



Royal Flying Doctor Service
WESTERN OPERATIONS

Clinical Manual

Part 2 Drug Infusion Guidelines

Version 6.0
January 2013

Royal Flying Doctor Service Western Operations
3 Eagle Drive, Jandakot Airport, Western Australia 6164

T 61-8-9417 6300

F 61-8-9417 6319

E medical@rfdswa.com.au

Clinical Manual - Part 2 – Drug Infusion Guidelines

Version 6.0

January 2013

This is a controlled document. Ensure you are using the latest version.

Filename: G:\HEALTH\MEDICAL\CLINICAL MANUAL\PART 2 – DRUG INFUSION GUIDELINES – JANUARY 2013

Savedate: 19/12/2012 12:33

Table of Contents

Part 2 - Drug Infusion Guidelines

1	ADRENALINE INFUSION.....	1
2	AMINOPHYLLINE INFUSION	2
3	AMIODARONE INFUSION	3
4	DOBUTAMINE INFUSION	4
5	DOPAMINE INFUSION	5
6	GLYCERYL TRINITRATE INFUSION	6
7	HEPARIN INFUSION	8
8	INSULIN INFUSION	9
9	ISOPRENALINE INFUSION	10
10	LIGNOCAINE INFUSION.....	11
11	MAGNESIUM SULPHATE INFUSION	12
12	MAGNESIUM SULPHATE – CARDIAC.....	14
13	MAGNESIUM SULPHATE – ASTHMA.....	15
14	METHYLPREDNISOLONE INFUSION	16
15	MORPHINE INFUSION	18
16	MORPHINE & MIDAZOLAM INFUSION	19
17	NORADRENALINE INFUSION.....	20
18	OCTREOTIDE INFUSION.....	21
19	PANTOPRAZOLE INFUSION	22
20	PROPOFOL INFUSION	23
21	SALBUTAMOL INFUSION – OBSTETRIC.....	24
22	SALBUTAMOL INFUSION – RESPIRATORY.....	26
23	VECURONIUM INFUSION.....	27

1 INTRODUCTION

1.1 Standard Guidelines

The guidelines which follow cover the common drugs used by the Service in patient transport. The guidelines are standardised to assist staff from widely differing clinical backgrounds. Use of standard guidelines assists in preventing drug administration errors and aids in the handover of patients. They do not preclude the infusion of other drugs or use of other concentrations, if these are required in individual patients.

A brief list of notes, indications, precautions and side effects are attached to each table but these are by no means comprehensive. Refer to the manufacturer's product information or the reference textbooks for full product details.

Care has been taken to ensure that the information in the guidelines is accurate at the time of printing but the user is advised to check the doses carefully. RFDS Western Operations shall not be held responsible for any errors in the guidelines. The final responsibility for any drug administered during transfer lies with the RFDS Medical Officer supervising the flight / transfer.

1.2 Use of Differing Concentrations

In general the infusions are presented in two concentrations; a concentrated format and one more dilute. The former is for use in 50 mL syringes. A syringe driver with minimal volume tubing allows very small flow rates to be used and is the preferred method for transport in most instances. Syringe drivers are usually not available in country hospitals so more dilute infusions using standard 500 mL fluid bags are offered. 500 mL formats are generally for use through an intravenous rate controlling device such as an IVAC infusion pump. Although greater fluid volumes are necessary, there is a greater margin of safety in controlling rates, especially during transport and handover.

1.3 Quantity of Infusions

Where practical, the quantity of drugs used has been minimized so as to provide only that necessary for treatment during transport (up to 6-8 hours). This may differ from standard teaching hospital infusion guidelines where many infusions are designed to last for 24 hours.

1.4 Manual Administration in Special Circumstances

Whilst an infusion pump should be used wherever possible, the infusions have been prepared to enable manual administration. This may be necessary in some remote locations without equipment, or when equipment fails. Caution must be exercised when administering drug infusions manually and only the more dilute solutions should be administered in this way. Please refer to the chart below to convert mL/min to drops/min with different giving sets.

READY RECKONER	mL/hour	IVAC SET drips/min	TUTA SET drips/min	MICRODRIP drips/min
Use this to convert mL/hour to drips per minute for manual administration of drugs using various giving sets.	10	4	4	10
	15	5	5	15
	20	7	7	20
	30	10	10	30
	60	20	20	60
	90	30	30	90

1.5 Escorting of Patients with Drug Infusions

We do not consider it good clinical practice for ambulance officers to supervise and administer drug infusions. As a minimum, a patient receiving any of the following infusions should be escorted to the pickup airstrip by a registered nurse from the referring centre. An RFDS Flight Nurse Specialist or Medical Officer should escort them to the receiving hospital. Current exceptions to these guidelines are:

- Patients receiving Heparin, provided the Heparin is in a burette or the infusion is stopped for the duration of the transfer (to prevent accidental infusion of a large dose).
- Patients who have been receiving Salbutamol infusion for the suppression of labour, provided that the infusion has been ceased prior to departure of the ambulance. Salbutamol should only be ceased if the patient's contractions have settled and the patient will not be compromised by the cessation of treatment.

The need for a medical doctor escort on the flight is discussed under "special notes" in each individual infusion guideline.

1.6 Formulae for Converting mL/hr to µg/kg/min and Vice Versa

First work out the concentration of solution to be infused (in µg/mL)

$$\bullet \text{ Drug concentration } \mu\text{g/mL} = \frac{\text{dose of drug added (mg)} \times 1000}{\text{volume (mL)}}$$

$$\text{eg Dopamine 200mg in 500 mL} = 200 \times 1000 / 500 = 400 \mu\text{g/mL}$$

⇒ To convert µg/kg/min:

$$\bullet \text{ rate (mL/hr)} = \frac{\text{desired rate (in } \mu\text{g/kg/min)} \times 60 \times \text{wt (kg)}}{\text{drug conc'n (}\mu\text{g/kg)}}$$

$$\text{eg Dopamine @ } 5 \mu\text{g/kg/min in a 40kg patient using Dopamine 400 in } \mu\text{g/mL}$$

$$\text{rate (mL/hr)} = 5 \times 60 \times 40 / 400 = 30\text{mL/hr}$$

⇒ To convert mL/hr to µg/kg/min:

$$\bullet \text{ rate (}\mu\text{g/kg/min)} = \frac{\text{infusion rate (mL/hr)} \times \text{drug conc'n (}\mu\text{g/mL)}}{60 \times \text{wt (kg)}}$$

$$\text{eg Dopamine @ } 5 \mu\text{g/kg/min in a 40kg patient using Dopamine 400 in } \mu\text{g/mL}$$

$$\text{rate (}\mu\text{g/kg/min)} = 30 \times 400 / 60 \times 40 = 5 \mu\text{g/kg/min}$$

References

Enkin M et al. A Guide to Effective Care in Pregnancy & Childbirth. 2nd Ed, Oxford University Press, 1995.

Shann F. Drug Doses. 10th Ed, Intensive Care Unit, Royal Children's Hospital, Melbourne, 1998.

Oh TE. (Ed) Intensive Care Manual. 4th Edition, Butterworth Heinemann, 1997.

King Edward Memorial Hospital Clinical Guidelines. King Edward Memorial Hospital, 1998.

Diabetic Clinic & Diabetic Working Party. Maintenance of Insulin Infusions. Royal Perth Hospital, 1994.

1998 MIMS Annual, 22nd Ed, MIMS Australia, 1998.

Royal Children's Hospital Melbourne. Paediatric Handbook, 5th Ed, Blackwell Science, 1995.

Therapeutic Guidelines: Cardiovascular. 3rd Ed, Therapeutic Guidelines Limited, 1999.

