24] References: SPC & Galway Guide*

IBUPROFEN	
Available preparations	Ibuprofen 400mg/100mL solution for infusion
Reconstitution	Already in solution
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** • Administer over 30 minutes
Compatibility & Stability	Not required - product ready for infusion
Comments	• Ibuprofen (IV route) is indicated for short term use when other routes of administration are not possible - **usual maximum three days** • Check whether NSAIDs are also being given by other routes - to avoid inadvertent duplication of therapy • Consider switch to oral treatment as soon as possible • Ensure adequate hydration to minimise risk of renal adverse reactions • Monitor for signs of gastrointestinal bleeding, ulceration or perforation • Monitor for signs of bronchospasm, urticarial or angioedema • Each mL of solution contains 3.58mg sodium
References	*Information provided relates to Ibuprofen manufactured by B. Braun [SmPC last update 03/23. SmPC checked 1/7/2024]* *PA 0736/041/001* *Reference: SmPC, Galway Guide*

IDARUCIZUMAB	
Available preparations	Praxbind 2.5g per 50mL vial
Reconstitution	Already in solution
Method of intravenous administration	**<u>Intermittent intravenous infusion (preferred method):</u>** • Administer a 5g dose as 2 vials of 2.5g/50ml in consecutive infusions over 5 to 10 minutes each • The residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing • Praxbind must not be mixed with other medicinal products. • A pre-existing intravenous line may be used for administration of Praxbind • The line must be flushed with sodium chloride 0.9% solution for injection prior to and at the end of the infusion • No other infusions should be administered in parallel via the same intravenous access **Bolus intravenous injection - see under comments**
Compatibility & Stability	Not required - product ready for infusion
Comments	• **Gloves, protective eyewear and a mask should be worn by those handling this drug** • Monitor relevant coagulation parameters are activated Partial Thromboplastin Time (aPTT) and Thrombin time (TT) • The manufacturers suggest that **the drug may be given as a bolus injection** (as an alternative to a short infusion) - however, the infusion method is preferable due to the volume (100ml per dose) involved. • Idarucizumab binds specifically to dabigatran and reverses its anticoagulant effect. **It will not reverse the effects of other anticoagulants** • Reversal effects are usually evident immediately after administration (plasma concentrations of unbound dabigatran reduced by more than 99%) • Dabigatran can be re-initiated 24 hours after administration of idarucizumab, if the patient is clinically stable and adequate haemostasis has been achieved • In order to improve the traceability of biological medicinal products, the name and batch number of the administered product should be clearly recorded in the patient chart • Precautions need to be taken during administration to prevent possible air embolism - particularly in central line administration. Bottles must be vented in one of two ways: directly by means of a filter needle into the bottle which goes through the rubber stopper and opens into the air, or direct air vent on the air inlet of the administration set, located between the drip chamber and piercing pin, it is covered with a bacterial retentive filter to reduce the chance of contamination • Each vial contains 2g sorbitol and 25mg sodium in 50mL
References	*Information provided relates to Praxbind manufactured by Boehringer* *[SPC last update 10/07/23. SPC checked 8/7/24]* *EU/1/15/1056/001 Reference: SPC, Galway Guide*

ILOPROST	
Available preparations	Ilomedin 100 microgram per 1 mL ampoule (unlicensed)
Reconstitution	**Already in solution** **Draw up using a 5 micron filter needle** **Dilute further prior to administration:** Each 1 ml ampoule (100 micrograms = 100,000 nanograms) to be diluted in 500mL infusion fluid. This provides a final concentration of 200 nanograms per mL (0.2micrograms/ml)
Method of intravenous administration	**Intermittent intravenous infusion (administer using an electronically controlled infusion device):** • **Using infusion as prepared above** • **Infused for six hours per day**, rates as per guideline below • Ilomedin is administered via a peripheral vein or a central venous catheter
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Iloprost dosing is weight based; ensure accuracy of documented weight before administration • Be careful with drug **calculations** - nanograms vs micrograms • A large volume of infusion may remain after the six hours infusion is complete. Any **unused solution should be discarded** • **Prepare a new infusion every 24 hours** • **Blood pressure and heart rate** should be monitored at the start of the infusion and subsequently after each dosage increase • Depending on the occurrence of adverse effects such as headache and nausea or an undesired blood pressure drop, the infusion rate should be reduced until the optimal tolerated dose is found • If the adverse effects are severe, the infusion should be temporarily interrupted • The treatment course can then be continued - with the dose based on the optimal tolerated dose. • If the drug comes into contact with the skin, a long-lasting but painless erythema may occur. In the event of such contact, the affected area should be washed immediately with copious amounts of water or saline. • May be used as a continuous 24 hour infusion for certain Rheumatology indications – refer to Rheumatology specialist for advice. • It should be administered with great care in patient with low blood pressure to avoid further decrease of blood pressure. Patients with significant heart disease should be closely monitored. • Possible orthostatic hypotension should be considered in patients who, at the end of administration get up from the supine to the standing position. **ILOPROST CONTINUED ON NEXT PAGE**

ILOPROST CONTINUED

Usual dose - treatment of severe chronic ischaemia of lower limbs in patients at risk of amputation

- 0.5 to 2 nanograms/kg/minute for **6 hours per day** see example below
- Starting dose: 0.5 nanograms/kg/minute (ng/kg/minute) for 30 minutes
- The dose should then be increased at intervals of 30 minutes in steps of 0.5 nanograms/kg/minute, up to 2 nanograms/kg/minute, as tolerated
- See table below for rate calculations
- **Stop the infusion after six hours from the start of the infusion**
- Dose may be reduced to previously tolerated rate if adverse effects are experienced
- Repeat this titration regimen on days 2 and 3 to determine the maximum rate, which can then be used each day for 6 hours daily for up to 4 weeks
- If adverse effects occur (headache, nausea, undesired drop in blood pressure), the infusion rate should be reduced in a stepwise manner
- **Duration of treatment**
    - Usually 4 weeks. It may be less in case of early efficacy

Infusion rate (ml/hour) for different doses when using infusion pump

In the case of an Ilomedin solution with a concentration of 0.2 micrograms/ml, the desired infusion rate should be determined according to the attached scheme to achieve a dose within the range of 0.5 and 2ng/kg/min

Body weight (kg)	Dose			
	0.5ng/kg/min	1ng/kg/min	1.5ng/kg/min	2ng/kg/min
	Infusion rate below (mL per hour) (using a 100microgram per 500mL infusion)			
40kg	6	12	18	24
50kg	7.5	15	22.5	30
60kg	9	18	27	36
70kg	10.5	21	31.5	42
80kg	12	24	36	48
90kg	13.5	27	40.5	54
100kg	15	30	45	60
110kg	16.5	33	49.5	66

References	*Information provided relates to Ilomedin manufactured by BAYER (Unlicensed) [SPC last update 07/2023. SPC checked 15/7/2024]* *References: SPC, Galway guide*

ISOPRENALINE	
Available preparations	Isoprenaline **hydrochloride** (Isoprenalina cloridrato monico) 0.2mg in 1mL (200 micrograms in 1mL) unlicensed
Reconstitution	Already in solution Draw up using a 5 micron filter needle
Method of intravenous administration	**Intravenous infusion CARDIOGENIC shock secondary to bradycardia (administer using an electronically controlled infusion device):** **For intravenous infusion**: dilute 10ml of isoprenaline hydrochloride 0.2mg/ml solution for injection with 500ml of 0.9% sodium chloride or 5% glucose to obtain a solution with a concentration of 0.004mg/ml (i.e. 4 microgram/ml) **For intravenous injection**: dilute 1ml of isoprenaline hydrochloride 0.2mg/ml solution for injection with 10ml of 0.9% sodium chloride or 5% glucose to obtain a solution with a concentration of 0.02mg/ml Use a microdrip or a continuous infusion pump to prevent sudden flow of an excessive quantity of drug
Compatibility & Stability	Glucose 5% or Sodium Chloride 0.9% Isoprenaline must not be mixed with medicinal solutions that have an alkaline pH (eg sodium bicarbonate, aminophylline, alkaline buffer antibiotics) because oxidation velocity increases considerably in conditions presenting pH levels higher than 6
Comments	• Isoprenaline solution must be administered immediately after its preparation • **Warning**: Product contains sodium metabisulphite: in sensitive subjects , and particularly in asthmatics, this substance can cause allergic reactions and severe asthma attacks • Store below 25 degrees Centigrade in original container to protect from light • If exposed to air, light or temperature rise, the solution can develop a colour ranging from pink to brownish pink. The solution must not be used if it is coloured or presents a precipitate
References	*Information provided relates to Isopreanline manufactured by Monico spa (unlicensed)* *[SPC last update 03/09/16. SPC checked 15/7/24]* *Ref: SPC, Galway guide*

