MEDICATION RECONSTITUTION

&

MEDICATION DILUTION

REFERENCE 2013

PHARMACY DEPARTMENT
HOSPITAL SULTANAH AMINAH

REVIEW DATE: 26/2/2013

MEDICATION RECONSTITUTION & MEDICATION DILUTION REFERENCE 2013

This is an internal publication of Pharmacy Department, Hospital Sultanah Aminah Johor Bahru.

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ACKNOWLEDGEMENT

This Reference is an initiative by the Pharmacy Department and Drugs & Therapeutics Committee of Hospital Sultanah Aminah, Johor Bahru.

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INTRODUCTION

In the medication delivery process, drug reconstitution/dilution always receive little attention. Nevertheless, dilution of medications is an essential part to ensure that patients receive the optimum therapy. It is important that the concentration of medications' dilution is correct to minimise the side effects. Besides, stability of the medications is essential to ensure safety, quality and efficacy of the medications.

This Medication Reconstitution and Medication Dilution Reference 2013 is produced to standardise the practice in general wards in HSAJB. Our aim is to provide comprehensive information regarding medication reconstitution/dilution. This Reference mainly contains the most commonly used medications requiring reconstitution and dilution in this hospital and is not exhaustive. This reference may not be applicable to other institutions.

It remains the responsibility of every healthcare personnel to evaluate the appropriateness of a particular opinion or therapy in the context of actual clinical situation and with due consideration of any new developments in the fields.

THE OBJECTIVE FOR THIS REFERENCE:

1. The use of this manual requires knowledge based interpretation by health care professional.
2. It is intended solely for use by healthcare personnel in HSAJB especially for nurses, junior doctors and pharmacists.
3. All information contained in this manual has been provided with the sole intent that it be readily accessible for information and as a guide for conducting dilution of drugs that may be prescribed.

USERS:
This Reference is intended to be a quick reference for all healthcare providers who are involved in the management of medication reconstitution and dilution.

LIST OF MEDICATIONS

22	Phenytoin	16
23	Potassium Dihydrogen Phosphate (KH2PO4)	16
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25	Streptokinase	16
26	Tranxenamic Acid	16

LIST OF ABBREVIATIONS	
D5%	5% Dextrose in Water
Gluc-NaCl	Glucose /Sodium Chloride Solution
IM	Intramuscular Injection
IT	Intrathecal
IV	Intravenous
K^+	Potassium Powder
LT	Lactated Ringers
Na^+	Sodium Powder
NS	Sodium Chloride 0.9%
RT	Room Temperature
SubQ	Subcutaneous
WFI	Water For Injection
HIGH ALERT	High Alert Medication Medications that bear a heightened risk of causing significant patient harm when these medications are used in error.

RECONSTITUTION & DILUTION PROCEDURE

No	Medication	Diluent	Administration	Reconstitution/Dilution	Final Concentration	Stability
1.	Acetylcysteine (NAC) 5g/25ml 2g/2ml	D5% NS	[2]**PCM Toxicity** NAC 150mg/kg (max 16.5g) over 15min, then 50mg/kg (max 5.5kg) over 4h then 100mg/kg (max 11g) over 16h	Dilute with D5% ***Adult & Chlid over 12 y.o*** Initially **0.75ml/kg** in 200ml over 15min then **0.25ml/kg** in 500ml over 4h then **0.5ml/kg** in 1L over 16h ***Child under 12y.o*** <u>Body weight > 20kg</u> **0.75ml/kg** in 100ml over 15min, then **0.25ml/kg** 250ml over 4h, the **0.5ml/kg** in 500ml over 16hr <u>Body weight< 20kg</u> **3ml/kg** given over 15min then **7ml/kg** over 4h, then **14ml/kg** over 16hr		24hr after dilution
			Prevention of Contrast-Induced Nephropathy (Unlabeled use) [4]**:** NAC 150mg/kg in over 1h prior contrast, then 50mg/kg in over 4h after contrast	Dilute with D5% **0.75ml/kg** in 500ml over 1h **0.25ml/kg** in 500ml over 4h		
			Dengue-associated acute liver failure (Unlabeled use): NAC 150mg/kg loading dose IV over 1h followed by 50mg/kg for 4h and then 6.25mg/kg/h for up to 72h	Dilute with D5% **0.75ml/kg** in 200ml over 1h **0.25ml/kg** in 500ml over 4h **25ml** (1vial) in 500ml (10mg/ml)	10mg/ml	