Therapeutic Guidelines: Respiratory. 1st Ed, Therapeutic Guidelines Limited, 1994.

Worthley LIG. Synopsis of Intensive Care Medicine. Churchill Livingstone, 1994.

Australian Medicines Handbook, Australian Medicines Handbook Pty Ltd, 1998.

Abbreviations

mL = millilitres

mg = milligrams

µg = micrograms

mEq = milliEquivalents

IU = International Units

1 ADRENALINE INFUSION

A. Syringe Driver		Adrenaline 3 mg/50 mL (60 µg/mL)
<ul style="list-style-type: none"> Use Adrenaline 1 mg in 1 mL ampoules Dilute 3 mg (3 mL) up to 50 mL with Normal Saline or 5% Dextrose Commence at 2 µg/min (2 mL/hr) and adjust rate according to clinical response 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	2 µg/min	2 mL/hr
	5 µg/min	5 mL/hr
	10 µg/min	10 mL/hr
	20 µg/min	20 mL/hr

B. Infusion Pump		Adrenaline 3 mg/500 mL (6 µg/mL)
<ul style="list-style-type: none"> Use Adrenaline 1 mg in 1 mL ampoules Dilute 3 mg (3 mL) up to 500 mL with Normal Saline or 5% Dextrose Commence at 2 µg/min (20 mL/hr) and adjust rate according to clinical response 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	2 µg/min	20 mL/hr
	5 µg/min	50 mL/hr
	10 µg/min	100 mL/hr
	20 µg/min	200 mL/hr

Indications

Management of shock (after hypovolaemia has been excluded), status asthmaticus

Precautions and Side Effects

1. Correct hypovolaemia prior to administration.
2. Administer via a central venous line or into a large peripheral venous line (extreme caution with concentrated solution in a peripheral vein because of the risk of vasoconstriction, ischaemic pain and local necrosis).
3. Monitor ECG and blood pressure closely.
4. Side effects include pulmonary oedema, arrhythmias, tachycardia, myocardial ischaemia, anxiety, palpitations, hypertension and peripheral ischaemia.

Special Notes

1. Infusion should be titrated to achieve desired clinical endpoint e.g. systolic blood pressure 80 - 100 mmHg. Usual range is between 1 - 70 µg/min in adults.
2. Double strength solution may be needed on some occasions.
3. Should only be administered on a doctor-accompanied flight unless under exceptional circumstances.

2 AMINOPHYLLINE INFUSION

A. Syringe Driver		Aminophylline 500 mg / 50 mL (10 mg /mL)	
<ul style="list-style-type: none"> Use Aminophylline 250 mg in 10 mL ampoules Dilute 500 mg (20 mL) up to 50 mL with 5% Dextrose If the patient is not already on oral Theophylline give a loading dose of 3 mg/kg over 20 minutes (eg 200 mg [20 mL] for a 70 kg adult) Follow this with an infusion of 0.5 mg/kg/hr (eg 35 mg/hr [3.5 mL/hr] for a 70 kg adult) 			
50 mL Syringe		Dose Range	Rate of Infusion - Syringe Driver
	Loading Dose over 20 min (70 kg patient)	200 mg (20 mL)	60 mL/hr for 20 min only
	Maintenance Dose (70 kg patient)	35 mg/hr	3.5 mL/hr

B. Infusion Pump		Aminophylline 500 mg / 500 mL (1 mg /mL)	
<ul style="list-style-type: none"> Use Aminophylline 250 mg in 10 mL ampoules Dilute 500 mg (20 mL) up to 500 mL with 5% Dextrose If the patient is not already on oral Theophylline give a loading dose of 3 mg/kg over 20 minutes (eg 200 mg [200 mL] for a 70 kg adult) Follow this with an infusion of 0.5 mg/kg/hr (eg 35 mg/hr [35 mL/hr] for a 70 kg adult) 			
500 mL Bag		Dose Range	Rate of Infusion - Infusion Pump
	Loading Dose over 20 min (70 kg patient)	200 mg (200 mL)	600 mL/hr for 20 min only
	Maintenance Dose (70 kg patient)	35 mg/hr	35 mL/hr

Indications

Severe Asthma

Precautions and Side Effects

- The dose will need to be reduced in the elderly and patients with cirrhosis, congestive cardiac failure, acute fevers, patients receiving Cimetidine, Erythromycin or patients with acute viral infections. The dose may need to be increased in young patients, smokers without chronic obstructive airways disease or regular drinkers without liver disease.
- Side effects include headache, nausea and vomiting, arrhythmias and convulsions.

Special Notes

Should only be administered on a doctor-accompanied flight unless under exceptional circumstances.

3 AMIODARONE INFUSION

A. Syringe Driver		Amiodarone 600 mg / 50 mL (12 mg /mL)	
<ul style="list-style-type: none"> Use Amiodarone 150 mg in 3 mL ampoules Dilute 600 mg (12 mL) up to 50 mL with 5% Dextrose In an emergency give 150 – 300 mg over 1-2 minutes, otherwise commence with a loading dose of 5 mg/kg over 20 minutes (eg 350 mg [29 mL] for a 70 kg adult) Follow this with an infusion of 0.4 - 0.7 mg/kg/hr for the next 24 hours (eg 28 - 50 mg/hr [2.3 - 4.2 mL/hr] for a 70 kg adult) 			
50 mL Syringe		Dose Range	Rate of Infusion - Syringe Driver
	Loading Dose over 20 min (70 kg patient)	350 mg (29 mL)	87 mL/hr for 20 min only
	Maintenance Dose (70 kg patient)	28 - 50 mg/hr	2.3 - 4.2 mL/hr

B. Infusion Pump		Amiodarone 600 mg / 500 mL (1.2 mg /mL)	
<ul style="list-style-type: none"> Use Amiodarone 150 mg in 3 mL ampoules Dilute 600 mg (12 mL) up to 500 mL with 5% Dextrose In an emergency give 150 – 300 mg over 1-2 minutes, otherwise commence with a loading dose of 5 mg/kg over 20 minutes (eg 350 mg [290 mL] for a 70 kg adult) Follow this with an infusion of 0.4 - 0.7 mg/kg/hr for the next 24 hours (eg 28 - 50 mg/hr [23 - 42 mL/hr] for a 70 kg adult) 			
500 mL Bag		Dose Range	Rate of Infusion – Syringe Driver
	Loading Dose over 20 min (70 kg patient)	350 mg (290 mL)	870 mL/hr for 20 min only
	Maintenance Dose (70 kg patient)	28 - 50 mg/hr	23 - 42 mL/hr

Indications

Treatment and prophylaxis of serious arrhythmias refractory to other treatment, including ventricular arrhythmias, atrial tachyarrhythmias and junctional tachycardias.

Precautions and Side Effects

- Infuse via a large or central vein.
- Contraindicated in 2nd or 3rd degree AV block (without pacemaker) and in pregnancy.
- Caution with use in patients on beta-blockers, verapamil or diltiazem, (increased risk of bradyarrhythmias) and in patients with thyroid or hepatic disease.
- Side effects include nausea and vomiting (especially while loading), headache, dizziness, fatigue, photosensitivity, bradycardia, atrio-ventricular block, torsades de pointes and liver dysfunction.

Special Notes

Should only be administered on a doctor-accompanied flight unless under exceptional circumstances.