LABETALOL	
Available preparations	Trandate 5mg/mL (100mg/20mL) ampoule
Reconstitution	Already in solution Draw up using a 5 micron filter needle
Method of intravenous administration	**<u>Continuous intravenous infusion (administer using an electronically controlled infusion device):</u>** • Dilute 200mg (40mL) injection solution with 160mL infusion fluid (1mg per mL) • Ideally administer via central line. If essential, can be given via a large peripheral vein. • Fluid restriction: use undiluted via central line - unlicensed **<u>Bolus intravenous injection (emergency situations such as hypertensive encephalopathy):</u>** • Administer 50mg over at least one minute. • If necessary, doses of 50mg may be repeated at five minute intervals until a satisfactory response occurs. Total dose should not exceed 200mg. • Administer via central line or large peripheral vein • Max effect usually occurs within 5 min and the duration of action is usually about 6 h, but may be as long as 18 h.
Compatibility & Stability	Glucose 5% or Sodium Chloride 0.9%
Comments	• Monitor BP, heart rate and respiratory function throughout the infusion • Monitor LFTs as severe hepatocellular damage has been reported • Monitor infusion site every 30 minutes • Patients should always receive the medicinal product whilst in the supine or left lateral position. • Raising the patient into the upright position within 3 hours of I.V. labetalol administration should be avoided since excessive postural hypotension may occur.
References	*Information provided relates to Labetalol 5mg/ml manufactured by S.A.L.F. S.p.A. Laboratorio Farmacologico* *[SPC last update 04/22. SPC checked 20/05/24]* *PA22760/001/001*

LACOSAMIDE	
Available preparations	Vimpat 10mg/mL (200mg/20mL) vial
Reconstitution	Already in solution
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** • Administer over 15 to 60 minutes. An infusion duration of at least 30 minutes for administration >200mg per infusion is preferred. • No dilution required – product ready for use. If required, can be diluted with suitable infusion fluid – suggest 100mL (volume use not critical) • If a 50ml infusion volume is used the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing.
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Each mL of solution for infusion contains 2.99mg sodium
References	*Information provided relates to Lacosamide manufactured by UCB Pharma S.A* *[SPC last update 07/22. SPC checked 20/05/23]* *EU/1/08/470/017*

LEVETIRACETAM	
Available preparations	Keppra 100mg/mL (500mg/5mL) vial
Reconstitution	Already in solution **Draw up using a 5 micron filter needle** **Dilute further prior to administration**
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** • Add required dose to at least 100mL infusion fluid • Administer over 15 minutes
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Each vial contains 19mg sodium • There is no experience with administration of intravenous levetiracetam for longer periods than 4 days • Consider **IV to oral switch** as soon as possible as excellent oral bioavailability (100%) • Avoid sudden withdrawal – refer to SPC for more detail
References	*Information provided relates to Keppra manufactured by UCB Pharma S.A* *[SPC last update 02/23. SPC checked 25/05/24]* *EU/1/00/146/033*

LEVOMEPROMAZINE	
Available preparations	Nozinan 25mg/mL ampoule
Reconstitution	Already in solution **Dilute further prior to IV administration**
Method of intravenous administration	**<u>Intravenous bolus injection:</u>** • Withdraw required dose and dilute with an equal volume of sodium chloride 0.9% immediately before use. • Give slowly over 3 to 5 minutes
Compatibility & Stability	Sodium Chloride 0.9%
Comments	• Can cause prolongation of QT interval • Sulphites: This medicinal product contains "sulphites" and can cause severe allergic reactions and bronchospasm. • Diluted solutions are for single use and should be used immediately after preparation. Discoloured solutions should not be used.
References	*Intravenous Drug Admin. Guidelines Pharmacy Dept. CUH, Version 1: 2021* *Information provided relates to Nozinan manufactured by Neuraxpharm Ireland Ltd. [SPC last update 11/23. SPC checked 28/06/24] PA23229/008/001*

LIDOCAINE	
Available preparations	Lidocaine 1% Lidocaine 2%
Reconstitution	Already in solution **Dilute further if using for IV infusion**
Method of intravenous administration	**<u>Bolus intravenous injection (FOR USE IN CARDIOLOGY):</u>** • Administer required dose over a few minutes • Maximum rate of 50mg/min **<u>Continuous intravenous infusion (FOR USE IN CARDIOLOGY) (administer using an electronically controlled infusion device):</u>** • To prepare an 0.2% infusion: • Remove 50mL from a Glucose 5% or Sodium chloride 0.9% 500mL infusion bag, and add 50mL of the lidocaine 2% solution. • This solution then contains **1000mg lidocaine in 500mL** - 2mg/mL **(0.2%)** • Adjust rate as per 'Dose'. See SPC for details. **<u>Bolus intravenous injection (FOR USE IN PAIN MANAGEMENT):</u>** • Bolus IV injections for use in pain management should only be carried out by personnel adequately skilled in the respective anaesthetic technique. **<u>Continuous intravenous infusion (FOR USE IN PAIN MANAGEMENT) (administer using an electronically controlled infusion device):</u>** • Continuous IV infusion for use in pain management should only be carried out by personnel adequately skilled in the respective anaesthetic technique.
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• ECG monitoring required for infusion and resuscitation facilities should be available. • Monitor for excessive dose: (drowsiness or dizziness) • Common or very common side effects (may indicate serious toxicity): bradycardia and hypotension (may lead to cardiac arrest); dizziness, drowsiness and paraesthesia (particularly if injection is too rapid); confusion, convulsions. In all such circumstances contact a senior physician. • Pain management: refer to specialist in pain management
References	*Information provided relates to Lidocaine manufactured by B.Braun. [SPC last update 03/23. SPC checked 28/06/24]* *PA0736/044/001, PA0736/044/002*

LORAZEPAM	
Available preparations	Lorazepam 4mg per 1ml ampoule (Macure) **Only Kept in Children's Ward in SIVUH.** Refer to 'The pharmacological management of inpatient Status Epilepticus in Paediatric (>3 months) patients in SIVUH.'

MAGNESIUM SULFATE	
Available preparations	Magnesium Sulfate 50%w/v concentrate (1g/2mL)
Reconstitution	Already in solution **Dilute the 50% ampoules before use** **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Intermittent intravenous infusion (PREFERRED ROUTE) (administer using an electronically controlled infusion device):</u>** • The 50% solution **MUST** be diluted before use – mix very thoroughly to avoid layering • Refer to local hypomagnesaemia guidelines for advice on dose and administration (See: pharmacy website on Intranet / clinical resources / electrolytes)
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Note: 50% = 1g in 2mL = 4mmol/2mL • Up to 50% of an IV dose may be eliminated in the urine, therefore, **slower administration may improve retention** (maximum rate: 1g/hour in asymptomatic hypomagnesaemia) • In patients not in cardiac arrest, hypotension and asystole may occur with rapid administration • Take care when calculating doses, rates and volumes • **Max concentrations:** ➢ ***Peripheral line*** = 5% i.e. 5g (20mmol) in at least 100ml, suggested practice is to add 1 to 2g to 100ml, or 5g to 250ml infusion fluid. If fluid restricted can use a 10% concentration, i.e. 5g (20mmol) in 50ml, monitor for phlebitis. ➢ ***Central line*** = Consider using same dilutions as peripheral use, however up to 20% i.e. 4g (16mmol) in 20ml can be used • Magnesium sulphate may cause tissue damage if it extravasates into the surrounding tissue • **Rate of administration for peripheral and central lines:** ➢ 1g (4mmol) per hour. ➢ Maximum rate of admin (except in emergencies) 2g (8mmol) per hour. ➢ Higher rate of admin (up to 9g (36mmol) per hour have been used in critical care or emergencies. • During intravenous magnesium administration monitor heart rate, blood pressure, respiratory rate, urine output and for signs of hypermagnesaemia and hypersensitivity. ECG monitoring is recommended, especially in the elderly. Monitor magnesium, calcium and other electrolyte plasma levels.
References	*Information provided relates to Magnesium Sulfate 50% manufactured by Ethypharm [SPC last update 02/23. SPC checked 28/06/2024] PA0549/020/001*