No	Medication	Diluent	Administration	Reconstitution/Dilution	Final Concentration	Stability
2.	Adrenaline 1mg/ml HIGH ALERT	NS D5%	**Adult** 1ml/h = 0.01mcg/kg/min **Children** **<12 years old** 1ml/h =0.1mcg/kg/min ***Please refer Appendix 6***	**Adult** 0.03mg/kg in 50ml **Children** **<12 years old** 0.3mg/kg in 50 ml		Reconstituted solution is stable for 24 hours at room temperature (DRUG INFO)
3.	Aminophylline 250mg/10ml	NS	**In patient not on theophylline before** Loading Dose (LD): 5.7mg/kg over 30 min Maintenance Dose (MD): Non-smoking: 0.5mg/kg/h Smoking: 0.875mg/kg/h Liver dysfunction, cor pulmonale, sepsis with organ failure, shock, CCF: 0.25mg/kg/h (maximum 500mg per day) **In patient on theophylline before hospital admission,** check TDM theophylline before deciding on dose ****Dose is based on Ideal Body Weight(IBW)***	250mg in 25-50 ml D5% or NS (5-10 mg/ml) According to Aminophylline IV-Fresenius: dilute with NS only Dilute to a concentration of 1mg/ml and infuse over 20-30 min. Max concentration: 25mg/ml. Max rate of infusion: 25mg/min.	5-10 mg/ml	
4.	Amiodarone 150mg/3ml	D5%	**United Kingdom (UK)** 300mg IV for 1h, then 900mg for 24h **American Heart Association (AHA)** 150mg over 15min 300mg over 6h (rate 17ml/hr) 600mg over 18h (rate 19ml/h)	**UK** LD: Dilute 300mg (2 amps) in 100ml D5%. MD: Then, 900mg (6 amps) in 500ml D5%. **AHA** 150mg in 50ml D5% 300mg in 100ml D5% 600mg in 350ml D5%	Continuous or intermittent in D5% ≤2 mg/ml **peripheral line** >2mg/ml **central line**	***Do NOT dilute with normal saline.***

No	Medication	Diluent	Administration	Reconstitution/Dilution	Final Concentration	Stability
5.	Atropine 1mg/ml HIGH ALERT		**Organophosphate poisoning** 1ml/h= 10mcg/kg/h IV infusion: 20 – 80mcg/kg/h (2-8ml/h) or IV: Initial: 1-5mg; double the dose every 5 min until signs of muscarinic excesserbate (clearing of bronchial secretions, bronchospasm, and adequate oxygenation). Overly aggressive dosing may cause anticholinergic toxicity (e.g., delirium, hyperthermia, and muscle twitching) Then IV infusion: 0.5-1mg/h or 10-20% of loading dose/h	1/2 body weight = ml of atropine in 50mls NS or Undiluted	 1mg/ml	
6.	Actrapid HIGH ALERT	NS	1iu/h = 1ml/h	50iu insulin actrapid (0.5 ml) + NS = 50ml	1iu/ml	
7.	Digoxin 0.5mg/2ml HIGH ALERT	WFI NS D5%	0.5mg in 10ml NS Give slow bolus over 10-20 mins	May be administered undiluted or diluted with a 4-fold or greater volume		Room temperature: 48hours
8.	Dobutamine HIGH ALERT	D5%	1ml/h= 1mcg/kg/min ***Please refer Appendix 8***	3mg/kg in 50ml NS or D5% 250mg in 50ml NS or D5%	 5mg/ml	Room temperature: 48hours
9.	Dopamine HIGH ALERT	D5%	1ml/h= 1mcg/kg/min ***Please refer Appendix 7***	3mg/kg in 50 ml NS or D5% 400mg in 50ml NS or D5%	 8mg/ml	Room temperature: 24 hours