4 DOBUTAMINE INFUSION

A. Syringe Driver		Dobutamine 250 mg/50 mL (5000 µg/mL)				
<ul style="list-style-type: none"> Use Dobutamine 250 mg in 5 mL ampoules Dilute 250 mg (5mL) up to 50 mL with 5% Dextrose Commence at a low dose (eg 2.5 µg/kg/min) 						
50 mL Syringe	Dose Range	Rate of Infusion (mL/hour) - Syringe Driver				
		40kg	60kg	70kg	80kg	100kg
	2.5 µg/kg/min	1	2	2	2	3
	5 µg/kg/min	2	4	4	5	6
	10 µg/kg/min	5	7	8	10	12

B. Infusion Pump		Dobutamine 250 mg/500 mL (500 µg/mL)				
<ul style="list-style-type: none"> Use Dobutamine 250 mg in 5 mL ampoules Dilute 250 mg (5mL) up to 500 mL with 5% Dextrose Commence at a low dose (eg 2.5 µg/kg/min) 						
500 mL Bag	Dose Range	Rate of Infusion (mL/hour) - Infusion Pump				
		40kg	60kg	70kg	80kg	100kg
	2.5 µg/kg/min	12	18	21	24	30
	5 µg/kg/min	24	36	42	48	60
	10 µg/kg/min	48	72	84	96	120

Indications

Management of shock (where hypovolaemia has been excluded), especially cardiogenic shock.

Precautions and Side Effects

- Hypovolaemia must be fully corrected prior to administration.
- Administer via a central venous line or into a large peripheral venous line (extreme caution with concentrated solution in a peripheral vein because of the risk of vasoconstriction, ischaemic pain and local necrosis).
- Side effects include ectopic beats, tachycardia, hypertension, angina, palpitations, nausea, vomiting, headache and dyspnoea.

Special Notes

- Not currently stocked by RFDS but stocked at some regional hospitals.
- Predominantly a β_1 stimulant of the myocardium.
- Infusion should be titrated to achieve desired clinical endpoint e.g. systolic blood pressure 80 - 100 mmHg. Usual dose range is 2.5 - 10 µg/kg/min. Discuss with receiving Intensive Care Unit before use.
- Should only be administered on a doctor-accompanied flight.

5 DOPAMINE INFUSION

A. Syringe Driver		Dopamine 200 mg/50 mL (4000 µg/mL)				
<ul style="list-style-type: none"> Use Dopamine 200 mg in 5 mL ampoules Dilute 200 mg (5mL) up to 50 mL with Normal Saline Commence at a low dose (eg 2.5 µg/kg/min) and adjust rate to obtain desired blood pressure and urinary output > 0.5 mL/kg/hr (1 mL/kg/hr in children). 						
50 mL Syringe	Dose Range	Rate of Infusion (mL/hour) - Syringe Driver				
		40kg	60kg	70kg	80kg	100kg
	2.5 µg/kg/min	2	2	3	3	4
	5 µg/kg/min	3	5	5	6	8
	10 µg/kg/min	6	9	10	12	15

B. Infusion Pump		Dopamine 200 mg/500 mL (400 µg/mL)				
<ul style="list-style-type: none"> Use Dopamine 200 mg in 5 mL ampoules Dilute 200 mg (5 mL) up to 500 mL with Normal Saline Commence at a low dose (eg 2.5 µg/kg/min) and adjust rate to obtain desired blood pressure and urinary output > 0.5 mL/kg/hr (1 mL/kg/hr in children). 						
500 mL Bag	Dose Range	Rate of Infusion (mL/hour) - Infusion Pump				
		40kg	60kg	70kg	80kg	100kg
	2.5 µg/kg/min	15	23	26	30	38
	5 µg/kg/min	30	45	53	60	75
	10 µg/kg/min	60	90	105	120	150

Indications

- Management of shock (where hypovolaemia has been excluded).
- Improvement in renal blood flow in oliguria.

Precautions and Side Effects

- Hypovolaemia must be fully corrected prior to administration.
- Administer via a central venous line or into a large peripheral venous line (extreme caution with concentrated solution in a peripheral vein because of the risk of vasoconstriction, ischaemic pain and local necrosis).
- Side effects include ectopic beats, tachycardia, angina, palpitations, nausea, vomiting, headache and dyspnoea.

Special Notes

- Low doses (2.5 - 5 µg/kg/min) are used to improve urinary output. Higher doses (5-10 µg/kg/min) have an additional inotropic effect. Doses greater than 10 µg/kg/min are rarely indicated - if additional effects are required Adrenaline, Noradrenaline or Dobutamine are more effective inotropic agents.
- Most if not all patients requiring Dopamine will require a medical escort on board.

6 GLYCERYL TRINITRATE INFUSION

A. Syringe Driver		Glyceryl Trinitrate 50 mg/50 mL (1,000 µg/mL)
<ul style="list-style-type: none"> Use Glyceryl Trinitrate 50 mg in 10 mL ampoule Dilute 50 mg (10 mL) up to 50 mL with 5% Dextrose Commence at 25 - 50 µg/min (1.5 - 3 mL/hr) Increase by 1 mL/hr every 5 -10 minutes according to response 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	50 µg/min	3 mL/hr
	100 µg/min	6 mL/hr
	150 µg/min	9 mL/hr
	200 µg/min	12 mL/hr

B. Infusion Pump		Glyceryl Trinitrate 50 mg/100 mL (500 µg/mL)
<ul style="list-style-type: none"> Use Glyceryl Trinitrate 50 mg in 10 mL ampoule Dilute 50 mg (10 mL) up to 100 mL with 5% Dextrose, preferably in a glass bottle Commence at 25 - 50 µg/min (3 - 6 mL/hr) Increase by 2 mL/hr every 5 -10 minutes according to response 		
100 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	50 µg/min	6 mL/hr
	100 µg/min	12 mL/hr
	150 µg/min	18 mL/hr
	200 µg/min	24 mL/hr

Indications

- Ischaemic chest pain or unstable angina not adequately relieved by oral, sublingual or transdermal nitrates.
- Acute left ventricular failure.
Acute hypertension.

Precautions and Side Effects

- Up to 80% of active agent may be absorbed by PVC giving sets or IV fluid bags. Absorption increases with increased concentration and increased exposure time to the plastic. Plastic syringes and minimum volume tubing reduce absorption but the dose may still need to be gradually increased. Use clinical response rather than calculated dose to get a dose that is appropriate for the patient.
- Headache is common. Other CNS effects can include restlessness, dizziness, apprehension, vomiting. CVS side effects include hypotension, reflex tachycardia, palpitations and circulatory collapse.
- Usual starting dose is 50 µg/min but some patients, particularly those with low blood pressure or pulmonary oedema, may require a lower starting dose.
- Monitor blood pressure at least 15 minutely until stable. Once a blood pressure response is noted increments should be made more cautiously. Titrate rate against patient's tolerance and therapeutic response rather than a precise dose. Cease infusion if the systolic blood pressure falls below 95 mmHg.

Glyceryl Trinitrate Infusion (cont'd)

5. Avoid skin contact with concentrated solution when preparing infusion.

Special Notes

The need for a medical escort on board for a patient with a GTN infusion should be critically reviewed.