METHYLPREDNISOLONE	
Available preparations	Solu-Medrone 125mg Act-O-vial Solu-Medrone 500mg and 1000mg vial
Reconstitution	**<u>500mg vial:</u>** Reconstitute with 7.8mL sterile water for injections (provided) **<u>1000mg vial:</u>** Reconstitute with 15.6mL sterile water for injections (provided) **<u>125mg Act-O-Vial:</u>** • Press down on plastic activator to force diluent into lower compartment • Gently agitate to effect dissolution • Remove plastic tab covering centre of stopper – sterilise top of stopper with suitable germicide • Insert needle squarely through centre of plunger-stopper until tip is just visible. Invert vial and withdraw dose.
Method of intravenous administration	**<u>Slow intravenous injection (doses of 250mg or less):</u>** • Use reconstituted solution • Administer dose over at least five minutes (see comments re adverse effects with rapid administration) **<u>Intermittent intravenous infusion (may be used for all doses):</u>** • Dilute reconstituted solution • Administer required doses over at least 30 minutes (see comments re adverse effects with rapid administration) • The infusion volume is not critical – any infusion volume may be used • An infusion volume of as little as 50mL may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant under-dosing
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5% Consider favouring Sodium Chloride 0.9% as the infusion fluid for high doses as administrations of glucose 5% may cause or aggravate hyperglycaemia
Comments	• Check the approved route of administration on product packaging carefully (intravenous and depot intramuscular steroid preparations could be easily confused) • Rapid infusion may be associated with arrhythmias, cardiac arrest and circulatory collapse • As rare instances of skin reactions and anaphylactic reactions have occurred in patients receiving corticosteroid therapy, appropriate precautionary measures should be taken prior to administration, especially when the patients has a history of drug allergy • Solu-Medrone is supplied as methylprednisolone sodium succinate (doses expressed in mg of methylprednisolone) • 500mg vial contains 58.3mg sodium. 1g vial contains 116.8mg sodium
References	*Information provided relates to Solu-Medrone manufactured by Pfizer [SPCs last update 04/24. SPC checked 01/07/24] 125mg vial – PA822/136/2, 500mg vial – PA 822/136/3, 1000mg vial – PA 822/136/4*

METOCLOPRAMIDE	
Available preparations	Metoclopramide 5mg/mL (10mg/2mL)
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Administer over at least 3 minutes (slow bolus) to minimise the risk of occurrence of adverse reactions, including cardiovascular reactions
Compatibility & Stability	
Comments	• Should only be prescribed for short-term use up to 5 days • Change to oral route as soon as possible • Maximum dose is 30mg (or 0.5mg/kg body weight) in 24 hours • Given very rare reports of serious cardiovascular events (e.g. circulatory collapse, severe bradycardia, cardiac arrest and QT prolongation), especially when the drug is given via the IV route, special care should be taken with at-risk populations including: elderly, patients with cardiac conduction disturbances, those taking other drugs known to prolong QT interval, uncorrected electrolyte imbalance and bradycardia.
References	*Information provided relates to Metoclopramide manufactured by Mercury Pharmaceuticals Ltd [SPC last update 09/22. SPC checked 25/05/24] PA 0073/084/001*

METOPROLOL	
Available preparations	Betaloc 1mg/mL (5mg/5mL) ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection (preferred):</u>** • Withdraw the required dose • Administer at a rate of 1 to 2 mg per minute • If necessary, may be diluted with Sodium Chloride 0.9% or Glucose 5% **<u>Intermittent intravenous infusion (unlicensed):</u>** • Dilute 20mg to 50mL infusion fluid. Suggested starting rate 40microgram/kg/hour (=7mL/hour for a 70kg patient). Titrate dose according to response, usually up to 100 micrograms/kg/hour.
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Monitor ECG, heart rate and blood pressure closely
References	*Information provided relates to Betaloc manufactured by Recordati [SPC last update 02/24. SPC checked 25/05/24]* *PA 1404/007/001*

MIDAZOLAM	
Available preparations	Midazolam 1mg/mL (5mg/5mL) – Accord Hypnoval 10mg/2mL and Hypnoval 10mg/5mL - Cheplapharm
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Administer required dose at a rate of 2mg per minute **<u>Continuous intravenous infusion (critical care areas only). Administer using electronically controlled infusion device:</u>** • Withdraw the required dose and dilute to a suitable volume with Sodium Chloride 0.9% or Glucose 5%. (The recommended concentration for infusion in a critically ill adult patient is 1 mg/mL but it may be administered undiluted) • Give by IV infusion at a rate appropriate to indication (see SPC for further details)
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Flumazenil injection must be available at all times when administering midazolam by the intravenous route • Midazolam should only be administered by experience physicians in a setting fully equipped for the monitoring and support of respiratory and cardiovascular function • Not to be used for conscious sedation in patients with severe respiratory failure or acute respiratory depression • Acute respiratory depression, respiratory arrest and cardiac arrest may occur especially when used for sedation in non-critical care settings • Monitor respiratory and cardiovascular parameters • Monitor blood pressure – hypotension is more common in patients also on opioids • Special caution should be exercised in the following patients: ➢ Adults over 60 years of age ➢ Chronically ill or debilitated patients ➢ Chronic respiratory insufficiency – respiratory arrest is more common with high doses/rapid administration ➢ Chronic renal failure, impaired hepatic or cardiac function • Elimination half-life may be prolonged up to six times in critically ill patients • Midazolam Accord 1mg/ml, Hypnovel 10mg/5ml and Hypnovel 10mg/2ml contain less than 1 mmol sodium (23 mg) per ampoule, i.e. essentially 'sodium- free'
References	*Information provided relates to: Midazolam 1mg/ml manufactured by Accord PA 627809 [SPC last update 07/23]* *Hypnovel 10mg/2ml manufactured by Cheplapharm Arzneimittel GmbH PA 2239/007/001 [SPC last update 09/23],* *Hypnovel 10mg/5ml manufactured by Cheplapharm Arzneimittel GmbH PA 2239/007/002 [SPC last update 09/23]* *[SPCs checked 08/07/2024]*

NALOXONE	
Available preparations	Naloxone 400 micrograms/mL ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Bolus intravenous injection (usual route):</u>** • Administer undiluted, inject over a few seconds **<u>Continuous intravenous infusion (used in opioid overdose)(administer using an electronically controlled infusion device):</u>** • Add 2,000 micrograms (2mg) to 500mL infusion fluid (4 micrograms per mL) • Titrate to response • Initial rate may be set to deliver 60% of the initial effective IV injection dose over 1 hour and adjusted according to response (in microgram/hour). Be aware that some opioids may be relatively long-acting.
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• The duration of some opioids (including dihydrocodeine and methadone) may exceed that of naloxone. In these circumstances, an intravenous infusion of naloxone will provide sustained antagonism of the opioid without the need for repeated injections • Patients should be monitored to ensure respiratory depression does not occur • Naloxone is not effective against respiratory depression caused by non-opioid drugs • Each 1 mL contains 3.54mg sodium
References	*Information provided relates to Naloxone manufactured by Hameln Pharma. PL 01502/0141 (ULM). [SPC last updated 09/23. SPC checked 07/05/24]*