No	Medication	Diluent	Administration	Reconstitution/Dilution	Final Concentration	Stability
10.	Esomeprazole 40mg	NS	**IV bolus:** IV 80mg (10ml) over 30 min **IV infusion:** Followed by 8mg/h (10ml/hr) infusion for 72h	**IV bolus**: Reconstitute (40mg) with 5ml NS **IV infusion:** Reconstitute with 5ml (40mg) NS, then further dilute to final volume of 50ml	8mg/ml 0.8mg/ml	If dilute with NS to be used within 12h If dilute with D5%, use within 6h
11.	Glyceryl Trinitrate 5mg/ml	NS D5%	Initially 0.6mg/h, titrated in increments of 0.3mg/h (0.75ml/h) every 3-5 min to a total dose of 6-12mg/h (15-30ml/h) 0.6-12mg/h i.e. 1.5-30ml/h	4ml (20 mg) in 50 ml NS or D5%	Max concentration: 0.4mg/ml	Stable for 24 hours at room temperature Avoid excessive heat
12.	Hydralazine HCl 20mg/ampoule	NS	7.5ml/hr=50mcg/min	20mg (1ampule) in 50 ml	0.4mg/ml	4 hours in room temperature; 24 hours in refrigerator
13.	Heparin HIGH ALERT	NS D5 LT	**IV Bolus**: 5000iu (1ml) then 1000iu/h infusion **IV Infusion**: (run @ 1ml/h)	**Dilution for infusion**: 1000iu/h = 10,000iu (2ml) + NS = 10ml	1000iu/ml	Invert container for at least 6 times after addition of diluent. Flush with WFI or NS before and after any acidic or incompatible medication or solution to avoid precipitation with heparin Discard unused portion after 4 hours

No	Medication	Diluent	Administration	Reconstitution/Dilution	Final Concentration	Stability
14.	Ketamine/ Midazolam HIGH ALERT	NS D5%	***Please refer Appendix 9***	500mg ketamine/50mg midazolam in 50 ml NS or D5%	10mg/ml ketamine 1mg/ml midazolam	
15.	Labetalol HCl 5mg/ml	D5% NS	IV continuous Infusion: 1-180 mg/h for periods up to 9 days ie: 1ml-180ml/h Patient should always receive the drug whilst in the supine or left lateral position. AVOID raising the patient into the upright position within 3 hours of IV administration.	25mg (5ml) in 25ml D5% (1mg/ml)	1mg/ml	D5%~ 72h in room temperature; If NS ~ 24h at room temp
16.	Lignocaine 100mg/5ml HIGH ALERT	D5%	**0.125ml/kg** (1 mg/kg) (max 3 mg/kg) over 3 min followed by **0.5ml/kg** (4 mg/min) x 30 min, **0.25ml/kg** (2 mg/min) x 2h then **0.125ml/kg** (1 mg/min)	20ml (400mg) in 50ml D5%	8mg/ml	
17.	Morphine/ Midazolam HIGH ALERT	NS D5%	***Please refer Appendix 9***	50mg morphine/50mg midazolam in 50 ml NS or D5%	1mg/ml	
18.	Magnesium Sulphate HIGH ALERT	NS	[4]If Mg2+ <0.6 mmol/L with cardiac abnormalities/asthma/ eclampsia/ tetanus/ pulmonary hypertension IV 0.05-0.07g/kg MgSO4 over 20 min, then 0.03-0.05g/kg/h Keep serum Mg2+ 2.0-3.5 mmol/L **Pre-eclampsia:** <u>Loading dose:</u> Infuse 20ml over 15 min	[4]50% MgSO4 solution has osmolarity of 4000 mOsm/L, dilute to 10-20% solution before IV use 1mg MgSO4 =4 mmol (8mEq) elemental Mg 1ml 50% MgSO4 =0.5g=2 mmol (4 mEq) Mg2+ **Pre-eclampsia:** <u>Loading dose:</u> 8ml (4gm) in 20ml NS	0.2mg/ml	Use within 24 hours