7 HEPARIN INFUSION

A. Syringe Driver		Heparin 25,000 IU/50 mL (500 IU/mL)
<ul style="list-style-type: none"> Use Heparin 5,000 International Units (IU) in 1 mL ampoule <i>or</i> 25,000 IU in 5 mL ampoule Give a loading dose of 5,000 IU intravenously Dilute 25,000 IU (5 mL) up to 50 mL with Normal Saline or 5% Dextrose Infuse at 1,000 IU/hr (2 mL/hr) 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	1,000 IU/hr	2 mL/hr

B. Infusion Pump		Heparin 25,000 IU/500 mL (50 IU/mL)
<ul style="list-style-type: none"> Use Heparin 5,000 International Units (IU) in 1 mL ampoule <i>or</i> 25,000 IU in 5 mL ampoule Give a loading dose of 5,000 IU intravenously Dilute 25,000 IU (5 mL) up to 500 mL with Normal Saline or 5% Dextrose Infuse at 1,000 IU/hr (20 mL/hr) 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	1,000 IU/hr	20 mL/hr

Indications

- Unstable Angina
- Deep Venous Thrombosis or Pulmonary Embolism

Precautions and Side Effects

Contraindicated in the presence of actual or potential haemorrhagic states e.g. haemophilia, threatened abortion, severe hypertension, active peptic ulcer disease

Special Notes

Modify infusion rate according to APTT (where available)

8 INSULIN INFUSION

A. Syringe Driver		Insulin 50 IU/50 mL (1 IU/mL)
<ul style="list-style-type: none"> Use Actrapid Insulin 1,000 IU / 10 mL ampoules (100 IU /mL) Give a loading dose of 10 IU intravenously (0.1 mL) (not in children) Dilute 50 IU (0.5 mL) up to 50 mL with Gelofusine Commence infusion at 5-10 IU/hr (5-10 mL/hr) (0.1 IU/kg/hr in children) 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	5 IU/hr	5 mL/hr
	10 IU/hr	10 mL/hr
	15 IU/hr	15 mL/hr

B. Infusion Pump		Insulin 50 IU/500 mL (0.1 IU/mL)
<ul style="list-style-type: none"> Use Actrapid Insulin 1,000 IU / 10 mL ampoules (100 IU /mL) Give a loading dose of 10 IU intravenously (0.1 mL) (not in children) Dilute 50 IU (0.5 mL) up to 500 mL with Gelofusine Commence infusion at 5-10 IU/hr (50-100 mL/hr) (0.1 IU/kg/hr in children) 		
500 mL Bag	Dose Range	Rate of Infusion -Infusion Pump
	5 IU/hr	50 mL/hr
	10 IU/hr	100 mL/hr
	15 IU/hr	150 mL/hr

Indications

1. Diabetic Ketoacidosis
2. Non Ketotic Hyperosmolar Coma

Precautions and Side Effects

Some insulin will be adsorbed by the tubing and so the actual dose of insulin delivered may vary. Gelofusine gives better delivery of insulin than normal saline.

Special Notes

1. In diabetic ketoacidosis the replacement of fluid and electrolyte losses should be given a higher priority than the control of blood glucose per se.
2. In diabetic ketoacidosis, if decrease in BSL is < 4 mmol/l/hr, double the rate of insulin infusion every hour *until* decrease in BSL is > 4 mmol/l/hr *or* until BSL < 15 mmol/l.
3. When decrease in BSL is > 4 mmol/l/hr, maintain insulin infusion until BSL < 15 mmol/l.
4. When BSL < 15 mmol/l decrease rate of infusion to 0.5 - 2 IU/hr with an aim of keeping BSL between 10 - 14 mmol/l.
5. Should only be administered on a doctor-accompanied flight unless under exceptional circumstances.

9 ISOPRENALINE INFUSION

A. Syringe Driver		Isoprenaline 1 mg/50 mL (20 µg/mL)
<ul style="list-style-type: none"> Use Isoprenaline hydrochloride 1 mg in 5 mL ampoules Dilute 1 mg (5 mL) up to 50 mL with 5% Dextrose Give 20 µg (1 mL), repeated according to clinical response, followed by an infusion at 1 – 4 µg/min (3 - 12 mL/hr) 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	1 µg/min	3 mL/hr
	2 µg/min	6 mL/hr
	4 µg/min	12 mL/hr

B. Infusion Pump		Isoprenaline 1 mg/500 mL (2 µg/mL)
<ul style="list-style-type: none"> Use Isoprenaline hydrochloride 1 mg in 5 mL ampoules Dilute 1 mg (5 mL) up to 500 mL with 5% Dextrose Give 20 µg (10 mL), repeated according to clinical response, followed by an infusion at 1 - 4 µg/min (30 - 120 mL/hr) 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	1 µg/min	30 mL/hr
	2 µg/min	60 mL/hr
	4 µg/min	120 mL/hr

Indications

Bradycardia with poor perfusion. Most commonly complete heart block.

Precautions and Side Effects

- Side effects include palpitations, headache, flushing of the skin, angina, nausea, vomiting, tremor, dizziness, weakness and sweating.
- If heart rate exceeds 80 *or* patient develops chest pain *or* other arrhythmias decrease dose *or* temporarily discontinue infusion.
- Administer with caution in the elderly, diabetic, hyperthyroid, patients with ischaemic heart disease *or* concurrently with other inotropes.
- Administer via a central venous line *or* into a large peripheral venous line (extreme caution with concentrated solution in a peripheral vein because of the risk of vasoconstriction, ischaemic pain and local necrosis).

Special Notes

- Required response usually achieved at < 3 µg/min, though may increase up to 20 µg/min if necessary to obtain required response
- Should only be administered on a doctor-accompanied flight unless under exceptional circumstances.

10 LIGNOCAINE INFUSION

Infusion Pump		Lignocaine 2 gm/500 mL (4 mg/mL)	
<ul style="list-style-type: none"> Use Lignocaine hydrochloride 2 g in 20 mL ampoules (10% solution) Dilute 2 g (20 mL) in 500 mL of 5% Dextrose Loading dose of 1 mg/kg slowly over 1-2 minutes if Lignocaine not given previously (use Minijet, or 10 mL 1% plain Lignocaine or 25 mL of 2gm/500 mL solution) Commence infusion at 4 mg/min for 1 hour, then 2 mg/min for the next 2 hours then 1 mg/min maintenance 			
500 mL Bag		Dose Range	Rate of Infusion - Infusion Pump
	1 st hour	4 mg/min	60 mL/hr
	next 2 hours	2 mg/min	30 mL/hr
	maintenance	1 mg/min	15 mL/hr

Indications

Ventricular tachycardia where the patient is haemodynamically compromised or if significant symptoms are present or if the tachycardia is persistent (e.g. greater than 30 seconds).

Precautions and Side Effects

- Hypotension
- Moderate overdose results in dizziness and drowsiness.
- Larger overdose results in CNS stimulation (agitation, convulsions) or CNS depression (respiratory depression).

Special Notes

Should only be administered on a doctor-accompanied flight unless under exceptional circumstances.

11 MAGNESIUM SULPHATE INFUSION

A. Syringe Driver		Magnesium Sulphate 9.88 g [40 mmol] / 20mL (0.5 g/mL)	
<ul style="list-style-type: none"> For Pre-Eclampsia, use 4 ampoules of Magnesium Sulphate (2.47 g [10 mmol] per 5 mL ampoule) <ul style="list-style-type: none"> (NB dose and rate are different for treatment of pre-term labour, see special notes) Use 4 ampoules (9.88 g) of Magnesium Sulphate undiluted (20 mL) Give a loading dose of approx 4 g (8 mL) over 20 min (6g pre-term labour) Follow the loading dose with an infusion of 1 g/hr (2mL/hr) (2g/hr pre term labour) If further seizures occur, give 2 g (4 mL) over 5 minutes (48 mL/hr for 5 minutes) 			
50 mL Syringe		Dose Range	Rate of Infusion – Syringe Driver
	Loading Dose (20 min)	4 g (8 mL)	24 mL/hr for 20 min only
	Maintenance Dose	1 g/hr	2 mL/hr
	If further seizures, give 2 g over 5 min	2 g (4 mL)	48 mL/hr for 5 min only