NORADRENALINE (NOREPINEPHRINE)	
Available preparations	Noradrenaline 1:1000 (1mg/mL as base) ampoule
Reconstitution	Ampoules (only) to be diluted further prior to administration **Draw up using a 5 micron filter needle**
Method of intravenous administration	**Continuous intravenous infusion (administer using an electronically controlled infusion device):** • **CENTRAL LINE administration only** • 4mg BASE (=4mL of 1:1000 solution) in 50mL Glucose 5% (=80 micrograms/mL solution) • Administer at a suitable, controlled rate, titrated to pressor effect observed • Higher concentrations may occasionally be used
Compatibility & Stability	Glucose 5%
Comments	• For administration in specialist units only • For central line administration only • Monitor infusion site frequently – extravasation may cause local tissue necrosis. • Monitor blood pressure continuously • The product license for the solution for infusion stipulates "adults weighing over 50kg". Contact pharmacy for advice is patient weighs <50kg. • Doses are expressed in terms of the **base** • 6.7mg sodium in each 2mL ampoule
References	*Information provided relates to Noradrenaline manufactured by Pfizer. PA0822/219/001. [SPC last updated 06/21. SPC checked 07/05/24]*

OCTREOTIDE	
Available preparations	Octreotide 100 micrograms per 1mL ampoule
Reconstitution	Already in solution. **Draw up using a 5 micron filter needle**
Method of intravenous administration	**Important:** The **subcutaneous** route is the **preferred** route in many circumstances, except where a rapid response is required. **Bolus intravenous injection (in emergencies):** • May be given undiluted (unlicensed) by rapid intravenous injection, if slow IV injection considered inappropriate **Slow intravenous injection (for use only when rapid response required):** • Dilute each 1mL with 1 to 9mL sodium chloride 0.9% • Administer over three to five minutes **Intermittent intravenous infusion:** • Add required dose to 100 to 200mL infusion fluid and administer over 15 to 30 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant under dosing **Continuous intravenous infusion:** • Add 500 micrograms to produce a total volume of 250mL (2 micrograms/mL) and administer at a rate according to dosage as per indication.
Compatibility & Stability	Sodium chloride 0.9% **ONLY**
Comments	• **Important:** The **subcutaneous** route is the **preferred** route in many circumstances • **Octreotide is stored in the fridge. To reduce local discomfort, let the solution reach room temperature before injection** • ECG and blood pressure monitoring is required • Monitor heart rate (bradycardia commonly reported) • Monitor blood glucose in all patients. This is especially important in patients with insulinomas (because octreotide is more potent at inhibiting the secretion of GH and glucagons than it is at inhibiting insulin. This is especially the case upon the introduction of the drug and at each change of dose) • Monitor blood glucose for patients with oesophageal varices as there is an increased risk for the development of insulin-dependent diabetes or for insulin changes in patients with pre-existing diabetes • Monitor LFTs • Long term therapy: Monitor thyroid function, six-monthly ultrasound checks for gall stones, monitor in patients with a history of pancreatitis, and also monitor vitamin B12 levels.
References	*Information provided relates to Octreotide manufactured by Pfizer. PA0822/218/002. [SPC last updated 05/22. SPC checked 17/05/23]*

ONDANSETRON	
Available preparations	Ondansetron 4mg/2mL ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**Note:** Must use intravenous infusion as method of administration for patients older than 65 years, for chemotherapy or radiotherapy induced nausea and vomiting **Slow intravenous injection:** • **Post op nausea and vomiting: all patients** • **Chemotherapy/radiotherapy induced nausea and vomiting: patients less than 65 years of age** o Administer over at least 30 seconds (and preferably over 2–5 minutes) o May be diluted to a convenient volume with Sodium chloride 0.9% to aid slow administration **Intermittent intravenous infusion:** • **Chemotherapy/radiotherapy induced nausea and vomiting, for adult patients of all ages** o Add required dose to 100mL of infusion fluid o Administer over at least 15 minutes o A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant under dosing **Continuous intravenous infusion:** • **Chemotherapy/radiotherapy induced nausea and vomiting in adult patients less than 65 years of age only** o Add required dose to 50 or 100mL of infusion fluid o Administer at a rate of 1mg per hour for up to 24 hours
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Ondansetron prolongs the QT interval in a dose-dependent manner • Hypokalaemia and hypomagnesaemia should be corrected prior to administration of ondansetron • Monitor blood pressure and heart rate
References	*Information provided relates to Ondansetron manufactured by Noridem. PA1122/004/001, [SPC last updated 04/24. SPC checked 08/05/24]*

PABRINEX (VITAMINS B AND C)	
Available preparations	Pabrinex IV (2 ampoules, no.1 and no.2) 2 x 5mL ampoules
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**Intermittent intravenous infusion (administer using an electronically controlled infusion device):** • Equal volumes of the contents of ampoules no.1 and 2 should be added to 100mL infusion fluid • Administer over 30 minutes • Up to three pairs of ampoules may be added to 100mL bag • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Two formulations are available – one for IV and one for IM (IM preparation not routinely stocked in SIVUH). Please ensure the correct formulation is being used for the required route • Repeated injections may give rise to anaphylactic shock. Mild allergic reactions such as sneezing or mild asthma are warning signs that further injections may give rise to anaphylactic shock. • Facilities for treating anaphylaxis should be available when administering this preparation • 79mg sodium per 1 pair of 5 mL ampoules
References	*Information provided relates to Pabrinex IV manufactured by Kyowa Kirin [SPC last update 11/18. SPC checked May 2024]* *PA: 2288/001/001*

PANTOPRAZOLE	
Available preparations	Not stocked in SIVUH

PAPAVERINE	
Available preparations	Papaverine 60mg/2mL
Reconstitution	Already in solution
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Administer over 1 to 2 minutes
Compatibility & Stability	
Comments	
References	*Information provided relates to Papaverine as per Medicines Complete accessed 26/07/2024*

PARACETAMOL	
Available preparations	Paracetamol 1g per 100mL glass vial (Accord) Paracetamol 500mg per 50mL infusion bottle (Fresenius Kabi)
Reconstitution	Already in solution.
Method of intravenous administration	**<u>Intermittent intravenous infusion:</u>** • Administer over 15 minutes **If using glass bottles : <u>Glass bottle precautions</u> as follows:** • Precautions need to be taken during administration to **prevent possible air embolism** - particularly in central line administration. • Bottles **must be vented** in one of two ways· Directly by means of a filter needle into the bottle which goes through the rubber stopper and opens into the air, or · Direct air vent on the air inlet of the administration set, located between the drip chamber and piercing pin, it is covered with a bacterial retentive filter to reduce the chance of contamination.
Compatibility & Stability	Not required - product ready for infusion
Comments	• **Reduce dose in patients weighing less than 50kg (15mg/kg/dose)** • Paracetamol for infusion is 10mg/1mL. Fatalities have been reported where patients have been dosed in ml instead of mg (potential 10-fold overdose). Always prescribe total dose in mg and mL e.g. 500mg/50mL. • A single dose of paracetamol should never exceed 100mL • Check whether paracetamol is also being given by other routes - to avoid inadvertant overdose – e.g. PO Solpadol, Paracetamol • Consider IV to PO or PR switch as soon as possible • The maximum daily dose is 3g in patients with risk factors for hepatotoxicity
References	*Information provided relates to Paracetamol manufactured by Accord [SPC last update 05/22] and Fresenius Kabi [SPC last update 07/22] [SPCs checked May 2024] PA: 2315/218/001 – 1g; PA: 2059/015/001 – 500mg*

PARECOXIB	
Available preparations	Dynastat 40mg vial
Reconstitution	Add 2 mL Sodium Chloride 0.9% or Glucose 5% per 40mg vial Dissolve the powder using a gentle swirling motion
Method of intravenous administration	**Bolus intravenous injection:** • Administer over 1 to 2 minutes
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Anti-inflammatory agent (COX-2 inhibitor)
References	*Information provided relates to Dynastat manufactured by Pfizer [SPC last update 01/24. SPC checked May 2024] EU 1/02/209/005*