No	Medication	Diluent	Administration	Reconstitution/Dilution	Final Concentration	Stability
			<u>Maintenance dose:</u> Infuse 50ml over 1h. Continue maintenance @ 1g/h till delivery **Magnesium correction:** <u>Peripheral line</u> Infuse 40ml over 2h Infuse 20ml over 1h	<u>Maintenance dose:</u> 2ml (1gm) in 50ml NS. **Magnesium correction:** <u>Peripheral line</u> 2 ampule (20 mmol/L) in 40ml NS 1 ampule (10 mmo/L) in 20ml NS	0.02mg/ml	
19.	Methylprednisolone 500mg/1g	D5% NS D5/HS	**Acute spinal cord injury-started within 8 hrs after injury** Bolus: 30mg/kg in 50 ml D5% over 15 mins Maintenance: 5.4mg/kg/h x 23 hour. Infuse at 10ml/h x 23 hours.	30mg/kg in 50 ml D5% Dilute to 230ml (final volume) D5%.		48h in room temperature
20.	Noradrenaline 4mg HIGH ALERT	D5%	Dosages range 0.02-1.5mcg/kg/min 1 ml/h = 0.01 mcg/kg/min ***Please refer Appendix 5***	0.03 mg/kg in 50 ml D5% If **infusion rate < 5ml/h** then dilute 4mg in 50ml D5% If **infusion rate > 5ml/h** then dilute 8mg in 50ml D5%	Max: 20mg/50ml	Diluted solution is stable for 24 hours at room temperature
21.	Pantoprazole 40mg	NS D5%	IV Pantoprazole 80mg stat then 8mg/h × 48-72h Ie: 20ml/hr	**IV bolus**: Reconstitute with 10ml NS and give over 2 min **IV infusion**: 40mg dilute with 100ml D5% or NS	0.4g/ml	Use within 12 hours

No	Medication	Diluent	Administration	Reconstitution/Dilution	Final Concentration	Stability
22.	Phenytoin 250mg/5ml	NS	Give through an inline filter (0.22-0.5 micron) at a rate not exceeding 50mg/min	Dilute in 50-100ml NS Flush line before and after infusion	<10mg/ml	Complete administration within 1h of preparation
23.	Potassium Dihydrogen Phosphate (KH_2PO_4) HIGH ALERT	NS D5	**Peripheral line** Infuse over 24hr **[4]Central line** Infuse over 6hr Infuse over 4hr	**Peripheral line** Add 2 ampule of KH_2PO_4 in 1 pint IVD **[4]Central line** Add 2 ampule (20mmol/L) in 100ml Add 1 ampule (10mmol/L) in 100ml		
24.	Potassium Chloride (KCl) HIGH ALERT	NS	If K^+ <2.5mmol/L or <3mmol/L if on digoxin or presence of life-threatening symptoms Give KCl 2g through a central line over an hour. **Max. rate 0.4 mmol/kg/hour (20-30 mmol/hour)** If no life threatening symptoms, K^+ <3.5 mmol/L Give KCl 1g over an hour **Max. rate 0.4 mmol/kg/hour (20-30 mmol/hour)**	2g diluted to 100 ml NS (1G KCl= 13.4mmol K^+) 1g diluted to 50mls NS (1G KCl= 13.4mmol K^+)		
25.	Streptokinase HIGH ALERT	NS	Run over 1h via 50ml syringe (i.e: 2 syringes run 100ml/h)	1.5 Mega Unit (1 vial) + NS = 100ml		24 hours at refrigerator
26.	Tranexamic Acid	NS	Bolus: over 10min Infusion: over 8hours	Bolus: 1g over 10 mins Infusion: 1g in 500ml NS over 8h		

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4. Micromedex® Healthcare Series [Internet database]. Greenwood Village, Colo: Thomson Reuters (Healthcare) Inc. Updated periodically.
5. Dilution Guide for High Alert Medications 2011, Pharmaceutical Services Division
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IV INFUSION RATE CALCULATION

If the dose prescribed is not on the table; manual calculation using this formula

$$\textbf{Infusion rate (ml/hr)} = \frac{\textbf{dose (mcg) x body weight (kg) x 60min}}{\textbf{1000mcg}} \times \frac{\textbf{1}}{\textbf{strength}}$$

For example: Patient weight : 70kg. Noradrenaline 0.65mcg/kg/min, what is the rate of infusion?

$$\text{Infusion rate (ml/hr)} = \frac{0.65\text{mcg x 70kg x 60min}}{1000\text{mcg}} \times \frac{1}{0.08\text{mg/ml}}.$$

$$= 34.125 \text{ ml/hr}$$

$$\sim \textbf{34.1ml/hr}$$

GUIDE

IV INFUSION CHART

Example : Patient weight : 70kg. Noradrenaline 0.35mg/kg/min, what is the rate of infusion?