B. Infusion Pump		Magnesium Sulphate 9.88 g [40 mmol] /120 mL (0.08 g/mL)	
<ul style="list-style-type: none"> For Pre-Eclampsia, use 4 ampoules of Magnesium Sulphate (2.47 g [10 mmol] per 5 mL ampoule) <ul style="list-style-type: none"> (NB dose and rate are different for treatment of pre-term labour, see special notes) Add to a 100 mL bag Normal Saline to equal 120 mL Give a loading dose of approx 4 g (50 mL) over 20 min (6g pre term labour) Follow the loading dose with an infusion of 1 g/hr (12 mL/hr) (2g/hr pre term labour) If further seizures occur, give 2 g (25 mL) over 5 minutes (300 mL/hr for 5 minutes) 			
120 mL Bag		Dose Range	Rate of Infusion – Infusion Pump
	Loading Dose (20 min)	4 g (50 mL)	150 mL/hr for 20 min only
	Maintenance Dose	1 g/hr	12 mL/hr
	If further seizures, give 2 g over 5 min	2 g (25 mL)	300 mL/hr for 5 min only

Indications

- Prevention of Eclampsia
- Suppression of labour where Salbutamol is contra-indicated or ineffective. Obtain obstetric advice before use.

Precautions and Side Effects

- Urine output should be maintained at > 30 mL/hr. Caution with fluid administration should be exercised to avoid fluid overload.
- Magnesium toxicity is suggested by:
 - The disappearance of the patella reflex (check hourly)
 - ✓ Disappearance of the patella reflex mandates cessation of the infusion. Serum Magnesium levels should be done when possible.
 - Respiratory depression (<12/min)

Magnesium Sulphate Infusion (cont'd)

- ✓ Respiratory rate should ideally be maintained at >16/min and the infusion should be definitely be ceased if the rate drops below 12/min.
 - Bradycardia (HR<60/min) may result from complete heart block.
3. Magnesium is contraindicated in the presence of myasthenia gravis and heart block and should be used with extreme caution in patients with impaired renal function.
 4. Maternal visual disturbance is common with Magnesium infusion, most commonly blurred vision, diplopia and ptosis. Neuro-ophthalmic effects resolve promptly with cessation of infusion.
 5. Treatment of overdose
 - Cease infusion.
 - Intravenous administration of 5-10 mEq of 10% Calcium Gluconate (10 - 20 mL) to reverse respiratory depression or heart block.

Special Notes

1. Should only be administered on a doctor-accompanied flight unless under exceptional circumstances.
2. Magnesium Sulphate infusion may also be used for suppression of labour where Salbutamol is contraindicated or ineffective. There is evidence to suggest that the drug is synergistic with Salbutamol in its effect on uterine contractions.
 - Obtain Obstetric advice before use.
 - Increased dosages and rates are used for suppression of preterm labour. NB **Eight** ampoules are required (take extra supplies from hangar or base hospital)
 - Give a loading dose of 6g (12mL of undiluted or 75mL of diluted solution) over 30 minutes.
 - Commence infusion at 4g/hr (8mL/hr of undiluted or 50mL/hr of diluted solution) for 2 hours.
 - Maintenance dose is 2g/hr (4mL/hr of undiluted or 25mL/hr of diluted solution).
 - Increase at 0.5g per hour if uterine activity persists and levels (when measurable) are sub-therapeutic.
3. Magnesium may be used for foetal neuroprotection for gestations less than 30 weeks where delivery is expected in the next four hours. It will generally not need to be routinely given in flight.
 - Give a loading dose of 4g (8mL of undiluted solution or 50mL of above dilute (0.08g/mL) solution) over 20min.
 - Commence infusion of 1g/hr of undiluted solution or 12.5mL/hr of above diluted solution (0.08g/mL)

12 MAGNESIUM SULPHATE - CARDIAC

A. Syringe Driver		Magnesium Sulphate 9.88 g [40 mmol] / 20mL (0.5 g/mL)	
<ul style="list-style-type: none"> For Arrhythmias, use 1 ampoule of Magnesium Sulphate (2.47 g [10 mmol] per 5 mL ampoule) Use 2 ampoules (20mmol) of Magnesium Sulphate undiluted (10 mL) Give a loading dose of approx 2g (4mL) over 10 min For cardiac arrest with shockable rhythm and/or hypokalemia give stat. 			
50 mL Syringe		Dose Range	Rate of Infusion – Syringe Driver
	Loading Dose (10 min)	2 g (4 mL)	24 mL/hr for 10 min only

B. Infusion Pump		Magnesium Sulphate 2.47g [10 mmol] /105 mL (0.025 g/mL)	
<ul style="list-style-type: none"> For Arrhythmias, use 1 ampoule of Magnesium Sulphate (2.47 g [10 mmol] per 5 mL ampoule) Remove 5mL from a 100 mL bag Normal Saline then add 1 ampoule.(Makes 0.025g/mL) Give a loading dose of approx 2 g (80 mL) over 10 min For cardiac arrest give undiluted as above. 			
100 mL Bag		Dose Range	Rate of Infusion – Infusion Pump
	Loading Dose (10min)	2 g (80 mL)	480 mL/hr for 10 min only

Indications

Cardiac arrhythmia responsive to magnesium, or as a result of hypomagnesaemia or hypokalemia. Eg, Torsades de Pointes, Ventricular tachycardia, arrhythmia associated with prolonged QTc (eg TCA overdose)

Contraindications

- Heart block
- Renal failure, monitor level or clinical evidence of hypermagnesaemia.
- Maintain cardiac monitoring, monitor reflexes and respiratory rate.
- Have Calcium gluconate available to treat hypermagnesaemia.

13 MAGNESIUM SULPHATE - ASTHMA

A. Syringe Driver		Magnesium Sulphate 9.88 g [40 mmol] / 20mL (0.5 g/mL)					
<ul style="list-style-type: none"> For Asthma, use 4 ampoules of Magnesium Sulphate (2.47 g [10 mmol] per 5 mL ampoule) Use 4 ampoules (9.88 g) of Magnesium Sulphate undiluted (20 mL) Give a loading dose of approx 50mg/kg over 20 min (for 75 kg 3.75g [7.5mL]) Follow the loading dose with an infusion of 30mg/kg/hr (for 75kg 2.25g/hr [4.5mL/hr]) 							
50 mL Syringe		Dose Range	Rate of Infusion – Syringe Driver				
			40kg	60kg	70kg	80kg	100kg
	Loading Dose (20 min)	50mg/kg	12mL/hr for 20min	18mL/hr for 20min	21mL/hr for 20min	24mL/hr for 20min	30mL/hr for 20min
Maintenance Dose	30mg/kg/hr	2.4mL/hr	3.6mL/hr	4.2mL/hr	4.8mL/hr	6mL/hr	

B. Infusion Pump		Magnesium Sulphate 9.88 g [40 mmol] /120 mL (0.08 g/mL)					
<ul style="list-style-type: none"> For Asthma, use 4 ampoules of Magnesium Sulphate (2.47 g [10 mmol] per 5 mL ampoule) Add to a 100 mL bag Normal Saline to equal 120 mL Give a loading dose of 50mg/kg (eg. for 75 kg 47mL over 20 min) Follow the loading dose with an infusion of 30mg/kg/hr (eg. for 75kg 28mL/hr) 							
120 mL Bag		Dose Range	Rate of Infusion – Infusion Pump				
			40kg	60kg	70kg	80kg	100kg
	Loading Dose (20 min)	50mg/kg	75mL/hr for 20min	112mL/hr for 20min	131mL/hr for 20min	150mL/hr for 20min	188mL/hr for 20min
Maintenance Dose	30mg/kg/hr	15mL/hr	22mL/hr	26mL/hr	30mL/hr	38mL/hr	

Indications

Acute severe asthma unresponsive to β agonists.