PHENYLEPHRINE

Available preparations	Phenylephrine hydrochloride 100 micrograms/mL (2mg/20mL) Phenylephrine hydrochloride *pre-filled syringe* 50 micrograms/mL (500micrograms/10mL)
Reconstitution	Already in solution
Method of intravenous administration	**Route of administration should be determined by the needs of the patient according to indication and dose** **Continuous intravenous infusion (administer using an electronically controlled infusion device):** • Draw up 3 x 2mg/20mL vials using a 50mL syringe (which has graduations marked up to 60mL) • This solution contains 100 micrograms/mL • Titrate dose to response • When an intravenous infusion is discontinued, slow the rate gradually – do not stop it abruptly • The initial rate is 25 - 50 micrograms/minute. The dose can be increased up to 100 micrograms/minute or reduced to 25 micrograms/minute according to response. (See infusion table below for rates in mL/hour) **Slow intravenous injection:** • Administer required dose over 3 to 5 minutes • An IV bolus dose should not exceed 100 micrograms
Compatibility & Stability	Not required – already in solution
Comments	• This medicine should only be administered by healthcare professionals with appropriate training and relevant experience. • Monitor for extravasation • Monitor blood pressure, heart rate, arterial blood gases, central venous pressure • Each 20 ml vial contains 78 mg equivalent to 3.4 mmol of sodium. • Each 10mL pre-filled syringe contains 37.2mg sodium (1.62mmol)

Infusion rate table for Phenylephrine 100micrograms/mL solution for injection/infusion:

Dose	Rate: mL/min	Rate: mL/hour
25 mcg/min	0.25 mL/min	15 mL/hour
30 mcg/min	0.30 mL/min	18 mL/hour
40 mcg/min	0.40 mL/min	24 mL/hour
50 mcg/min	0.50 mL/min	30 mL/hour
60 mcg/min	0.60 mL/min	36 mL/hour
70mcg/min	0.70 mL/min	42 mL/hour
80mcg/min	0.80 mL/min	48 mL/hour
90mcg/min	0.90 mL/min	54 mL/hour
100mcg/min	1 mL/min	60 mL/hour

References	Information provided relates to Phenylephrine manufactured by Aguettant [SPC last update 09/20 and 01/22. SPC checked May 2024] PA: *1968/007/002 PA: 1968/007/001*

PHENOBARBITONE / PHENOBARBITAL	
Available preparations	Phenobarbital 200mg/1ml See local guidelines for Status Epilepticus in Adults in SIVUH
Reconstitution	Already in solution Draw up using a 5 micron filter needle Dilute further prior to administration
Method of intravenous administration	**Slow intravenous injection** Dilute each 1ml injection solution to 10ml with water for injection Administer at a rate of 50mg to 100mg per minute (rates greater than 60mg/min reserved for emergencies such as status epilepticus) Maximum rate of injection cannot exceed **100mg per minute**
Compatibility & Stability	
Comments	There are numerous interactions – check current BNF Monitor sedation score, respiratory rate, heart rate and blood pressure Extravasation may cause tissue damage
References	*Information provided relates to Phenobarbital Martindale. PL:01883/6190R* *Reference: Galway IV Guidelines,* *"The Pharmacological Management of Inpatient Status Epilepticus in adults in SIVUH"*

<table>
<tr><th colspan="2">PHENYTOIN</th></tr>
<tr><td>Available preparations</td><td>Epanutin 250mg per 5mL ready mixed parenteral solution</td></tr>
<tr><td>Reconstitution</td><td>Already in solution</td></tr>
<tr><td>Method of intravenous administration</td><td><u>Intermittent intravenous infusion (preferred route for both loading and maintenance doses)(Administer using an electronically controlled infusion device):</u>
• Administer into a large vein through a large-gauge needle or IV catheter
• Add required dose to a suitable volume of infusion fluid - the concentration cannot exceed 10mg/1mL (see table below)
<table><tr><th>Required dose</th><th>Volume of infusion fluid</th></tr><tr><td>Less than 500mg</td><td>50mL</td></tr><tr><td>500-1000mg (loading doses)</td><td>100mL</td></tr><tr><td>Greater than 1000mg (loading doses)</td><td>250mL</td></tr></table>
• The rate of administration cannot exceed 50mg per minute - example 1400mg as loading dose over at least 30 minutes
• A rate of 25mg per minute or lower may be appropriate in some patients including the elderly and those with heart disease
• Administration should commence immediately after the mixture has been prepared and must be completed within 60 minutes
• An in-line 0.2 micron filter must be used.
<u>Slow intravenous injection (maintenance doses only) (infusion preferred):</u>
• Administer at a rate not exceeding 50mg per minute, into a large vein through a large-gauge needle or IV catheter

<u>Important:</u>
• Each injection or infusion of phenytoin should be preceded and followed by an injection of sterile sodium chloride 0.9% through the same needle or catheter to avoid local venous irritation due to alkalinity of the solution
• Ensure remainder of drug solution in the administration set is administered - flush through with Sodium chloride 0.9% at the same rate at which the phenytoin was given</td></tr>
<tr><td>Compatibility & Stability</td><td>Sodium chloride 0.9% only</td></tr>
<tr><td>Comments</td><td>• Continuous ECG and BP monitoring is required
• Monitor respiratory rate
• Monitor injection site during and for 72 hours following administration
• Adjust dose as per levels (contact pharmacy for advice re-TDM)</td></tr>
<tr><td>References</td><td>Information provided relates to Epanutin manufactured by Upjohn [SPC last update 03/23. SPC checked May 2024], PA:23055/003/006</td></tr>
</table>

PHOSPHATE (AS SODIUM OR POTASSIUM SALTS)

Available preparations

Phosphate salt	Volume	Phosphate content	Sodium content	Potassium content
Potassium phosphate (Braun)	20mL	12mmol	Nil	20mmol
Phosphate polyfuser (F.Kabi)	500mL	50mmol	81mmol	9.5mmol

Reconstitution

Already in solution
Ampoules should be diluted further prior to administration

Method of intravenous administration

Intermittent intravenous infusion (using an electronically controlled infusion device):

- Administer as per indication (see local protocols on pharmacy intranet page)

Phosphates Polyfusor®

- The required dose from a Phosphates Polyfusor® is usually given over 12 - 24 hours but can be given over 6 - 12 hours.
- Phosphates Polyfusor® is already in solution i.e. ready to infuse

Potassium Phosphate 20ml amps (BBraun) Concentrate for solution for infusion

Potassium Phosphate amps – use should be limited to GFS3 due to their high potassium content

Dilution

- Must be diluted before use - each 20ml ampoule must be diluted with at least 500ml of 0.9% Sodium Chloride or 5% Glucose
  Max concentration – 40mmol of potassium per 1,000ml (corresponds to 24mmol/L of phosphate) via peripheral line

Rate of administration (administration should be via a rate controlled infusion pump)

- Max rate – 10mmol of potassium per hour (6mmol of phosphate per hour)
- GFS3 – max rate = 20mmol of potassium per hour with cardiac monitoring
- A recommended maximum dose is 2-3mmol/kg of potassium in 24 hours

Compatibility & Stability

Sodium chloride 0.9% (preferred). Glucose 5% may be used if clinically appropriate

PHOSPHATE CONTINUED ON NEXT PAGE

Comments **PHOSPHATE CONTINUED**	• Potassium phosphate ampoules are treated as a **controlled drug in SIVUH**. The routine supply of potassium phosphate is restricted to designated wards, and must be stored in CD cupboards • Monitor fluid balance and blood pressure and ECG (as K^+ content) • Monitor the following electrolytes every 6 to 12 hours: **Phosphate:** Rapid or excessive phosphate replacement through intravenous dosing can lead to hyperphosphataemia. Phosphate is an intracellular anion and therefore serum concentrations are not an exact measurement of total body stores **Calcium:** Calcium-phosphate precipitation in soft tissue may cause hypotension and organ damage and can result in acute renal failure. Intravenous calcium and phosphate must not be co-administered - significant risk of precipitation in the line **Magnesium:** Administration of intravenous phosphate can lead to hypomagnesaemia **Potassium:** Care with rate of administration of potassium phosphate salts- too rapid may be fatal. Caution with potassium salts: Cardiac disease, conditions predisposing to hyperkalaemia - renal/ adrenocortical insufficiency, acute dehydration or extensive tissue destruction as occurs in severe burns. Also risk of cardiac arrythmias with rapid administration **Sodium:** Due to the sodium content of solutions used, caution in hypertensive patients, or those with heart failure or oedema.
References	*Information provided relates to Phosphate manufactured by Braun [SPC last updated 05/17] and Fresenius Kabi [SPC last updated 09/14] [SPCs checked May 2024 and 17/05/23 respectively], SIVUH Guidance on the management of acute hypophosphataemia in adults. PA179/5/1, PL08828/006*