No	MEDICATION DILUTION	INFUSION CHART											
			Body weight (kg)										
		Dose	45	50	55	60	65	70	75	80	85	90	95	100
		mcg/kg/min	Rate (ml/hr)											
1	NORADRENALINE 1mg/ml (4ml amp) Dilution: 4mg (1amp) into final volume 50ml D5% Strength : 0.08mg/ml	0.05	0.8	1.9	2.1	2.3	2.4		2.8	3.0	3.2	3.4	3.6	3.8
		0.1	3.3	3.8	4.1	4.5	4.8		5.6	6.0	6.3	6.8	7.1	7.5
		0.15	5.1	5.6	6.2	6.8	7.3		8.4	9.0	9.6	10.1	10.7	11.3
		0.2	6.7	7.6	8.2	9.0	9.7		11.2	12.0	12.7	13.5	14.2	15.0
		0.25	8.4	9.4	10.3	11.3	12.2		14.1	15.0	15.9	16.9	17.8	18.8
		0.3	10.1	11.4	12.3	13.5	14.6		16.8	18.0	19.1	20.3	21.3	22.5
		0.35						18.4	19.7	21.0	22.3	23.6	24.9	26.3
		0.4	13.50	15.2	16.4	18.0	19.4	21.0	22.4	24.0	25.4	27.0	28.4	30.0
		0.45	15.2	16.9	18.6	20.3	21.9	23.6	25.3	27.0	28.7	30.4	32.1	33.8

Instruction : 1. Find Patient weight (column)
2. Find desired dose (row)
3. Find infusion rate (intersection)

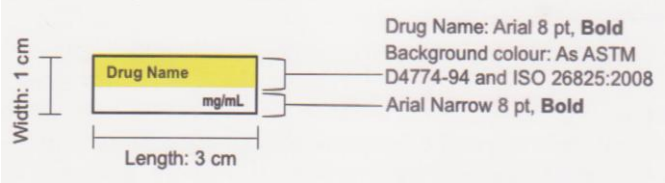
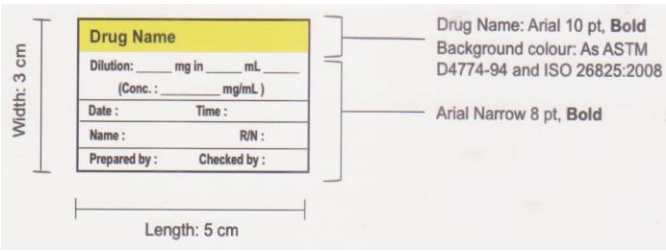
Example : 1. Patient weight = 70kg
2. Desired dose = 0.35mcg/kg/min
3. Infusion rate = 18.4 ml/hr

Medication Reconstitution & Medication Dilution Reference 2013
Pharmacy Department HSAJB

GUIDE

LABEL SPECIFICATIONS

Label to be used according to their respected department/unit:

Department/Unit	Label specifications
Accident & Emergency Operation Theaters	
Units with Critically Ill Patients	

a) **Drug name:** Generic name as in MOH Drug Formulary

b) **Drug Dilution/Concentration:**

Dilution of drug shall be stated clearly by writing the amount of drug in **mg**, amount of diluents in **mL** and type of diluents as shown below:

Example:

Dilution: 1 mg in 250 mL NS
(amount of drug) (amount of diluents) (type of diluents)

Final concentration shall be written as shown as below:

Example:
(Conc.: 60 mcg/mL)
(Check units for respective drug)

Units and symbols for concentration should be as below:

No.	Units	Symbols
i.	Milligram per milliliter	mg/mL
ii.	Microgram per milliliter	mcg/mL
iii.	Units per milliliter	unit/mL

c) **Date & time** of when the drug is prepared

d) **Lettering:**

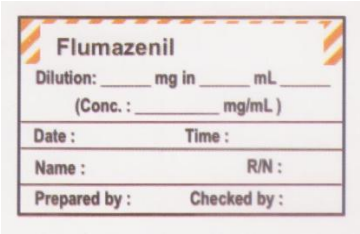
- For drug name:

  - Lettering should be in sentence case written/printed on upper part of label.
  - Background color shall be used for maximum contrast.
  - Tall Man Lettering is used to distinguish look alike, sound alike medications from one another in order to avoid medications errors.
  - Font type: Arial
  - Font size: 10 point, Bold

- For others:
  - Font type: Arial Narrow
  - Font size: 8 point, Bold

e) Special labeling:

To donate a drug of **opposite action** or **antagonists** e.g. Neostigmine and Flumazenil, 1mm wide diagonal stripes of the designated color, alternating with a 1mm wide white stripe is used. The stripes should run from lower left top upper right at approximately 45 degrees. The stripes should be omitted behind the drug name. **Example:**



f) Prepared by and checked by:

Reconstituted medication must be counterchecked by different personnel. Initials of personnel shall be written on the space provided.

g) Size of label:

Recommended size:
- 1 cm (width) x 3 cm (length) for Accident & Emergency unit and Operation Theatre.
- 3 cm (width) x 5 cm (length) for other units with critically ill patients.

h) Type of material:

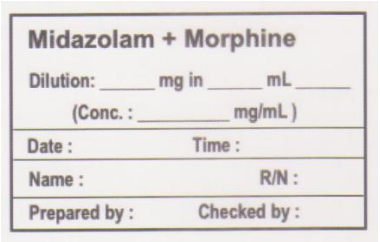
Quality of paper should enable the label to be written clearly.

i) Combination drugs:

Syringe labels for the following combination of the drugs shall be prepared on white background:

i. Midazolam + Morphine
ii. Midazolam + Fentanyl

Example:



LABEL

LABEL

No	MEDICATION DILUTION	INFUSION CHART											
1	NORADRENALINE 1mg/ml (4ml amp) Dilution: 4mg (1amp) into final volume 50ml D5% Strength : 0.08mg/ml		Body weight (kg)										
		Dose	45	50	55	60	65	70	75	80	85	90	95	100
		mcg/kg/min	Rate (ml/hr)											
		0.05	0.8	1.9	2.1	2.3	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8
		0.1	3.3	3.8	4.1	4.5	4.8	5.3	5.6	6.0	6.3	6.8	7.1	7.5
		0.15	5.1	5.6	6.2	6.8	7.3	7.9	8.4	9.0	9.6	10.1	10.7	11.3
		0.2	6.7	7.6	8.2	9.0	9.7	10.5	11.2	12.0	12.7	13.5	14.2	15.0
		0.25	8.4	9.4	10.3	11.3	12.2	13.1	14.1	15.0	15.9	16.9	17.8	18.8
		0.3	10.1	11.4	12.3	13.5	14.6	15.8	16.8	18.0	19.1	20.3	21.3	22.5
		0.35	11.8	13.1	14.4	15.8	17.1	18.4	19.7	21.0	22.3	23.6	24.9	26.3
		0.4	13.50	15.2	16.4	18.0	19.4	21.0	22.4	24.0	25.4	27.0	28.4	30.0
		0.45	15.2	16.9	18.6	20.3	21.9	23.6	25.3	27.0	28.7	30.4	32.1	33.8
		0.5	16.8	18.8	20.6	22.5	24.3	26.3	28.1	30.0	31.8	33.8	35.6	37.5

NORARENALINE 1MG/ML

No	MEDICATION DILUTION	INFUSION CHART

Instruction : 1. Find Patient weight (column)
2. Find desired dose (row)