Precautions and contraindications

- Heart block.
- Monitor rhythm, respiratory rate, reflexes.
- Not compatible in same line as salbutamol, ketamine, aminophylline.

Side effects

- Arrhythmia
- Respiratory depression / paralysis.

14 METHYLPREDNISOLONE INFUSION

A. Syringe Driver		Methylprednisolone 2g/50mL (40mg/mL)		
<ul style="list-style-type: none"> Use Methylprednisolone Sodium Succinate (Solu-Medrol) 500mg or 1g ampoules. Use supplied diluent or Water for Injection to reconstitute (10mL for 500mg, 20mL for 1g). Loading dose. Dilute loading dose of 30mg/kg body weight (see below) further to 50mL with Normal Saline or 5% Dextrose in a syringe. Administer over 15 minutes, then wait 45 minutes. Dose may be approximated to nearest 0.5g. Infusion. Dilute 2g (40mL) of reconstituted Methylprednisolone to 50mL in a syringe making 40mg/mL. (This should provide for a minimum of 4 hours infusion). Commence at 5.4mg/kg/hr (see rates below). Infusion should run for 23 hrs total. 				
50 mL Syringe	Weight (kg)	Loading Dose	Infusion Dose (mg/hr)	Infusion Rate (mL/hr)
	40	1.0g	216	5.4
	50	1.5g	270	6.8
	60	2.0g	324	8.1
	70	2.0g	378	9.5
	80	2.5g	432	10.8
	90	2.5g	486	12.2
	100	3.0g	540	13.5

B. Infusion Pump		Methylprednisolone 2g/500mL (4mg/mL)		
<ul style="list-style-type: none"> Use Methylprednisolone Sodium Succinate (Solu-Medrol) 500g or 1g ampoules. Use supplied diluent or Water for Injection to reconstitute (10mL for 500mg, 20mL for 1g). Loading dose. Add loading dose of 30mg/kg body weight (see below) to 100mL bag of Normal Saline. Administer over 15 minutes, then wait 45 minutes. Dose may be approximated to nearest 0.5g. Infusion. Add 2g (40mL) of reconstituted Methylprednisolone to 500mL bag of Normal Saline or 5% Dextrose making 4mg/mL. (Provides for a minimum of 4 hours infusion). Commence at 5.4mg/kg/hr (see rates below). Infusion should run for 23 hrs total. 				
500mL Bag	Weight (kg)	Loading Dose (G)	Infusion Dose (mg/hr)	Infusion Rate (mL/hr)
	40	1.0g	216	54
	50	1.5g	270	68
	60	2.0g	324	81
	70	2.0g	378	95
	80	2.5g	432	108
	90	2.5g	486	122
	100	3.0g	540	135

Indications

Acute spinal cord injuries (< 8 hours old).

Precautions and Side Effects

- Contraindicated in open injuries (stab wounds, missile injuries).
- Patients should receive prophylaxis against gastrointestinal haemorrhage (i.e. IV Ranitidine or oral Sucralfate).

Methylprednisolone Infusion (cont'd)

3. Elevated blood sugar is a known side-effect. Monitor blood sugar levels 4 hourly and treat as appropriate.

Special Notes

1. Infusions are based on minimum quantities of Methylprednisolone carried and should be sufficient for duration of transfer. Ensure receiving hospital is aware of when treatment commenced and continues drug infusion for full 23 hours.
2. If volume to be delivered by IVAC is considered excessive, use 100mL bag instead and recalculate rates (dividing by 5).

References

1. Bracken MB, Shepard MJ, Collins WF et al. NEJM 322(20):1405-11
2. Pharmacy Department & Spinal Injuries Unit, Austin Hospital. Preparation of Methylprednisolone for Acute Spinal Injury. Nov 1990.

<http://www.health.qld.gov.au/qscis/pdf/QSCIS%20Information/Methylprednisolone%20Protocol.pdf>

15 MORPHINE INFUSION

A. Syringe Driver		Morphine 30 mg/ 30mL (1 mg/mL)
<ul style="list-style-type: none"> Use Morphine 15 mg/mL or Morphine 10 mg/mL Dilute 30 mg Morphine up to 30 mL with Normal Saline (or 45 mg to 45 mL) Administer a loading dose of 2 - 10 mL (2mg - 10mg) Commence infusion at 2 - 5 mL/hr and adjust according to clinical response 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	2 mg/hr	2mL/hr
	4 mg/hr	4 mL/hr
	5 mg/hr	5 mL/hr

B. Infusion Pump		Morphine 50 mg/ 500mL (0.1mg/mL)
<ul style="list-style-type: none"> Use Morphine 15 mg/mL or Morphine 10 mg/mL Dilute 50 mg Morphine up to 500 mL with Normal Saline Administer a loading dose of 20 - 100 mL (2mg - 10mg) Commence infusion at 25- 50 mL/hr and adjust according to clinical response 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	2 mg/hr	20 mL/hr
	4 mg/hr	40 mL/hr
	5 mg/hr	50 mL/hr

Indications

Analgesia

Precautions and Side Effects

Side effects include nausea and vomiting, hypotension, CNS and respiratory depression.

Special Notes

- Adjust rate according to clinical response.
- Smaller volume solutions (e.g. 30mg made up to 30 mL) should be used for shorter flights.
- Morphine infusion is preferable to Pethidine infusion because of the risk of nor-Pethidine induced fitting with large doses of Pethidine.
- Treat nausea or vomiting with Prochlorperazine 12.5 mg IV or IM 6/24 or Metoclopramide 10 mg IV or IM 6/24.
- If respiratory rate < 8 breaths / min, excessive sedation or symptomatic hypotension develops cease infusion and contact duty RFDS Medical Officer.
- Overdose can be reversed with Naloxone 0.1 - 0.4 mg IV, repeated if necessary.

16 MORPHINE & MIDAZOLAM INFUSION

A. Syringe Driver		Morphine 30 mg + Midazolam 30 mg/30 mL (1 mg Morphine + 1 mg Midazolam /mL)
<ul style="list-style-type: none"> • Use Morphine 15 mg/mL <i>or</i> Morphine 10 mg/mL and Midazolam 15 mg/3 mL • Dilute 30 mg Morphine plus 30 mg Midazolam up to 30 mL with Normal Saline (<i>or</i> 45mg + 45mg to 45 mL <i>or</i> 50mg + 50mg to 50 mL) • Administer a loading dose of 2 - 10 mL (2mg+2mg – 10mg+10mg) • Commence infusion at 2.5 - 5 mL/hr 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	2.5mg + 2.5 mg/hr	2.5 mL/hr
	5mg + 5mg/hr	5 mL/hr
	10mg + 10mg/hr	10 mL/hr
	15mg +15mg/hr	15 mL/hr

B. Infusion Pump		Morphine 50 mg + Midazolam 50 mg/500 mL (0.1 mg Morphine + 0.1 mg Midazolam /mL)
<ul style="list-style-type: none"> • Use Morphine 15mg/mL <i>or</i> Morphine 10mg/mL and Midazolam 15mg/3 mL • Dilute 50mg Morphine plus 50mg Midazolam up to 500 mL with Normal Saline • Administer a loading dose of 20-100 mL (2mg+2mg – 10mg+10mg) • Commence infusion at 25 – 50 mL/hr 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	2.5mg + 2.5 mg/hr	25 mL/hr
	5mg + 5 mg/hr	50 mL/hr
	10mg + 10mg/hr	100 mL/hr
	15mg +15mg/hr	150 mL/hr

Indications

Sedation

Precautions and Side Effects

Side effects include hypotension, CNS and respiratory depression

Special Notes

1. Adjust rate according to clinical response.
2. Smaller volume solutions (e.g. 30mg + 30mg made up to 30 mL) should be used for shorter flights.
3. Should only be administered on a doctor-accompanied flight unless under exceptional circumstances.