VITAMIN K (PHYTOMENADIONE)	
Available preparations	Konakion MM 10mg per 1mL ampoule (usual strength) Konakion MM Paediatric 2mg per 0.2mL ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Use undiluted. Give as a very slow IV injection over 3 to 5 minutes (also see 'comments' below for alternative administration information)
Compatibility & Stability	Glucose 5%
Comments	• **The UK licence allows a slow intravenous injection (undiluted) to be given over at least 30 seconds. However, we have suggested a slower rate, due to the risks associated with rapid intravenous injection** • Hypersensitivity reactions have been reported, facilities for treating anaphylaxis must be available • Both preparations are licensed for intravenous injection and oral use • Excessively rapid administration can lead to reactions including flushing, cyanosis, sweating, sense of chest constriction, peripheral vascular collapse
References	*Information provided relates to Konakion manufactured by Cheplapharm* *[SPC last update 10/23. SPC checked May 2024] PA: 2239/2/2, PA:2239/2/1*

POTASSIUM CHLORIDE

Available preparations

Fluid	Potassium content	Volume	Comments
Potassium chloride 15% w/v (B. Braun)	20mmol	10mL	-Concentrate -For dilution and infusion -Controlled drug -Critical care areas only
Potassium Chloride 0.15% w/v and Sodium Chloride 0.9% w/v (Baxter)	20mmol	1000mL	-Stock on oncology day ward -Available to order by other wards from pharmacy -Segregate from other IV fluids in ward storage areas

Reconstitution

Premixed bags: Already in Solution

Ampoules: Already in solution. **MUST** be further diluted with not less than 500mL of suitable diluent before administration. Bolus injection can be fatal.

Method of intravenous administration

Intravenous infusion (using electronically controlled infusion device):

- Administer as per indication (see local protocols on pharmacy intranet page).
- Rate: Rate control is essential. Usual maximum infusion rate is 10mmol potassium per hour. If cardiac monitoring is in situ, rate can be increased to 20mmol per hour. **DO NOT EXCEED** a rate of 20mmol per hour due to risk of asystole.

Compatibility & Stability

Use **Sodium Chloride 0.9% as fluid of choice** for initial replacement (unless contraindicated) as Glucose may cause a further decrease in plasma potassium levels

Comments

- Potassium chloride solutions can be **FATAL**. Administration must be by **slow intravenous infusion through a pump**
- Any form of potassium which contains a concentration **greater than 40mmol per litre**, is a **controlled drug** within SIVUH. Routine supply of potassium chloride is restricted to designated wards, and must be stored in CD cupboards.
- Pain at injection site and phlebitis may occur during IV administration of solutions containing ≥40mmol/L
- After adding potassium concentrate to infusion bag, squeeze and invert bag a **MINIMUM** of ten times to avoid inadvertent administration of a toxic bolus
- Always prescribe in mmol and specify the final volume of infusion to avoid confusion
- Oral potassium supplements can be prescribed in conjunction with intravenous potassium

Continuous Cardiac Monitoring requirements:

- Advised if rate of infusion is >10mmol potassium/hour, and must be used if rate of infusion ≥20mmol potassium/hour
- Required if the potassium concentration being administered exceeds 80mmol per litre
- Required if the patient's serum potassium is ≤2.5mmol/L
- Peaking of T wave/ECG changes associated with hyperkalemia: rate of potassium infusion excessive and should be reduced

References

Information provided relates to Potassium chloride CONC. (PA0179/030/002) [B. Braun SPC updated 05/18] and Potassium Chloride pre-mixed bag (PA2299/010/002) [Baxter SPC updated 04/24] [SPCs checked 08/05/24]

PROCHLORPERAZINE	
Available preparations	Stemetil 12.5 mg/ml solution for injection
Reconstitution	Already in solution
Method of intravenous administration	Prochlorperazine should be administered by **intramuscular injection** only
Compatibility & Stability	N/A
Comments	
References	*Information provided relates to Stemetil manufactured by Sanofi-Aventis. PA0540/127/002. [SPC last updated 05/2024. SPC checked 16/05/24]*

PROCYCLIDINE	
Available preparations	Procyclidine 10mg per 2ml ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Administer required dose over 3 to 5 minutes
Compatibility & Stability	Not required - product ready for administration
Comments	
References	*Information provided relates to Procyclidine Hydrochloride manufactured by Accord. PL20075/0706 (ULM). [SPC last updated 05/18. SPC checked 08/05/24]*

PROMETHAZINE	
Available preparations	Phenergan 25mg/mL solution for injection
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	Promethazine is typically given by **deep intramuscular** injection Slow intravenous injection **(emergencies only)**: • Dilute each 1mL of solution with 10mL WFI immediately before use • Inject at a maximum rate of 25mg/minute
Compatibility & Stability	Water for Injections
Comments	• **Deep intramuscular injection** is the recommended route of administration. • IV injection should only be performed in emergencies due to risk of extravasation and inadvertent intra-arterial injection, which could lead to necrosis and peripheral gangrene.
References	*Information provided relates to Phenergan manufactured by Sanofi. PL 53886/0056 (ULM). [SPC last updated 06/2023. SPC checked 08/05/24]*

PROPRANOLOL	
Available preparations	Dociton (propranolol) 1mg per 1mL ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**Bolus intravenous injection:** • Administer required dose over 1 minute
Compatibility & Stability	Not required - product ready for administration
Comments	• Continuous pulse, blood pressure and ECG monitoring required
References	*Information provided relates to Dociton Injektionslosung manufactured by Mibe. No PA or PL number (ULM). [PIL last updated 08/19. PIL checked on 08/05/24]*

PROTAMINE SULPHATE	
Available preparations	Protamine sulphate 1400 anti-heparin units per mL ampoule (10mg/mL)
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection (max 5mL dose):</u>** • Administer required dose over approximately 10 minutes – **max rate 5mg per minute** • May cause severe hypotension if administered too rapidly **<u>Intermittent intravenous infusion (can be used for all doses):</u>** • Add required dose to infusion fluid (volume not critical), and administer as a continuous infusion, adjusting rate according to aPTT response - **max rate 5mg per minute**
Compatibility & Stability	Sodium chloride 0.9% (volume not critical)
Comments	• Can cause anaphylactic reactions – resuscitation facilities should be available • Very rapid administration of protamine sulphate can lead to hypotension and anaphylactic reactions • Excessive dosage of protamine sulphate or when given in the absence of heparin or LMWH may induce prolonged coagulation time since protamine sulphate in itself has anticoagulant activity • Frequent monitoring of aPTT and other coagulation parameters is essential to guide treatment – see manufacturers guide for dosing • Anti Xa level is best for monitoring LMWH but may not always be available on an emergency basis • A rebound anticoagulation effect with haemorrhage has been reported occasionally despite adequate heparin inhibition by protamine sulphate • This occurs more frequently in cases of extra-corporeal circulation in cardiovascular surgery, within 20 minutes to 18 hours after protamine sulphate administration. This rebound bleeding responds to further doses of protamine sulphate • Excessive dosage may prolong the coagulation time because protamine sulphate in itself has anticoagulant activity • Risk factors for hypersensitivity (including anaphylactic reactions) to protamine sulphate: allergy to fish; previous treatment with protamine insulin, protamine sulphate or protamine chloride; infertility in men; medical history of vasectomy.
References	*Information provided relates to Protamine sulphate manufactured by Leo Pharma. PA1025/002/001. [SPC last update 10/14. SPC checked 07/05/24*]

SALBUTAMOL	
Available preparations	Ventolin 500micrograms/mL ampoule
Reconstitution	Already in solution **Dilute further prior to administration** **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Use 500 microgram per mL ampoule – make up to 10mL with Water for Injections • Administer required dose over 3 to 5 minutes
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• Potentially serious hypokalaemia may result from salbutamol therapy. Plasma-potassium concentration should therefore be monitored in severe asthma • Monitor blood glucose, lactate and potassium levels
References	*Information provided relates to Ventolin manufactured by GSK. PA1077/049/001 [SPC last update 03/2024. SPC checked 21/05/24]*