Example : 1. Patient weight = 70kg
2. Desired dose = 0.25mcg/kg/min

IV INFUSION CHART: ADRENALINE

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Pharmacy Department HSAJB

ADRENALINE 1MG/ML

No	MEDICATION DILUTION	INFUSION CHART	Body weight (kg)										
			100										
		mcg/kg/min	Rate (ml/hr)										
2.	ADRENALINE 1mg/ml (1ml amp) Dilution : 3mg (3 amp) into final volume 50ml NaCL 0.9% Strength : 0.06mg/ml	0.1	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
		0.15	6.8	7.5	8.3	9.0	9.8	10.5	11.3	12.0	12.8	13.5	14.3	15.0
		0.2	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
		0.25	11.3	12.5	13.8	15.0	16.3	17.5	18.8	20.0	21.3	22.5	23.8	25.0
		0.3	13.5	15.0	16.5	18.0	19.5	21.0	22.5	24.0	25.5	27.0	28.5	30.0
		0.35	15.8	17.5	19.3	21.0	22.8	24.5	26.3	28.0	29.8	31.5	33.3	35.0
		0.4	18.0	20.0	22.0	24.0	26.0	28.0	30.0	32.0	25.5	36.0	28.5	40.0
		0.45	20.3	22.5	24.8	27.0	27.0	31.5	33.8	36.0	38.3	40.5	42.3	45.0
		0.5	22.5	25.0	27.5	30.0	32.5	35.0	37.5	40.0	42.5	45.0	47.5	50.0

IV INFUSION CHART: DOPAMINE

Instruction : 1. Find Patient weight (column)
2. Find desired dose (row)
3. Find infusion rate (intersection)

Example : 1. Patient weight = 70kg
2. Desired dose = 0.25mcg/kg/min
3. Infusion rate = 17.5 ml/hr

			Body weight (kg)										
		Dose	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**
		mcg/kg/min	**Rate (ml/hr)**											
3.	DOPAMINE 40mg/ml (5ml amp) Dilution: 400mg (2 amp) into final volume 50ml NaCL 0.9% Strength : 8mg/ml	5	1.7	1.9	2.1	2.3	2.4	2.6	2.8	3.0	3.1	3.4	3.5	3.8
		6	2.0	2.3	2.5	2.7	2.9	3.2	3.4	3.6	3.8	4.1	4.3	4.5
		7	2.4	2.6	2.9	3.1	3.4	3.7	3.9	4.2	4.5	4.7	5.0	5.3
		8	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.0
		9	3.0	3.4	3.7	4.1	4.4	4.7	5.1	5.4	5.7	6.1	6.4	6.8
		10	3.4	3.8	4.2	4.6	4.8	5.2	5.6	6.0	6.2	6.8	7.1	7.5
		11	3.7	4.1	4.5	5.0	5.4	5.8	6.2	6.6	7.0	7.4	7.8	8.3
		12	4.1	4.5	5.0	5.4	5.9	6.3	6.8	7.2	7.7	8.1	8.6	9.0
		13	4.4	4.9	5.4	5.9	6.3	6.8	7.3	7.8	8.3	8.8	9.3	9.8
		14	4.7	5.3	5.8	6.3	6.8	7.4	7.9	8.4	8.9	9.5	10.0	10.5
		15	5.1	5.7	6.3	6.9	7.2	7.8	8.4	9.0	9.3	10.1	10.6	11.3
		16	5.4	6.0	6.6	7.2	7.8	8.4	9.0	9.6	10.2	10.8	11.4	12.0
		17	5.7	6.4	7.0	7.7	8.3	8.9	9.6	10.2	10.8	11.5	12.1	12.8
		18	6.1	6.8	7.4	8.1	8.8	9.5	10.1	10.8	11.5	12.2	12.8	13.5
		19	6.4	7.1	7.8	8.6	9.3	10.0	10.7	11.4	12.1	12.8	13.5	14.3
		20	6.8	7.6	8.4	9.2	9.7	10.4	11.2	12.0	12.4	13.5	14.2	15.0