17 NORADRENALINE INFUSION

A. Syringe Driver		Noradrenaline 4 mg/50 mL (80 µg/mL)
<ul style="list-style-type: none"> Use Noradrenaline 1:1,000 (2 mg/2mL) ampoules Dilute 4 mg (4 mL) up to 50 mL with 5% Dextrose Commence at 1 µg/min (0.8 mL/hr) and adjust rate according to clinical response 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	1 µg/min	1 mL/hr
	5 µg/min	4 mL/hr
	10 µg/min	8 mL/hr
	20 µg/min	15 mL/hr

B. Infusion Pump		Noradrenaline 4 mg/500 mL (8 µg/mL)
<ul style="list-style-type: none"> Use Noradrenaline 1:1,000 (2 mg/2mL) ampoules Dilute 4 mg (4 mL) up to 500 mL with 5% Dextrose Commence at 1 µg/min (8 mL/hr) and adjust rate according to clinical response 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	1 µg/min	8 mL/hr
	5 µg/min	37 mL/hr
	10 µg/min	75 mL/hr
	20 µg/min	150 mL/hr

Indications

Management of shock (after hypovolaemia has been excluded)

Precautions and Side Effects

- Correct hypovolaemia prior to administration.
- Administer via a central venous line or into a large peripheral venous line (extreme caution with concentrated solution in a peripheral vein because of the risk of vasoconstriction, ischaemic pain and local necrosis).
- Monitor ECG and blood pressure closely.
- Side effects include pulmonary oedema, arrhythmias, tachycardia, myocardial ischaemia, anxiety, palpitations, hypertension and peripheral ischaemia.
- Incompatible with Normal Saline.

Special Notes

- Infusion should be titrated to achieve desired clinical endpoint e.g. systolic blood pressure 80 - 100 mmHg. Usual dose is between 1 - 70 µg/min. Discuss with receiving Intensive Care Unit before use.
- Should only be administered on a doctor-accompanied flight.

18 OCTREOTIDE INFUSION

A. Syringe Driver		Octreotide 0.1 mg/50 mL (2µg/mL)
<ul style="list-style-type: none"> Use Octreotide 0.1 mg/mL in 1 mL ampoules Dilute 0.1 mg (1 mL) up to 50 mL with Normal Saline or 5% Dextrose Commence at 25 µg/hr (10 mL/hr) 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	25 µg/hr	12.5 mL/hr
	50 µg/hr	25 mL/hr

B. Infusion Pump		Octreotide 0.1 mg/500mL(0.2 µg/mL)
<ul style="list-style-type: none"> Use Octreotide 0.1 mg/mL in 1 mL ampoules Dilute 0.1 mg (1mL) up to 500 mL with Normal Saline or 5% Dextrose Commence at 25 µg/hr (125 mL/hr) 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	25 µg/hr	125 mL/hr
	50 µg/hr	250 mL/hr

Indications

First line control of acute variceal bleeding.

Precautions and Side Effects

- Blood glucose should be monitored regularly during administration.
- At low doses, (less than 100 micrograms), there are generally no side effects. Greater doses may cause nausea, delayed abdominal pain and diarrhoea.
- A loading bolus of 25-50 micrograms may be given.
- Increase infusion rate to 50 micrograms per hour if bleeding is not adequately controlled.
- Check ampoule concentration carefully. May be supplied at 0.05 mg/mL, 0.1 mg/mL or 0.5 mg/mL.

Special Notes

- Octreotide (Sandostatin) is an analogue of somatostatin which inhibits intestinal motility, secretion of gastric acid, pepsin and intrinsic factor, splanchnic blood flow and bile flow. It also blocks secretion of growth hormone, thyroid stimulating hormone, insulin, glucagon, gastrin, VIP and secretin. Half-life is approximately 90 minutes.
- Clinical uses include acromegaly, carcinoid tumours, VIPoma, Zollinger-Ellison syndrome, glucagonoma and dumping syndrome. It is widely used for variceal bleeding, although not formally approved by the TGA.
- Studies have shown less morbidity with Octreotide than balloon tamponade in variceal bleeding.

Reference

Drug Sub-committee, Royal Perth Hospital. Indications for Octreotide. Revised 1998.

19 PANTOPRAZOLE INFUSION

A. Syringe Driver		Pantoprazole 40mg/50mL (0.8mg/mL)
<ul style="list-style-type: none"> Administer 80mg loading dose, see Special Notes below. Use Pantoprazole powder for reconstitution, 1x 40mg ampoule. Make up to 50 mL with Normal Saline or 5% Dextrose 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	Maintenance infusion 8mg/hr	10mL/hr

B. Infusion Pump		Pantoprazole 40mg/100mL (0.4mg/mL)
<ul style="list-style-type: none"> Administer 80mg loading dose, see Special Notes below. Use Pantoprazole powder for reconstitution, 1x40mg ampoule. Make up to 100mL with Normal Saline or 5% Dextrose 		
100 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	Maintenance infusion 8mg/hr	20mL/hr

Indications for infusion

Treatment of suspected bleeding peptic ulcer

Precautions and Side Effects

Known allergy to pantoprazole

Non-specific symptoms including headache, nausea, metallic taste

Special Notes

- Loading dose: 80mg in 100mL over 15-30 minutes.
- Pantoprazole requires a dedicated i.v. line.
- Ensure that 80mg bolus dose is given, but ongoing infusion should not take precedence over resuscitation if line is required for fluids or blood products.

References

- Pantoprazole MaxRx Injection: Drug insert, Max Pharma Pty Ltd, 2012.
- Fremantle Hospital Upper GI Bleed Guidelines, 2012

20 PROPOFOL INFUSION

Syringe Driver		Propofol 500mg/50mL (10mg/mL)				
<ul style="list-style-type: none"> Use Propofol 500mg in 50 mL glass bottle. DO NOT DILUTE Contents should be drawn up in 50mL syringe for syringe driver. Commence at 0.5mg/kg/hr and titrate up as required. Usual dose range 1 - 12 mg/kg/hr 						
50 mL syringe or IVAC	Dose Range	Rate of Infusion				
		40 kg	60 kg	70 kg	80 kg	100 kg
	0.5 mg/kg/hr	2 mL/hr	3 mL/hr	3.5 mL/hr	4 mL/hr	5 mL/hr
	1 mg/kg/hr	4 mL/hr	6 mL/hr	7 mL/hr	8 mL/hr	10 mL/hr
	2 mg/kg/hr	8 mL/hr	12 mL/hr	14 mL/hr	16 mL/hr	20 mL/hr
	3 mg/kg/hr	12 mL/hr	18 mL/hr	21 mL/hr	24 mL/hr	30 mL/hr
	6 mg/kg/hr	24 mL/hr	36 mL/hr	42 mL/hr	48 mL/hr	60 mL/hr
12 mg/kg/hr	48 mL/hr	72 mL/hr	84 mL/hr	96 mL/hr	120 mL/hr	

◆ Beware of hypotension at these doses.

Indications for infusion

Sedation of ventilated patients especially where rapid awakening and extubation is desirable once tertiary hospital is reached. (For example, ventilated psychiatric patients or overdose cases).

May be used in management of status epilepticus.

Precautions and Side Effects

Side-effects include hypotension, local pain at site of infusion (can be avoided by mixing 2 mL of 1% lignocaine with propofol prior to infusion) and allergic reactions.