SODIUM BICARBONATE	
Available preparations	Sodium bicarbonate 8.4% 100mmol (mEq) per 100mL infusion
Reconstitution	Already in solution Product is ready for use
Method of intravenous administration	**Bolus intravenous injection:** • In emergency situations can give (8.4%) as a bolus injection **Intermittent intravenous infusion (administer using an electronically controlled infusion device):** • Central line – use any strength up to 8.4% • Administer at the required rate
Compatibility & Stability	Glucose 5%
Comments	• Any reference to mmol refers to both sodium and bicarbonate (as they are equimolar) • Equivalences: 1mmol is equivalent to 1mEq bicarbonate • Except in emergencies, the 8.4% infusion MUST be given via a central line • Monitor pH, serum bicarbonate, and arterial blood gases • Frequent monitoring of serum electrolyte concentrations and acid-base status is essential during treatment • Watch for consequences of sodium load • Monitor for extravasation (hypertonic solution (>1.4%) may cause venous irritation, and extravasation mat lead to tissue necrosis) • Accidental intra-arterial administration of the 8.4% preparation may cause shock, or may lead to the loss of extremity • Significant sodium content: 100mmol/100mL • Hypokalaemia and hypocalcaemia should be corrected before beginning of the alkalinising therapy
References	*Information provided relates to Sodium bicarbonate 8.4% manufactured by B.Braun. PA0179/006/001 [SPC last update 08/17. SPC checked 24/05/24]*

SODIUM THIOSULPHATE

Available preparations

Sodium thiosulphate 250mg/mL, 50mL vial (12.5g in 50mL)

Reconstitution

Already in solution

Method of intravenous administration

<u>Intermittent intravenous infusion (calciphylaxis):</u>

- Dilute with infusion fluid (volume not critical)
- Administer over 30 to 60 minutes during the last hour of, or after the haemodialysis session
- Administer via a large peripheral vein or a central line
- The residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing

Compatibility & Stability

Sodium chloride 0.9% or Glucose 5%

Comments

Calciphylaxis:

- The dose of sodium thiosulphate is empiric
- **Non-dialysis patients:**

Optimal dose in unknown and requires adjustment depending on eGFR and upon development of side effects. Suggested starting dose:		
eGFR ≥60ml/min/1.73m^2	<60kg	12.5g twice weekly. Can be increased to five times weekly as required
	>60kg	25g twice weekly. Can be increased to five times weekly as required
eGFR <60ml/min/1.73m^2	<60kg	12.5g twice weekly. Can be increased to four times weekly as required
	>60kg	25g twice weekly. Can be increased to four times weekly as required

- Monitor serum bicarbonate weekly for two weeks for development of metabolic acidosis. In absence of overt metabolic acidosis (serum bicarbonate concentration below 18 mEq/L) or hypotension, increase gradually as per suggestions in table above.
- Monitor for injection site irritation
- Nausea, metabolic acidosis, hypotension and volume overload are potential adverse effects
- 3.6g sodium per 50mL solution
- 115mg potassium per 50mL solution
- 140mg boric acid per 50mL solution

References

Information provided relates to Sodium thiosulphate manufactured by Hope (unlicensed) [SPC last update June 2023. SPC checked 24/05/24]

SODIUM VALPROATE	
Available preparations	Epilim 400mg vial
Reconstitution	**Water for Injection (provided) (Draw up using a 5 micron filter needle): 3.8ml per 400mg vial** (produces a concentration of 100mg/mL)
Method of intravenous administration	**Slow intravenous injection:** • Administer over a minimum of 3 to 5 minutes • **Peripheral administration** (max 600mg by this route*). Dilute with at least 20mL Sodium chloride 0.9% or Glucose 5% • **Central line administration** (any dose). May be used diluted or undiluted **Intermittent intravenous infusion (Do not use for INITIATION of treatment - can be used for MAINTENANCE doses):** • Volume of infusion not critical (but should be at least 50mL) • If a 50mL infusion volume is used the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing • Administer as a 60 minute infusion. Max rate of 20mg per minute **Continuous intravenous infusion (Do not use for INITIATION of treatment - can be used for MAINTENANCE doses):** • Volume of infusion not critical (but should be at least 50mL) • Administer required daily dose over 24 hours
Compatibility & Stability	Sodium chloride 0.9% or Glucose 5%
Comments	• * **Peripheral administration -** max 600mg by this route. Tissue injury due to extravasation may occur (due to the high osmolality). • Valproate is **contraindicated in women of childbearing potential**, unless the conditions of the pregnancy prevention programme are fulfilled- contact Pharmacy for details • Co-administration with carbapenem agents (e.g.meropenem) may result in a 60-100% decrease in valproic acid levels within two days- therefore concurrent use is not recommended • LFTs, U&Es and full blood counts are recommended prior to initiation of therapy, and then periodically during treatment. • 55.35mg sodium per vial **Serum level monitoring** • Serum valproate levels are of little use in patient management except in the investigation of non-compliance/adverse reactions - routine monitoring is discouraged • Optimum dosage is mainly determined by seizure control. • If levels are to be taken, please take pre-dose levels, at a consistent time of day (contact pharmacy for advice) • An increased incidence of adverse effects may occur with plasma levels above the effective therapeutic range. • The pharmacological (or therapeutic) effects of valproate may not be clearly correlated with levels
References	*Information provided relates to Sodium valproate manufactured by Sanofi. PA540/150/13 [SPC last update 03/24. SPC checked 24/05/24] [SPC partial update April 2025, checked 31/05/25]*

SOLIVITO N	
Available preparations	Solivito N Powder for Concentrate for Solution for Infusion
Reconstitution	Reconstitute with 10mL Vitlipid N adult
Method of intravenous administration	**Intermittent intravenous infusion:** • Add reconstituted vial containing the Solivito N/Vitlipid N solution to 100mL infusion fluid • Invert the infusion bag several times to ensure adequate mixing • If patient is also prescribed Additrace, this may be added to the same infusion bag • Administer over a minimum of two hours (usually given over three hours) • Protect from light during administration • Refer to Appendix 3 of DIET0002ORG Guidelines on the provision of PN in adult pts, available on the intranet, for advice
Compatibility & Stability	Sodium Chloride 0.9%
Comments	• Must be co-administered with Vitlipid N (to ensure both water and fat soluble vitamins are given) • The laboratory personnel should be consulted when ordering laboratory tests in patients taking biotin (contained in Solivito N)
References	*Information provided relates to Solivito N manufactured by Fresenius Kabi. PA2059/064/001* *[SPC last update 10/19. SPC checked 24/05/24]*

TERLIPRESSIN	
Available preparations	Glypressin 1mg vial
Reconstitution	Add 5mL of solvent provided per 1 mg vial Draw up solvent using a 5 micron filter needle
Method of intravenous administration	**<u>Bolus intravenous injection:</u>** • Administer required dose slowly over 3 to 5 minutes • Use a large peripheral vein or a central line • Very acidic - will cause tissue damage if extravasates - admin via a central access device where possible and monitor the injection site closely
Compatibility & Stability	
Comments	• Monitor blood pressure, heart rate, haematology, fluid balance and electrolytes
References	*Information provided relates to Glypressin manufactured by Ferring. PA1009/004/001* *[SPC last update 03/23. SPC checked 24/05/24]*

TETRACOSACTIDE	
Available preparations	Synacthen 250 microgram in 1mL ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection - see also under comments:</u>** • Administer over two minutes
Compatibility & Stability	
Comments	• The drug may also be given by intramuscular injection (at the same dose) • Patients should be kept under observation for 30 minutes after the injection due to the possibility of hypersensitivity reactions • Ensure resuscitation facilities are available, should a serious hypersensivity reaction occur. • 1mL contains 3.33mg sodium
References	*Information provided relates to Tetracosactide manufactured by Alfasigma. PA2206/002/001* *[SPC last update 03/22. SPC checked 24/05/24]*