IV INFUSION CHART: DOBUTAMINE

DOPAMINE 40MG/ML

No	MEDICATION DILUTION	INFUSION CHART

4. DOBUTAMINE 12.5mg/ml (20ml vial)

Dilution : 250mg (1 vial) into final volume 50ml NaCL 0.9%

Strength : 5mg/ml

	Body weight (kg)											
Dose	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**	**100**
mcg/kg/min	**Rate (ml/hr)**											
5	2.7	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.0
6	3.2	3.6	4.0	4.3	4.7	5.0	5.4	5.8	6.1	6.5	6.8	7.2
7	3.8	4.2	4.6	5.0	5.5	5.9	6.3	6.7	7.14	7.6	8.0	8.4
8	4.3	4.8	5.3	5.8	6.2	6.7	7.2	7.7	8.2	8.6	9.1	9.6
9	4.9	5.4	5.9	6.5	7.0	7.6	8.1	8.6	9.2	9.7	10.3	10.8
10	5.4	6.0	6.6	7.2	7.8	8.4	9.0	9.6	10.2	10.8	11.4	12.0
11	5.9	6.6	7.3	7.9	8.6	9.2	9.9	10.6	11.2	11.9	12.5	13.2
12	6.5	7.2	7.9	8.6	9.4	10.1	10.8	11.5	12.2	13.0	13.7	14.4
13	7.0	7.8	8.6	9.4	10.1	10.9	11.7	12.5	13.3	14.0	14.8	15.6
14	7.6	8.4	9.2	10.1	10.9	11.8	12.6	13.4	14.3	15.1	16.0	16.8
15	8.1	9.0	9.9	10.8	11.7	12.6	13.5	14.4	15.3	16.2	17.1	18.0
16	8.6	9.6	10.6	11.5	12.5	13.4	14.4	15.4	16.3	17.3	18.2	19.2
17	9.2	10.2	11.2	12.2	13.3	14.3	15.3	16.3	17.3	18.4	19.4	20.4
18	9.7	10.8	11.9	13.0	14.0	15.1	16.2	17.3	18.4	19.4	20.5	21.6
19	10.3	11.4	12.5	13.7	14.8	16.0	17.1	18.2	19.4	20.5	21.7	22.8
20	10.8	12.0	13.2	14.4	15.6	16.8	18.0	19.2	20.4	21.6	22.8	24.0

Instruction : 1. Find Patient weight (column)
2. Find desired dose (row)
3. Find infusion rate (intersection)

Example : 1. Patient weight = 70kg
2. Desired dose = 10mcg/kg/min
3. Infusion rate = 5.2 ml/hr

DOBUTAMINE 12.5MG/ML

IV DILUTION AND ADMINISTRATION: KETAMINE/MIDAZOLAM

KETAMINE/MIDAZOLAM	
DILUTION (in 50ml syringe)	
50mg ketamine (10mg/ml)	**50mg midazolam (1mg/ml)**
LOADING DOSE	
Give IV bolus of 0.05mg/kg midazolam	
eg: 70kg ~ 3.5ml	eg: 70kg ~ 3.5ml
INFUSION	
Start at 1mcg/kg/min (0.06mg/kg/hr) of midazolam	
eg: 70kg ~ 4ml/h 40mg/h ketamine (0.6mg/kg) *Infusion dose range (70kg)* *0.6 – 3mg/kg/h → 4-20ml/h*	
INCREMENT	
Increase infusion rate 1ml/h every 20minute till target RASS (ie: -2 to +1) achieved	

IV DILUTION AND ADMINISTRATION: MORPHINE/MIDAZOLAM

MORPHINE/MIDAZOLAM	
DILUTION (in 50ml syringe)	
50mg morphine (1mg/ml)	**50mg midazolam (1mg/ml)**
LOADING DOSE	
Give IV bolus of 0.05mg/kg midazolam	
eg: 70kg ~ 3.5ml	eg: 70kg ~ 3.5ml
INFUSION	
Start at 1mcg/kg/min (0.06mg/kg/hr) of midazolam	
eg: 70kg ~ 4ml/h 4mg/h morphine (0.06mg/kg) *Infusion dose range (70kg)* *0.06 – 0.2mg/kg/h → 4-14 ml/h*	
INCREMENT	
Increase infusion rate 1ml/h every 20minute till target RASS (ie: -2 to +1) achieved	

SEDATIVE