Special Notes

- Propofol is a short-acting intravenous anaesthetic agent with onset and offset of action < 5 minutes. Initial (distribution) half-life of 2-4 mins, is followed by elimination half-life of 30-60 mins.
- Propofol is compatible with 0.9% (normal) saline or 5% dextrose.
- Only 4 vials of Propofol are carried in the drug box. Additional may be needed if planning to use in larger patient or on a long flight.
- Monitor BP carefully and use with caution in hypovolaemic or hypotensive patients.
- Propofol contains egg protein and should not be given to patients with egg allergies.

References

- Propofol Emulsion: Drug insert, Mayne Pharma Pty Ltd Melbourne, 2003.
- Society of Critical Care Medicine. Diprivan (Propofol) Injectable Emulsion. AstraZeneca. 2003.
- S.M. Green. Propofol in Emergency Medicine. Further Evidence of Safety. (Editorial) Emergency Medicine Australasia. Oct 2007 Vol 19 No. 5 pp389-393 Blackwell (Pub).

21 SALBUTAMOL INFUSION - OBSTETRIC

A. Infusion Pump (concentrated)		Salbutamol 5 mg/100 mL (50 µg/mL)
<ul style="list-style-type: none"> Use Salbutamol 5 mg in 5 mL ampoule Dilute 5 mg (5 mL) up to 100 mL with Normal Saline Commence infusion at 10 µg/min (12 mL/hr) Increase in increments of 10 µg/min (12 mL/hr) at 30 minute intervals until contractions cease or limits (as listed below) are reached 		
100 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	10 µg/min	12 mL/hr
	20 µg/min	24 mL/hr
	30 µg/min	36 mL/hr
	40 µg/min	48 mL/hr
50 µg/min	60 mL/hr	

B. Infusion Pump (dilute)		Salbutamol 5 mg/500 mL (10 µg/mL)
<ul style="list-style-type: none"> Use Salbutamol 5 mg in 5 mL ampoule Dilute 5 mg (5 mL) up to 500 mL with Normal Saline Commence infusion at 10 µg/min (60 mL/hr) Increase in increments of 10 µg/min (60 mL/hr) at 30 min intervals until contractions cease or limits (as listed below) are reached 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	10 µg/min	60 mL/hr
	20 µg/min	120 mL/hr
	30 µg/min	180 mL/hr
	If rate exceeds 180 mL/hr double the concentration of Salbutamol (10 mg/ 500 mL, 20 µg/mL) and halve rates accordingly	
	40 µg/min	120 mL/hr (of 20 µg/mL solution)
50 µg/min	150 mL/hr (of 20 µg/mL solution)	

Indications

Inhibition of labour

Precautions and Side Effects

- Cease infusion if
 - contractions cease *or*
 - maternal pulse = 130/min *or*
 - there are signs of fetal distress or FHR exceeds 190 *or*
 - the maximum drip rate of 50 µg/min is reached
- Side effects include palpitations, tachycardia, tremor, hypotension, pulmonary oedema, cardiac arrhythmias, myocardial ischaemia, hypokalaemia, hyperglycaemia, flushing, headache, dizziness, anxiety, nausea and vomiting.
- Use with caution in patients with heart disease, diabetes or hypertension

Salbutamol Infusion - Obstetric (cont'd)

4. Absolute obstetric contraindications include fetal death in utero and severe antepartum haemorrhage.
5. May be use when relative contraindications exist, if risks outweighed by the risk of delivery during transport.

Special Notes

1. In this RFDS protocol both the rate of increase of infusion and the maximum limits are greater when compared with the King Edward Memorial Hospital protocol. This reflects the different risks involved in the delivery of the pre-term infant outside the tertiary Hospital setting. Care must be exercised at high doses.
2. Alternatives / adjuncts to Salbutamol infusion for tocolysis include Nifedipine, Ritodrine, Indomethacin and GTN. Consult Clinical Guideline on Preterm Labour.

22 SALBUTAMOL INFUSION - RESPIRATORY

A. Syringe Driver		Salbutamol 5 mg/50 mL (100 µg/mL)
<ul style="list-style-type: none"> Use Salbutamol 5 mg in 5 mL ampoule Dilute 5 mg (5 mL) up to 50 mL with Normal Saline Administer a loading dose of 4 - 5 µg/kg [eg 250 µg (2.5 mL) in an adult] over 10 min Commence at 3 mL/hr (5 µg/min) [1-5 µg/kg/min in children] Increase in increments of 5 µg/min (3 mL/hr) at 15 min intervals up to a maximum dose of 20 µg/min 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	5 µg/min	3 mL/hr
	10 µg/min	6 mL/hr
	15 µg/min	9 mL/hr
	20 µg/min	12 mL/hr

B. Infusion Pump		Salbutamol 5 mg/500 mL (10 µg/mL)
<ul style="list-style-type: none"> Use Salbutamol 5 mg in 5 mL ampoule Dilute 5 mg (5 mL) up to 500 mL with Normal Saline Administer a loading dose of 4 - 5 µg/kg [eg 250 µg (25 mL) in an adult] over 10 min Commence at 30 mL/hr (5 µg/min) [1-5 µg/kg/min in children] Increase in increments of 5 µg/min (30 mL/hr) at 15 min intervals up to a maximum dose of 20 µg/min 		
500 mL Bag	Dose Range	Rate of Infusion - Infusion Pump
	5 µg/min	30 mL/hr
	10 µg/min	60 mL/hr
	15 µg/min	90 mL/hr
	20 µg/min	120 mL/hr

Indications

Severe bronchospasm.

Precautions and Side Effects

- Additional side effects included palpitations, tachycardia, tremor, lactic acidosis, pulmonary oedema, hypokalaemia, hyperglycaemia, flushing, headache, dizziness and anxiety.
- Side effects include palpitations, tachycardia, tremor, hypotension, pulmonary oedema, cardiac arrhythmias, myocardial ischaemia, hypokalaemia, hyperglycaemia, flushing, headache, dizziness, anxiety, nausea and vomiting.
- Consider continuous nebulised Salbutamol, intravenous Aminophylline and/or Adrenaline infusion as alternative or additional therapies.
- Should only be administered on a doctor-accompanied flight unless under exceptional circumstances. Infusions can be made up using either Ventolin Obstetric Injection (Salbutamol 5 mg / 5 mL) or Ventolin Injection (Salbutamol 500 µg / mL, 1 mL).

23 VECURONIUM INFUSION

A. Syringe Driver		Vecuronium 20 mg / 20 mL (1 mg /mL)
<ul style="list-style-type: none"> • Use Vecuronium 4 mg or 10 mg ampoules • Reconstitute the powder in the ampoules with water for injection • Dilute 20 mg up to 20 mL with Normal Saline (<i>or</i> 10 mg to 10 mL <i>or</i> 30 mg to 30 mL) • After patient has been intubated give a loading dose of 0.05 mg/kg (eg 4 mg for an 80 kg patient) • Run infusion at 0.1 mg/kg/hr (eg 8 mg/hr in a 80 kg patient) 		
50 mL Syringe	Dose Range	Rate of Infusion - Syringe Driver
	8 mg/hr (for 80 kg patient)	8 mL/hr

Indications

Maintenance of muscle relaxation in ventilated patients.

Precautions and Side Effects

1. Patient must be adequately sedated with Morphine and Midazolam in addition to being paralysed.
2. Patients with hepatic or renal disease may have reduced excretion resulting in prolongation of neuromuscular blockade. Use lower doses in these patients.

Special Notes

Should only be administered on a doctor-accompanied flight.