THIAMINE (VITAMIN B1)*	
Available preparations	Vitamin B1 50mg/ml solution for injection Ratiopharm 2ml ampoule i.e. 100mg in each 2ml ampoule
Reconstitution	Already in solution Draw up using a 5 micron filter needle Dilute further prior to administration
Method of intravenous administration	Add the required dose to 100ml of infusion fluid and administer over 30 minutes
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	*Unlicensed medicine • Protect from light – store ampoules in original box. Use a light protective bag when administering the infusion. • To be used when stock of IV Pabrinex is unavailable due to global shortage 2024/2025 • Administer using an electronically controlled infusion device • A 50ml infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant underdosing • Facilities for treating anaphylaxis should be available when administering this preparation
References	*Information provided relates to Vitamin B1 – Ratiopharm 50mg/ml (unlicensed)* *Reference: medinfogalway.ie IV Guides (Adult) accessed 03/06/2025* *[SPC last updated July 2015 - SPC checked 31/05/2024]*

TRAMADOL	
Available preparations	Tradol 100mg/2mL ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Intermittent intravenous infusion (preferred over slow IV injection):</u>** • Add required dose to 100mL of infusion fluid and administer over 15 to 30 minutes • A 50mL infusion may be used if required (e.g. fluid restriction) but the residual volume in the infusion line must be flushed through at the same rate to avoid significant under-dosing **<u>Slow intravenous injection:</u>** • Administer over 2 to 3 minutes • Rapid intravenous injection may be associated with a higher incidence of adverse events and therefore should be avoided
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• If used in combination with SSRIs or other serotonergic agents, monitor for symptoms of serotonin syndrome (e.g. agitation, tremor, fever or diarrhoea)
References	*Information provided relates to Tradol manufactured by Rowex. PA0711/029/003* *[SPC last update 10/21. SPC checked 24/05/24]*

TRANEXAMIC ACID	
Available preparations	Cyklokapron 500mg/5mL ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**Slow intravenous injection:** • Administer required dose at a rate of 1mL/minute (100mg/minute) • Rapid intravenous injection may cause malaise and hypotension, with or without loss of consciousness **Intravenous:** • Add required dose to a convenient volume of infusion fluid (e.g. 100mL). Max rate 100mg/minute
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	
References	*Information provided relates to Cyklokapron manufactured by Pfizer. PA822/117/1* *[SPC last update 08/23. SPC checked 24/05/24*

VERAPAMIL	
Available preparations	Isoptin 5mg/2mL ampoule
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**<u>Slow intravenous injection:</u>** • Administer required dose over 2 minutes (3 minutes in elderly patients) **<u>Continuous intravenous infusion:</u>** • Add required dose to a suitable volume of infusion fluid • Administer as per 'Dose' – see manufacturer's guidelines
Compatibility & Stability	Sodium Chloride 0.9% or Glucose 5%
Comments	• Continuous ECG and blood pressure monitoring required
References	*Information provided relates to Isoptin manufactured by Mylan. PA2010/003/004* *[SPC last update 01/21. SPC checked 24/05/24]*

VITLIPID N	
Available preparations	Vitlipid N Adult
Reconstitution	Already in solution **Draw up using a 5 micron filter needle**
Method of intravenous administration	**Intermittent intravenous injection:** • Add the contents of one ampoule of Vitlipid N to one vial of Solivito N – this will reconstitute the Solivito N • Then add the mixture of Solivitio N/Vitlipid N to 100mL infusion fluid • Invert the infusion bag several times to ensure adequate mixing • If patient is also prescribed Additrace, this may be added to the same infusion bag • Administer over a minimum of two hours (usually given over 3 hours) • Protect from light during administration • Refer to Appendix 3 of DIET0002ORG Guidelines on the provision of PN in adult pts, available on the intranet, for advice
Compatibility & Stability	Sodium Chloride 0.9%
Comments	• Must be co-administered with Solivito N (to ensure both water and fat soluble vitamins are given)
References	*Information provided relates to Vitlipid N Adult manufactured by Fresenius Kabi. PA2059/067/001* *[SPC last update 04/22. SPC checked 24/05/24*

ZOLEDRONIC ACID	
Available preparations	Zerlinda 4mg/100mL (Teva) – solution ready for infusion Aclasta 5mg/100mL infusion
Reconstitution	Already in solution

Method of intravenous administration	**Intermittent intravenous infusion (administer using an electronically controlled infusion device):**
	
	Zoledronic acid (Teva):
	• Administer required dose over at least 15 minutes
	
	Aclasta:
	• Administer over at least 15 minutes via a vented infusion line
	• Precautions need to be taken during administration to prevent possible air embolism – particularly in central line administration
	• Bottles must be vented in one of two ways:
	  ○ Directly by means of a filter needle into the bottle which goes through the rubber stopper and opens into the air, or:
	  ○ Direct air vent on the air inlet of the administration set, located between the drip chamber and piercing pin, it is covered with a bacterial retentive filter to reduce the chance of contamination

Compatibility & Stability	Zerlinda™ (Teva), Aclasta™: Not required - product ready for infusion
Comments	• **See SIVUH local protocols for dosing guidance** • A pharmacist must complete a clinical check before Zerlinda can be administered. Contact pharmacy for more details. • There are two preparations/strengths available – with different indications for each – check carefully that the correct product is being used • Dental checks required – osteonecrosis of the jaw can occur • Ensure adequate hydration before and after administration to try and prevent real adverse reactions • Pre-existing hypocalcaemia must be treated by adequate intake of calcium and vitamin D before initiating treatment with zoledronic acid. In Paget's disease it is advised that supplemental calcium corresponding to at least 500mg elemental calcium twice daily is given for at least 10 days post infusion • There are different cut-off points for patients with renal impairment for the different indications • Hydration must be maintained prior to, and following administration of zoledronic acid
References	*Information provided relates to [SPCs checked 24/05/24]* *Zoledronic acid by Teva [SPC last updated 05/22] PA1986/119/001*

DOCUMENT LEGEND:

ACRONYMS/ ABBREVIATIONS	EXPLANATION
mg	milligram
g	gram
kg	kilogram
mcg	microgram
ng	nanogram
ml or mL	millilitre
L or l	Litre
NS	Normal Saline or Sodium Chloride 0.9%
G5%	Glucose 5%
WFI	Water for Injections
IV	Intravenous
IM	Intramuscular
w/v	Weight per volume - i.e. %w/v is number of g in 100ml
LFT	Liver Function Tests
FBC	Full Blood Count
micro	Microbiology
ID	Infectious Diseases
min	Minute
mmol	Millimole
mEq	Milliequivalent
OD	Once daily
BD	Twice daily
TDS	Three times daily
QDS	Four times daily
WFI	Water for Injection
SPC/SmPC	Summary of product characteristics
BNF	British National Formulary
N/A	Not applicable
BP	Blood Pressure
Cr	Creatinine
CrCl	Creatinine Clearance
eGFR	Estimated Glomerular Filtration Rate

RECORD OF DOCUMENT HISTORY

VERSION	CHANGES/UPDATES	DATE	INITIALS
1.0	Creation of document – all new monographs	22/08/2024	All pharmacists: NS, MV, NOC, LD, FOR, EMcG, MB, ÚR, JH, KB, AF
1.1	Esomeprazole, Ferric Carboxymaltose, Anidualfungin monographs – change/addition of brand	02/12/2024	NOS, FOR, ÚR, LD
1.2	Aciclovir - change of brand	09/01/2024	LD, ÚR
1.3	Sodium Valproate – change of volume for reconstitution, Daptomycin & Tigecycline change in brands, Reserve antimicrobials amended (amphotericin, anidulafungin, caspofungin, colistin, daptomycin, ertapenem, linezolid, meropenem, tigecycline, voriconazole, rifampicin) and Restricted removed (aztreonam, ceftazidime, cefazolin), addition of thiamine new monograph	30/05/2025	LD, ÚR, AF
1.4	Esomeprazole, Diclofenac monographs – change/addition of brand Thiamine monograph – addition of anaphylaxis caution CefTAZidime/Avibactam monograph – new monograph	18/09/2025	NS, LD, AF